MEMORANDUM

Date: April 28, 2020

To: City of Three Forks

From: Susan Hayes, P.E.

Craig Pozega, P.E., Project Manager

Subject: 2020 Preliminary Engineering Report Assumptions

The Preliminary Engineering Report being completed for the City of Three Forks for the water system will be based on a number of preliminary assumptions. Those assumptions include those related to current population, population growth, current water use, future water use, current drinking water regulations, and future drinking water regulations. Also taken into consideration are the costs of proposed improvements, current financial situation of the City as well as rate structures, and possible changes to the needs of the City in the future.

This memorandum is intended to outline the assumptions and goals of the PER for the City's consideration, comment, and approval.

1. Population – Current and Projected

The current estimated population as of 2018 from American Community Surveys (ACS) for Three Forks is 2053 people. The 2010 Census data for the City showed a population of 1869 people. The growth rate from 2010 through 2018 is 1.18%. The 2013 PER assumed a growth rate of 2.5% for the 20 year planning period resulting in a population of 3,200 people in 2032. As can be seen in the available data, the actual growth rate has been lower than the assumed growth rate. It is proposed that an annual growth rate of 2% be used determine the 20 year design population for the PER. This is a conservative growth rate more in line with what has been observed since the completion of the previous PER. Utilizing the 2% growth rate over 20 years the estimated population in 2040 will be 3,136 people.

Alternatively, if the actual growth rate of 1.18% is used the predicted population in 2040 would be 2,662 people. Both growth rates are shown in the following table.

City of Three Forks Population Data			
Year	Data	1.18% Annual Growth Rate	2% Annual Growth Rate
2010	1,869	1,869	1,869
2018	2,053	2,053	2,053
2020		2,102	2,137
2030		2,365	2,610
2040		2,662	3,188

2. Water Usage Analysis

In addition to analyzing the population of the City, an analysis of the last 3 years of water usage has also been completed. The following table summarized the total amount of water used on a monthly basis over the three year period as well as the average flow rate based on that usage.

City of Three Forks - Water Use Data 2017-2019					
Month	**2017**	**2018**	**2019**	**Monthly Average**	**gpm**
January	3,325,052	3,761,891	3,401,017	3,495,987	78
February	2,742,673	2,900,743	3,255,162	2,966,193	74
March	2,868,719	2,669,102	4,033,074	3,190,299	71
April	3,296,978	2,669,102	3,083,320	3,016,467	70
May	3,038,721	2,975,533	4,627,976	3,547,410	79
June	6,860,800	5,100,886	4,038,625	5,333,437	123
July	8,222,558	7,447,414	7,172,633	7,614,201	171
August	8,598,214	9,893,926	7,106,258	8,532,799	191
September	6,994,125	6,082,140	6,015,018	6,363,761	147
October	3,187,217	4,238,795	3,276,721	3,567,578	80
November	3,328,950	2,815,451	3,913,476	3,352,625	78
December	2,802,839	2,901,327	2,925,040	2,876,402	64
Annual Total	**55,266,847**	**53,456,311**	**52,848,319**	**53,857,159**	**102**

3. System Demands and Population

Taking into account both the total water usage as well as the population data and estimates it is possible to better understand the water being used per capita as well as what the peaking factor is between winter and summer water use. The following table correlates the average monthly water use with the average population of the city over the last 3 years to determine the usage based on a per capita basis, or gallons per capita per day (gpcd).

City of Three Forks - Water Usage as Gallons Per Capita Per Day		
Month	**Monthly Average**	**gpcd**
January	3,495,987	55.0
February	2,966,193	51.7
March	3,190,299	50.2
April	3,016,467	49.0
May	3,547,410	55.8
June	5,333,437	86.7
July	7,614,201	119.8
August	8,532,799	134.2
September	6,363,761	103.4
October	3,567,578	56.1
November	3,352,625	54.5
December	2,876,402	45.2
Annual Total	**53,857,159**	**71.9**
Average population		*2051*

With the monthly annual average use data, the summer average use data, and the winter average use data, the average daily demand (ADD) and maximum daily demand (MDD) for the system are calculated. This data is necessary as one of the requirements for supply as stated by DEQ is that *the system must be able to supply the MDD with the largest source of water out of service*. In the case of Three Forks, the largest source of supply is Well #2. A summary of the ADD, MDD, and the sources of supply are detailed in the next two tables.

City of Three Forks - Maximum Day Demand/Average Day Demand Ratio				
Month	**2017**	**2018**	**2019**	**Monthly Average**
Annual Total (gal)	55,266,847	53,456,311	52,848,319	53,857,159
ADD (gal)	151,416	146,456	144,790	147,554
ADD (gpm)	105	102	101	102
MDD - August (gal)	277,362	319,159	229,234	275,252
MDD - August (gpm)	193	222	159	191
Ratio MDD/ADD	1.83	2.18	1.58	1.87

The average MDD of 191 gpm for the past three years means that the City must be capable of producing at least that volume of water with Well #2 out of service. The well summary table indicates that theoretically the City has a total capacity of 700 gpm. However, Well #8 is not currently in use. With Well #2 and Well #8 offline the theoretical capacity of the system is 340 gpm.

