

April 21, 2026

VIA ELECTRONIC FILING

Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
1325 "G" Street, N.W., 8th Floor
Washington, D.C. 20005

**Re: Formal Case No. 1179
[Washington Gas – Year 1 Annual Project List]**

Dear Ms. Westbrook-Sedgwick:

Pursuant to Public Service Commission of the District of Columbia ("Commission") Order Nos. 22798 and 22819, Washington Gas Light Company (Company") hereby submits its Year 1 Annual Project List ("Project List") for the modified District SAFE Plan.

This filing includes a Project List for Year 1 (July 01, 2026 – June 30, 2027) as well as Attachment A – the JANA model outputs for the Year 1 Project List, Attachment B – a roadmap showing the location in this filing of each requirements for the Annual Project Lists (contained in Paragraph 168 or Order No. 22798), Attachment C – an explanation of the Year 1 Project List NPA analysis, Attachment D – a description of the NPA cost risk assessment process, and Attachment E – providing information regarding employment opportunities, with contractors and subcontractors affiliated with the Company, for District residents.

Attachment A – the JANA model outputs for the Year 1 Project List is **confidential** and being concurrently herewith filed under separate cover.

The Project List and Attachments A-C are also being provided to the Commission and all parties who have executed the applicable non-disclosure agreement in native format (Excel) on the FC1179 SharePoint that is maintained by the Company.

Please contact the undersigned, should you have any questions about this filing.

Sincerely,

/s/ Deborah Moss

Deborah Moss
Associate General Counsel

cc: Per Certificate of Service

[illegible]

[illegible]

[illegible]

FC 1179 District SAFE Year 1 Project List Crosswalk			
Requested Information	Location Provided		
	Sheet Name	Column Name	Column Letter
Project BCA Number	DC SAFE Project List	BCA	A
Project Name/Location	DC SAFE Project List	Project Name/Location	B
Ward	DC SAFE Project List	Ward	D
Project BCA Status	DC SAFE Project List	BCA Status	C
Feet of Main to be abandoned in the program Year by material type and pipe size	Main Abandonment Sizes	Estimated Year 1 Project Scope (July 1 2026 - June 30 2027)	AU through CL
Total feet of Main to be abandoned in the program Year	Main Abandonment Sizes	Estimated Year 1 Main Abandonment (FT)	CL
Contingent Main to be abandoned in the program Year	Main Abandonment Sizes	Total Contingent	CK
Feet of Main to be installed in the program Year by pipe size	DC SAFE Project List	Estimated Year 1 Project Scope - Main Installation	X through AC
Total estimated Feet of Main to be installed in the program Year	DC SAFE Project List	Estimated Year 1 Main Install (FT)	AC
Total affected Services in the program Year	DC SAFE Project List	Estimated Year 1 Project Scope - Affected Services	AD
Class 3 Cost Estimate for the Program Year	DC SAFE Project List	Estimated Year 1 Spend	AF
Feet of Main to be abandoned for the entire Project by material type and pipe size	Main Abandonment Sizes	Total Project Scope Main Abandonment Footage	C through AT
Total Feet of Main to be abandoned for the entire Project	Main Abandonment Sizes	Total Estimated Main Abandonment	AT
Feet of Main to be installed for the entire Project by pipe size	DC SAFE Project List	Total - Main Installation	J through O
Total estimated Feet of Main to be installed in the entire Project	DC SAFE Project List	Total Estimated Main Installation	O
Total affected Services for the entire Project	DC SAFE Project List	Total Project Scope - Affected Services	P
Class 3 Cost Estimate for the entire Project	DC SAFE Project List	Total Estimated Project Cost	R
Estimated Construction Start Date	DC SAFE Project List	Est. Construction Start Date	AG
Estimated Construction Completion Date	DC SAFE Project List	Est. Construction Complete Date	AH
Estimated Paving Completion Date	DC SAFE Project List	Est. Paving Complete Date	AI
Risk Reduced per Dollar Spent (RRPD) Score	DC SAFE Project List	Project Origination	AJ
Explanation of the need for replacement and any NPAs considered			Attachment C

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Girard St NW	
3 BCA	300975	
4 BCA NAME	DC SAFE - Girard St NW - C006NW3 - Ward 1	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	721	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	2582		1025	
19	COUNT OF SERVICES		63		63

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 888,849	\$ 1,617,476	\$ 2,506,325

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y is there a parallel distribution main?
25	Is Abandonment applicable?	Yes	Yes
26	Comments	Installing a single 2" plastic medium pressure main on Girard St NW allows for the abandonment of 2 low pressure cast iron mains on this street.	

CIPL

27	Main Size	6	
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, can it be replaced with smaller pipe size
			Yes
			If >25# and CI, CI MAOP is only for 25#
31	Number of Connected Services/Customers	63	
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	
			If No Customer(s) will be out of gas for > 1 week.
33	Main Location	Easy to Access Location	
34	Is CIPL Applicable ?	Yes	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	4.04	If MR/10k ratio is >1, Lining is not preferred

35

Comments

CIPB is not viable here as the mitigated risk per 10K is lower than replacing with 2" plastic main.

CISBOT

36 Main Size

6

If Pipe size is <12" CISBOT not applicable

37 Main Material

Cast Iron

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

LP

If LP can it be replaced with smaller pipe size?

39 Main Pressure

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint Can it be sealed internally?

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs

Replacement (See NPA

consideration)

N/A

If MR/10k ratio is >1,
CISBOT is not preferred

CISBOT is not applicable for gas mains under 12" in diameter.

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Cast Iron

50 Length

51 Size

4

52 Existing Pressure

53 New Pressure

54 Number of Services

55 Uprating required?

No

56 Is Replacement Required?

Yes

57 Is Utilizing Existing
Infrastructure Applicable?

No

There are two parallel cast iron low pressure mains on this street. Both mains can be abandoned by installing new 2" medium pressure plastic.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

The NPA analysis concluded that the best option to mitigate the risk associated with the 6" and 4" cast iron low pressure mains is to replace these mains with a single new 2" plastic medium pressure line. This option has the lowest mitigated risk per \$10K of all other alternatives.

64

Comments

Review and Approval:

Engineer	Douglas Pugh	4/1/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																		NPA/ALTERNATIVE - CIPL																		NPA/ALTERNATIVE - CISBOT																	
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																											
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																										
		UNIT COST																																																					
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																										
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																										
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																										
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																										
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																										
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																										
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																										
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																										
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																										
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																										
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																											
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																											
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																											
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																											
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																										
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																										
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																										
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																									

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material - Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	\$ 2,369.65
6	\$ 304.82	\$ 2,399.00
8	\$ 333.50	\$ 2,620.34
10	\$ 356.37	\$ 2,800.03
12	\$ 397.94	\$ 3,126.65
16	\$ 459.69	\$ 3,906.78
20	\$ 513.82	\$ 4,368.82
24	\$ 617.97	\$ 5,114.20

Multiplier of Liner costs 16" = Total Project Cost/Liner costs) 6,275,798

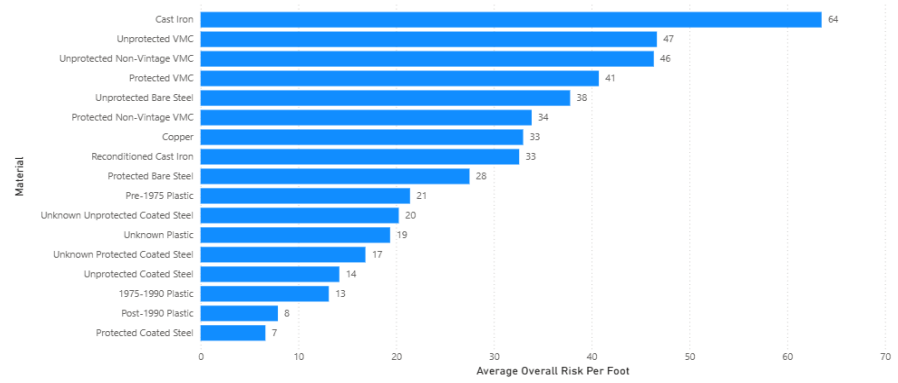
Multiplier of Liner costs 12" and below (Total Project Cost/Liner costs) 7,892,708

Row Labels	Sum of ARP_Charges
71002	1,699,202
DCI UIS, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	18,993
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPPL Lining Costs	134,476
TDW SERVICES INC.	81,198
(blank)	58,467
123380	1,678,165
DCI UIS, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,783
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPPL Lining Costs	355,775
PROGRESSIVE PIPELINE MANAGEMENT	819,859
TDW SERVICES INC.	78,330
(blank)	108,542
235820	1,967,167
DCI UIS, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,951
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TDW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	785
UIS BANK	6,860
(blank)	231,753
254660	3,215,974
DCI UIS, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	61,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	356,921
Grand Total	7,320,487

O:\Shared Folders\Accelerated Recovery Programs\Financial Results\2023 CY112 DEC\Property Accounting\Property Accounting_final\PayItem_DCPPEP_DEC23_Final.xlsx[Pivot (2)

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Q ST NW	
3 BCA	307299	
4 BCA NAME	DC SAFE - Q ST NW - E004NW3 - JANA 23726	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	616	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14 MATERIAL		VARIOUS	VARIOUS	PLASTIC	PLASTIC
15 SIZE		4	VARIOUS	4	VARIOUS
16 PRESSURE		LP	LP	MP	MP
17 CP (Y/N)		No	No	No	No
18 LENGTH		1766		330	
19 COUNT OF SERVICES			5		5

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD		Direct Bury	Direct Bury	
21 JANA ESTIMATED COST				
22 CLASS 3 ESTIMATE		\$ 966,227	\$ 240,164	\$ 1,206,391

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	Yes	
24 Connected Services?	Yes	If Y
		Is there a parallel distribution main?
		Yes
25 Is Abandonment applicable?	Yes	
26 Comments	Per System Planning Analysis - PSIA, some segments can be permanently abandoned without pipe replacement. Other Segments of main that have connecting services and no existing parrallel main, will require newly installed medium pressure main. 5 services connected will be replaced/transferred to new PLA-20# main.	

CIPL

27 Main and Service Size	4	VARIOUS	
28 Main Material	Cast Iron		
29 Main Pipe Condition			
30 Main System Pressure	LP	If LP, can it be replaced with smaller pipe size	
			No
		If >25# and CI, CI MAOP is only for 25#	Yes

31	Number of Connected Services/Customers	5
32	Are the existing customers able to be supplied with temporary gas supply?	Yes

If No
Customer(s) will be out of gas for > 1 week.

33	Main Location	Easy to Access Location
34	Is CIPL Applicable ?	Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	2.9
35	Comments	If Yes If MR/10k ratio is >1, Lining is not preferred <i>Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.</i>

CISBOT

36	Main Size	4	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP, can it be replaced with smaller pipe size
40	Type of Joints	CI JOINTS	If >20# and CI If Mech or Flange Joint, can it be sealed internally
41	Main Location	Easy to Access Location	
42	Is CISBOT Applicable?	No	If Yes
	What is the Estimated Cost?		
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	<i>CISBOT is not applicable for this 4" cast iron main. CISBOT application is only limited to main diameters 12" and greater.</i>	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes
49	Material Type	Various
50	Length	Full length
51	Size	4
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	5
55	Upgrading required?	Yes
56	Is Replacement Required?	Yes
57	Is Utilizing Existing Infrastructure Applicable?	Yes
58	Comments	<i>Segments where there are no existing medium pressure parallel mains will need to be replaced with 4" PLA. All the connected services will be either transferred or replaced to the existing 4" PLA-20# main.</i>

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

64

Comments

Based on the consideration of the above NPA alternatives, the existing main will be Abandoned or replaced with new plastic pipe. All the connected services will be transferred/replaced to the new 20# main.

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																				NPA/ALTERNATIVE - CIPL																				NPA/ALTERNATIVE - CISBOT																			
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																																	
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																																
		UNIT COST																																																											
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" WPP&D 20" - 36")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																															
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																															
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																															
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																															

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

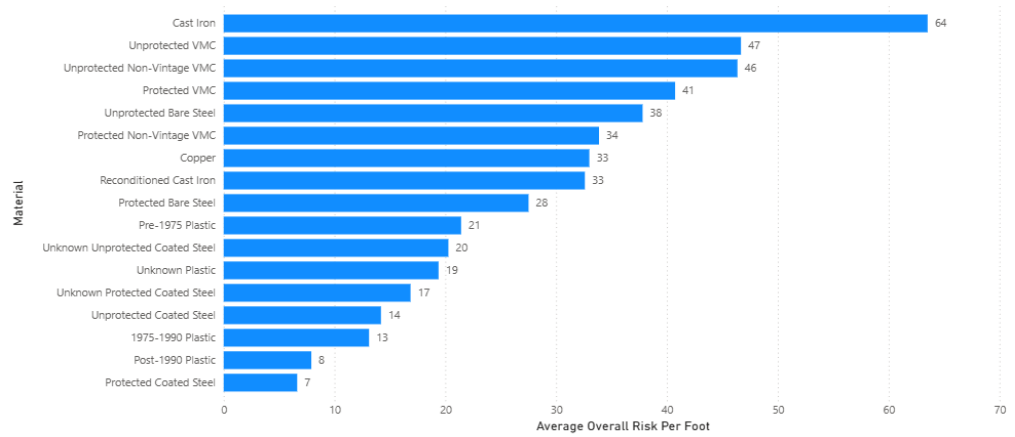
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

O:\Shared Folders\Accelerated Recovery Programs\Financial Results\2023 CY12 DEC\Property Accounting\Property Accounting_Final\PayItem_DCPIPES_DEC23_Final.xlsx[Pivot (2)

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC
2 LOCATION/ADDRESS	Ames St NE
3 BCA	309507
4 BCA NAME	DC - SVC ONLY - Ames St NE - 2025 - Ward 7 - I001NE - Jana 107134
5 BCA TYPE	SERVICE ONLY
6 BCA PROGRAM	APRP
7 JANA BUNDLE (MR/\$)	954 (MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK	
9 JANA SERVIC BUNDLE RISK	

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	MP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Existing Material	Copper	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	Pipe Size	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	System Pressure	MP	MP	MP
17	CP (Y/N)		No		No
18	LENGTH				
19	COUNT OF SERVICES		55		55

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE		\$ 2,554,178	\$ 2,554,178

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	No	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
25	Is Abandonment applicable?	No	No
26	Comments	Service Only Project	

CIPL

27	Main and Service Size	VARIOUS	
28	Main Material	Existing Material	
29	Main Pipe Condition		
30	Main System Pressure	MP	If LP, can it be replaced with smaller pipe size?
			Y/N
			If >25# and CI, CI MAOP is only for 25#
			Y/N
31	Number of Connected Services/Customers	55	
32	Are the existing customers able to be supplied with temporary gas supply?		
			If No Customer(s) will be out of gas for > 1 week.
33	Main Location	Easy to Access Location	

34 Is CIPL Applicable ?	No	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, Lining is not preferred
35	Service Only Project	
Comments		

CISBOT

36 Main Size		If Pipe size is <12" CISBOT not applicable
37 Main Material	Existing Material	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	MP	If LP, can it be replaced with smaller pipe size?
		If >20# and CI
40 Type of Joints		If Mech or Flange Joint, can it be sealed internally?
41 Main Location	Major Roadway	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Service Only Project	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	
49 Material Type	Copper
50 Length	Full length
51 Size	< 2
52 Existing Pressure	MP
53 New Pressure	MP
54 Number of Services	55
55 Uprating required?	No
56 Is Replacement Required?	Yes
57 Is Utilizing Existing Infrastructure Applicable?	Yes
58	Service Only Project. Services can be replaced/transferred to the existing 20# mains
Comments	

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, No existing main will be replaced or abandoned. All affected services will be replaced or transferred to existing 20# mains.
Comments	

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA		NPA/ALTERNATIVE - CIPL																				NPA/ALTERNATIVE - CISBOT							
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24				12		16		20		24	
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			LP	MP	LP	MP	LP	MP	LP	MP
		UNIT COST																													
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36", W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93					0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93					0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

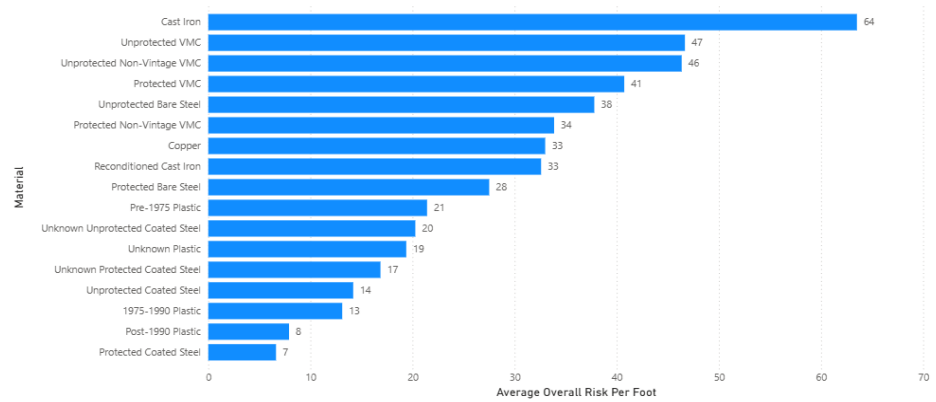
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,095,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Franklin St NE	
3 BCA	309629	
4 BCA NAME	DC - IRVING ST NW - E006NW1 - WARD 1 - JANA BUNDLE 58345	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1125	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Unprotected Wrapped Steel	VARIOUS	PLASTIC	REPLACEMENT MATERIAL
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	Y/N	Y/N
18	LENGTH	1307		1185	
19	COUNT OF SERVICES		88		88

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,724,225	\$ 2,886,650	\$ 4,610,875

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? No
25	Is Abandonment applicable?	No	
26	Comments	Per System Planning Analysis - PSIA, Abandonment is not possible without main installation.	

