

Town of Bristol, Vermont
Proposed 1905 Waterline Replacement Approach
February 27, 2023



Project Background

- ▶ Bristol completed a Preliminary Engineering Report to evaluate the existing water distribution system and develop a comprehensive plan to replace portions of the aging water system infrastructure as needed.
- ▶ The PER was completed in August, 2021 and approved by the State in September, 2021.

PER Findings

- ▶ Bristol's distribution system consists of approximately 58,000 lineal feet of water main (total).
- ▶ The current distribution system leakage rate exceeds 55% which represents approximately 45,000,000 gallons per year. This percentage is expected to increase without significant capital investment to replace major portions of the distribution system. For comparison, the typical municipal water system leakage rate is approximately 16% according to AWWA.
- ▶ The PER recommended that approximately 33,000 lineal feet (57%) of Bristol's existing water distribution be replaced. The great majority of the distribution piping recommended for replacement is cast iron pipe with lead joints that was installed in 1905 (123 years old). This pipe is significantly beyond its anticipated useful life expectancy of 60-80 years.
- ▶ There is no viable alternative to distribution system replacement.

Water Leak Repair – Road Cut



Discussion

- At the current pace of replacement, it will take approximately 40-years to replace all of the 1905 watermains. Bristol's engineer as well as the Town's water system operator have advised that it is unlikely major portions of the existing distribution will continue to operate in a functional capacity for 40-years. Additionally, failure to replace the aging portions of the water distribution system will result in:
 - Ever increasing replacement costs;
 - Ever increasing leakage rate;
 - Increased emergency repair costs;
 - Decreasing pavement quality due to repairs (Town wide);
 - Increased potential for isolation valve failures;
 - Increased potential for catastrophic failures and required system wide shutdowns;
 - Increased risk of distribution system contamination;
 - Increased annual operational costs including: electricity; increased wear on equipment; chlorine and increased staff and consulting time.

Recent Watermain Replacement Projects

- ▶ 2005, North Street - 1,640 LF Pine to Plank
- ▶ 2017 West Street 2,815 LF Airport to Maple
- ▶ 2023 Pine Street - 2,600 LF North to Town Garage/End

Replacement Alternatives

1. Continue at the current pace of replacement (50 + years)
2. Replace all of the watermains as part of one large project.
3. Split the Town into 3 or 4 different geographic areas and complete the replacement of watermains one area at a time.

Alternative 1 - Continue at the current pace of replacement (50+ years)

Advantages

1. Disruption limited to one street at a time.
2. Numerous smaller bond votes increases the likelihood of passage.

Disadvantages

1. Roughly 50-years at the current pace to replace all of the 1905 water mains. Bristol's consultant as well as the Town's water system operator have advised that it is unlikely major portions of the 1905 distribution piping will continue to operate in a functional capacity for that length of time.
2. Ever increasing replacement costs
3. Ever increasing leakage rates
4. Increased emergency repair costs
5. Decreased pavement quality due to future repairs (Town wide)
6. Increased potential for larger or system wide failures requiring Town wide system shutdowns
7. Increased risk of distribution system contamination
8. Increased annual operational costs including: electricity; increased wear on equipment; chlorine and increased staff and consulting time.

Water Leak on 4" Rockydale Main



Alternative 2 – Replace all of the 1905 watermains as part of one large project

Advantages

1. Completes the project over a much shorter period-of-time
2. Reduced overall replacement costs due to economy of scale as well as reduced inflationary costs

Disadvantages

1. Unlikely that the Drinking Water State Revolving Fund (DWSRF) will fund a single replacement project of this scale
2. The majority of the Town would be under construction at the same time causing significant impacts to residents and the business community. Traffic control as well as utility disruptions would be chaotic.
3. Would require gaining voter approval for a very large bond and at least double water rates in one vote.

Alternative 3 – Split Town into geographic areas for replacement

Advantages

1. Concept would be to complete each geographic area in a 3-year time span to include design, permitting, funding and construction.
2. Reduced replacement costs due to economy of scale as well as reduced inflationary costs over Alternative 1
3. Traffic and utility disruptions would be limited to one area of Town at a time
4. DWSRF would be much more likely to fund individual moderately sized projects

Disadvantages

- 1.