City of Three Forks Well Production Rates Summary	
Well ID	**Flow Rate**
Well #2	200
Well #5	60
Well #6	60
Well #8	160
Well #9	60
Well #10	160
Total	**700**

4. Future Population and Demands

Utilizing a growth rate of 2% and an ADD:MDD ratio of 2 for analyzing the future needs of the water system, the following is the 2040 scenario to be used for planning improvements presented in the PER.

City of Three Forks - Planning Assumptions	
Year	2040
Population	3,188
gpcd	71.9
ADD (gal)	229,217
ADD (gpm)	159
ADD:MDD factor	2
MDD (gal)	458,434
MDD (gpm)	318

Assuming the City can continue to utilize all its wells and bring Well #8 online with appropriate treatment the system is well positioned to continue to provide adequate supply to its customers for the 20 year planning period. Without the use of Wells #8, #9, and #10 the City would not be able to meet DEQ regulations for an adequate supply of water for the system.

5. Existing Water Quality

The water quality in Three Forks meets nearly all drinking water quality standards.

- Well #2 exceeds the MCL for arsenic but a water treatment plant is in place to remove arsenic and bring the water into compliance prior to distribution.
- Wells #8, #9 and #10 have water quality that is not aesthetically pleasing. The water exceeds the SMCLs in more than one case.
- Wells #9 and #10 are near the Gross Alpha MCL and have exceeded it in past samples. If the MCL is exceeded again quarterly monitoring will be required to determine the running annual average (RAA).

The following table identifies the areas where the water quality could be improved through treatment.

City of Three Forks - Water Quality Summary Wells #8, #9, & #10						
Analyte	**units**	***MCL***	***SMCL***	**Well #8**	**Well #9**	**Well #10**
pH	s.u.		*6.5-8.5*	8.3	7.8	8.4
Temp	C			19	18	18
TDS	mg/L		*500*	670	1060	1600
Alkalinity (total as CaCO3)	mg/L			291	352	402
Bicarbonate as HCO3	mg/L			350	429	484
Carbonate as CO3	mg/L			ND	ND	ND
Chloride	mg/L		*250*	50	132	138
Sulfate	mg/L		*250*	150	319	657
Fluoride	mg/L		*2*	0.9	0.8	1.6
Nitrogen, Nitrite as N	mg/L			ND	ND	ND
Nitrogen, Nitrate as N	mg/L			ND	ND	ND
Nitrogen, Nitrate+Nitrite as N	mg/L	*10*		ND	ND	ND
Antimony	mg/L	*0.006*		ND	ND	ND
Arsenic	mg/L	*0.01*		0.002	0.001	ND
Barium	mg/L	*2*		ND	ND	ND
Beryllium	mg/L	*0.004*		ND	ND	ND
Cadmium	mg/L	*0.005*		ND	ND	ND
Calcium	mg/L			13	63	15
Chromium	mg/L	*0.1*		ND	ND	ND
Copper	mg/L	*1.3*	*1*	ND	0.009	0.008
Iron	mg/L		*0.3*	0.51	0.46	0.28
Lead	mg/L	*0.015*		ND	ND	ND
Magnesium	mg/L			1	15	2
Manganese	mg/L		*0.05*	0.04	0.326	0.021
Mercury	mg/L	*0.002*		ND	ND	ND
Nickel	mg/L			ND	ND	ND
Potassium	mg/L			8	7	4
Selenium	mg/L	*0.05*		ND	0.001	0.002
Sodium*	mg/L			203	272	526
Thallium	mg/L	*0.002*		ND	ND	ND
Grosh Alpha (adjusted)***	pCi/L	*15*		3.7	12.7	12.7
Uranium	mg/L	*0.03*		0.0009	0.0056**	0.0013

**Sodium - EPA does not have an enforceable limit for sodium. However, EPA recommends reducing sodium concentrations in drinking water to between 30 and 60 mg/L based on esthetic effects (i.e., taste).*

***Uranium result for Well #9 is combined sample with Well #10 on 2/12/2020*

****Gross Alpha results have ranged from 4 pCi/L up to 21 pCi/L in the past 10 years. A result over the MCL would trigger quarterly monitoring to establish a running annual average (RAA).*

As can be seen in the table:

- All three wells exceed the SMCL for TDS,
- All three wells exceed the EPA recommended limit for sodium (not an SMCL but a recommendation based on taste),
- Wells # 9 and #10 are near the Gross Alpha MCL,
- Wells #8 and #9 exceed the SMCL for iron, and Well #10 is very close to the iron SMCL,
- Wells #9 and #10 exceed the SMCL for sulfate, and
- Well #9 exceeds the SMCL for manganese.

6. Improving Water Quality

To improve the water quality of Wells #8, #9, and #10 a two stage treatment plant would be needed. Reducing iron, manganese, and TSS would be necessary prior to being able to successfully remove TDS, sodium, and sulfate. This is due to the fact that iron and manganese particles are much larger than the others and foul or ruin the treatment equipment that is used for removing the smaller particles.

The most common way to remove iron and manganese is with pressure filtration and oxidation of iron and manganese. This is very similar treatment to what is being used for Well #2 for arsenic removal. Alternatively, ultrafiltration membranes can be used to remove iron and manganese. The most common way to remove the other particles – TDS, sodium, and sulfate – is through the use of reverse osmosis.

