FALLON FLATS IRRIGATION PROJECT

November 29, 2021

Presented by:

TOPICS OF DISCUSSION

FLOWS AND SYSTEM OVERVIEW

DISTRIBUTION ASSUMPTIONS

DISTRIBUTION MODEL

INTAKE / PUMP STATION

COST CONSIDERATIONS


DAWSON CO
PRAIRIE CO
Fallon
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Google Earth

FLOWS AND SYSTEMS OVERVIEW

- Irrigable Acres: 15,200 Acres
- Application Rate: 8 gpm/acre (0.42in/day)
- Run time: 24 hr/day
- Irrigation Season: 145 Days (April 15 to Sept 7)
- Split up into four initial flow rates based on the % of the system that would operate at one time

Pivot Operations	GPM	CFS
100%	121,610	270.9
50%	60,805	135.5
33%	40,537	90.3
25%	30,403	67.7

WATER RIGHTS

Instantaneous Pivots Operations

50% Pivots	33% Pivots
38,447 acre feet/year	24,029 acre feet/year

- Estimated Based on a 145-day Irrigation Season
- Point of Withdrawal needs to be in Prairie County

DISTRIBUTION SYSTEM

Key Hydraulic Modeling Assumptions

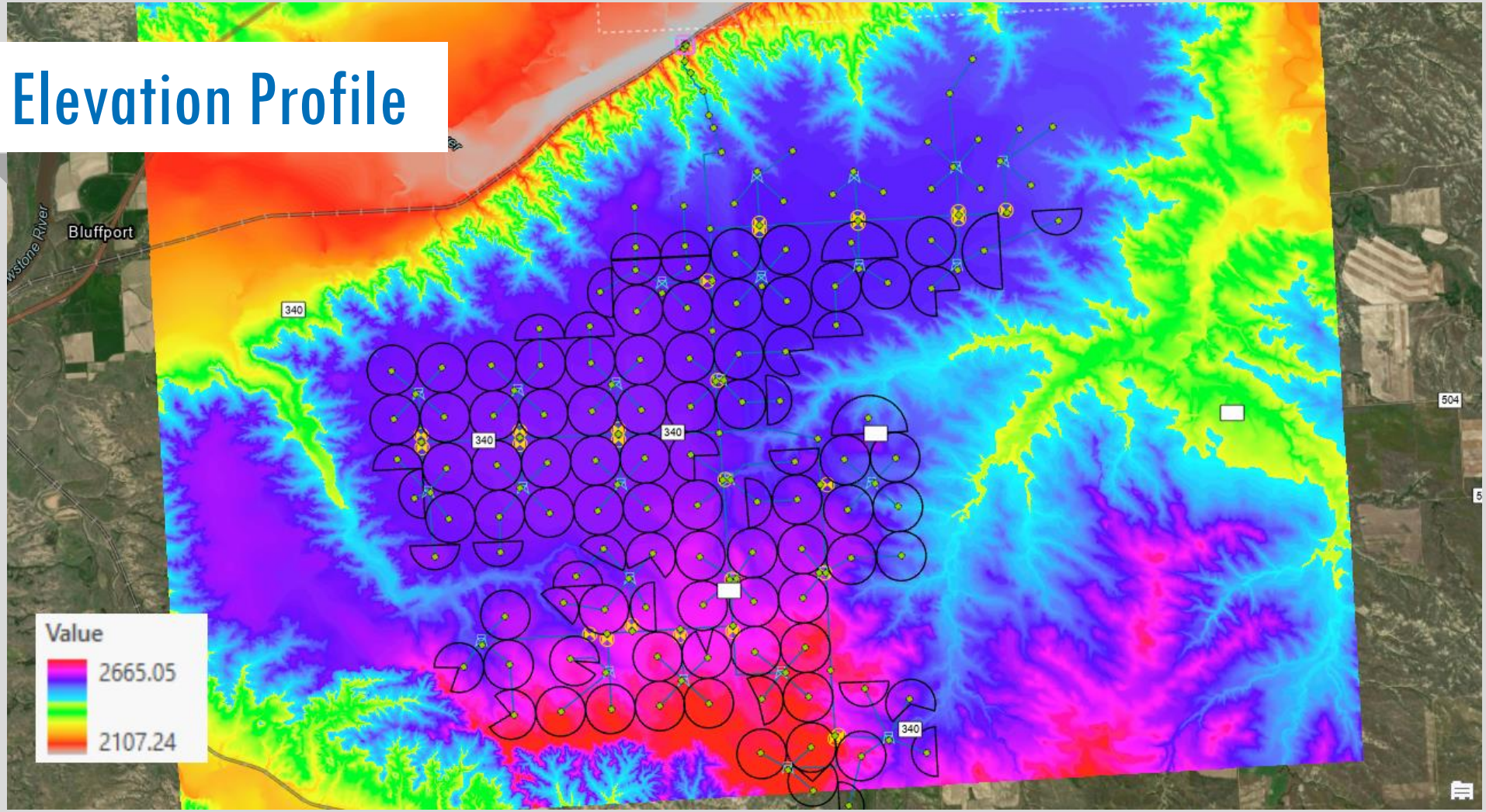
- Water pumped out of the river at essentially the same rate as the system is running at which is maintained by automated controls
- Pond size not significant in water delivery
- Three inches of evaporation per week assumed from Ponds
- Scenario 3 excludes ponds and assumes direct connection to pivots