CIPL

27	Main and Service Size	6	VARIOUS
28	Main Material	Unprotected Wrapped Steel	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, can it be replaced with smaller pipe size? Yes
31	Number of Connected Services/Customers	88	If >25# and CI, CI MAOP is only for 25# Y/N
32	Are the existing customers able to be supplied with temporary gas supply?	No	If No Customer(s) will be out of gas for > 1 week. Yes
33	Main Location	Easy to Access Location	

34 Is CIPL Applicable ?	Yes	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)	4.04	If MR/10k ratio is >1, Lining is not preferred
35	Lining is not preferred for this project as replacement will result in a higher risk reduced per dollar	
Comments		

CISBOT

36 Main Size	6	If Pipe size is <12" CISBOT not applicable
37 Main Material	Unprotected Wrapped Steel	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	LP	If LP, can it be replaced with smaller pipe size?
		If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint, can it be sealed internally
41 Main Location	Easy to Access Location	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	CISBOT is not applicable for this project as material is not cast iron and main diameter is less than 12".	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	No	
49 Material Type		
50 Length		
51 Size	4	
52 Existing Pressure	LP	
53 New Pressure	MP	
54 Number of Services	88	
55 Uprating required?	Yes	
56 Is Replacement Required?	Yes	
57 Is Utilizing Existing Infrastructure Applicable?	No	
58	No existing infrastructure in the vicinity that can be utilized therefore, replacement is required.	
Comments		

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be abandoned and will be replaced with 2"PLA-20#. All affected 87 services will be replaced/Transferred to the new MP main. 1 services will be abandoned.
Comments	

Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA		NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT										
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	SYSTEM FRICTION UNIT COST	N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	LP	MP	LP	MP	LP	MP	LP	MP		
		LP	\$ 1,679	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11	
	4	MP	\$ 1,679	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11	
		LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
		LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.64	2.64	1.14	1.14	1.39	1.39	1.63	1.63	1.99	1.99
	12	MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.64	2.64	1.14	1.14	1.39	1.39	1.63	1.63	1.99	1.99
		LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	2.20	2.20	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	2.20	2.20	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	1.68	1.68	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	1.68	1.68	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

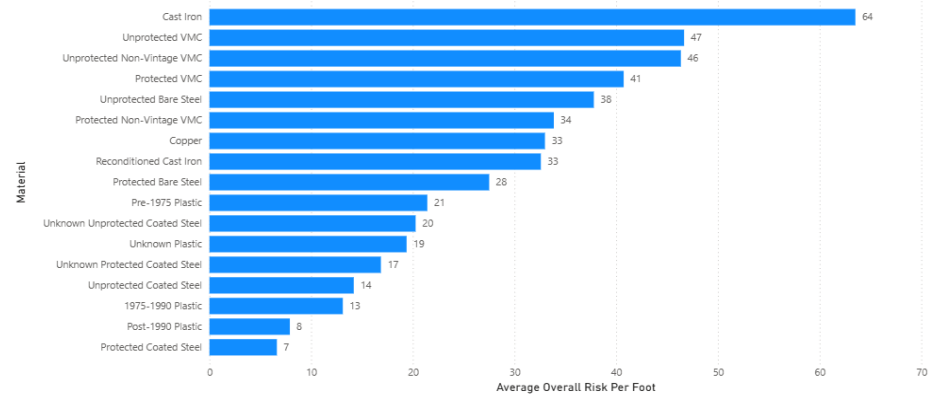
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	3rd St NE	
3 BCA	309640	
4 BCA NAME	DC - 3rd St NE - A005NE2 - WARD 5 - JANA 22934	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1275	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	2242		1786	
19	COUNT OF SERVICES		140		140

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 2,579,099	\$ 4,250,856	\$ 6,829,955

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
25	Is Abandonment applicable?	No	No
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned but require pipe replacement. 2" PLA - 20# Main to be installed in its place. 140 services are to be replaced or transferred to new main. 1 additional service and 1 gas light to be abandoned.	

CIPL

27	Main and Service Size	6	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, can it be replaced with smaller pipe size?	
				Yes
			If >25# and CI, CI MAOP is only for 25#	No

31 Number of Connected
Services/Customers
Are the existing customers able
32 to be supplied with temporary
gas supply?

140
No

If No
Customer(s) will be out of gas for > 1 week.

Yes

33 Main Location
34 Is CIPL Applicable ?

Easy to Access Location
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
4.04 Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35
Comments

CISBOT

36 Main Size
37 Main Material
38 Main Pipe Condition
39 Main Pressure
40 Type of Joints

6
Cast Iron
LP
CI JOINTS

If Pipe size is <12" CISBOT not applicable
If Material is not Cast Iron, CISBOT is not applicable
If LP, can it be replaced with smaller pipe size?
If Mech or Flange Joint, can it be sealed internally?

41 Main Location
42 Is CISBOT Applicable?
What is the Estimated Cost?

Easy to Access Location
No

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43
Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?
49 Material Type
50 Length
51 Size
52 Existing Pressure
53 New Pressure
54 Number of Services
55 Upgrading required?
56 Is Replacement Required?
57 Is Utilizing Existing Infrastructure
Applicable?

No
WRPD
Full Length
8
MP
3
No
No
Yes

New main is to be installed at a lack of existing parallel infrastructure.

58
Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision
63 Calculated RR/\$

Direct Bury

64

Comments

Based on the consideration of the above NPA alternatives, the existing mains will be replaced. 140 of the connected services will be replaced or transferred to new 2" PLA - 20# mains. The final service is to be abandoned as well as a gas light.

Review and Approval:

Engineer	Andrés del Campo	4/1/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT															
	REPLACE MENT MAIN SIZE	EXISTING SYSTEM SIZE	UNIT COST	2		4		6		8		10		12		16		20		24		12		16		20		24																					
				LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																				
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,396	\$ 2,396	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,068	\$ 3,068	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.68	3.68	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.68	5.68	5.83	5.83	7.11	7.11																				
		MP	\$ 1,079	N/A	N/A	3.68	3.68	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.68	5.68	5.83	5.83	7.11	7.11																				
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																				
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																				
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																				
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																				
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																				
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																				

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

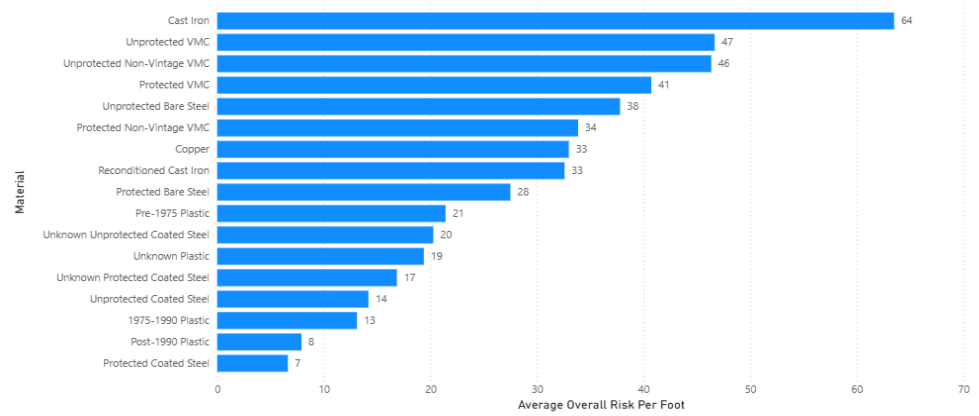
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Penn ST NE	
3 BCA	309641	
4 BCA NAME	DC APRP 4 - PENN ST NE - D003NE3 - WARD 5 - JANA 52925	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	906	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	Y/N	Y/N
18	LENGTH	1061		765	
19	COUNT OF SERVICES		47	0	45

ESTIMATED COST

	MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21 JANA ESTIMATED COST			
22 CLASS 3 ESTIMATE	\$ 1,154,913	\$ 1,420,570	\$ 2,575,483

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	Yes	
24 Connected Services?	Yes	If Y
		Is there a parallel distribution main?
		No
25 Is Abandonment applicable?	Yes	
26 Comments	Per System Planning Analysis - PSIA, some segments can be permanently abandoned without pipe replacement. Other Segments of main that has connecting services will require newly installed medium pressure main. 45 services connected will be transferred/replaced to new 2" PLA-20# main.	

CIPL

27 Main and Service Size	6	VARIOUS	
28 Main Material	Cast Iron		
29 Main Pipe Condition			
30 Main System Pressure	LP	If LP, Canit be replaced with smaller pipe size	
			Yes
		If >25# and CI, CI MAOP is only for 25#	No
31 Number of Connected Services/Customers	45		
32 Are the existing customers able to be supplied with temporary gas supply?	Yes		
		If No	

Customer(s) will be out of gas for > 1 week.

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33 Main Location	Major Roadway	
34 Is CIPL Applicable ?	Yes	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)	4.04	If MR/10k ratio is >1, Lining is not preferred
35	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar.	
Comments		

36 Main Size	6	If Pipe size is <12" CISBOT not applicable
37 Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	LP	If LP, Can it be replaced with smaller pipe size? If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint, can it be sealed internally?
41 Main Location	Major Roadway	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	CISBOT is not applicable for this 6" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	No	
49 Material Type	Cast Iron	
50 Length	Full length	
51 Size	6	
52 Existing Pressure	LP	
53 New Pressure	MP	
54 Number of Services	47	
55 Uprating required?	Yes	
56 Is Replacement Required?	Yes	
57 Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Segments where there are no existing parrallel mains will need to be replaced with 2" PLA. All the connected services will be eithernterfered or replaced to new 2" PLA 20# main.	
Comments		

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be Abandoned or replaced with new plastic pipe. All the connected services will be transferred to the new 20# main.
Comments	

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA		NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT										
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	SYSTEM FRICTION UNIT COST	N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	LP	MP	LP	MP	LP	MP	LP	MP		
		LP	\$ 1,679	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11	
	4	MP	\$ 1,679	N/A	N/A	3.88	3.88	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.97	4.97	5.68	5.68	5.83	5.83	7.11	7.11	
		LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
		LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.64	2.64	1.14	1.14	1.39	1.39	1.63	1.63	1.99	1.99
	12	MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.64	2.64	1.14	1.14	1.39	1.39	1.63	1.63	1.99	1.99
		LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	2.00	2.00	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
		LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23		
	20	MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23		
		LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

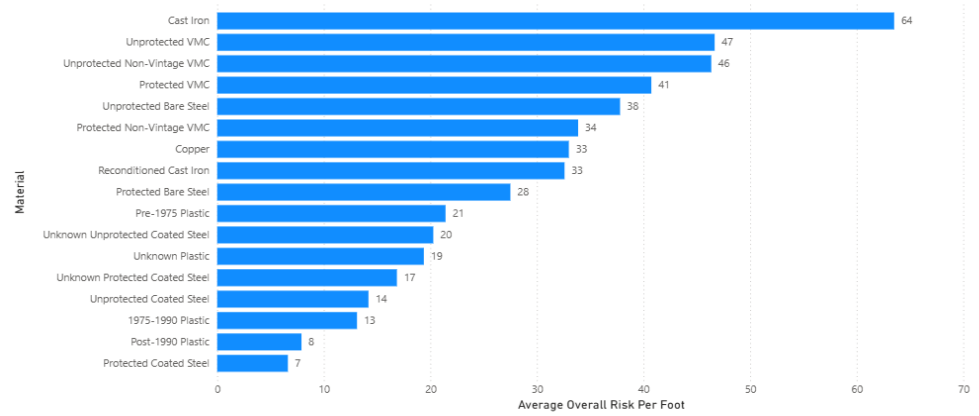
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Irvington St SW	
3 BCA	310556	
4 BCA NAME	DC SAFE - Irvington St SW - Ward 8	
5 BCA TYPE	SERVICE ONLY	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	644	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

EXISTING		PROPOSED	
14 MATERIAL	MAIN	SERVICE	MAIN
15 SIZE	VARIOUS		PLASTIC
16 PRESSURE	VARIOUS		VARIOUS
17 CP (Y/N)	LP		MP
18 LENGTH	No	No	No
19 COUNT OF SERVICES		23	23

ESTIMATED COST

	MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD		Direct Bury	
21 JANA ESTIMATED COST			
22 CLASS 3 ESTIMATE		\$ 1,168,914	\$ 1,168,914

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	No	
24 Connected Services?	Yes	If Y
		Is there a parallel distribution main?
		Yes
25 Is Abandonment applicable?	Yes	
26 Comments	Two affected services on this project are stubs and are therefore eligible for abandonment.	

CIPL

27 Main Size		
28 Main Material		
29 Main Pipe Condition		
30 Main System Pressure		If LP, can it be replaced with smaller pipe size?
		If >25# and CI, CI MAOP is only for 25#
31 Number of Connected Services/Customers		
32 Are the existing customers able to be supplied with temporary gas supply?		
		If No Customer(s) will be out of gas for > 1 week.
33 Main Location	Easy to Access Location	
34 Is CIPL Applicable ?	No	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)	N/A	If MR/10k ratio is >1, Lining is not preferred
35 Comments	Lining is not applicable here, as this is a service only project.	

CISBOT

36 Main Size		If Pipe size is <12" CISBOT not applicable
37 Main Material		If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure		If LP, can it be replaced with smaller pipe size?
40 Type of Joints		If >20# and CI If Mech or Flange Joint, can it be sealed internally?
41 Main Location	Easy to Access Location	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost? MR/10K ratio Lining vs Replacement (See NPA consideration)	N/A	If MR/10k ratio is >1, CISBOT is not preferred
43 Comments	CISBOT is not applicable for gas services.	

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	Yes
49 Material Type	
50 Length	
51 Size	
52 Existing Pressure	MP
53 New Pressure	
54 Number of Services	
55 Uprating required?	No
56 Is Replacement Required?	Yes
57 Is Utilizing Existing Infrastructure Applicable?	Yes
58 Comments	There are several services that will be replaced to a parallel medium pressure main. This will help to decrease load on the low pressure system and allow for future abandonment of low pressure mains.

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64 Comments	The NPA analysis concluded that the best option to mitigate the risk associated with the 23 wrapped steel and copper services is to replace them with new plastic services. This option has the lowest mitigated risk per \$10K of all other alternatives.

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																				NPA/ALTERNATIVE - CIPL																				NPA/ALTERNATIVE - CISBOT																			
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																																	
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																																
		UNIT COST																																																											
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																															
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																															
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																															
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																															

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

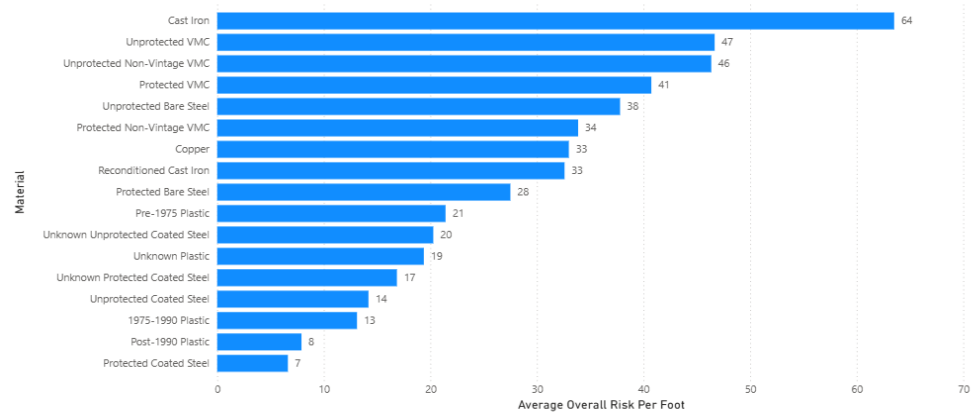
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Ridgecrest Ct SE	
3 BCA	310560	
4 BCA NAME	DC SAFE - Ridgecrest Ct SE - D005SE - Ward 8	
5 BCA TYPE	SERVICE ONLY	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1067	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	MP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14 MATERIAL		Unprotected Wrapped Steel			PLASTIC
15 SIZE		Pipe Size	VARIOUS	Pipe Size	VARIOUS
16 PRESSURE			MP		MP
17 CP (Y/N)			No		
18 LENGTH		0		0	
19 COUNT OF SERVICES			21	0	17

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD			Direct Bury	
21 JANA ESTIMATED COST				
22 CLASS 3 ESTIMATE		\$ -	\$ 1,042,137	\$ 1,042,137

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	No	
24 Connected Services?	Yes	If Y
		Is there a parallel distribution main?
25 Is Abandonment applicable?	No	
26 Comments	Service Only Project	

CIPL

27 Main and Service Size		
28 Main Material	Existing Material	
29 Main Pipe Condition		
30 Main System Pressure	MP	If LP, can it be replaced with smaller pipe size?
		Y/N
		If >25# and CI, CI MAOP is only for 25#
		Y/N
31 Number of Connected Services/Customers	17	

32 Are the existing customers able to be supplied with temporary gas supply?

--

Yes

If No
Customer(s) will be out of gas for > 1 week.

Y/N

33 Main Location

Easy to Access Location

34 Is CIPL Applicable ?

No

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

--

If MR/10k ratio is >1,
Lining is not preferred

Service Only Project

35

Comments

--

CISBOT

36 Main Size

--

If Pipe size is <12" CISBOT not applicable

37 Main Material

Existing Material

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

--

39 Main Pressure

MP

If LP, can it be replaced with smaller pipe size?

If >20# and CI

40 Type of Joints

--

If Mech or Flange Joint, can it be sealed internally?

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

--

MR/10K ratio Lining vs Replacement
(See NPA consideration)

--

If MR/10k ratio is >1,
CISBOT is not preferred

Service Only Project

43

Comments

--

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?

Y/N

49 Material Type

WRPD-STL

50 Length

Full Length

51 Size

< 2

52 Existing Pressure

MP

53 New Pressure

MP

54 Number of Services

16

55 Upgrading required?

No

56 Is Replacement Required?

Yes

57 Is Utilizing Existing Infrastructure Applicable?

Yes

Service Only Project. Services can be replaced/transferred to the existing 20# mains

58

Comments

--

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

--

64

Comments

Based on the consideration of the above NPA alternatives, No existing main will be replaced or abandoned. All affected services will be replaced or transferred to existing 20# mains.

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																				NPA/ALTERNATIVE - CIPL																				NPA/ALTERNATIVE - CISBOT																			
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 34")	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																																	
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																																
		UNIT COST																																																											
	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.94	4.94	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.94	4.94	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																																
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																																
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																																
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																																
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																																	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																																
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																																
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																																
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																																

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized. No candidates for inclusion on the District SAFE Year 1 list met the criteria for site specific cost estimation of the alternatives.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for CISBOT. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CISBOT, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4 5	276.14	#####
6 5	304.82	#####
8 5	333.50	#####
10 5	356.37	#####
12 5	397.94	#####
16 5	459.09	#####
20 5	515.82	#####
24 5	617.07	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

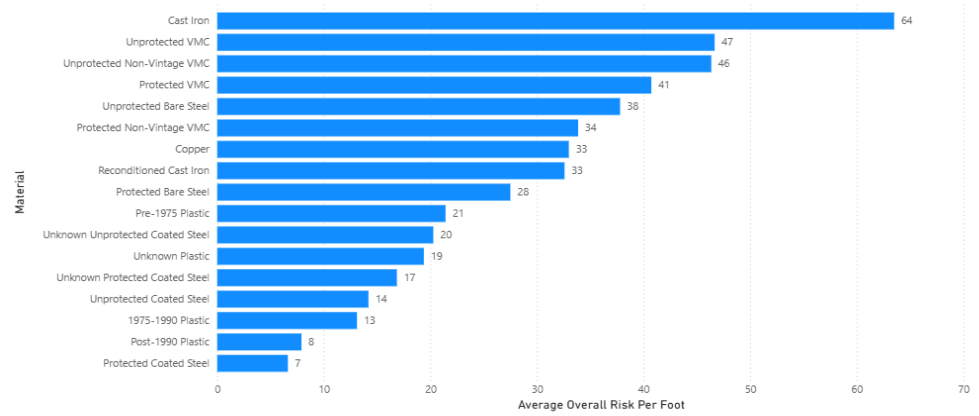
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Ceiling (12"/Joint)	\$/Ft Joint Ceiling	Joint Ceiling Unit Cost (Ceiling + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	I St SW	
3 BCA	310564	
4 BCA NAME	DC APRP 3 - I St SW - Ward 6	
5 BCA TYPE	SERVICE ONLY	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	3441	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK	82704.84	

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL		VARIOUS		PLASTIC
15	SIZE	Pipe Size	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	0		0	
19	COUNT OF SERVICES		23		22

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD		Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ -	\$ 1,053,755	\$ 1,053,755

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	No	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			No
25	Is Abandonment applicable?	No	
26	Comments	This project is a service only job and as such does not have a PSIA. Abandonment is not applicable.	

CIPL

27	Main and Service Size	Pipe Size	
28	Main Material	VARIOUS	
29	Main Pipe Condition		
30	Main System Pressure	MP	If LP, can it be replaced with smaller pipe size?

31	Number of Connected Services/Customers	23	If >25# and CI, CI MAOP is only for 25#	Yes
32	Are the existing customers able to be supplied with temporary gas supply?			

			If No Customer(s) will be out of gas for > 1 week.	
--	--	--	---	--

33	Main Location	Major Roadway	
34	Is CIPL Applicable ?	No	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, Lining is not preferred
35	Comments	Lining is not applicable due to this project being a service only job.	