The following scenarios are being considered:

A. Alternative T1: Vertical Pressure Filters followed by Reverse Osmosis

   This alternative would provide treatment of the water from Wells #8, #9, and #10. The water would be blended at a common point or tank and then flow through the two stage treatment process. After treatment the water would be pumped into the distribution system.

B. Alternative T2: Ultrafiltration Membranes followed by Reverse Osmosis

   This alternative is very similar to T1, but uses ultrafiltration membranes for pretreatment in lieu of vertical pressure filters.

C. Alternative T3: Expand existing arsenic treatment plant in conjunction with drilling a new well.

   This alternative would be coupled with a new source alternative and would have to be approached in phases. The phases include

   - Identify locations for 1 to 3 new wells near existing Well #2
   - Complete test wells
   - Coordinate with a water rights expert/attorney and DNRC to determine if moving and replacing wells is a viable path for Three Forks while maintaining water rights
   - Complete new wells and design/construct and expansion to the existing arsenic treatment plant (assumes that new wells will require arsenic treatment)

D. Alternative T4: Electrodialysis or Capacitive Deionization (CapDI).

    a. The electrodialysis or CapDI options would require further research. Both technologies are relatively new to municipal water systems and would require careful consultation with DEQ. A cost is not presented in these preliminary findings, however it is assumed that the same building size would be required and the total capital cost would be similar to or slightly greater than Alternative T2.

E. Alternative S1: Construct new wells, each with a target flowrates to be determined after test well completion, in the same area as existing Well #2, and assume that they require arsenic treatment

A preliminary cost estimate and illustrative figure are included for each treatment option are presented in the following pages for reference.

All of the above scenarios will be analyzed for life cycle cost to ensure that a full picture of cost is presented in the PER.

7. Alternative T1: Vertical Pressure Filters followed by Reverse Osmosis.

OPINION OF PROBABLE COST CITY OF THREE FORKS WTP PROJECT ALTERNATIVE T1 - VERTICAL PRESSURE FILTRATION + RO					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
	TREATMENT				
1	Well Improvements (#8 & #10) and/or Reconstruction	1	LS	$ 200,000.00	$ 200,000
2	Pump Improvements	1	LS	$ 40,000.00	$ 40,000
3	Pilot Study	1	LS	$ 30,000.00	$ 30,000
4	Additional Water Quality Analysis	1	LS	$ 5,000.00	$ 5,000
5	Vertical Pressure Filters + RO	1	LS	$ 1,250,000.00	$ 1,250,000
6	Booster Station- post treatment	1	LS	$ 50,000.00	$ 50,000
7	Installation of Packaged Plant	1	LS	$ 438,000.00	$ 438,000
8	Interior Mechanical Piping	1	LS	$ 75,000.00	$ 75,000
9	Tank (Feed, Blending)	1	LS	$ 35,000.00	$ 35,000
10	Building	3,250	SF	$ 250.00	$ 812,500
11	Building Mechanical	1	LS	$ 75,000.00	$ 75,000
12	Yard Piping	1	LS	$ 40,000.00	$ 40,000
13	Electrical	1	LS	$ 150,000.00	$ 150,000
14	SCADA	1	LS	$ 50,000.00	$ 50,000
15	Backup Generator	1	LS	$ 125,000.00	$ 125,000
16	Site Work	1	LS	$ 50,000.00	$ 50,000
17	Connection to Sewer	1	LS	$ 15,000.00	$ 15,000
18	Fencing	500	LF	$ 45.00	$ 22,500
19	Lab Equipment	1	LS	$ 20,000.00	$ 20,000
20	Water Quality Monitoring (pH, temp, NTU, Cl2)	6	EA	$ 3,000.00	$ 18,000
	Subtotal: 2020 Direct Construction Subtotal				**$ 3,501,000**
	Mobilization		10.0%		$ 350,100
	Subtotal: 2020 Construction Cost				**$ 3,851,100**
	2022 Construction Cost [2]		3.0%		$ 4,085,632
	Contingency		10.0%		$ 408,563
	Subtotal: 2022 Construction Subtotal				**$ 4,494,195**
	Land Acquisition				
	Water Rights				$ -
	Right-of-Way & Permits				$ 5,000
	Hydrogeologic Investigation				$ -
	Geotechnical Investigation				$ 10,000
	Engineering		20%		$ 898,839
	Legal & Administrative		5%		$ 224,710
	TOTAL				**$ 5,633,000**

[1] *Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.*

[2] *The ENR 20 year average Construction Cost Index is +2.88% (1994-2013), so capital costs are projected to an anticipated construction date in 2022 using a 3.0% inflation rate.*