PER Replacement Recommendations

Appendix C
Preliminary Engineering Report
Town of Bristol, Vermont
Water Main Replacement
Recommended Priority List

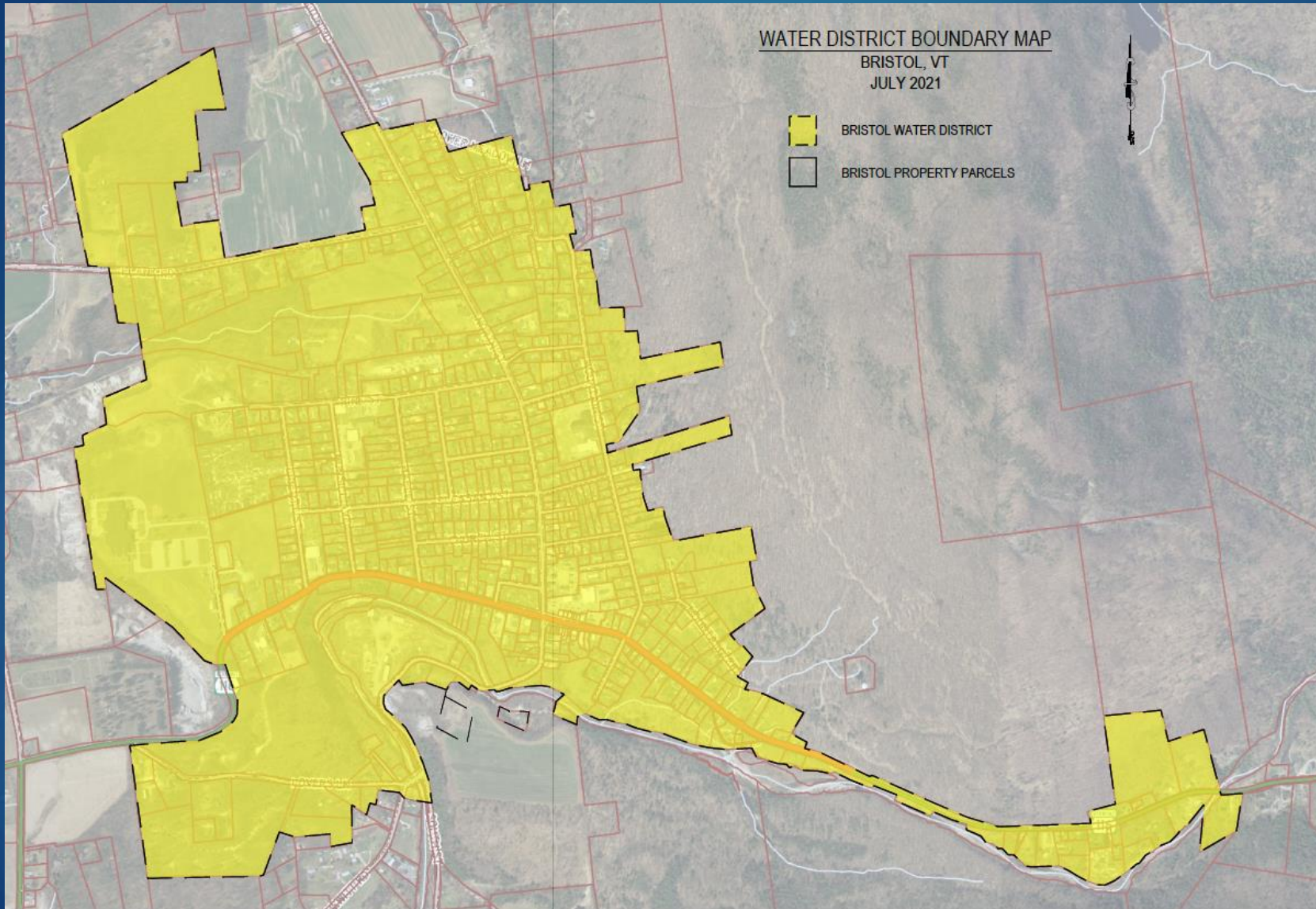
Revised 8-9-21

Priority Number	Street	From Intersection with ...	To Intersection with ...	Current Size	Material	Approximate length (ft)	Approximate Installation Year	Recommended Replacement Size (Inches)	Comments
				4"	C.I.	250	1905	8	Beyond Useful life
1	Pine St.	Liberty St.	last residence on street	4"	C.I.	250	1905	8	Beyond Useful life
-	Pine St.	Maple St.	Liberty St.	6"	C.I.	970	1905	8	Beyond Useful life
-	Pine St.	North St.	Maple St.	8"	C.I.	1080	1905	8	Beyond Useful life
2	Munsill Ave.	West St.	Pleasant St.	4"	C.I.	600	1905	8	Beyond Useful life
-	Munsill Ave.	Pleasant Street	Pine St.	6"	D.I.	990	1980	8	Hydraulic Analysis recommends increasing line size
3		Reservoir	Rockydale Dr.	4"	C.I.	4300	1905	8	Beyond Useful life
4	Liberty Street	Pine Street	West Street	8"	D.I.	1600	1983	8	Hydraulic Analysis recommends increasing line size
5	Maple St.	West St.	Pine St.	6"	C.I.	1760	1905	8	Beyond Useful life
6	Mountain Street	East St.	Mountain Terrace	8"	D.I.	350	1984	8	Hydraulic analysis recommends increasing line size
	Mountain Street	Mountain Terrace	Garfield	8"	D.I.	670	1984	8	Hydraulic Analysis recommends increasing line size
-	Mountain Street	Garfield	Fitch	6"	C.I.	1440	1905	8	Beyond Useful life
-	Mountain Street	Fitch Ave.	Crescent Street	6"	C.I.	350	1905	8	Beyond Useful life
-	Mountain Street	Crescent Street	Meadow Lane	4"	D.I.	1420	1968	8	Hydraulic analysis recommends increasing line size??
-	Mountain Street	Meadow Lane	North Street	-	-	550	N/A	8	Currently no waterline. Hyd. analysis recommends loop
-	Devino Lane	Meadow Lane	North St.	8"	C.I.	1210	1905	8	Beyond Useful life
7	Pleasant St.	Maple St.	North St.	8"	C.I.	1210	1905	8	Beyond Useful life
-	Pleasant St.	Munsill Ave.	Maple St.	6"	C.I.	606	1905	8	Beyond Useful life
-	Pleasant St.	Liberty St.	Munsill Ave.	6"	C.I.	468	1905	8	Beyond Useful life
-	North St.	Spring St.	Pine St.	8"	C.I.	1115	1905	8	Beyond Useful life