CISBOT

36	Main Size	Pipe Size	If Pipe size is <12" CISBOT not applicable
37	Main Material	VARIOUS	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	MP	If LP, can it be replaced with smaller pipe size?
40	Type of Joints	CI JOINTS	If >20# and CI If Mech or Flange Joint, can it be sealed internally?
41	Main Location	Major Roadway	
42	Is CISBOT Applicable?	No	If Yes
	What is the Estimated Cost?		
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not applicable due to this project being a service only job.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	No
49	Material Type	Various
50	Length	Full length
51	Size	6
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	23
55	Upgrading required?	No
56	Is Replacement Required?	
57	Is Utilizing Existing Infrastructure Applicable?	Yes

58

Comments

18 affected services are to be replaced with newer services onto the same existing 20# mains. 4 affected services are to be replaced and uprated onto parallel existing 20# mains. 1 service to be abandoned.

OVERALL COMMENTS:

62 Risk Mitigation Decision

63 Calculated RR/\$

Direct Bury

64

Comments

Based on the consideration of the above NPA alternatives, 18 affected services are to be replaced with newer services onto the same existing 20# mains. 4 affected services are to be replaced and uprated onto parallel existing 20# mains. 1 service to be abandoned.

Review and Approval:

Engineer	Andrés del Campo	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT															
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																					
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																				
		UNIT COST																																															
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																				
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																				
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																				
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																				
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																			
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																			
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																			
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																			

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

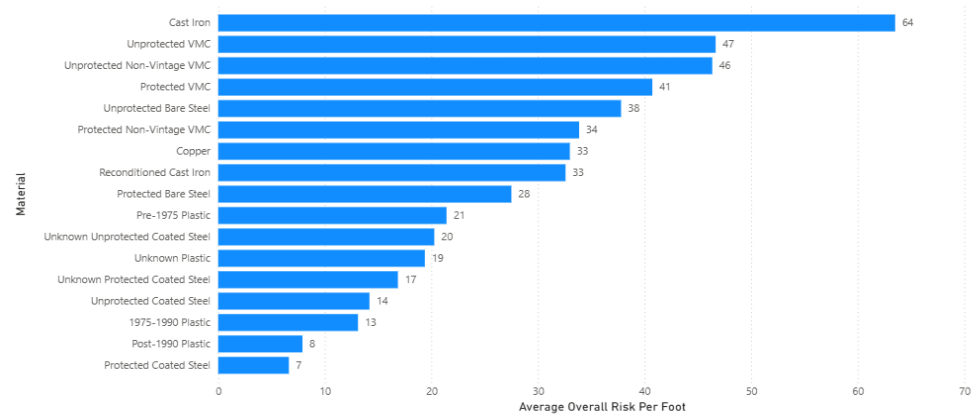
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Michigan Ave NE	
3 BCA	311615	
4 BCA NAME	DC APRP 4 - Michigan Ave NE - B007NE - Ward 5	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1026	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	Yes
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS		PLASTIC
15	SIZE	12	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	5386		0	
19	COUNT OF SERVICES		39		35

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,205,358	\$ 1,376,723	\$ 2,582,081

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
25	Is Abandonment applicable?	Yes	Yes
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 36 services connected will be replaced/transferred to an existing parallel or same MP main. Remaining 2 services are to be abandoned.	

CIPL

27	Main and Service Size	12	1-1/4
28	Main Material	VARIOUS	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, can it be replaced with smaller pipe size
			Yes
			No

If >25# and CI,
CI MAOP is only for 25#

31	Number of Connected Services/Customers	39
32	Are the existing customers able to be supplied with temporary gas supply?	Yes

If No
Customer(s) will be out of gas for > 1 week.

Y/N

33	Main Location	Major Roadway
34	Is CIPL Applicable ?	Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	1.18
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

If Yes

If MR/10k ratio is >1,
Lining is not preferred

CISBOT

36	Main Size	12	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP, can it be replaced with smaller pipe size
40	Type of Joints	Mechanical Joint	If >20# and CI If Mech or Flange Joint, can it be sealed internally
41	Main Location	Major Roadway	
42	Is CISBOT Applicable?	Yes	If Yes
	What is the Estimated Cost?	\$ 3,079,944.00	
	MR/10K ratio Lining vs Replacement (See NPA consideration)	1.08	If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not preferred for this project as joint sealing would be more expensive and eliminate less risk than main abandonment.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes	
49	Material Type	Various	
50	Length	Full Length	
51	Size	Various	
52	Existing Pressure	LP	
53	New Pressure	MP	
54	Number of Services	35	
55	Uprating required?	No	
56	Is Replacement Required?	No	
57	Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Comments	There are segments of 20# mains of various different sizes and materials within the vicinity of services connected to the targeted LP Mains of various different sizes and materials. Services can be replaced/transferred to these mains to allow for abandonment of the LP mains.	

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

64

Comments

Based on the consideration of the above NPA alternatives, the existing mains will be abandoned. 36 of the connected services will be replaced or transferred to existing 20# mains of various different sizes and materials. The remaining 2 services are to be abandoned.

Review and Approval:

Engineer	Andrés del Campo	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT															
	REPLACE MENT MAIN SIZE	EXISTING SYSTEM SIZE	NPA UNIT COST	2		4		6		8		10		12		16		20		24		12		16		20		24																					
				LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																				
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,396	\$ 2,396	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,068	\$ 3,068	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/95% 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.68	3.68	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.68	5.68	5.83	5.83	7.11	7.11																				
		MP	\$ 1,079	N/A	N/A	3.68	3.68	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.68	5.68	5.83	5.83	7.11	7.11																				
	4	LP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
		MP	\$ 1,360	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																			
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																			
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																				
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																				
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																				
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																				
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																				
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																				
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																				
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																				

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

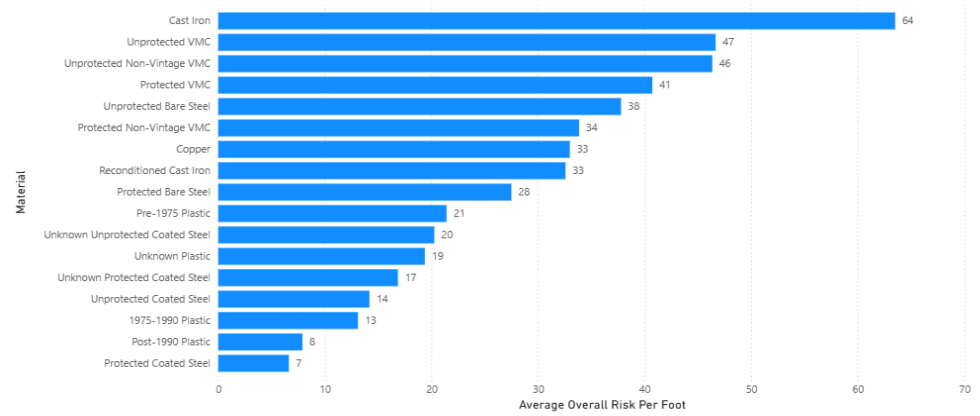
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Linear Unit Cost (Total Project)
4	\$ 276.14	\$ 2,169.65
6	\$ 304.82	\$ 2,395.00
8	\$ 333.50	\$ 2,620.34
10	\$ 356.37	\$ 2,800.53
12	\$ 397.94	\$ 3,126.65
16	\$ 459.99	\$ 3,806.78
20	\$ 515.82	\$ 4,268.82
24	\$ 617.97	\$ 5,114.30

Multiplier of Linear costs 36" (Total Project Cost/Linear costs) 8.2735

Multiplier of Linear costs 12" and below (Total Project Cost/Line 7.65708

Row Labels	Sum of ARP_Charges
	71002
	1,659,202
DCI URS, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	18,993
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134476
TOW SERVICES INC.	61,196
(blank)	58,467
	123380
	1,678,165
DCI URS, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,530
(blank)	108,542
	235920
	1,367,147
DCI URS, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,951
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,219,974
DCI URS, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,456
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	356,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	E Capitol St SE	
3 BCA	311622	
4 BCA NAME	DC SAFE - E Capitol St SE - E001SE1 - WARD 7	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1100	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS		PLASTIC
15	SIZE	6	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	LP	LP		MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1288			
19	COUNT OF SERVICES		7		7

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandonment	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,025,337	\$ 468,413	\$ 1,493,750

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned. 7 connected services will be replaced/transferred to an existing parallel MP main	

CIPL

27	Main and Service Size	6	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, can it be replaced with smaller pipe size	Yes
			If >25# and CI, CI MAOP is only for 25#	Yes
31	Number of Connected Services/Customers	7		
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	If No Customer(s) will be out of gas for > 1 week.	No
33	Main Location	Easy to Access Location		
34	Is CIPL Applicable ?	Yes	If Yes	

MR/10K ratio Lining vs Replacement
(See NPA consideration)

4.04

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as abandonment would result in a higher risk reduced per dollar than lining.

35

Comments

CISBOT

36 Main Size

6

If Pipe size is <12" CISBOT not applicable

37 Main Material

Cast Iron

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

39 Main Pressure

LP

If LP, can it be replaced with smaller pipe size

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint can it be sealed internally/

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 6" gas main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Plastic

50 Length

51 Size

6

52 Existing Pressure

LP

53 New Pressure

MP

54 Number of Services

7

55 Uprating required?

No

56 Is Replacement Required?

Yes

57 Is Utilizing Existing Infrastructure
Applicable?

Yes

There is a 6" medium pressure main within the vicinity of services connected to the targeted 6" CI LP Main. Services can be replaced/transferred to these mains to allow for abandonment of the 6" LP main.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

The NPA analysis concluded that existing services could be replaced/transferred to existing 6" Plastic medium pressure main in order to facilitate the abandonment of 1,288 feet of 6" CI low pressure main.

64

Comments

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA/ALTERNATIVE - CIPL																NPA/ALTERNATIVE - CISBOT															
	REPLACE MENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24																					
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																				
		UNIT COST																																															
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 36" W/PSD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																				
		MP	\$ 1,079	N/A	N/A	3.88	3.88	4.84	4.84	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.87	4.87	5.88	5.88	5.83	5.83	7.11	7.11																				
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																				
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																				
	10	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																				
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.58	1.58	1.63	1.63	1.99	1.99																				
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.16	1.16	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																					
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																					
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																			
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																			
	24	LP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																			
		MP	\$ 8,285	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																			

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury w/ Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

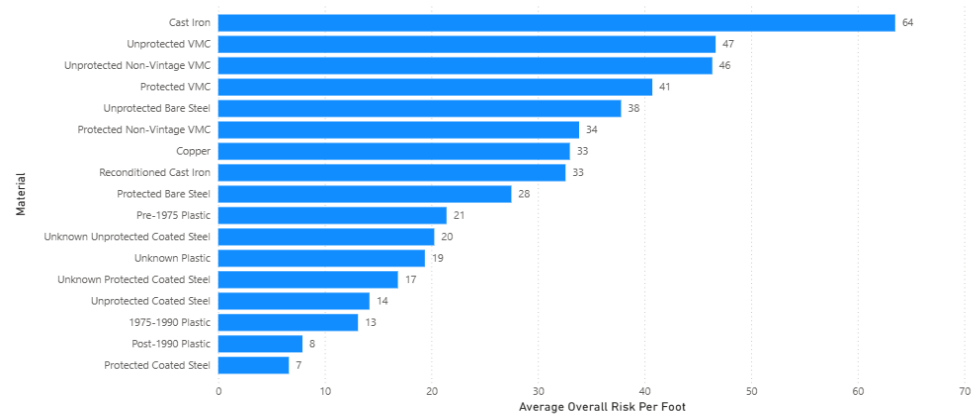
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 18" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	21st St NW	
3 BCA	311630	
4 BCA NAME	DC SAFE - 21ST NW - F003NW4 - WARD 2	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1306	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	REPLACEMENT MATERIAL	REPLACEMENT MATERIAL
15	SIZE	6	VARIOUS	Pipe Size	SERVICE SIZE
16	PRESSURE	LP	LP	System Pressure	MP
17	CP (Y/N)	No	No		
18	LENGTH	1200			
19	COUNT OF SERVICES		4		4

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandonment	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 592,265	\$ 248,065	\$ 840,330

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without main pipe replacement. 4 services connected will be replaced/transferred to an existing parallel MP main	

CIPL

27	Main and Service Size	6	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP,	
			Can it be replaced with Smaller Pipe Size?	Yes
			If >25# and CI,	
			CI MAOP is only for 25#	Y/N

31	Number of Connected Services/Customers	4
32	Are the existing customers able to be supplied with temporary gas supply?	Yes

If No
Customer(s) will be out of gas for > 1 week.

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33	Main Location	Major Roadway
34	Is CIPL Applicable ?	Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
1.52 Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35
Comments

CISBOT

36	Main Size	6
37	Main Material	Cast Iron
38	Main Pipe Condition	
39	Main Pressure	LP

If Pipe size is <12" CISBOT not applicable

If Material is not Cast Iron, CISBOT is not applicable

If LP can it be replaced with a smaller pipe size?

If >20# and CI

40	Type of Joints	CI JOINTS
41	Main Location	Major Roadway
42	Is CISBOT Applicable?	No

If Mech or Flange Joint can it be sealed internally?

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not preferred

CISBOT is not applicable for this 6" and 4" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43
Comments

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes
49	Material Type	Various
50	Length	Full length
51	Size	6
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	4
55	Uprating required?	No
56	Is Replacement Required?	No
57	Is Utilizing Existing Infrastructure Applicable?	Yes

There is a segment of 2" PLA-20# main within the vicinity of services connected to the targeted 6" and 4" CI LP Main. Services can be replaced/transferred to the 2" PLA-20# to allow for abandonment of the 6" and 4" CI LP main.

58
Comments

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

64

Comments

Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 2" PLA-20# main.

Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

			NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT												
			EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24				
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837				
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11				
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64				
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64				
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67			
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67			
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67			
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67			
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99				
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59			
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59			
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	0.93	0.93
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	0.93	0.93	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

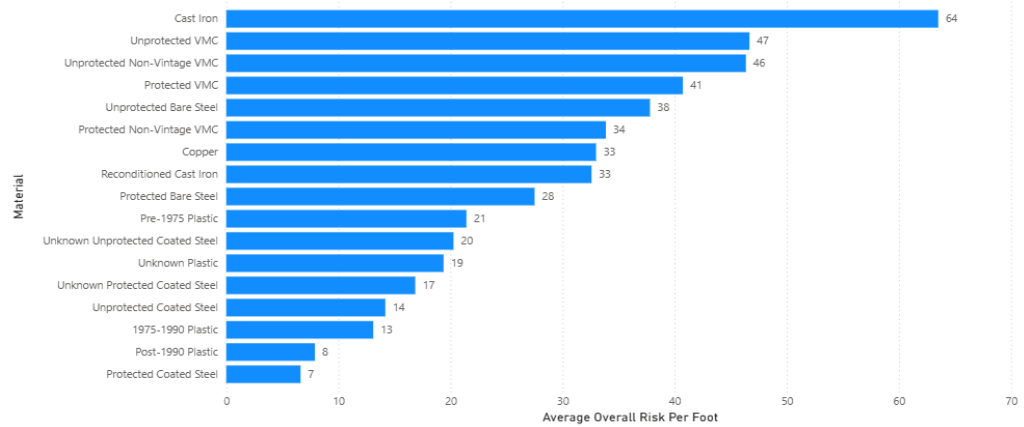
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,095,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	108,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134,478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Connecticut Ave NW	
3 BCA	311642	
4 BCA NAME	DC APRP 4 - Connecticut Ave NW - J011NW - Ward 3	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1975	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	Yes
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14 MATERIAL		VARIOUS	VARIOUS	REPLACEMENT MATERIAL	PLASTIC
15 SIZE		8	2		2
16 PRESSURE		LP	LP		MP
17 CP (Y/N)		No	No		No
18 LENGTH		2953			
19 COUNT OF SERVICES			3		3

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD		Abandonment	Direct Bury	
21 JANA ESTIMATED COST				
22 CLASS 3 ESTIMATE		\$ 1,178,229	\$ 137,102	\$ 1,315,330

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	Yes	
24 Connected Services?	Yes	If Y
		Is there a parallel distribution main?
		Yes
25 Is Abandonment applicable?	Yes	
26 Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 3 services connected will be replaced/transferred to an existing parallel MP main	

CIPL

27 Main and Service Size	8	2
28 Main Material	VARIOUS	
29 Main Pipe Condition		
30 Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?
		Yes
		If >25# and CI, CI MAOP is only for 25#
		No
31 Number of Connected Services/Customers	3	

Are the existing customers able
32 to be supplied with temporary
gas supply?

Yes

If No
Customer(s) will be out of gas for > 1 week.

--

33 Main Location

34 Is CIPL Applicable ?

Major Roadway
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

1.66

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35

Comments

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CISBOT

36 Main Size

8

If Pipe size is <12" CISBOT not applicable

37 Main Material

Cast Iron

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

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39 Main Pressure

LP

If LP can it be replaced with a smaller pipe size?

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint can it be sealed internally?

41 Main Location

Major Roadway

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

--

MR/10K ratio Lining vs Replacement
(See NPA consideration)

--

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

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OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

WRPD

50 Length

Full Length

51 Size

8

52 Existing Pressure

MP

53 New Pressure

--

54 Number of Services

3

55 Uprating required?

No

56 Is Replacement Required?

No

57 Is Utilizing Existing
Infrastructure Applicable?

Yes

There are segments of 8" 20# mains within the vicinity of services connected to the targeted 8" CI LP Main. Services can be replaced/transferred to these mains to allow for abandonment of the 8" CI LP main.

58

Comments

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OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

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64

Comments

Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 8"WRPD 20# mains.

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Review and Approval:

Engineer	Andrés del Campo	3/30/2026
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System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT								
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	0.83	0.83
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

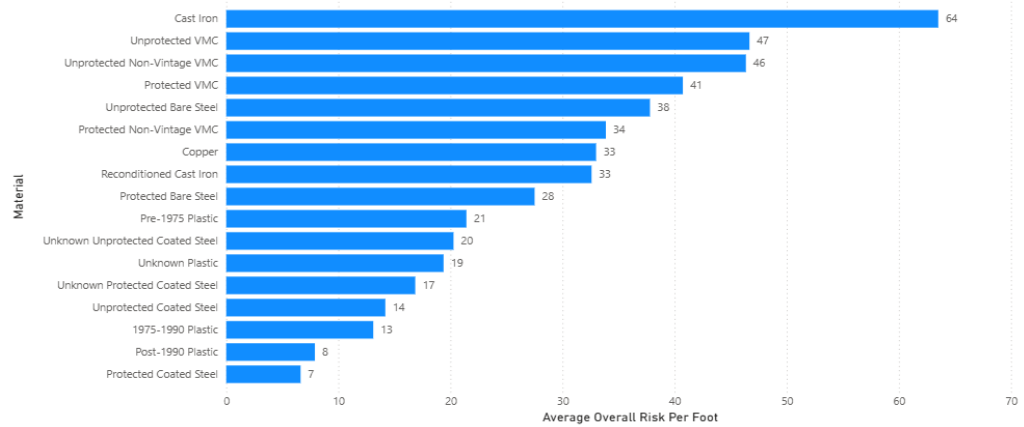
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Douglas St NE	
3 BCA	311959	
4 BCA NAME	DC APRP 4 - Douglas St NE - B006NE - Ward 5 - PLUG FEEDER 14009	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1932	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	PLASTIC	PLASTIC
15	SIZE	8	VARIOUS	2	3/4
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	3999		2565	
19	COUNT OF SERVICES		103		103

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 3,297,262	\$ 2,668,748	\$ 5,966,010

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? No
25	Is Abandonment applicable?	No	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned but require pipe replacement. 2" PLA - 20# Main to be installed in its place. All 103 services are to be replaced or transferred to new main.	