0 50 100
SCALE IN FEET

NORTH

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Figure 1-1

Planning Area

THREE FORKS, MT
WATER SYSTEM PER 2020

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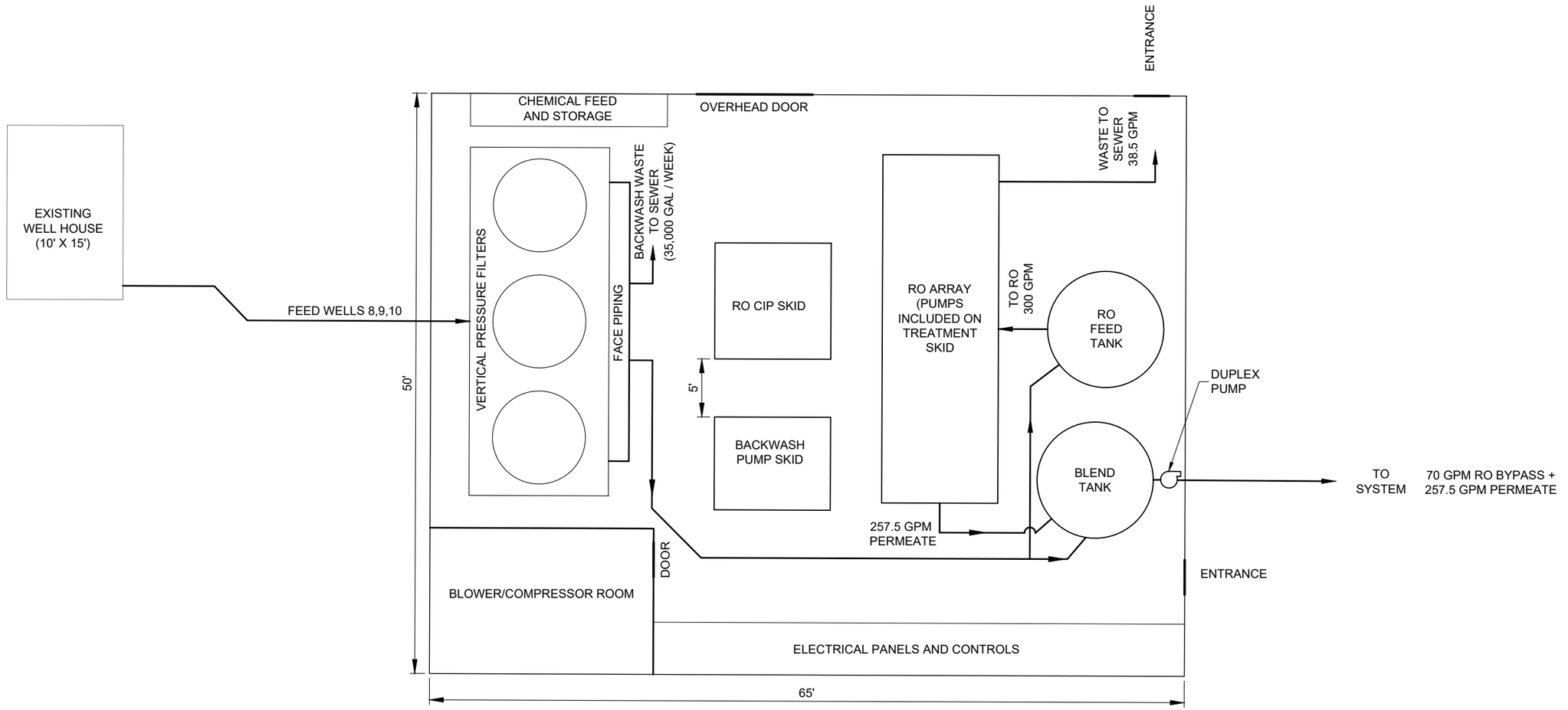

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NORTH

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SCALE IN FEET

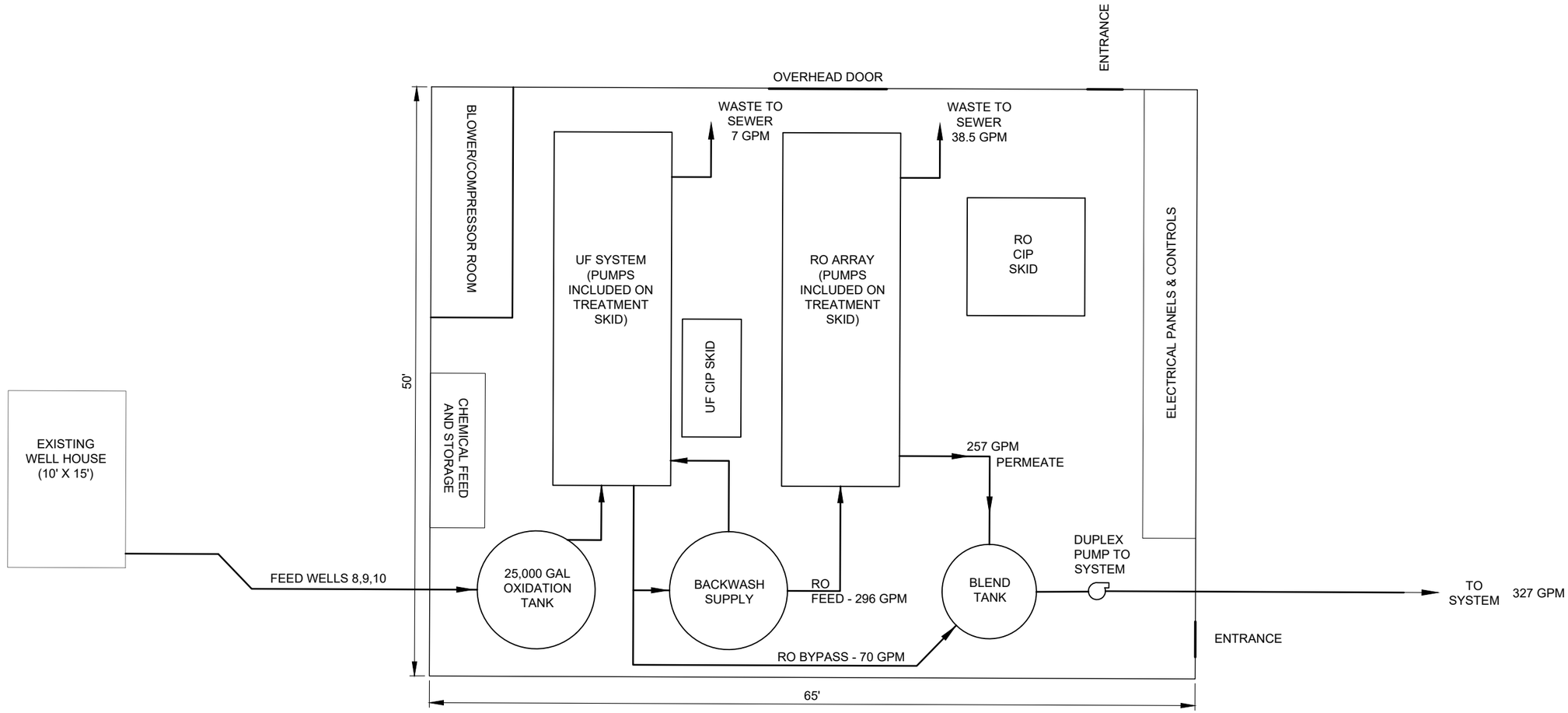
Figure 1-1
Treatment Alternative #1
Vertical Pressure Filtration + RO
Westech
THREE FORKS, MT
WATER SYSTEM PER 2020