8	Church St.	North St.	Maple St.	6"	C.I.	1200	1905	8	Beyond Useful life
-	Church St.	North St.	North St.	6"	C.I.	570	1905	8	Beyond Useful life
-	Park Pl.	School St.	North St.	6"	C.I.	570	1905	8	Beyond Useful life
-	School St.	West St.	Park Place	6"	C.I.	220	1905	8	Beyond Useful life
9		Reservoir	Bingham Residence	10"	C.I.	1450	1905	12	Beyond Useful life
			Taylor Ave.	4"	C.I.	785	1905	8	Beyond Useful life
10	Elm St.	North St.	Pine St.	4"	C.I.	785	1905	8	Beyond Useful life
-	Taylor Ave.	Pleasant St.	Pine St.	6"	C.I.	1020	1905	8	Beyond Useful life
11	Crescent Street	North St.	Mountain St.	6"	D.I.	840	1983	8	Hydraulic Analysis recommends increasing line size
-	Garfield Street	North St.	Mountain St.	6"	C.I.	775	1905	8	Beyond Useful life
-	Garfield Street	North St.	Mountain St.	4"	C.I.	690	1905	8	Beyond Useful life
-	Fitch Ave.	North St.	Mountain St.	4"	C.I.	690	1905	8	Beyond Useful life
12	West St.	Maple St.	School St.	8"	C.I.	750	1905	12	Beyond Useful life
-	West St.	Maple St.	School St.	8"	C.I.	470	1905	12	Beyond Useful life
-	West St.	School St.	North St.	8"	C.I.	750	1905	12	Beyond Useful life
13	Main St.	North St.	Prince Ln.	10"	C.I.	350	1905	12	Beyond Useful life
-	Main St.	North St.	Prince Ln.	10"	C.I.	425	1905	12	Beyond Useful life
-	Main St.	Prince Ln.	Mountain St.	10"	C.I.	425	1905	12	Beyond Useful life
-	Main St.	Service Loop For Businesses	Mountain St.	8"	C.I.	622	1905	8	Beyond Useful life
-	Main St.	Service Loop For Businesses	Mountain St.	8"	C.I.	622	1905	8	Beyond Useful life
14	East St.	Mountain St.	Bingham Residence @ 75 East St.	10"	C.I.	900	1905	12	Beyond Useful life
-	East St.	Mountain St.	Bingham Residence @ 75 East St.	10"	C.I.	900	1905	12	Beyond Useful life
-	East St.	Bingham Residence @ 75 East St.	Drake Smith Rd. Hyd. Valve	6"	C.I.	375	1905	8	Beyond Useful life
-	East St.	Bingham Residence @ 75 East St.	Drake Smith Hydrant Valve	4"	C.I.	275	1905	8	Beyond Useful life
-	East St.	3 Houses	End of Line	4"	C.I.	1000	1905	8	Beyond Useful life
-	East St.	3 Houses	End of Line	1"	C.I.	1000	1905	8	Beyond Useful life
15	Pumphouse Rd	South St.	End of Line at Lathrop's Mill	4"	C.I.	1040	1905	8	Beyond Useful life