CIPL

27	Main and Service Size	8	VARIOUS	
28	Main Material	VARIOUS		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?	Yes
			If >25# and CI, CI MAOP is only for 25#	No
31	Number of Connected Services/Customers	103		
32	Are the existing customers able to be supplied with temporary gas supply?	No	If No Customer(s) will be out of gas for > 1 week.	Yes

33 Main Location	Easy to Access Location	
34 Is CIPL Applicable ?	Yes	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, 4.42 Lining is not preferred
35	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.	
Comments		

CISBOT

36 Main Size	8	If Pipe size is <12" CISBOT not applicable
37 Main Material	VARIOUS	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	LP	If LP can it be replaced with a smaller pipe size? If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint can it be sealed internally?
41 Main Location	Easy to Access Location	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	No	
49 Material Type	WRPD	
50 Length	Full Length	
51 Size	8	
52 Existing Pressure	MP	
53 New Pressure		
54 Number of Services	103	
55 Uprating required?	No	
56 Is Replacement Required?	Yes	
57 Is Utilizing Existing Infrastructure Applicable?	No	
58	New main is to be installed at a lack of existing parallel infrastructure.	
Comments		

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be replaced. All the connected services will be replaced or transferred to new 2" PLA - 20# mains.
Comments	

Review and Approval:

Engineer	Andrés del Campo	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP		
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837		
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23		
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99		
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

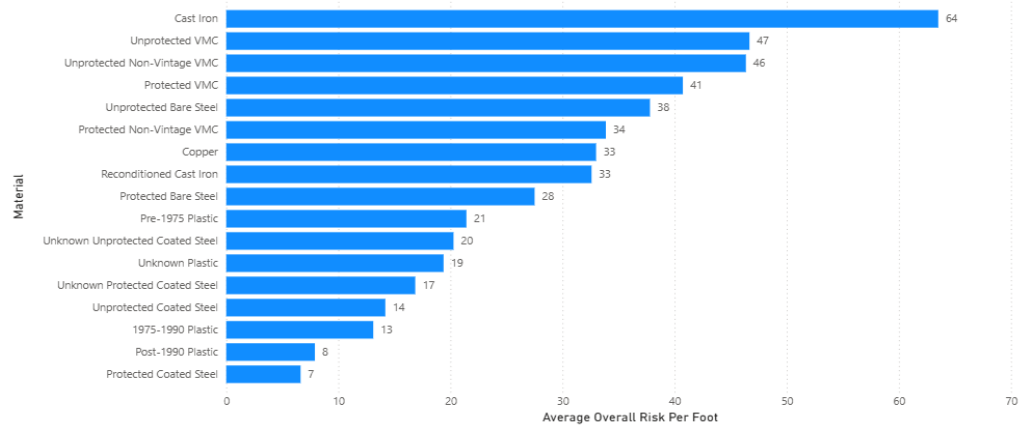
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,095,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Franklin St NE	
3 BCA	311963	
4 BCA NAME	DC SAFE - Franklin St NE - B006NE - Ward 5	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1280	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	PLASTIC	REPLACEMENT MATERIAL
15	SIZE	4	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	2682		2790	
19	COUNT OF SERVICES		144		142

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 3,171,852	\$ 3,382,314	\$ 6,554,166

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			No
25	Is Abandonment applicable?	No	
26	Comments	Per System Planning Analysis - PSIA, Abandonment is not possible with out main installation.	

CIPL

27	Main and Service Size	4	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?	Yes
			If >25# and CI, CI MAOP is only for 25#	Y/N

31	Number of Connected Services/Customers	142
32	Are the existing customers able to be supplied with temporary gas supply?	No

If No
Customer(s) will be out of gas for > 1 week.

Yes

33	Main Location	Easy to Access Location
34	Is CIPL Applicable ?	Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	3.66

If Yes

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

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Comments

CISBOT

36	Main Size	4
37	Main Material	Cast Iron
38	Main Pipe Condition	
39	Main Pressure	LP

If Pipe size is <12" CISBOT not applicable

If Material is not Cast Iron, CISBOT is not applicable

If LP can be replaced with a smaller pipe size?
If >20# and CI

40	Type of Joints	CI JOINTS
41	Main Location	Easy to Access Location
42	Is CISBOT Applicable?	No
	What is the Estimated Cost?	

If Mech or Flange Joint can it be sealed internally?

If Yes

If MR/10k ratio is >1,
CISBOT is not preferred

CISBOT is not applicable for this 4" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

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Comments

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	No
49	Material Type	Various
50	Length	Full length
51	Size	4
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	144
55	Uprating required?	No
56	Is Replacement Required?	Yes
57	Is Utilizing Existing Infrastructure Applicable?	No

No existing infrastructure in the vicinity that can be utilized therefore, replacement is required.

58
Comments

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

Based on the consideration of the above NPA alternatives, the existing main will be abandoned and will be replaced with 2"PLA-20#. All affected 142 services will be replaced/Transferred to the new MP main. Two services will be abandoned.

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Comments

Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT										
	REPLACEMENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
		SYSTEM PRESSURE	RE	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
		UNIT COST		N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

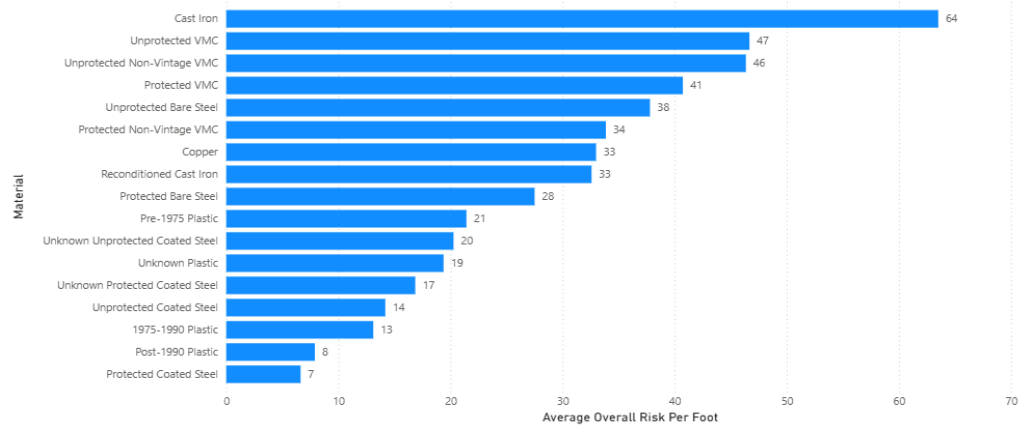
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Bunker Hill Rd NE	
3 BCA	312029	
4 BCA NAME	DC SAFE - Bunker Hill Rd NE - E008NE - WARD 5	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	817	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	PLASTIC	PLASTIC
15	SIZE	8	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	19566		15547	
19	COUNT OF SERVICES		427		427

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE			\$35,333,451.00

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	No	
26	Comments	Per System Planning Analysis - PSIA, all targeted main segments can be permanently abandoned, allowing that 2" medium pressure main is installed to feed all existing cutomers.	

CIPL

27	Main and Service Size	8	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes	
			If >25# and CI, CI MAOP is only for 25# Yes	
31	Number of Connected Services/Customers	427		
32	Are the existing customers able to be supplied with temporary gas supply?	No	If No Customer(s) will be out of gas for > 1 week. Yes	
33	Main Location	Easy to Access Location		
34	Is CIPL Applicable ?	Yes	If Yes	

MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, Lining is not preferred
35	4.42	<i>Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.</i>
Comments		

CISBOT

36 Main Size	8	If Pipe size is <12" CISBOT not applicable
37 Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	LP	If LP can it be replaced with a smaller pipe size? If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint can it be sealed internally?
41 Main Location	Easy to Access Location	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)	N/A	If MR/10k ratio is >1, CISBOT is not preferred
43	<i>CISBOT is not applicable for mains less than 12" in diameter.</i>	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	Yes	
49 Material Type	Plastic	
50 Length		
51 Size	4	
52 Existing Pressure	LP	
53 New Pressure	MP	
54 Number of Services	15	
55 Uprating required?	No	
56 Is Replacement Required?	Yes	
57 Is Utilizing Existing Infrastructure Applicable?	Yes	
58	<i>There is a 4" medium pressure main un Bunker Hill Rd NE. Services that are currently attached to the low pressure main on Bunker Hill Rd NE can be transferred to the medium pressure main.</i>	
Comments		

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury	
63 Calculated RR/\$		
64	<i>The NPA analysis concluded that the best option to mitigate the risk associated with the gas mains on Bunker Hill Rd NE and associated side streets is to abandon the targeted cast iron low pressure mains and install new 2" plastic medium pressure main to feed existing customers. This approach has the highest mitigated risk per \$10K score of all available options.</i>	
Comments		

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT								
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP		
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,360	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,360	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59				
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59				
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23		
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23		
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99		
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99		
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	0.83	0.83			
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	0.83	0.83			

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

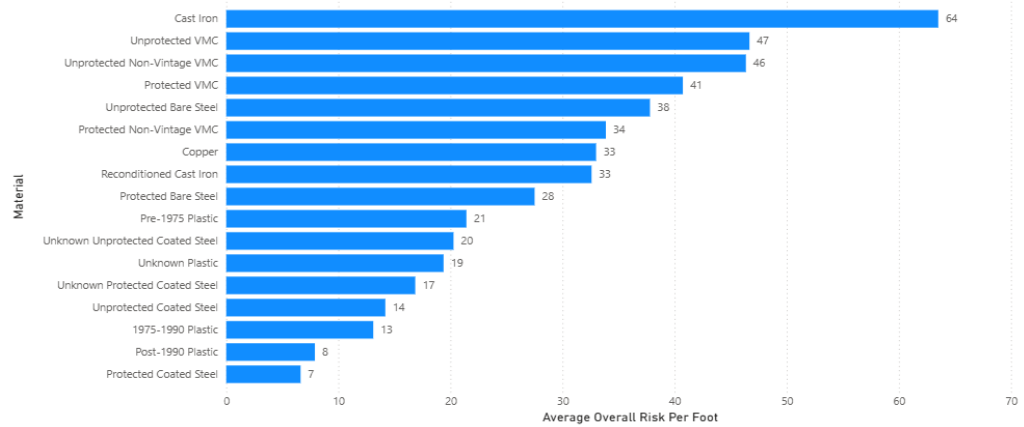
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Glenbrook Rd NW	
3 BCA	312065	
4 BCA NAME	DC SAFE - Glenbrook Rd NW	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1670	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1604		1550	
19	COUNT OF SERVICES		15		15

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$1,546,767	\$486,645	\$2,033,412

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	If Y Is there a parallel distribution main?	No
24	Connected Services?	Yes		
25	Is Abandonment applicable?	No		
26	Comments	No parallel main is available to transfer affected services. System planning recommends installing new medium pressure main.		

CIPL

27	Main and Service Size	6	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?	Yes
			If >25# and CI, CI MAOP is only for 25#	Yes

- 31 Number of Connected Services/Customers
Are the existing customers able to be supplied with temporary gas supply?

15
No

If No
Customer(s) will be out of gas for > 1 week.

Yes

- 33 Main Location
34 Is CIPL Applicable ?

Easy to Access Location
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

- 35
Comments

CISBOT

- 36 Main Size
37 Main Material
38 Main Pipe Condition
39 Main Pressure

6
Material
LP

If Pipe size is <12" CISBOT not applicable
If Material is not Cast Iron, CISBOT is not applicable
If LP, can it be replaced with a smaller pipe size?
If >20# and CI

- 40 Type of Joints
41 Main Location
42 Is CISBOT Applicable?
What is the Estimated Cost?

CI JOINTS
Easy to Access Location
No

If Mech or Flange Joint can it be sealed internally?

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not preferred

CISBOT is not applicable for this 6" gas main. CISBOT application is only limited to main diameters 12" and greater.

- 43
Comments

OTHER NPA - Utilize Existing Infrastructure

- 48 Any Parallel main within the Scope?
49 Material Type
50 Length
51 Size
52 Existing Pressure
53 New Pressure
54 Number of Services
55 Upgrading required?
56 Is Replacement Required?
57 Is Utilizing Existing Infrastructure Applicable?

No
No
Yes
No

No parallel main is available to transfer affected services. System planning recommends installing new medium pressure main.

- 58
Comments

OVERALL COMMENTS:

- 62 Risk Mitigation Decision
63 Calculated RR/\$

Direct Bury

64

Comments

The NPA analysis concluded that the best option to mitigate the associated risk for the targeted 6" CI low pressure main is to replace it with new 2" PLA medium pressure. This option has the highest available mitigated risk per \$10K.

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT										
	REPLACEMENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
		SYSTEM PRESSURE	RE	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
		UNIT COST		N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

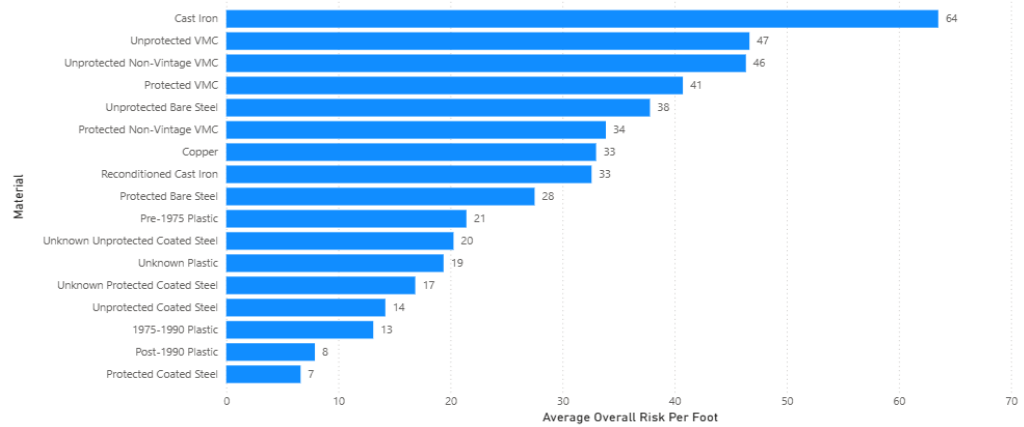
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
DCI US, LLC	1,059,202
FERGUSON INTEGRATED SERVICES	32,420
FORT MYER CONSTRUCTION CORPORATION	9,067
MILLER PIPELINE CORP	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134,478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
DCI US, LLC	1,676,165
FERGUSON INTEGRATED SERVICES	207,680
FORT MYER CONSTRUCTION CORPORATION	19,793
MILLER PIPELINE CORP	52,777
MULCARE PIPELINE SOLUTIONS	26,132
NORTHERN PIPELINE CONSTRUCTION INC	23,399
PROGRESSIVE PIPELINE MANAGEMENT	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	106,542
	235920
DCI US, LLC	1,367,147
FERGUSON INTEGRATED SERVICES	12,409
FORT MYER CONSTRUCTION CORPORATION	37,961
INFRA SOURCE CONSTRUCTION, LLC	67,335
MILLER PIPELINE CORP	659,521
NORTHERN PIPELINE CONSTRUCTION INC	2,533
PROGRESSIVE PIPELINE MANAGEMENT	2,832
TOW SERVICES INC.	148,875
TEAM INDUSTRIAL SERVICES, INC.	197,304
US BANK	795
(blank)	5,850
	231,753
	254660
DCI US, LLC	3,215,974
FERGUSON INTEGRATED SERVICES	2,468,471
FORT MYER CONSTRUCTION CORPORATION	51,666
MILLER PIPELINE CORP	61,790
MULCARE PIPELINE SOLUTIONS	9,455
NORTHERN PIPELINE CONSTRUCTION INC	26,078
PROGRESSIVE PIPELINE MANAGEMENT	8,518
(blank)	233,075
	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	14th St NW	
3 BCA	312067	
4 BCA NAME	DC SAFE - 14th St NW - D003NW4 - Ward 2	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	829	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	12	VARIOUS	4	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1890		320	
19	COUNT OF SERVICES		3		3

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,272,900	\$ 157,520	\$ 1,430,420

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, the majority of targeted main segments can be permanently abandoned without pipe replacement. Approximately 320 of 4" medium pressure install is required in order to maintain service to affected customers.	

CIPL

27	Main Size	12	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes	
			If >25# and CI, CI MAOP is only for 25# Yes	
31	Number of Connected Services/Customers	3		
32	Are the existing customers able to be supplied with temporary gas supply?	No	If No Customer(s) will be out of gas for > 1 week. Yes	
33	Main Location	Easy to Access Location		

34 Is CIPL Applicable ?
MR/10K ratio Lining vs
Replacement (See NPA
consideration)

Yes	If Yes
	If MR/10k ratio is >1, 4.18 Lining is not preferred
Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.	

35

Comments

CISBOT

36 Main Size
37 Main Material
38 Main Pipe Condition
39 Main Pressure

40 Type of Joints
41 Main Location
42 Is CISBOT Applicable?
What is the Estimated Cost?
MR/10K ratio Lining vs
Replacement (See NPA
consideration)

12	If Pipe size is <12" CISBOT not applicable
Material	If Material is not Cast Iron, CISBOT is not applicable
LP	If LP can it be replaced with a smaller pipe size? If >20# and CI
CI JOINTS	If Mech or Flange Joint can it be sealed internally?
Easy to Access Location	
Yes	If Yes
	If MR/10k ratio is >1, 3.23 CISBOT is not preferred
CISBOT could be applicable for this gas main, but the MR/10K score is less than the option involving installing 4" medium pressure.	

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?
49 Material Type
50 Length
51 Size
52 Existing Pressure
53 New Pressure
54 Number of Services
55 Uprating required?
56 Is Replacement Required?
57 Is Utilizing Existing
Infrastructure Applicable?

Yes
Plastic
4
LP
MP
1
No
Yes
Yes

There is a 4" medium pressure main within the vicinity of a service connected to a segment of targeted 8" WRPD LP Main. This service can be replaced to this main to allow for abandonment of the 8" WRPD LP main.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision
63 Calculated RR/\$

Direct Bury
The NPA analysis concluded that 1,890 feet of targeted low pressure main could be abandoned while only requiring 320 feet of medium pressure main installation. This had the highest mitigated risk per \$10K of all available options.

64

Comments

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT										
	REPLACEMENT MAIN SIZE	EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
		SYSTEM PRESSURE	RE	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	
		UNIT COST		N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11	
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64	
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

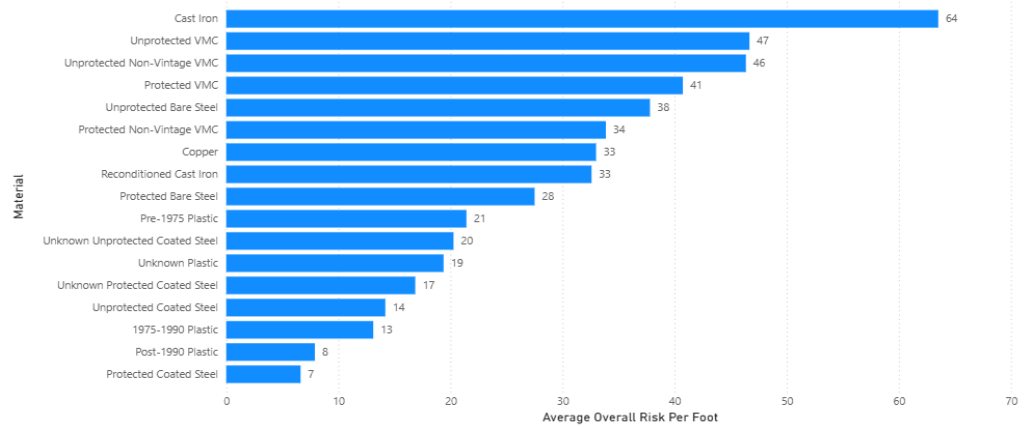
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	16th St NW	
3 BCA	312068	
4 BCA NAME	DC SAFE - 16th St NW - D005NW - Ward 1	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	838	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	2776		240	
19	COUNT OF SERVICES		18		16

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,524,122	\$ 493,363	\$ 2,017,485

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, some segments can be permanently abandoned without pipe replacement. Other Segments of main that have connecting services and no existing parallel main, will require newly installed medium pressure main. 16 services connected will be replaced/transferred to new or existing PLA-MP main.	