8. Alternative T2: Ultrafiltration Membranes followed by Reverse Osmosis

OPINION OF PROBABLE COST CITY OF THREE FORKS WTP PROJECT ALTERNATIVE T2 - UF + RO					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
1	Well Improvements (#8 & #10) and/or Reconstruction	1	LS	$ 200,000.00	$ 200,000
2	Pump Improvements	1	LS	$ 40,000.00	$ 40,000
3	Pilot Study	1	LS	$ 50,000.00	$ 50,000
4	Additional Water Quality Analysis	1	LS	$ 5,000.00	$ 5,000
5	Ultrafiltration + RO	1	LS	$ 1,500,000.00	$ 1,500,000
6	Booster Station- post treatment	1	LS	$ 50,000.00	$ 50,000
7	Installation of Packaged Plant	1	LS	$ 525,000.00	$ 525,000
8	Interior Mechanical Piping	1	LS	$ 75,000.00	$ 75,000
9	Backwash/Blending Tanks	2	LS	$ 15,000.00	$ 30,000
10	Building	3,250	SF	$ 275.00	$ 893,750
11	Building Mechanical	1	LS	$ 75,000.00	$ 75,000
12	Yard Piping	1	LS	$ 40,000.00	$ 40,000
13	Electrical	1	LS	$ 175,000.00	$ 175,000
14	SCADA	1	LS	$ 50,000.00	$ 50,000
15	Backup Generator	1	LS	$ 125,000.00	$ 125,000
16	Site Work	1	LS	$ 50,000.00	$ 50,000
17	Connection to Sewer	1	LS	$ 15,000.00	$ 15,000
18	Fencing	500	LF	$ 45.00	$ 22,500
19	Lab Equipment	1	LS	$ 20,000.00	$ 20,000
20	Water Quality Monitoring (pH, temp, NTU, Cl2)	6	EA	$ 3,000.00	$ 18,000
	Subtotal: 2020 Direct Construction Subtotal				**$ 3,959,250**
	Mobilization		10%		$ 395,925
	Subtotal: 2020 Construction Cost				**$ 4,355,175**
	2022 Construction Cost [2]		3%		$ 4,620,405
	Contingency		10%		$ 462,041
	Subtotal: 2022 Construction Subtotal				**$ 5,082,446**
	Land Acquisition				
	Water Rights				$ -
	Right-of-Way & Permits				$ 5,000
	Hydrogeologic Investigation				$ -
	Geotechnical Investigation				$ 10,000
	Engineering		20%		$ 1,016,489
	Legal & Administrative		2%		$ 101,649
	TOTAL				**$ 6,216,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +2.88% (1994-2013), so capital costs are projected to an anticipated construction date in 2022 using a 3.0% inflation rate.



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SCALE IN FEET

NORTH

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Figure 1-3
Treatment Alternative #2
UF System + RO
Westech
THREE FORKS, MT
WATER SYSTEM PER 2020

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9. Alternative S1 + Alternative T3: New Well and Expand Existing Arsenic Treatment Plant

The following table outlines the estimate cost of pursuing and constructing new wells and connecting them to the existing treatment plant site.