DISTRIBUTION SYSTEM

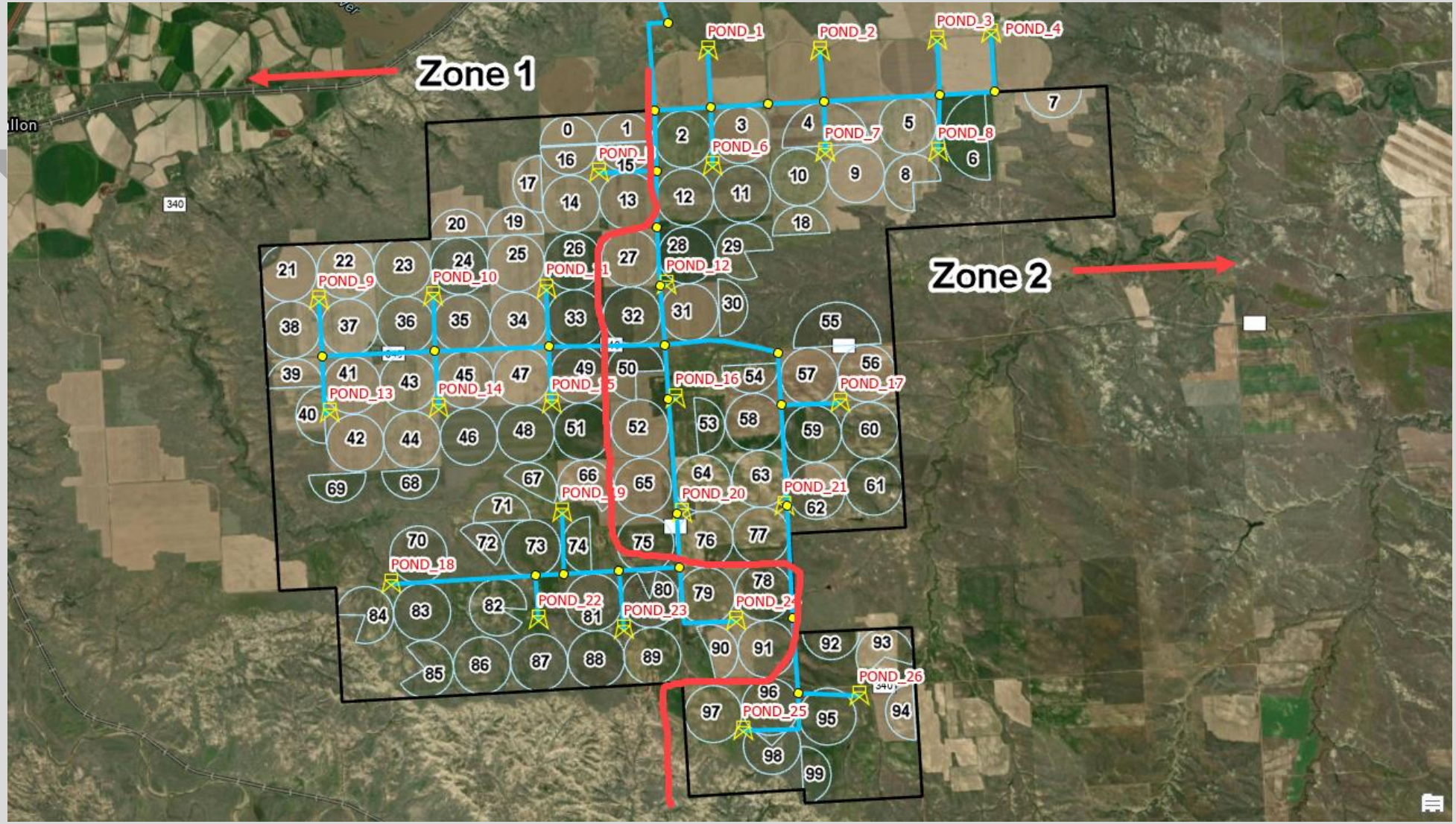
Key Hydraulic Modeling Assumptions

- Operations for both scenarios is:
  - 50% of the pivots irrigated at 8 gpm/acre (based on circular pivot area) for one-day to one-week intervals, then alternating with the other 50% at the selected time interval.
- Additional flow capacity allowed for leakage, and inefficiencies with automated controls.