CIPL

27	Main Size	6	VARIOUS
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?
			Yes

		If >25# and CI, CI MAOP is only for 25#	No
31	Number of Connected Services/Customers	18	
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	

		If No Customer(s) will be out of gas for > 1 week.	
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33	Main Location	Easy to Access Location	
34	Is CIPL Applicable ?	Yes	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	4.04	If MR/10k ratio is >1, Lining is not preferred
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining. CIPL is not applicable for this main as there are several connected services to it with no parrallel main.	

CISBOT

36	Main Size	6	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP can it be replaced with a smaller pipe size?
			If >20# and CI
40	Type of Joints	CI JOINTS	If Mech or Flange Joint can it be sealed internally?
41	Main Location	Easy to Access Location	
42	Is CISBOT Applicable?	No	If Yes
	What is the Estimated Cost?		
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not applicable for this 6" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes	
49	Material Type	Cast Iron	
50	Length	Full Length	
51	Size	6	
52	Existing Pressure	LP	
53	New Pressure	MP	
54	Number of Services	16	
55	Uprating required?	No	
56	Is Replacement Required?	Yes	
57	Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Comments	There are segments of 2" PLA & 8" WRPD 20# mains within the vicinity of services connected to the targeted 6" CI LP Main. Segments where there are no existing parrallel mains will need to be replaced with 2" PLA. All the connected services will be either uprated and transferred or replaced with new plastic	

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be Abandoned or replaced with new plastic pipe. All the connected services will be replaced or transferred to the new or exististing parallel 20# main.
Comments	

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

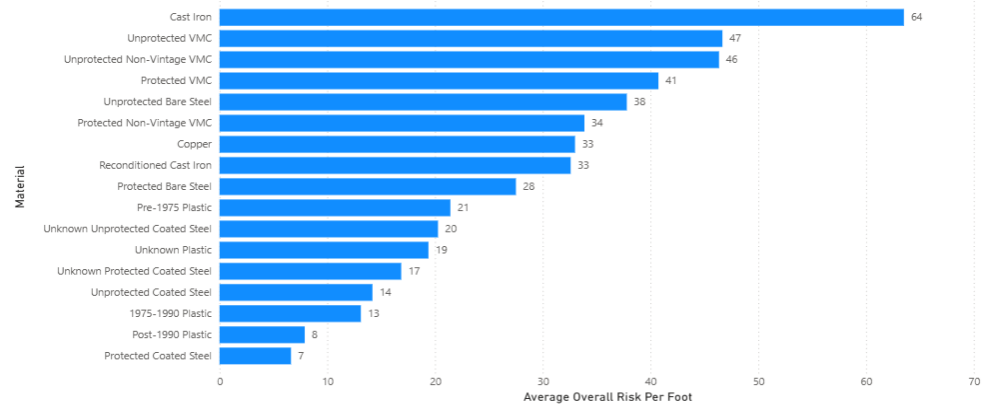
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (Sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Columbia Rd NW	
3 BCA	312345	
4 BCA NAME	DC SAFE - Columbia Rd NW - E005NW1 - Ward 1	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1059	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	REPLACEMENT MATERIAL	REPLACEMENT MATERIAL
15	SIZE	4	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	LP	LP		System Pressure
17	CP (Y/N)	No	No		No
18	LENGTH	1648			
19	COUNT OF SERVICES		7		7

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandonment	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,005,152	\$ 242,368	\$ 1,247,520

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 7 services connected will be replaced/transferred to an existing parallel MP main	

CIPL

27	Main Size	4	VARIOUS
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes
			If >25# and CI, CI MAOP is only for 25# Yes
31	Number of Connected Services/Customers	7	

Are the existing customers able
32 to be supplied with temporary
gas supply?

Yes

If No
Customer(s) will be out of gas for > 1 week.

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33 Main Location

34 Is CIPL Applicable ?

Easy to Access Location
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

2.9

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35

Comments

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CISBOT

36 Main Size

4

If Pipe size is <12" CISBOT not applicable

37 Main Material

Material

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

--

39 Main Pressure

LP

If LP

Can it be replaced with Smaller Pipe Size

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint

Can it be sealed internally?

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

--

MR/10K ratio Lining vs Replacement
(See NPA consideration)

--

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 4" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

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OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Various

50 Length

Full length

51 Size

8

52 Existing Pressure

LP

53 New Pressure

MP

54 Number of Services

7

55 Upgrading required?

No

56 Is Replacement Required?

No

57 Is Utilizing Existing

Infrastructure Applicable?

Yes

There is a segments of 8" 20# main within the vicinity of services connected to the targeted 4" CI LP Main. Services can be replaced/transferred to these mains to allow for abandonment of the 4" CI LP, 4" WRPD, 6" WRPD and 8" WRPD main.

58

Comments

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OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

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Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 8" WRPD 20# main.

64

Comments

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Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

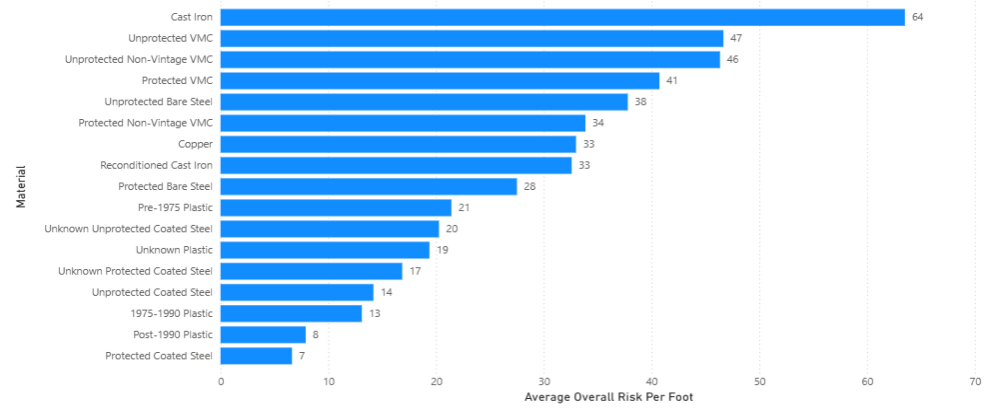
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	49th St	
3 BCA	312398	
4 BCA NAME	DC SAFE - 49th St NW - M008NW - WARD 3	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1705	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	REPLACEMENT MATERIAL	REPLACEMENT MATERIAL
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1089		1145	
19	COUNT OF SERVICES		21		21

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,880,680	\$ 671,903	\$ 2,552,583

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			No
25	Is Abandonment applicable?	No	
26	Comments	Per System Planning Analysis - PSIA Abandonment without a replacement is not possible because no parallel main in the vicinity.	

CIPL

27	Main Size	6	VARIOUS
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?
			Yes
			If >25# and CI, CI MAOP is only for 25#
			Yes
31	Number of Connected Services/Customers	21	

Are the existing customers able
32 to be supplied with temporary
gas supply?

No

If No
Customer(s) will be out of gas for > 1 week.

Yes

33 Main Location

34 Is CIPL Applicable ?

Easy to Access Location
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

4.04

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35

Comments

CISBOT

36 Main Size

6

If Pipe size is <12" CISBOT not applicable

37 Main Material

Material

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

--

39 Main Pressure

System Pressure

If LP can it be replaced with a smaller pipe size?

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint can it be sealed internally?

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs Replacement
(See NPA consideration)

--

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 6" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

No

49 Material Type

Various

50 Length

Full length

51 Size

Pipe Size

52 Existing Pressure

LP

53 New Pressure

MP

54 Number of Services

21

55 Upgrading required?

No

56 Is Replacement Required?

Yes

57 Is Utilizing Existing
Infrastructure Applicable?

No

Based on the NPA analysis this project requires replacement with a smaller size plastic 20# and services will be replaced and transferred. No parallel main in the vicinity to be utilized.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

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64

Comments

Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 6", 8", & 12" WRPD 20# mains.

Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)

Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA																NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT															
		EXISTING MAIN SIZE				2		4		6		8		10		12		16		20		24		12		16		20		24																			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																		
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.40	2.40	2.90	2.90			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.99	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

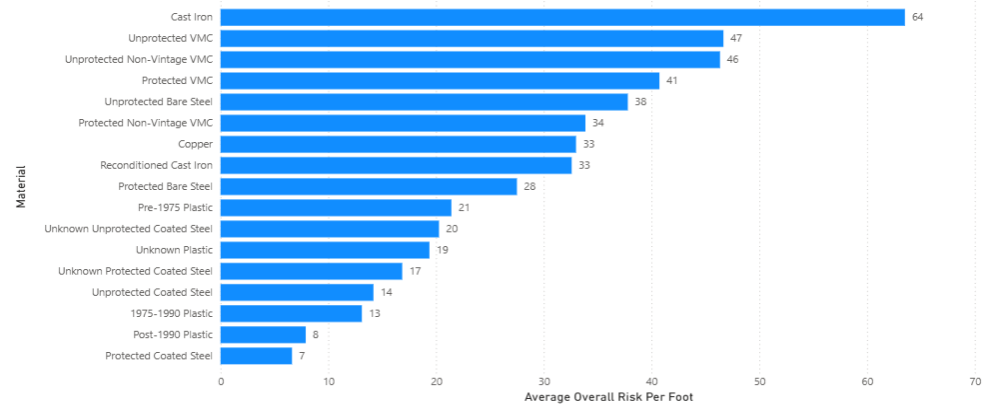
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	108,542
	235920
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Foxboro Pl NW	
3 BCA	312586	
4 BCA NAME	DC APRP - SVC ONLY - FOXBORO PL NW - WARD 3	
5 BCA TYPE	SERVICE ONLY	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	855	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	MP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14 MATERIAL		VARIOUS	VARIOUS		PLASTIC
15 SIZE		6	VARIOUS	Pipe Size	VARIOUS
16 PRESSURE		MP	MP	MP	MP
17 CP (Y/N)		No	No	No	No
18 LENGTH		0		0	
19 COUNT OF SERVICES			29		28

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD		Direct Bury	Direct Bury	
21 JANA ESTIMATED COST				
22 CLASS 3 ESTIMATE		\$ -	\$ 1,389,184	\$ 1,389,184

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	No	If Y Is there a parallel distribution main?	No
24 Connected Services?	Yes		
25 Is Abandonment applicable?	No		
<i>This project is a service replacement only project and as such does not have a PSIA and abandonment is not applicable.</i>			
26 Comments			

CIPL

27 Main and Service Size	Pipe Size	1-1/4	
28 Main Material	VARIOUS		
29 Main Pipe Condition			
30 Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? If >25# and CI, CI MAOP is only for 25#	No

31	Number of Connected Services/Customers	29
32	Are the existing customers able to be supplied with temporary gas supply?	No

If No
Customer(s) will be out of gas for > 1 week.

33	Main Location	Easy to Access Location
34	Is CIPL Applicable ?	No

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
Lining is not preferred

Lining is not applicable, no main will be affected during this project.

35
Comments

CISBOT

36	Main Size	Pipe Size
37	Main Material	Cast Iron
38	Main Pipe Condition	
39	Main Pressure	LP

If Pipe size is <12" CISBOT not applicable

If Material is not Cast Iron, CISBOT is not applicable

If LP can't be replaced with a smaller pipe size?

If >20# and CI

40	Type of Joints	Mechanical Joint
41	Main Location	Easy to Access Location
42	Is CISBOT Applicable?	No

If Mech or Flange Joint can it be sealed internally?

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not preferred

CISBOT is not applicable, no main will be affected during this project.

43
Comments

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	No
49	Material Type	WRPD
50	Length	Full Length
51	Size	Pipe Size
52	Existing Pressure	MP
53	New Pressure	MP
54	Number of Services	29
55	Upgrading required?	No
56	Is Replacement Required?	Yes
57	Is Utilizing Existing Infrastructure Applicable?	No

One service will be abandoned. The rest are to be replaced with newer plastic services. All replacements are MP-MP.

58
Comments

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

Based on the consideration of the above NPA alternatives, the services will be replaced with newer plastic services onto the same main they are already attached to (MP-MP replacement). One service to be abandoned.

64
Comments

Review and Approval:

Engineer	Andrés del Campo	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT															
		EXISTING MAIN SIZE				2		4		6		8		10		12		16		20		24		12		16		20		24																			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																		
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.40	2.40	2.90	2.90			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

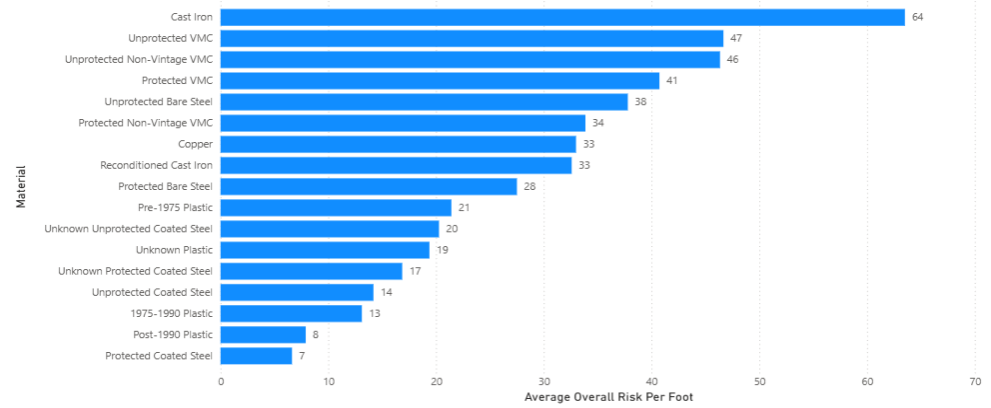
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" - (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,455
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Alabama Ave SE	
3 BCA	312604	
4 BCA NAME	DC APRP - SVC ONLY - ALABAMA AVE SE	
5 BCA TYPE	SERVICE ONLY	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1849	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	No
11 SERVICE ONLY ?	Yes
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	MP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL		VARIOUS		PLASTIC
15	SIZE	Pipe Size	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	MP	MP		MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	0		0	
19	COUNT OF SERVICES		9		9

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD		Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ -	\$ 335,927	\$ 335,927

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	No	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			No
25	Is Abandonment applicable?	No	
26	Comments	This project is a service only job and as such does not have a PSIA. Abandonment is not applicable.	

CIPL

27	Main and Service Size	Pipe Size	VARIOUS
28	Main Material	VARIOUS	
29	Main Pipe Condition		
30	Main System Pressure	MP	If LP, Can it be replaced with Smaller Pipe Size?
			No

31	Number of Connected Services/Customers	9	If >25# and CI, CI MAOP is only for 25#	Yes
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	If No Customer(s) will be out of gas for > 1 week.	

33	Main Location	Major Roadway	
34	Is CIPL Applicable ?	No	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, Lining is not preferred
35	Comments	<i>Lining is not applicable due to this project being a service only job.</i>	

CISBOT

36	Main Size	Pipe Size	If Pipe size is <12" CISBOT not applicable
37	Main Material	VARIOUS	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	MP	If LP can it be replaced with a smaller pipe size?
40	Type of Joints	CI JOINTS	If >20# and CI
41	Main Location	Major Roadway	If Mech or Flange Joint can it be sealed internally?
42	Is CISBOT Applicable?	No	If Yes
	What is the Estimated Cost?		
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	<i>CISBOT is not applicable due to this project being a service only job.</i>	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	No	
49	Material Type	Various	
50	Length	Full length	
51	Size	Pipe Size	
52	Existing Pressure	System Pressure	
53	New Pressure	MP	
54	Number of Services	9	
55	Upgrading required?	No	
56	Is Replacement Required?	No	
57	Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Comments	<i>All affected services are to be replaced with newer services onto the same existing 20# mains.</i>	

OVERALL COMMENTS:

62 Risk Mitigation Decision
63 Calculated RR/\$

Direct Bury

64

Comments

Based on the consideration of the above NPA alternatives, all the connected services will be replaced with newer services onto the same existing 20# mains.

Review and Approval:

Engineer	Andrés del Campo	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

			NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT											
			EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837			
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11			
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64			
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64			
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59		
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59		
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

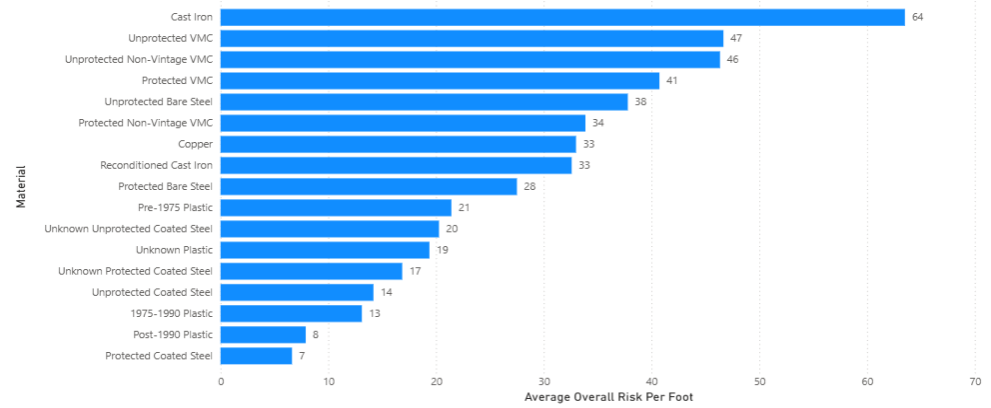
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	15th St NE	
3 BCA	313060	
4 BCA NAME	DC SAFE - 15th St NE - D002NE4 - WARD 6	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	660	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	Post 1990 Plastic	PLASTIC	PLASTIC
15	SIZE	12	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1185		150	
19	COUNT OF SERVICES		3		2

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,125,612	\$ 95,645	\$ 1,221,257

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, some segments can be permanently abandoned without pipe replacement. Other Segments of main that has connecting services will require newly installed medium pressure main. 2 services connected will be transferred to new 2" PLA-20# main.	

CIPL

27	Main and Service Size	12	VARIOUS
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP,
			Can it be replaced with Smaller Pipe Size?
			Yes
			If >25# and CI,

31	Number of Connected Services/Customers	2	CI MAOP is only for 25#	No
32	Are the existing customers able to be supplied with temporary gas supply?	Yes		

If No

Customer(s) will be out of gas for > 1 week.

33	Main Location	Major Roadway	
34	Is CIPL Applicable ?	Yes	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	5.27	If MR/10k ratio is >1, Lining is not preferred
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar.	

CISBOT

36	Main Size	12	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP can it be replaced with a smaller pipe size?
40	Type of Joints	CI JOINTS	If >20# and CI If Mech or Flange Jointit Can it be sealed internally?
41	Main Location	Major Roadway	
42	Is CISBOT Applicable?	Yes	If Yes
	What is the Estimated Cost?	\$ 2,604,630	
	MR/10K ratio Lining vs Replacement (See NPA consideration)	0.91	If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not preferred for this project as replacement would result in a higher risk reduced per dollar.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes	
49	Material Type	Cast Iron	
50	Length	Full Length	
51	Size	12	
52	Existing Pressure	LP	
53	New Pressure	MP	
54	Number of Services	3	
55	Uprating required?	No	
56	Is Replacement Required?	Yes	
57	Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Comments	Segments where there are no existing parrallel mains will need to be replaced with 2" PLA. All the connected services will be transferred.	