Existing Pine Street Service Line



Service Area Map



1905 Cast Iron Pipe and Service



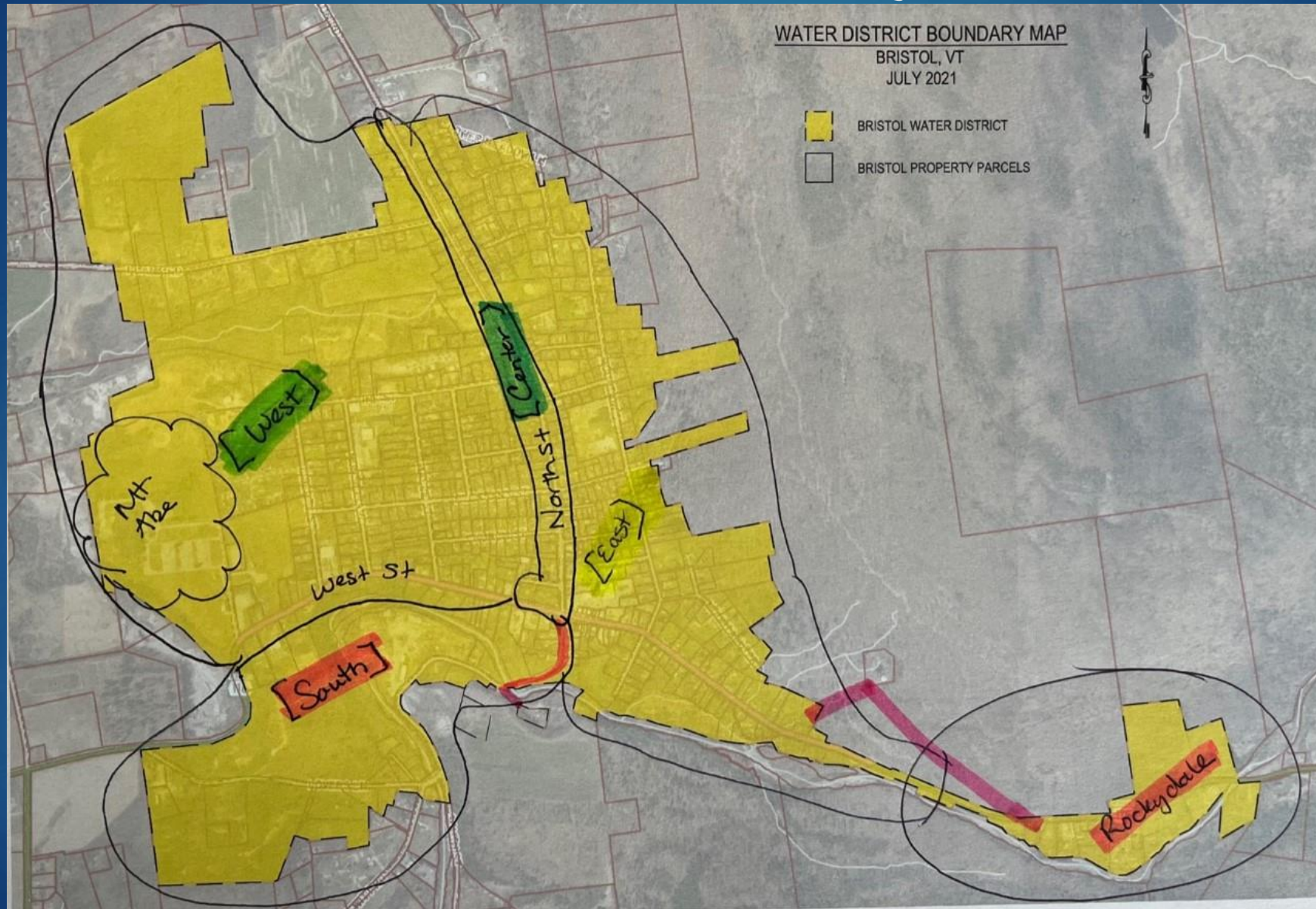
Alternative 3 - Detail

Street/Road Name	From Intersection	To Intersection	Size	Material	Length	Installation Date
Church St.	North St.	Maple St.	6"	C.I.	1200	1905
Elm St.	North St.	Taylor Ave.	4"	C.I.	785	1905
Maple St.	West St.	Pine St.	6"	C.I.	1760	1905
Munsill Ave.	West St.	Pleasant St.	4"	C.I.	600	1905
Pleasant St.	Munsill Ave.	Maple St.	6"	C.I.	606	1905
Pleasant St.	Liberty St.	Munsill Ave.	6"	C.I.	468	1905
Pleasant St.	Maple St.	North St.	8"	C.I.	1210	1905
Taylor Ave.	Pleasant St.	Pine St.	6"	C.I.	1020	1905
West St.	Maple St.	School St.	8"	C.I.	750	1905
West St.	School St.	North St.	8"	C.I.	470	1905
East St.	3 houses	end of line	1"	iron (?)	1000	1905
East St.	Mountain St.	Bingham Residence	10"	C.I.	900	1905
East St.	Drake Smith Rd. Hyd Valve	Next 3 houses	4"	C.I.	275	1905
East St.	Bingham Residence	Drake Smith Rd. Hyd. Valve	6"	C.I.	375	1905
Fitch Ave.	North St.	Mountain St.	4"	C.I.	690	1905
Garfield St.	North St.	Mountain St.	6"	C.I.	775	1905
Mountain St.	Garfield St.	Crescent St.	6"	C.I.	1852	1905
Spring St.	North St.	Mountain St.	8"	C.I.	690	1905
Main St.	Prince Ln.	Mountain St.	10"	C.I.	425	1905
Main St.	North St.	Prince Ln.	10"	C.I.	350	1905
Main St.	Service "loop" for businesses		8"	C.I.	622	1905