OPINION OF PROBABLE COST CITY OF THREE FORKS WTP PROJECT ALTERNATIVE S1 - NEW WELL, CONNECT TO TANKS					
#	**BID ITEM**	**QTY**	**UNITS**	**UNIT PRICE [1]**	**TOTAL**
	Phase 1 - Land Acquisition & Test Wells				
	Hydrogeologic Investigation	1	LS	$ 20,000.00	$ 20,000
	Land Acquisition	3	AC	$ 10,000.00	$ 30,000
	Test Well	3	EA	$ 20,000.00	$ 60,000
	Subtotal Phase 1				$ 110,000
	Phase 2 - Water Rights Analysis				
	Water Rights Analysis	1	LS	$ 40,000.00	$ 40,000
	Water Consultant Assistance	1	LS	$ 10,000.00	$ 10,000
	DNRC Permitting	1	LS	$ 15,000.00	$ 15,000
	Subtotal Phase 2				$ 65,000
	Phase 3 - Well Construction & Connection to System				
1	Pitless Adaptors	2	EA	$ 15,000.00	$ 30,000
2	Temporary Surface Casing	2	LS	$ 15,000.00	$ 30,000
3	Drill 12" Borehole	400	LF	$ 125.00	$ 50,000
4	Install 8" Casing	300	LF	$ 75.00	$ 22,500
5	Pump Test (72 hours)	144	Hrs	$ 300.00	$ 43,200
6	Water Quality Analysis	2	LS	$ 3,500.00	$ 7,000
7	Well Completion	2	LS	$ 30,000.00	$ 60,000
8	Connection to System	4,000	LF	$ 65.00	$ 260,000
	Subtotal Phase 3				$ 502,700
	Direct Construction Subtotal				**$ 677,700**
	Mobilization		10%		$ 67,770
	Subtotal: 2020 Construction Cost				**$ 745,470**
	2022 Construction Cost [2]		3%		$ 790,869
	Contingency		10%		$ 79,087
	Subtotal: 2022 Construction Subtotal				**$ 869,956**
	Right-of-Way & Permits				$ 15,000
	Engineering		20%		$ 173,991
	Legal & Administrative		5%		$ 43,498
	TOTAL				**$ 1,103,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +2.88% (1994-2013), so capital costs are projected to an anticipated construction date in 2022 using a 3.0% inflation rate.

A figure showing the general location where it is assumed new wells could be constructed is included. The construction of two or three new wells allows the system to meet the DEQ criteria of meeting the MDD with the largest well out of service. A decision regarding the number of wells necessary would depend on the results of test wells and water rights considerations.