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
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63 Calculated RR/\$

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64

Comments

<i>Based on the consideration of the above NPA alternatives, the existing main will be Abandoned or replaced with new plastic pipe. All the connected services will be transferred to the new 20# main.</i>
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Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

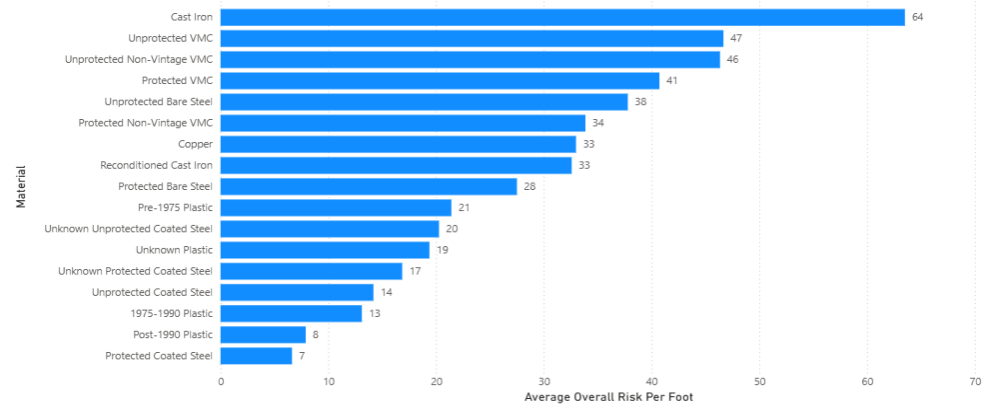
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (Sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
--------------------------------------	-----

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,095,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Newton St NW	
3 BCA	313064	
4 BCA NAME	DC SAFE - Newton St NW	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1363	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - LP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14 MATERIAL		VARIOUS	VARIOUS	REPLACEMENT MATERIAL	REPLACEMENT MATERIAL
15 SIZE		3	VARIOUS	Pipe Size	SERVICE SIZE
16 PRESSURE		LP	LP		LP
17 CP (Y/N)		No	No	No	No
18 LENGTH		937			
19 COUNT OF SERVICES			4	0	4

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20 CONSTRUCTION METHOD		Abandonment	Direct Bury	
21 JANA ESTIMATED COST				
22 CLASS 3 ESTIMATE		\$ 418,755	\$ 87,760	\$ 506,515

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23 System Planning Analysis Received?	Yes	
24 Connected Services?	Yes	If Y Is there a parallel distribution main?
25 Is Abandonment applicable?	Yes	Yes
26 Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 4 services connected will be replaced/transferred to an existing parallel LP main	

CIPL

27 Main and Service Size	3	VARIOUS	
28 Main Material	VARIOUS		
29 Main Pipe Condition			
30 Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?	Yes
31 Number of Connected Services/Customers	4	If >25# and CI, CI MAOP is only for 25#	Yes
32 Are the existing customers able to be supplied with temporary gas supply?	Yes	If No Customer(s) will be out of gas for > 1 week.	
33 Main Location	Easy to Access Location		
34 Is CIPL Applicable ?	No	If Yes	

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
Lining is not preferred

Lining is not applicable to the existing 3" cast iron main as CIPL cannot be applied to pipe sizes smaller than 4"

35

Comments

CISBOT

36 Main Size

3

If Pipe size is <12" CISBOT not applicable

37 Main Material

Material

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

39 Main Pressure

System Pressure

If LP can it be replaced with a smaller pipe size?

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint canit be sealed internally?

41 Main Location

Easy to Access Location

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 3" gas main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Various

50 Length

Full length

51 Size

3

52 Existing Pressure

LP

53 New Pressure

MP

54 Number of Services

4

55 Uprating required?

No

56 Is Replacement Required?

No

57 Is Utilizing Existing Infrastructure
Applicable?

Yes

There are segments of 12" LP mains within the vicinity of services connected to the targeted 3" CI & WRPD LP Main. Services can be replaced/transferred to these mains to allow for abandonment of the 3" LP main.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

The NPA analysis concluded that existing services could be replaced/transferred to existing 12" CI low pressure main in order to facilitate the abandonment of 937 feet of 3" CI and WRPD low pressure mains

64

Comments

Review and Approval:

Engineer	Douglas Pugh	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

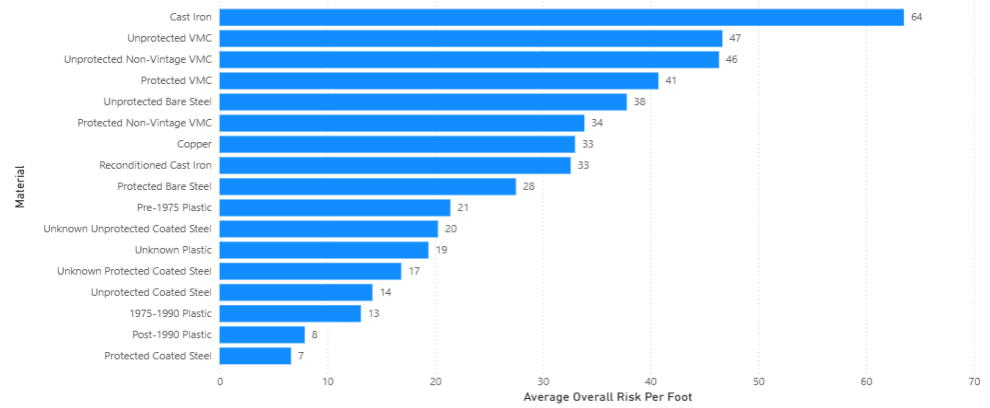
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Evarts St NE	
3 BCA	313065	
4 BCA NAME	DC SAFE - Evarts St NE - A005NE2 - Ward 5 - PLUG FEEDER 14009	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1517	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	PLASTIC	PLASTIC
15	SIZE	6	VARIOUS	2	VARIOUS
16	PRESSURE	LP	LP	MP	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	3027		1800	
19	COUNT OF SERVICES		103		102

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 2,556,573	\$ 2,920,521	\$ 5,477,094

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, some segments can be permanently abandoned without pipe replacement. Other Segments of main that has connecting services will require newly installed medium pressure main. 102 services connected will be replaced/transferred to new or existing PLA-MP main.	

CIPL

27	Main and Service Size	6	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes	
			If >25# and CI, CI MAOP is only for 25#	No
31	Number of Connected Services/Customers	102		
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	If No	

Customer(s) will be out of gas for > 1 week.

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33 Main Location	Major Roadway	
34 Is CIPL Applicable ?	Yes	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)	4.04	If MR/10k ratio is >1, Lining is not preferred
35	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining. CIPL is not applicable for this main as there are several connected services to it with no parallel main.	
Comments		

CISBOT

36 Main Size	6	If Pipe size is <12" CISBOT not applicable
37 Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	LP	If LP can it be replaced with a smaller pipe size?
		If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint can it be sealed internally?
41 Main Location	Major Roadway	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	CISBOT is not applicable for this 6" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	Yes	
49 Material Type	Cast Iron	
50 Length	Full Length	
51 Size	6	
52 Existing Pressure	LP	
53 New Pressure	MP	
54 Number of Services	103	
55 Uprating required?	No	
56 Is Replacement Required?	Yes	
57 Is Utilizing Existing Infrastructure Applicable?	Yes	
58	There are segments of 6" PLA 20# mains within the vicinity of services connected to the targeted 6" CI LP Main. Segments where there are no existing parallel mains will need to be replaced with 2" PLA. All the connected services will be either transferred or replaced with new plastic.	
Comments		

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be abandoned or replaced with new plastic pipe. All the connected services will be replaced or transferred to the new or exististing parallel 20# main.
Comments	

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA																NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT															
		EXISTING MAIN SIZE				2		4		6		8		10		12		16		20		24		12		16		20		24																			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																		
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

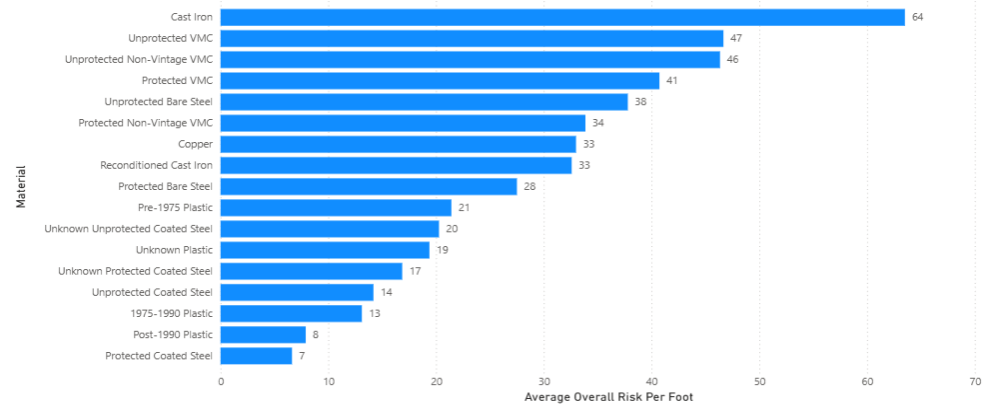
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (Sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Sheridan St NW	
3 BCA	313078	
4 BCA NAME	DC SAFE - Sheridan St NW - B012NW4 - Ward 4	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	4061	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	Pre-1975 Plastic	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	6	1-1/4	Pipe Size	1-1/4
16	PRESSURE	LP	LP		MP
17	CP (Y/N)	No	No		No
18	LENGTH	431			
19	COUNT OF SERVICES		1		1

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandonment	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 234,604	\$ 57,068	\$ 291,672

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 1 connected will be replaced/transferred to an existing parallel MP main	

CIPL

27	Main and Service Size	6	1-1/4
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP,
			Can it be replaced with Smaller Pipe Size?
			Yes
			If >25# and CI,
			CI MAOP is only for 25#
			Y/N
31	Number of Connected Services/Customers	1	

Are the existing customers able
32 to be supplied with temporary
gas supply?

Yes

If No
Customer(s) will be out of gas for > 1 week.

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33 Main Location

34 Is CIPL Applicable ?

Major Roadway
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

1.52

If MR/10k ratio is >1,
Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35

Comments

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CISBOT

36 Main Size

6

If Pipe size is <12" CISBOT not applicable

37 Main Material

Existing Material

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

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39 Main Pressure

System Pressure

If LP can it be replaced with a smaller pipe size?

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint

Can it be sealed internally?

41 Main Location

Major Roadway

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

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MR/10K ratio Lining vs Replacement
(See NPA consideration)

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If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 6" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

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OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Various

50 Length

Full length

51 Size

6

52 Existing Pressure

LP

53 New Pressure

MP

54 Number of Services

1

55 Upgrading required?

No

56 Is Replacement Required?

No

57 Is Utilizing Existing
Infrastructure Applicable?

Yes

There is a segment of 6" 20# main within the vicinity of services connected to the targeted 6" CI LP Main. Service can be replaced/transferred to this main to allow for abandonment of the 6" CI LP main.

58

Comments

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OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

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Based on the consideration of the above NPA alternatives, the existing main will be abandoned. The connected service will be replaced and transferred to existing 6" PLA-main.

64

Comments

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Review and Approval:

Engineer	Fasica Negash	3/30/2026
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System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.07	#####

Multiplier of Liner costs 36" = (Total Project Cost/Liner costs) 8.2756

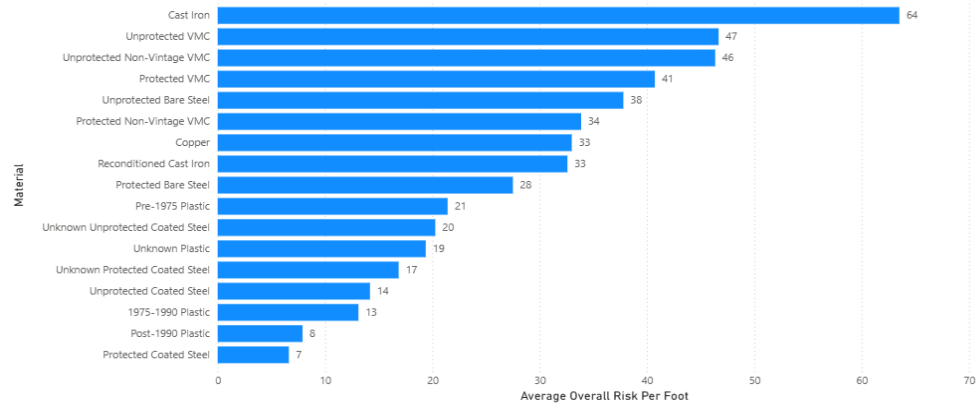
Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
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MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
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(blank)	106,542
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	1,367,147
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NORTHERN PIPELINE CONSTRUCTION INC	2,832
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TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
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NORTHERN PIPELINE CONSTRUCTION INC	8,518
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(blank)	366,921
Grand Total	7,320,487

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Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
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	123380
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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Connecticut AVE NW	
3 BCA	313079	
4 BCA NAME	DC SAFE - Connecticut AVE NW - Ward 3	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1166	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	VARIOUS	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	8	VARIOUS	2	SERVICE SIZE
16	PRESSURE	LP	LP	System Pressure	MP
17	CP (Y/N)	No	No	No	No
18	LENGTH	1745		205	
19	COUNT OF SERVICES		3		3

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,384,679	\$ 124,552	\$ 1,509,231

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main?
25	Is Abandonment applicable?	No	Yes
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned with installation of 205' of 2" PLA-MP. Parallel main was utilized on applicable area.	

CIPL

27	Main and Service Size	8	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?	Yes
			If >25# and CI, CI MAOP is only for 25#	Y/N

31	Number of Connected Services/Customers	3
32	Are the existing customers able to be supplied with temporary gas supply?	Yes

If No
Customer(s) will be out of gas for > 1 week.

33	Main Location	Major Roadway
34	Is CIPL Applicable ?	Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	4.42
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

CISBOT

36	Main Size	8	If Pipe size is <12" CISBOT not applicable
37	Main Material	Material	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	System Pressure	If LP can it be replaced with smaller pipe size?
40	Type of Joints	CI JOINTS	If >20# and CI
41	Main Location	Major Roadway	If Mech or Flange Joint can it be sealed internally?
42	Is CISBOT Applicable?	No	If Yes
	What is the Estimated Cost?		
	MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes
49	Material Type	Various
50	Length	Full length
51	Size	8
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	3
55	Upgrading required?	No
56	Is Replacement Required?	No
57	Is Utilizing Existing Infrastructure Applicable?	Yes
58	Comments	This project requires replacement. Existing parallel main is used to transfer 1 service. New main installation is still required to replace/transfer the remaining 2 services.

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

64

Comments

Based on the consideration of the above NPA alternatives, 1745' of existing main will be abandoned and 205' of new 2" PLA main will be installed to maintain 2 services. For the one service we will be utilizing a parallel main.

Review and Approval:

Engineer	Fasica Negash	3/31/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

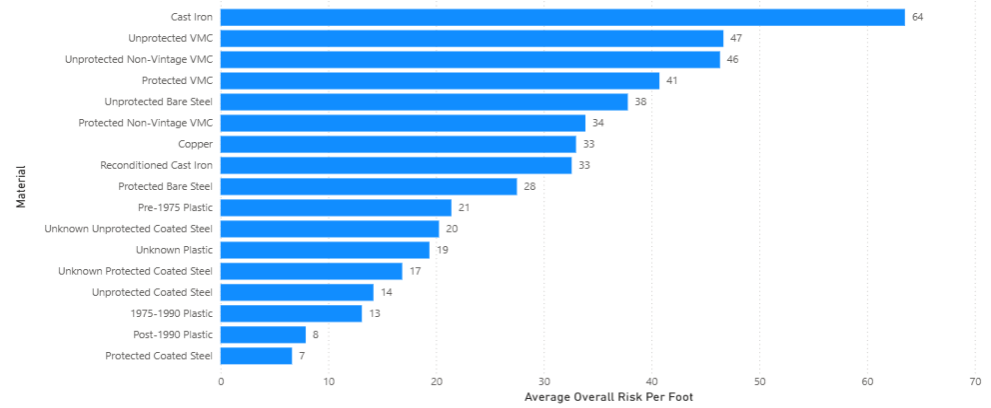
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71902
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Bladensburg Rd NE	
3 BCA	313093	
4 BCA NAME	DC SAFE - Bladensburg Rd NE - D002NE2 - Ward 5	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	784	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - LP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	8	VARIOUS	Pipe Size	VARIOUS
16	PRESSURE	LP	LP		LP
17	CP (Y/N)	No	No		No
18	LENGTH	739			
19	COUNT OF SERVICES		2		2

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandonment	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 426,386	\$ 179,428	\$ 605,814

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 2 services connected will be replaced/transferred to an existing parallel LP main	

CIPL

27	Main and Service Size	8	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes	
31	Number of Connected Services/Customers	2	If >25# and CI, CI MAOP is only for 25# No	

Are the existing customers able
32 to be supplied with temporary
gas supply?

Yes

If No
Customer(s) will be out of gas for > 1 week.

--

33 Main Location

34 Is CIPL Applicable ?

Major Roadway
Yes

If Yes

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
1.66 Lining is not preferred

Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.

35

Comments

CISBOT

36 Main Size

8

If Pipe size is <12" CISBOT not applicable

37 Main Material

Cast Iron

If Material is not Cast Iron, CISBOT is not applicable

38 Main Pipe Condition

--

39 Main Pressure

LP

If LP, can it be replaced with a smaller pipe size?

If >20# and CI

40 Type of Joints

CI JOINTS

If Mech or Flange Joint can it be sealed internally?

41 Main Location

Major Roadway

42 Is CISBOT Applicable?

No

If Yes

What is the Estimated Cost?

--

MR/10K ratio Lining vs Replacement
(See NPA consideration)

If MR/10k ratio is >1,
CISBOT is not
preferred

CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.

43

Comments

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the
Scope?

Yes

49 Material Type

Cast Iron

50 Length

Full Length

51 Size

8

52 Existing Pressure

LP

53 New Pressure

LP

54 Number of Services

2

55 Upgrading required?

No

56 Is Replacement Required?

No

57 Is Utilizing Existing
Infrastructure Applicable?

Yes

There is a segment of 12" WRPD Low Pressure main within the vicinity of services connected to the targeted 8" CI LP Main. Services can be replaced/transferred to the existing main to allow for abandonment of the 8" CI LP main.

58

Comments

OVERALL COMMENTS:

62 Risk Mitigation Decision

Direct Bury

63 Calculated RR/\$

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Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 12" WRPD LP main.