North St.	West St.	Pine St.	8"	C.I.	2280	1905
Park Pl.	School St.	North St.	6"	C.I.	570	1905
School St.	West St.	Park Pl.	6"	C.I.	220	1905
Pine St.	Liberty St.	last residence on street	4"	C.I.	250	1905
Pine St.	Maple St.	Liberty St.	6"	C.I.	970	1905
Pine St.	North St.	Maple St.	8"	C.I.	1080	1905
Pumphouse Rd.	South St.	end of line at Lathrop's Mill	4"	C.I.	1040	1905
South St.	North St.	Pumphouse Rd.	6"	C.I.	1080	1905
	Reservoir	Bingham Residence	10"	C.I.	1450	1905
	Reservoir	Rockydale Dr.	4"	C.I.	4300	1905
	Baseball field	High School	2"	C.I.	220	1905
	High School	Hydrant in front of northern side of High School	4"	C.I.	130	1905
	Western side of parking lot	Hydrant in front of southern side of High School	6"	C.I.	180	1905
	Airport Dr.	Baseball Field	6"	C.I.	550	1905
	Airport Dr.	Western side of parking lot	8"	C.I.	200	1905

Alternative 3 – Summary of Est. Costs

Color Coding for Area	Which Area	LF in Highlighted Area	Approx. Cost at \$400/LF	w 50% Grant
	West Side 1905	8,869	\$ 3,547,600	\$ 1,773,800
	East Side 1905	6,557	\$ 2,622,800	\$ 1,311,400
	Center 1905	4,467	\$ 1,786,800	\$ 893,400
	Current Pine Street Project 1905	2,300	\$ 920,000	\$ 460,000
	Mountain Runs/Not in PER/Do Last 190	7,870	\$ 3,148,000	\$ 1,574,000
	Does this Belong to Mt. Abe? 1905	2,280	\$ 912,000	\$ 456,000
	Sum of All Projects	32,343	\$ 12,937,200	\$ 6,468,600

Service Area Map – Project Areas



Questions?