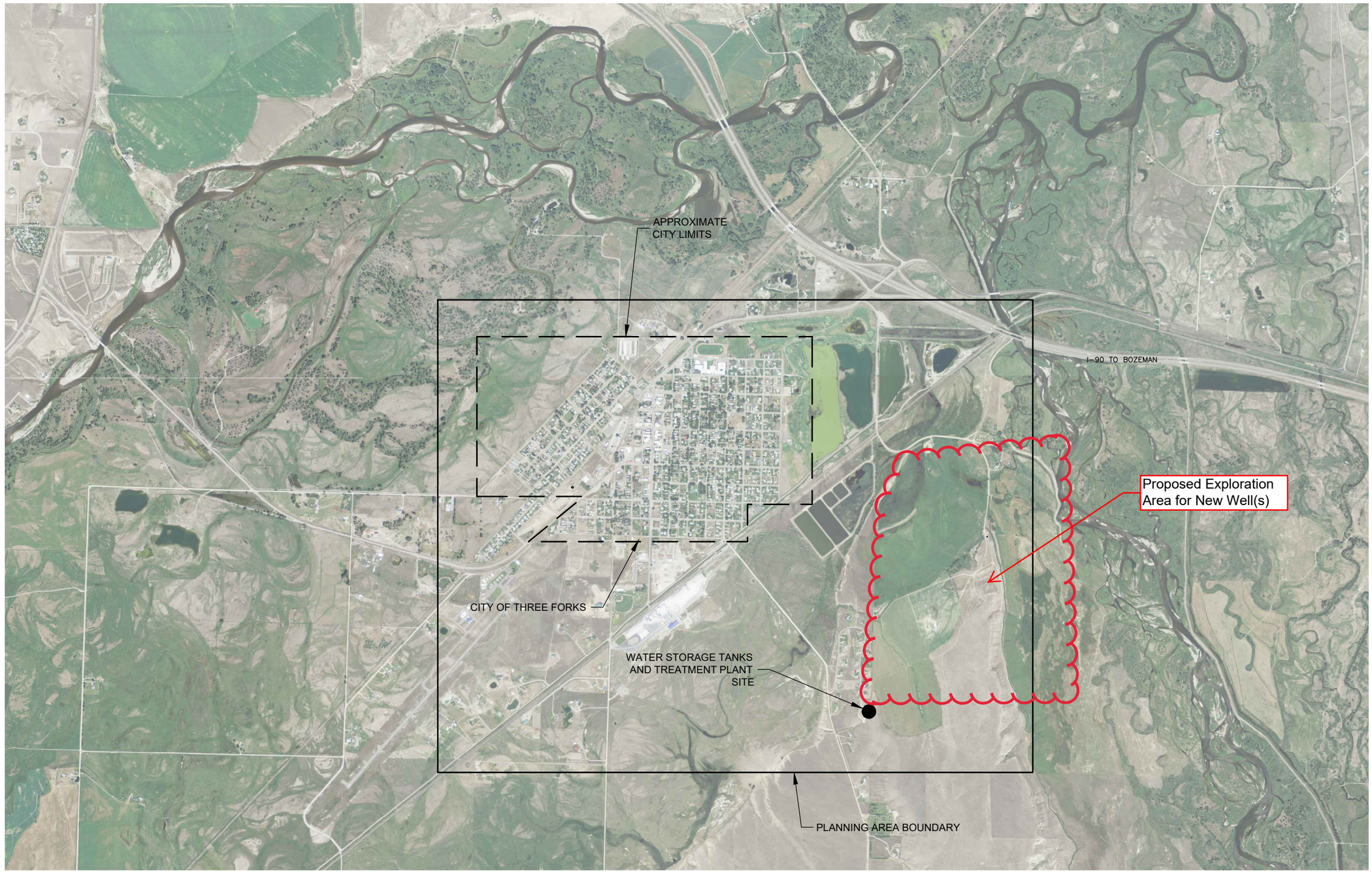

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FIGURE 2-1
VICINITY MAP

CITY OF THREE FORKS
WATER SYSTEM IMPROVEMENTS

The expansion of the existing treatment plant would be assumed to increase the size of the existing building to accommodate additional filters. Based on the property limits observed in aerial photos it is assumed that a 15 ft addition could be added to the building to house three new 8 ft diameter filters. The plant would be designed to treat the increased flow from the new wells needing arsenic treatment and would include the DEQ required redundancy.

OPINION OF PROBABLE COST
CITY OF THREE FORKS WTP PROJECT
ALTERNATIVE T3 - EXPAND EXISTING ARSENIC TREATMENT

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	Packaged WTP (Additional 150gpm+redundancy)	1	LS	$ 550,000.00	$ 550,000
2	Installation of Packaged System	1	LS	$ 192,500.00	$ 192,500
3	Building	750	SF	$ 275.00	$ 206,250
4	Building Mechanical	1	LS	$ 40,000.00	$ 40,000
5	Electrical	1	LS	$ 75,000.00	$ 75,000
6	Controls/SCADA	1	LS	$ 20,000.00	$ 20,000
7	Process Piping	1	LS	$ 40,000.00	$ 40,000
8	Valves/Fittings	1	LS	$ 25,000.00	$ 25,000
9	Chemical Feed Upgrades	1	LS	$ 25,000.00	$ 25,000
10	Site Work	1	LS	$ 20,000.00	$ 20,000
11	Chemical storage/pumps	1	LS	$ 25,000.00	$ 25,000
	Subtotal: 2020 Direct Construction Subtotal				**$ 1,218,750**
	Mobilization		10%		$ 121,875
	Subtotal: 2020 Construction Cost				**$ 1,340,625**
	2022 Construction Cost [2]		3%		$ 1,422,269
	Contingency		10%		$ 142,227
	Subtotal: 2022 Construction Subtotal				**$ 1,564,496**
	Land Acquisition		1 Acre		$ 20,000
	Water Rights				$ -
	Right-of-Way & Permits				$ 5,000
	Hydrogeologic Investigation				$ -
	Geotechnical Investigation				$ 10,000
	Engineering		20%		$ 312,899
	Legal & Administrative		5%		$ 78,225
	TOTAL				**$ 1,991,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +2.88% (1994-2013), so capital costs are projected to an anticipated construction date in 2022 using a 3.0% inflation rate.

The estimate total of this alternative is $3.1 million. It is assumed that with this option, wells #8, #9, and #10 would no longer be used for the system.

10. Distribution System Improvements

The distribution system for the City is in good condition overall. There are some areas where improvements can be made to increase flow/pressure during maximum day demand and fire flow situations. These areas include;

A. Loop around the talc plant

B. Adding loops between 2nd/3rd Avenues

C. Consider looping the ends of lines on 7th Ave – currently the operators use these dead ends as points to flush the system.

   a. With the addition of a treatment facility to improve the water quality of the existing wells in town, or by switching to a different water source as proposed in Alternative S1+T3, it is likely that the overall water quality in the water lines will improve and flushing, while still necessary, may not be as critical to limiting the amount of sediment accumulating in the water lines. With the improvement of the water quality it may become more attractive to add the loops and improve flow/pressure in this area.

D. Continue the capital improvements to the system as currently scheduled in the capital improvement plan. The City has made good improvements to the system over the years by maintain a quality capital improvements schedule.

The cost of items 1 and 2, the loop around the talc plant and loops at 4 areas between 2nd and 3rd Ave, is included in the following table.