64

Comments

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)

Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
		EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE	RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
					N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

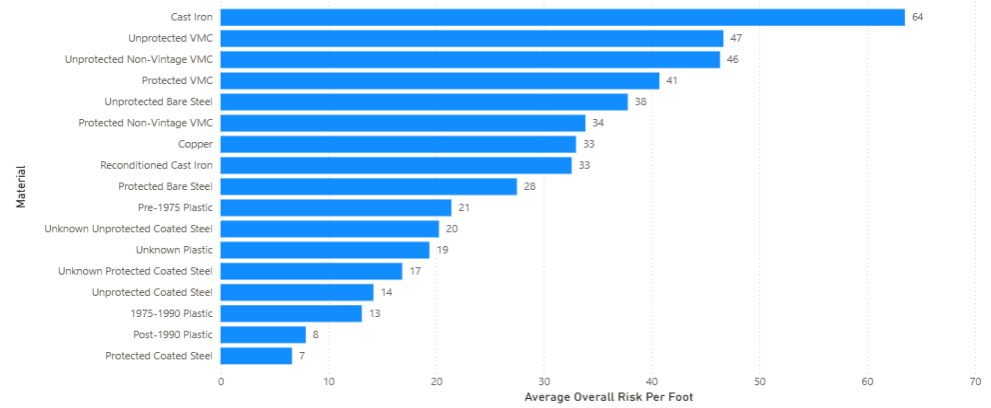
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (Sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,095,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	78,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	16th St NW	
3 BCA	313099	
4 BCA NAME	DC APRP 4 - 16th St NW	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	2591	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	Yes
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	VARIOUS	Pre-1975 Plastic	REPLACEMENT MATERIAL	PLASTIC
15	SIZE	12	1-1/4	Pipe Size	3/4
16	PRESSURE	LP	LP		MP
17	CP (Y/N)	No	No		No
18	LENGTH	2045			
19	COUNT OF SERVICES		1		1

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,278,013	\$ 40,656	\$ 1,318,669

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without additional main pipe installation. 1 affected service is to be replaced to existing 20# main.	

CIPL

27	Main and Service Size	12	1-1/4
28	Main Material	VARIOUS	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP,

		Can it be replaced with Smaller Pipe Size?	Yes
		If >25# and CI, CI MAOP is only for 25#	No
31	Number of Connected Services/Customers	1	
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	
		If No Customer(s) will be out of gas for > 1 week.	

33	Main Location	Major Roadway	
34	Is CIPL Applicable ?	Yes	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	1.18	If MR/10k ratio is >1, Lining is not preferred
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.	

CISBOT

36	Main Size	12	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP, can it be replaced with smaller pipe size? If >20# and CI
40	Type of Joints	Mechanical Joint	If Mech or Flange Joint can it be sealed internally?
41	Main Location	Major Roadway	
42	Is CISBOT Applicable?	Yes	If Yes
	What is the Estimated Cost?	\$ 4,536,364	
	MR/10K ratio Lining vs Replacement (See NPA consideration)	0.91	If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is not preferred for this project as replacement would result in a higher risk reduced per dollar than CISBOT.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes
49	Material Type	WRPD
50	Length	Full Length
51	Size	8
52	Existing Pressure	LP
53	New Pressure	MP
54	Number of Services	1
55	Upgrading required?	No
56	Is Replacement Required?	No
57	Is Utilizing Existing Infrastructure Applicable?	Yes

58

Comments

The service to be replaced will be installed on the existing 8" WRPD - 20# Main.

OVERALL COMMENTS:

62 Risk Mitigation Decision

63 Calculated RR/\$

64

Comments

Direct Bury

Based on the consideration of the above NPA alternatives, the existing main will be abandoned. The connected service will be replaced onto the existing 8" WRPD - 20# main.

Review and Approval:

Engineer	Andrés del Campo	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	(Date)
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

			NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT								
			EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24		
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP		
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837		
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

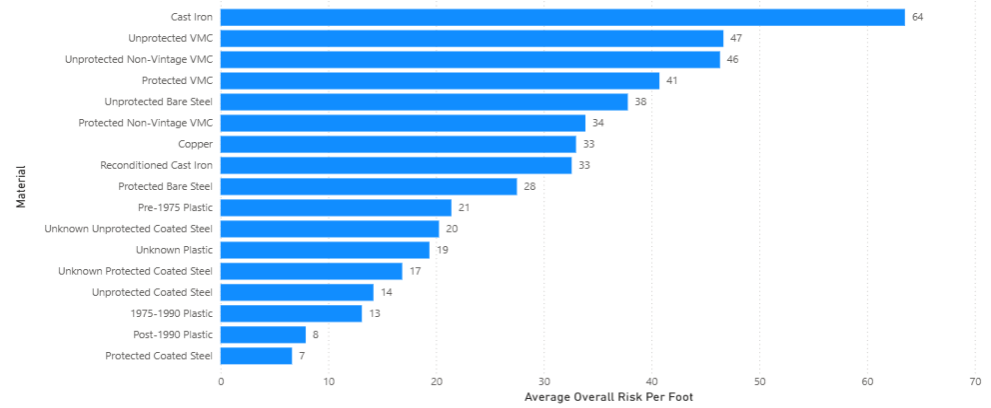
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Sealing Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot			
Size	Material + Lining	Linear Unit Cost (Total Project)	
4	\$	276.14	\$ 2,189.65
6	\$	304.82	\$ 2,395.00
8	\$	333.50	\$ 2,620.34
10	\$	356.37	\$ 2,800.03
12	\$	397.04	\$ 3,126.65
16	\$	459.99	\$ 3,606.79
20	\$	515.82	\$ 4,268.82
24	\$	617.97	\$ 5,114.20

Multiplier of Linear costs 16" = (Total Project Cost/Linear costs) = 8.275799

Multiplier of Linear costs 12" and below (Total Project Cost/Linear costs) = 7.85756

Row Labels	Sum of ARP Changes	
	71002	1,056,202
DCI UIS, LLC		32,420
FERGUSON INTEGRATED SERVICES		9,067
FORT MYER CONSTRUCTION CORPORATION		21,260
MULCARE PIPELINE SOLUTIONS		18,993
PROGRESSIVE PIPELINE MANAGEMENT		703,303
PPM Lining Costs		134,471
TOW SERVICES INC.		81,188
(blank)		55,467
	123380	1,679,165
DCI UIS, LLC		207,680
FERGUSON INTEGRATED SERVICES		19,783
FORT MYER CONSTRUCTION CORPORATION		52,777
MILLER PIPELINE CORP		26,132
MULCARE PIPELINE SOLUTIONS		22,399
NORTHERN PIPELINE CONSTRUCTION INC		5,788
PPM Lining Costs		335,775
PROGRESSIVE PIPELINE MANAGEMENT		819,959
TOW SERVICES INC.		78,330
(blank)		108,542
	239929	1,867,147
DCI UIS, LLC		12,409
FERGUSON INTEGRATED SERVICES		37,991
FORT MYER CONSTRUCTION CORPORATION		67,335
INFRASOURCE CONSTRUCTION, LLC		699,521
MILLER PIPELINE CORP		2,533
NORTHERN PIPELINE CONSTRUCTION INC		2,832
PROGRESSIVE PIPELINE MANAGEMENT		148,875
TOW SERVICES INC.		197,304
TEAM INDUSTRIAL SERVICES, INC.		785
US BANK		5,850
(blank)		231,753
	254569	3,215,974
DCI UIS, LLC		2,465,471
FERGUSON INTEGRATED SERVICES		51,666
FORT MYER CONSTRUCTION CORPORATION		61,790
MILLER PIPELINE CORP		9,465
MULCARE PIPELINE SOLUTIONS		26,078
NORTHERN PIPELINE CONSTRUCTION INC		8,518
PROGRESSIVE PIPELINE MANAGEMENT		233,075
(blank)		356,921
Grand Total		7,329,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Connecticut Ave NW	
3 BCA	313147	
4 BCA NAME	DC SAFE - Connecticut Ave NW - I010NW - Ward 3	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	1964	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - MP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	VARIOUS	REPLACEMENT MATERIAL	REPLACEMENT MATERIAL
15	SIZE	8	VARIOUS	Pipe Size	SERVICE SIZE
16	PRESSURE	LP	LP		MP
17	CP (Y/N)	No	No		
18	LENGTH	4445			
19	COUNT OF SERVICES		7	0	7

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Abandon	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,866,589	\$ 234,858	\$ 2,101,347

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y Is there a parallel distribution main? Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all main segments can be permanently abandoned without pipe replacement. 7 services connected will be replaced/transferred to an existing parallel MP main	

CIPL

27	Main and Service Size	8	VARIOUS	
28	Main Material	Cast Iron		
29	Main Pipe Condition			
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size? Yes	
31	Number of Connected Services/Customers	7	If >25# and CI, CI MAOP is only for 25# Yes	
32	Are the existing customers able to be supplied with temporary gas supply?	Yes	If No	

Customer(s) will be out of gas for > 1 week.

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33 Main Location	Major Roadway	
34 Is CIPL Applicable ?	Yes	If Yes
MR/10K ratio Lining vs Replacement (See NPA consideration)	1.66	If MR/10k ratio is >1, Lining is not preferred
35	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining.	
Comments		

CISBOT

36 Main Size	8	If Pipe size is <12" CISBOT not applicable
37 Main Material	Material	If Material is not Cast Iron, CISBOT is not applicable
38 Main Pipe Condition		
39 Main Pressure	System Pressure	If LP Can it be replaced with Smaller Pipe Size If >20# and CI
40 Type of Joints	CI JOINTS	If Mech or Flange Joint Can it be sealed internally?
41 Main Location	Major Roadway	
42 Is CISBOT Applicable?	No	If Yes
What is the Estimated Cost?		
MR/10K ratio Lining vs Replacement (See NPA consideration)		If MR/10k ratio is >1, CISBOT is not preferred
43	CISBOT is not applicable for this 8" cast iron main. CISBOT application is only limited to main diameters 12" and greater.	
Comments		

OTHER NPA - Utilize Existing Infrastructure

48 Any Parallel main within the Scope?	Yes
49 Material Type	Various
50 Length	Full length
51 Size	6
52 Existing Pressure	LP
53 New Pressure	MP
54 Number of Services	7
55 Uprating required?	No
56 Is Replacement Required?	No
57 Is Utilizing Existing Infrastructure Applicable?	Yes
58	There are segments of 6", 8", and 12" 20# mains within the vicinity of services connected to the targeted 8" CI LP Main. Services can be replaced/transferred to these mains to allow for abandonment of the 8" CI LP main.
Comments	

OVERALL COMMENTS:

62 Risk Mitigation Decision	Direct Bury
63 Calculated RR/\$	
64	Based on the consideration of the above NPA alternatives, the existing main will be abandoned. All the connected services will be replaced or transferred to existing 6", 8", & 12" WRPD 20# mains.
Comments	

Review and Approval:

Engineer	Joseph Atmore	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	Joseph Atmore	3/30/2026
Sr Director	(Name)	(Date)

**RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA**

			NPA		NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT											
			EXISTING MAIN SIZE		2		4		6		8		10		12		16		20		24		12		16		20		24			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP			
				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837			
			\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11			
	4	MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64			
			\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64			
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	8	MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
			\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
			\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99		
	12	MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59		
			\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59		
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23
			\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	20	MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
			\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

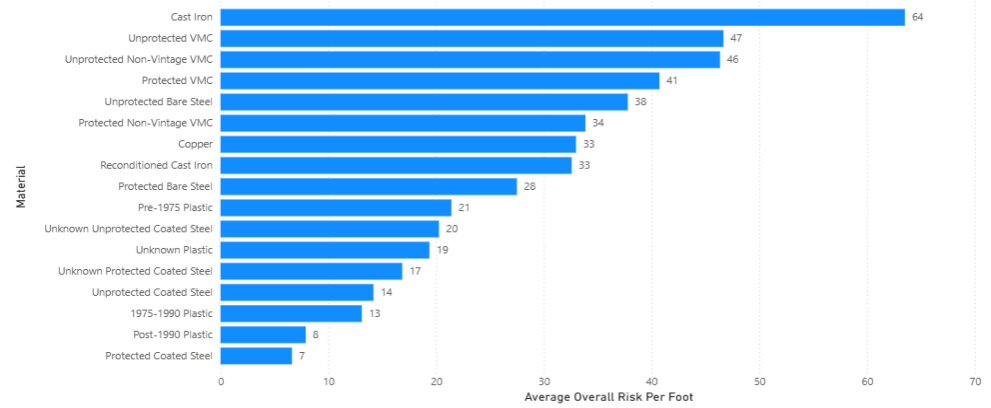
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Ceiling Unit Cost (sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5

% Mitigated Risk Addressed by Cisbot	50%
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Starline CIPL Installed Price Estimate

Diameter Total Price Per Foot

Size	Material + Lining	Liner Unit Cost (Total Project)
4	\$ 276.14	#####
6	\$ 304.82	#####
8	\$ 333.50	#####
10	\$ 356.37	#####
12	\$ 397.94	#####
16	\$ 459.09	#####
20	\$ 515.82	#####
24	\$ 617.97	#####

Multiplier of Liner costs 36" > (Total Project Cost/Liner costs) 8.2756

Multiplier of Liner costs 12" and below (Total Project Cost/Liner 7.85708

Row Labels	Sum of ARP_Charges
	71002
	1,059,202
DCI US, LLC	32,420
FERGUSON INTEGRATED SERVICES	9,067
FORT MYER CONSTRUCTION CORPORATION	21,280
MULCARE PIPELINE SOLUTIONS	16,960
PROGRESSIVE PIPELINE MANAGEMENT	703,303
PPM Lining Costs	134478
TOW SERVICES INC.	81,198
(blank)	56,467
	123380
	1,676,165
DCI US, LLC	207,680
FERGUSON INTEGRATED SERVICES	19,793
FORT MYER CONSTRUCTION CORPORATION	52,777
MILLER PIPELINE CORP	26,132
MULCARE PIPELINE SOLUTIONS	23,399
NORTHERN PIPELINE CONSTRUCTION INC	5,788
PPM Lining Costs	335,775
PROGRESSIVE PIPELINE MANAGEMENT	819,959
TOW SERVICES INC.	76,330
(blank)	106,542
	235920
	1,367,147
DCI US, LLC	12,409
FERGUSON INTEGRATED SERVICES	37,961
FORT MYER CONSTRUCTION CORPORATION	67,335
INFRASOURCE CONSTRUCTION, LLC	659,521
MILLER PIPELINE CORP	2,533
NORTHERN PIPELINE CONSTRUCTION INC	2,832
PROGRESSIVE PIPELINE MANAGEMENT	148,875
TOW SERVICES INC.	197,304
TEAM INDUSTRIAL SERVICES, INC.	795
US BANK	5,850
(blank)	231,753
	254660
	3,215,974
DCI US, LLC	2,468,471
FERGUSON INTEGRATED SERVICES	51,666
FORT MYER CONSTRUCTION CORPORATION	61,790
MILLER PIPELINE CORP	9,405
MULCARE PIPELINE SOLUTIONS	26,078
NORTHERN PIPELINE CONSTRUCTION INC	8,518
PROGRESSIVE PIPELINE MANAGEMENT	233,075
(blank)	366,921
Grand Total	7,320,487

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NON-PIPE ALTERNATIVES (NPA) CONSIDERATIONS AND GUIDANCE

GENERAL DESCRIPTIONS

1 STATE	DC	
2 LOCATION/ADDRESS	Connecticut Ave NW	
3 BCA	313169	
4 BCA NAME	DC SAFE - Connecticut Ave NW - H008NW - Ward 2	
5 BCA TYPE	MAIN & SERVICE	
6 BCA PROGRAM	APRP	
7 JANA BUNDLE (MR/\$)	696	(MR=Mitigated Risk per \$10k)
8 JANA MAIN BUNDLE RISK		
9 JANA SERVIC BUNDLE RISK		

REPLACEMENT TYPE

10 MAIN & SERVICE ?	Yes
11 SERVICE ONLY ?	No
12 ABANDONMENT ONLY ?	No
13 REPLACEMENT PRESSURE	LP - LP

FACILITY ATTRIBUTE

		EXISTING		PROPOSED	
		MAIN	SERVICE	MAIN	SERVICE
14	MATERIAL	Cast Iron	1975-Pre-1991 Plastic	PLASTIC	PLASTIC
15	SIZE	12	2	6	2
16	PRESSURE	LP	LP	LP	LP
17	CP (Y/N)	Y/N	Y/N	Y/N	Y/N
18	LENGTH	1463		312	
19	COUNT OF SERVICES		1	0	1

ESTIMATED COST

		MAIN	SERVICE	TOTAL
20	CONSTRUCTION METHOD	Direct Bury	Direct Bury	
21	JANA ESTIMATED COST			
22	CLASS 3 ESTIMATE	\$ 1,304,408	\$ 32,022	\$ 1,336,430

ENGINEERING ALTERNATIVES CONSIDERED :

ABANDONMENT

23	System Planning Analysis Received?	Yes	
24	Connected Services?	Yes	If Y
			Is there a parallel distribution main?
			Yes
25	Is Abandonment applicable?	Yes	
26	Comments	Per System Planning Analysis - PSIA, all segments can be permanently abandoned without pipe replacement. 6" PLA Low Pressure Tie-in required to maintain system minimums . 1 service connected will be transferred to existing 12" WRPD-LP main.	

CIPL

27	Main Size	12	2
28	Main Material	Cast Iron	
29	Main Pipe Condition		
30	Main System Pressure	LP	If LP, Can it be replaced with Smaller Pipe Size?
			Yes

If >25# and CI,

31	Number of Connected Services/Customers	1	CI MAOP is only for 25#	No
32	Are the existing customers able to be supplied with temporary gas supply?			Yes
			If No Customer(s) will be out of gas for > 1 week.	No

33	Main Location	Major Roadway	
34	Is CIPL Applicable ?	Yes	If Yes
	MR/10K ratio Lining vs Replacement (See NPA consideration)	1.98	If MR/10k ratio is >1, Lining is not preferred
35	Comments	Lining is not preferred for this project as replacement would result in a higher risk reduced per dollar than lining	

CISBOT

36	Main Size	12	If Pipe size is <12" CISBOT not applicable
37	Main Material	Cast Iron	If Material is not Cast Iron, CISBOT is not applicable
38	Main Pipe Condition		
39	Main Pressure	LP	If LP can it be replaced with smaller pipe size? If >20# and CI
40	Type of Joints	CI JOINTS	If Mech or Flange Joint can it be sealed internally?
41	Main Location	Major Roadway	
42	Is CISBOT Applicable?	Yes	If Yes
	What is the Estimated Cost?	\$ 3,215,674	
	MR/10K ratio Lining vs Replacement (See NPA consideration)	0.91	If MR/10k ratio is >1, CISBOT is not preferred
43	Comments	CISBOT is applicable for this 12" cast iron main but not necessary since parallel main exists.	

OTHER NPA - Utilize Existing Infrastructure

48	Any Parallel main within the Scope?	Yes	
49	Material Type	Cast Iron	
50	Length	Full Length	
51	Size	12	
52	Existing Pressure	LP	
53	New Pressure	LP	
54	Number of Services	1	
55	Upgrading required?	No	
56	Is Replacement Required?	No	
57	Is Utilizing Existing Infrastructure Applicable?	Yes	
58	Comments	There is a segment of 12" WRPD Low Pressure main within the vicinity of the service connected to the targeted 12" CI LP Main. Service can be transferred to the existing main to allow for abandonment of the 12" CI LP main. 6" PLA Low Pressure Tie-in required to maintain system minimums .	

OVERALL COMMENTS:

62	Risk Mitigation Decision	Direct Bury
63	Calculated RR/\$	

64

Comments

Based on the consideration of the above NPA alternatives, the existing main will be abandoned. The connected service will be transferred to existing 12" WRPD LP main. 6" PLA Low Pressure Tie-in required to maintain system minimums.

Review and Approval:

Engineer	Mohamed-Ali Bourguiba	3/30/2026
System Planning Analyst	(Name)	(Date)
Supervisor/Manager	(Name)	(Date)
Sr Director	(Name)	(Date)

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL
IF < 1, CONSIDER NPA

		NPA																NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT															
		EXISTING MAIN SIZE				2		4		6		8		10		12		16		20		24		12		16		20		24																			
	REPLACEMENT MAIN SIZE	SYSTEM PRESSURE RE	UNIT COST	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP																		
				N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837																				
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UPTO 16" WRPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62			4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11																		
	4	LP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
		MP	\$ 1,369	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84			3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64																		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24			1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67																		
	10	LP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
		MP	\$ 3,849	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42			1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99																			
	12	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93			0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59																
	16	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.40	1.40			N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23																	
	20	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20			N/A	N/A	N/A	N/A	0.81	0.81	0.99	0.99																	
	24	LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00			N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83																	

The above table was utilized to perform NPA analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via CISBOT. This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar for each project evaluated. Project candidates with ratios over 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized.

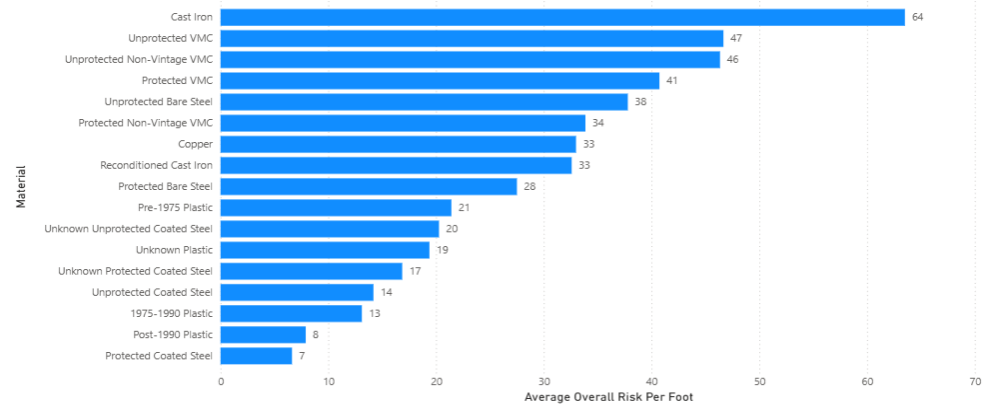
Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for joint sealing. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For joint sealing, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk that would otherwise be remediated by full pipe replacement. Based on the IANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. Since the Company has not historically used joint remediation, the Company made a conservative assumption that the joint remediation would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" - 24" cast iron mains which are the only sizes CISBOT is capable of remediating. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of the alternatives and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's policy on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. WGL considers installing CIPL on mains outside of this criteria where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges.

Cast Iron Risk/Ft	64
Lined Cast Iron Risk/Ft	33
Modern Plastic Risk/Ft	8
Ratio of mitigated Risk removed by Lining vs replacement	0.55

Average Overall Risk Per Foot of Distribution Pipe in the District by Material (JANA Run 20240720)



Size	Assumed Length	Mobilization	Pre Inspection	Pre Inspection Tapping	Joint Sealing (12'/Joint)	\$/Ft Joint Sealing	Joint Ceiling Unit Cost (Sealing + support)
12"	1200	3000	8206	5551.05	319000	279.7975417	2198.391808
16"	1200	3000	9654	5551.05	450000	390.170875	3065.603973
20"	1200	3000	9654	5551.05	462156	400.300875	3145.196198
24"	1200	3000	9654	5551.05	567758	488.3025417	3836.632377

Item #	Description	UOM	Year 1	Year 2	Year 3
1	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI)	PER DAY	4827	4971.81	5120.96
2	PRE CISBOT VGC INSPECTION DAILY RATE (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5068.35	5220.4	5377.01
3	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
4	PRE CISBOT VGC INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFFERENTIAL	PER HOUR	639	658.17	677.91
5	PRE CISBOT VGC INSPECTION DAILY RATE (SAT - SUN)	PER DAY	6424	6612.76	6815.22
6	PRE CISBOT VGC INSPECTION OF HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
7	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
8	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (1) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (1) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5828.6	6043.06	6183.56
9	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI)	PER DAY	5551.05	5717.58	5889.11
10	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI)	PER DAY	4103	4226.09	4352.87
11	PRE CISBOT PRX250 INSPECTION DAILY RATE - 12" PIPE ONLY (MON - FRI) - NIGHT DIFF	PER DAY	4308.15	4437.39	4570.92
12	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI)	PER HOUR	608.57	626.83	645.63
13	PRE CISBOT PRX250 INSPECTION OF HOURLY (MON - FRI) - NIGHT DIFF	PER HOUR	639	658.17	677.91
14	PRE CISBOT PRX250 INSPECTION DAILY RATE (SAT - SUN)	PER DAY	5333.9	5493.92	5685.73
15	PRE CISBOT PRX250 INSPECTION OT HOURLY (SAT - SUN)	PER HOUR	608.57	626.83	645.63
16	PRE CISBOT VGC TAPPING DAILY RATE - INCLUDES (2) 4" TAP UTILIZING ALH SYSTEM 3 VALVE/TAPPING SYSTEM AND (2) COMPLETION PLUG (MON - FRI) - NIGHT DIFFERENTIAL	PER DAY	5551.05	5717.58	5889.11
17	VGC MOBILIZATION	PER PROJE	1200	1236	1273.08
18	VGC MOBILIZATION - NIGHT DIFFERENTIAL	PER PROJE	1260	1297.8	1336.73
19	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 12" - 24" CIP	PER ITEM	408.66	420.92	433.55
20	SPECIALIZED 4" LOW PROFILE COMPLETION PLUG WITH CANOPY - 30" - 48" CIP	PER ITEM	440.23	453.44	466.95
21	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3190	3285.7	3384.27
22	SEAL CAST IRON GAS MAIN - 12" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3349.5	3449.99	3553.48
23	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	3668.3	3778.65	3891.91
24	SEAL CAST IRON GAS MAIN - 12" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	3851.93	3967.48	4086.51
25	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4500	4635	4774.05
26	SEAL CAST IRON GAS MAIN - 16" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4658.55	4805.4	4957.56
27	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5018.4	5173.95	5335.17
28	SEAL CAST IRON GAS MAIN - 16" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5174.86	5330.11	5490.99
29	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4511.52	4648.67	4786.27
30	SEAL CAST IRON GAS MAIN - 18" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4737.1	4879.21	5025.59
31	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5188.25	5343.9	5510.22
32	SEAL CAST IRON GAS MAIN - 18" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5447.66	5611.09	5779.42
33	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4621.56	4760.21	4903.01
34	SEAL CAST IRON GAS MAIN - 20" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4852.64	4998.22	5148.16
35	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5314.79	5474.24	5638.46
36	SEAL CAST IRON GAS MAIN - 20" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5580.53	5747.95	5920.39
37	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	4737.1	4879.21	5025.59
38	SEAL CAST IRON GAS MAIN - 22" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	4973.55	5121.32	5276.87
39	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5447.66	5611.09	5779.42
40	SEAL CAST IRON GAS MAIN - 22" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6264.81	6452.76	6646.34
41	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5677.58	5847.91	6023.35
42	SEAL CAST IRON GAS MAIN - 24" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	5961.46	6130.36	6324.51
43	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6529.22	6725.09	6926.85
44	SEAL CAST IRON GAS MAIN - 24" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6855.68	7061.35	7273.19
45	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	5961.45	6140.29	6324.5
46	SEAL CAST IRON GAS MAIN - 30" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6259.58	6447.3	6640.72
47	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6855.66	7061.33	7273.17
48	SEAL CAST IRON GAS MAIN - 30" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7198.45	7414.1	7636.83
49	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	6259.51	6447.3	6640.71
50	SEAL CAST IRON GAS MAIN - 36" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	6572.49	6769.66	6972.75
51	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	7198.44	7414.39	7636.82
52	SEAL CAST IRON GAS MAIN - 36" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	7558.38	7785.11	8018.06
53	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	9389.27	9670.94	9961.06
54	SEAL CAST IRON GAS MAIN - 42" ROBOTIC BELL SPIGOT CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	9873.88	10154.49	10450.12
55	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT	PER JOINT	12562	12938.86	13227.03
56	SEAL CAST IRON GAS MAIN - 42" ROBOTIC MECHANICAL CAST IRON JOINT SEALING, PRICE PER JOINT - NIGHT DIFFERENTIAL	PER JOINT	13190.1	13585.8	13993.38
61	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME	PER HOUR	524.51	540.25	556.45
62	SEAL CAST IRON GAS MAIN - 12"-48" ROBOTIC CAST IRON JOINT SEALING, HOURLY RATE FOR WAITING TIME - NIGHT DIFFERENTIAL	PER HOUR	550.74	567.26	584.28
63	MOBILIZATION (ROUND TRIP)	PER PROJE	3000	3090	3182.7
64	MOBILIZATION - NIGHT DIFFERENTIAL (ROUND TRIP)	PER PROJE	3150	3244.5	3341.84
65	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - DAILY RATE	PER DAY	2330.43	2400.34	2472.35
66	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH TUBE - NIGHT DIFFERENTIAL	PER DAY	2446.95	2520.36	2595.97
67	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE	PER HOUR	282.87	291.36	300.1
68	JOB SITE MAINTENANCE/BOOM TRUCK SERVICES - REMOVE/REPLACE ROAD PLATES, SUPPLY TRAFFIC MAINT., LIFT/TRANSPORT CISBOT LAUNCH HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	297.02	305.93	315.11
69	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY)	PER DAY	2840	2925.2	3012.96
70	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, DAILY RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER DAY	2982	3069.46	3159.63
71	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY)	PER HOUR	338.08	348.22	358.57
72	BOOM TRUCK FOR LIFTING/RIGGING OF VENDER EQUIPMENT, HOURLY OVERTIME RATE (BOOM TRUCK SERVICES ONLY) - NIGHT DIFFERENTIAL	PER HOUR	354.98	365.63	376.6
73	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR)	PER DAY	1719	1770.57	1823.69
74	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - (8 HOUR) - NIGHT DIFFERENTIAL	PER DAY	1804.95	1859.1	1914.87
75	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE	PER HOUR	322.31	331.98	341.94
76	JOB SITE MAINTENANCE ONLY - SUPPLY TRAFFIC MAINTENANCE ONLY - HOURLY OVERTIME RATE - NIGHT DIFFERENTIAL	PER HOUR	338.43	348.58	359.04
77	LEASE AND MAINTENANCE OF 12" CONTROL VALVE	PER DAY	33.15	34.14	35.17
78	PER DIEM	PER HOUR	85	87.55	90.18
79	HOTEL/ACCOMMODATIONS (PASS-THROUGH COST* - TOTAL IS AN ESTIMATE)	PER HOUR	Pass Throu	Pass Throu	Pass Throu

Row Labels	Sum of MitigatedRisk*	Sum of RiskByPipeWeldOrJointFailure*	Average of % Risk by Pipe Weld or Joint Failure
Cast Iron	19492693	10352229	0.5
12	10646347	5466030	0.5
16	3043084	1789711	0.5
20	2520010	1380520	0.5
24	3283252	1715968	0.5
Grand Total	19492693	10352229	0.5
% Mitigated Risk Addressed by Cisbot			50%

RISK REDUCED PER DOLLAR COMPARISON MATRIX : NPA / CONV REPL																															
IF < 1, CONSIDER NPA																															
		NPA				NPA ALTERNATIVE - CIPL																NPA ALTERNATIVE - CISBOT									
REPLACEMENT T MAIN SIZE	SYSTEM PRESSURE	EXISTING MAIN		2		4		6		8		10		12		16		20		24		12		16		20		24			
		LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP	LP	MP		
	UNIT COST	N/A	N/A	\$ 2,170	\$ 2,170	\$ 2,395	\$ 2,395	\$ 2,620	\$ 2,620	\$ 2,800	\$ 2,800	\$ 3,127	\$ 3,127	\$ 3,807	\$ 3,807	\$ 4,269	\$ 4,269	\$ 5,114	\$ 5,114	\$ 2,198	\$ 2,198	\$ 3,066	\$ 3,066	\$ 3,145	\$ 3,145	\$ 3,837	\$ 3,837	\$ 2,198	\$ 3,837		
CONVENTIONAL REPLACEMENT - DIRECT BURY (PLASTIC UP TO 16" WPD 20" - 24")	2	LP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
		MP	\$ 1,079	N/A	N/A	3.66	3.66	4.04	4.04	4.42	4.42	4.72	4.72	5.27	5.27	6.41	6.41	7.19	7.19	8.62	8.62	4.07	4.07	5.68	5.68	5.83	5.83	7.11	7.11		
	4	LP	\$ 1,260	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
		MP	\$ 1,260	N/A	N/A	2.90	2.90	3.20	3.20	3.50	3.50	3.74	3.74	4.18	4.18	5.09	5.09	5.71	5.71	6.84	6.84	3.23	3.23	4.51	4.51	4.63	4.63	5.64	5.64		
	6	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	1.52	1.52	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	8	LP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
		MP	\$ 2,870	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.66	1.66	1.77	1.77	1.98	1.98	2.41	2.41	2.70	2.70	3.24	3.24	1.53	1.53	2.14	2.14	2.19	2.19	2.67	2.67	
	12	LP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
		MP	\$ 3,848	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.32	1.32	1.48	1.48	1.80	1.80	2.02	2.02	2.42	2.42	1.14	1.14	1.59	1.59	1.63	1.63	1.99	1.99	
	16	LP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
		MP	\$ 4,827	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.18	1.18	1.43	1.43	1.61	1.61	1.93	1.93	0.91	0.91	1.27	1.27	1.30	1.30	1.59	1.59	
	20	LP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
		MP	\$ 6,244	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.11	1.11	1.24	1.24	1.49	1.49	N/A	N/A	0.98	0.98	1.01	1.01	1.23	1.23	
	24	LP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.91	0.91	0.99	0.99	N/A	N/A
		MP	\$ 7,762	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	1.20	1.20	N/A	N/A	N/A	N/A	0.91	0.91	0.99	0.99	N/A	N/A
		LP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	0.83	0.83
		MP	\$ 9,280	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.00	1.00	N/A	N/A	N/A	N/A	N/A	N/A	0.83	0.83	0.83	0.83

The above table was utilized to perform Non-Pipeline Alternative (NPA) analyses for the projects included on the District SAFE Year 1 Project List. The table includes a ratio comparing conventional replacement via direct bury vs Cured in Place Liner (CIPL) or Joint Sealing via Cast Iron Joint Sealing Robot (CISBOT). This ratio considers both the unit cost of the replacement activity as well as the comparative mitigated risk for each alternative. Ratios over 1.0 indicate that conventional replacement should be selected while ratios under 1.0 indicate that an alternative to replacement may be the appropriate selection to optimize risk reduced per dollar spent for each project evaluated. Project candidates with ratios under 1.0 would undergo a site-specific evaluation and cost estimate before a decision would be finalized, where it can be determined whether there are site-specific challenges or opportunities and/or site-specific cost considerations that impact the decision to pursue an NPA in lieu of conventional replacement. No candidates for inclusion on the District SAFE Year 1 list met the criteria for site specific cost estimation of the NPAs.

Cost inputs include the unit cost for replacement via direct bury from the Washington Gas cost memo, a calculated unit cost for CIPL, and a calculated unit cost for CISBOT. The calculated unit cost for CIPL is derived from the published unit costs for CIPL and a multiplier factor derived from previous CIPL projects on Washington Gas' system. This multiplier factor represents the difference between direct liner costs and the total costs for these projects. It accounts for the additional costs required to install the liner (excavation, pipe disconnect and tie in activities) and restoration of the project (paving) area. These costs are incremental to the direct liner installation costs. For CISBOT, the same multiplier was applied since Washington Gas has no direct experience with this technology and similar construction support, and restoration activities would be required.

When considering risk mitigation, CIPL and CISBOT do not remove the same amount of risk as full pipe replacement. Based on the JANA risk model output, CIPL eliminates 55% of the total risk relative to replacing with plastic. For CIPL, this was confirmed by comparing the risk per foot of cast iron mains to the risk per foot of lined cast iron mains and the risk per foot of post 1990 plastic mains. These calculations are captured within the NPA analysis for each project on the Liner Risk Mitigation tab. Since the Company has not historically used CISBOT, the Company made a conservative assumption that the CISBOT would fully reduce the Risk by Pipe Joint Failure which equates to 50% of the total risk for 12" – 24" cast iron mains which are the only sizes CISBOT is capable of remediating. These calculations are captured within the NPA analysis for each project on the CISBOT Risk Mitigation tab. The Company will continue to evaluate and refine this assumption as better information becomes available.

The above analysis serves solely as an economic assessment of NPAs and does not include additional feasibility and applicability challenges associated with the technologies (most notably implications

associated with thinner wall for smaller diameter piping and customer impacts such as outages for up to a week). WGL's practice on lining is that it is most applicable to cast iron pipes that are 16" or greater in diameter with minimal to no service taps, as these pipes have thicker pipe walls with longer expected life than those of smaller diameters. Lined pipe is dependent on the integrity of the host pipe wall and does not prevent the host pipe wall from continued deterioration due to corrosion. Finally, WGL considers installing CIPL on mains outside of these criteria, where replacement or alternative system configuration is challenging or infeasible, such as underneath railroads or along bridges, among other circumstances.

Employment Opportunities Report

This attachment provides employment opportunity information for District residents in accordance with Order No. 22798.¹ It includes details on open positions for contractors and subcontractors affiliated with Washington Gas Light Company's (WGL) Annual SAFE Project List, as of March 31, 2026.² The roles include may, or may not, support the Company's District SAFE Plan directly. The Company is not responsible for the hiring processes at its contractors and subcontractors.

Career opportunities can be found at the following links:

Contractor/Subcontractor	Website
Infrasource (Quanta)	https://www.infrasourceus.com/careers/
Miller Pipeline	https://millerpipeline.com/our-careers/
Williams Construction and Meter Services	https://williamsmeter.com/careers/
Dynamic Concepts Incorporated (DCI)	https://dynamicconcepts.bamboohr.com/careers
Northern Pipeline (NPL)	https://centuri.com/careers/
Capitol Paving of D.C., Inc	https://capitolpaving.com/careers/
Fort Myer Construction	https://www.fortmyer.com/employment
UtiliQuest	https://utiliquest.com/opportunities/
Entrust	https://entrustsol.com/careers/
Dewberry	https://www.dewberry.com/careers
The Roderick Group, Inc.	https://www.ardmoreroderick.com/careers/job-openings/
Casilo Consulting, LLC (Vector Services)	https://vectortalentsolutions.com/open-positions/
Dandan Inc.	https://www.linkedin.com/company/dandantrafficcontrol/jobs/
Diamonds Management Group, Inc.	https://diamondsmanagement.com/join-our-company/
Digmasters, LLC	https://www.digmasters.net/employment-digmasters.html
Kaslo Enterprises, LLC	https://www.kasloenterprises.com/
B & J Construction Co., LLC	https://www.b-jcontracting.com/career/
The Traffic Group, Inc.	https://trafficgroup.com/current-openings

¹ FC 1179, *In the Matter of the Investigation into Washington Gas Light Company's Strategically Targeted Pipe Replacement Plan*, Order No. 22798 at 183 (March 4, 2026).

² The list of contractors/subcontractors may change dependent on the Company's workload, funding, mix of work, etc.

Lorenz Engineering	https://saleminc.com/about-us/our-companies/lorenz-engineering/
LW Survey Co	https://www.lwsurvey.com/career-fairs/
Sterling Engineering, Inc.	https://www.sterling-engineering.com/sterling-careers/

Additional roles available at Washington Gas can be found at the following link, regardless of their direct impact to the Company's District SAFE Program.

<https://wgl.wd5.myworkdayjobs.com/AltaGas>

CERTIFICATE OF SERVICE

I, the undersigned counsel, hereby certify that on this 21st day of April 2026, I caused copies of the foregoing to be hand-delivered, mailed, postage-prepaid, or electronically delivered to the following:

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