OPINION OF PROBABLE COST
CITY OF THREE FORKS WTP PROJECT
ALTERNATIVE D1 - Talc Plant, Neil/Ash/Cedar/Elm Loops

#	BID ITEM	QTY	UNITS	UNIT PRICE [1]	TOTAL
1	8-inch PVC Water Main	3,500	LF	$ 55.00	$ 192,500
2	6-inch PVC Water Main	2,550	LF	$ 45.00	$ 114,750
3	8-inch Gate Valves	3	EA	$ 2,500.00	$ 7,500
4	6-inch Gate Valves	10	EA	$ 1,500.00	$ 15,000
5	Air Release Valves	6	EA	$ 2,500.00	$ 15,000
6	12" Steel Casing under RR	120	LF	$ 200.00	$ 24,000
7	Type B Surface Restoration	3,500	LF	$ 10.00	$ 35,000
8	Pavement Removal/Replacement	2,550	SY	$ 40.00	$ 102,000
	Direct Construction Subtotal				**$ 505,750**
	Mobilization		10%		$ 50,575
	Subtotal: 2020 Construction Cost				**$ 556,325**
	2022 Construction Cost [2]		3%		$ 590,205
	Contingency		10%		$ 59,021
	Subtotal: 2022 Construction Subtotal				**$ 649,226**
	Land Acquisition				$ -
	Traffic Control		2%		$ 12,985
	Right-of-Way & Permits				$ 15,000
	Geotechnical Investigation				$ 10,000
	Engineering		20%		$ 129,845
	Legal & Administrative		5%		$ 32,461
	TOTAL				**$ 850,000**

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR 20 year average Construction Cost Index is +2.88% (1994-2013), so capital costs are projected to an anticipated construction date in 2022 using a 3.0% inflation rate.

11. Cost Summary

The total capital costs of each alternative, assuming construction in 2022, is presented in the following table.

OPINION OF PROBABLE COSTS CITY OF THREE FORKS WTP PROJECT ALTERNATIVE SUMMARY - TOTAL COSTS WITH CONTINGENCIES, 2022 CONSTRUCTION			
T1	Vertical Pressure Filters + Reverse Osmosis	$	5,633,000
T2	Ultrafiltration + Reverse Osmosis	$	6,216,000
T3	Expansion of the Existing Arsenic Treatment Plant	$	1,991,000
S1	New Water Source - New Well	$	1,103,000
D1	Distribution System Improvements	$	850,000

The operations and maintenance costs of each of the treatment alternatives are presented below.

OPINION OF PROBABLE COSTS CITY OF THREE FORKS WTP PROJECT ALTERNATIVE SUMMARY - INCREASES TO OPERATIONS AND MAINTENANCE COSTS			
T1	Vertical Pressure Filters + Reverse Osmosis	$	64,746.70
T2	Ultrafiltration + Reverse Osmosis	$	69,649.87
T3	Expansion of the Existing Arsenic Treatment Plant	$	34,500.00

12. Preliminary Rate Changes

All of the projects presented would require an increase to water rates. The following table outlines possible rate increases for the three treatment alternatives based on two separate funding scenarios.

CITY OF THREE FORKS PRELIMINARY FUNDING SCENARIOS						
	100% SRF Loan			**TSEP + RRGL Grant, SRF Loan**		
	Alt. T1	Alt T2	Alt T3 + S1	Alt. T1	Alt T2	Alt T3 + S1
Total Estimate Project Cost	$5,633,000	$6,216,000	$3,100,000	$5,633,000	$6,216,000	$3,100,000
TSEP Grant	$ -	$ -	$ -	$ 750,000	$ 750,000	$ 750,000
RRGL Grant	$ -	$ -	$ -	$ 125,000	$ 125,000	$ 125,000
Base SRF Loan	$5,633,000	$6,216,000	$3,100,000	$4,758,000	$5,341,000	$2,225,000
Annual Debt Service	$ 385,623	$ 425,534	$ 212,219	$ 325,722	$ 365,633	$ 152,319
Increase to O&M (total)	$ 64,800	$ 69,700	$ 34,500	$ 64,800	$ 69,700	$ 34,500
Total Annual Cost Increase	$ 488,985	$ 537,787	$ 267,941	$ 423,095	$ 471,897	$ 202,051
Increase per Connection	*$ 43.49*	*$ 47.83*	*$ 23.83*	*$ 37.63*	*$ 41.97*	*$ 17.97*
Existing Cost per Connection	$ 40.58	$ 40.58	$ 40.58	$ 40.58	$ 40.58	$ 40.58
Total Proposed Cost/Connection	$ 84.07	$ 88.41	$ 64.41	$ 78.21	$ 82.55	$ 58.55
Existing Sewer Rate/EDU	$ 83.18	$ 83.18	$ 83.18	$ 83.18	$ 83.18	$ 83.18
Total Combine Rate Proposed	**$ 167.25**	**$ 171.59**	**$ 147.59**	**$ 161.39**	**$ 165.73**	**$ 141.73**
Combine System Target Rate	$ 98.91	$ 98.91	$ 98.91	$ 98.91	$ 98.91	$ 98.91
Percent of Combined Target Rate	169%	173%	149%	163%	168%	143%

13. Proposed Schedule

The completion of the PER will require input from the City. A preferred project should be identified, followed by alternatives. With the preferred project a full rate scenario depending on various funding sources will be developed and presented. To meet the deadline for grant applications the following schedule is proposed.

Task	Deadline
City to provide direction on preferred alternative and grant applications.	April 28, 2020 – May 12, 2020
Water & Sewer Committee Review PER draft	May 18, 2020 – May 22, 2020
RRGL Grant Application Due	June 1, 2020
Public Hearing #1	June 2, 2020
TSEP Grant Application Due	June 12, 2020
Public Hearing #2	July 2020
Grant Recommendations to Legislature	January 2021
Funding Available	July 2021