Elevation Profile



Pivot Zone Operations Concept



MODELING SCENARIOS

SCENARIO 1

Larger Pipes and
Smaller HP Pumps

SCENARIO 2

Larger HP Pumps
and Smaller Pipes

- Both scenarios evaluated effect on pond sizes, operational approaches (zonal flows), and pond fill rates

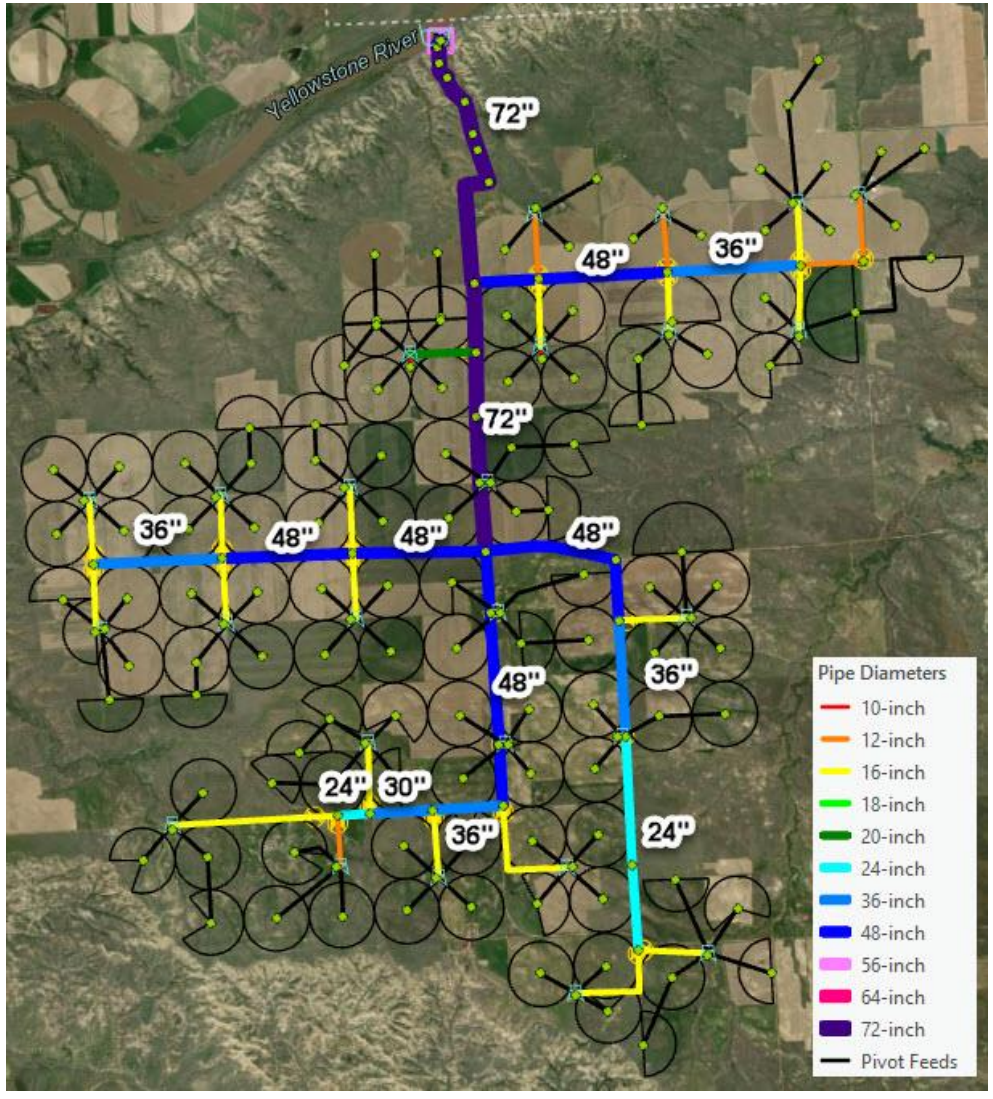
MODELING SCENARIOS

SCENARIO 3

Smaller Pipes and
Larger HP Pumps

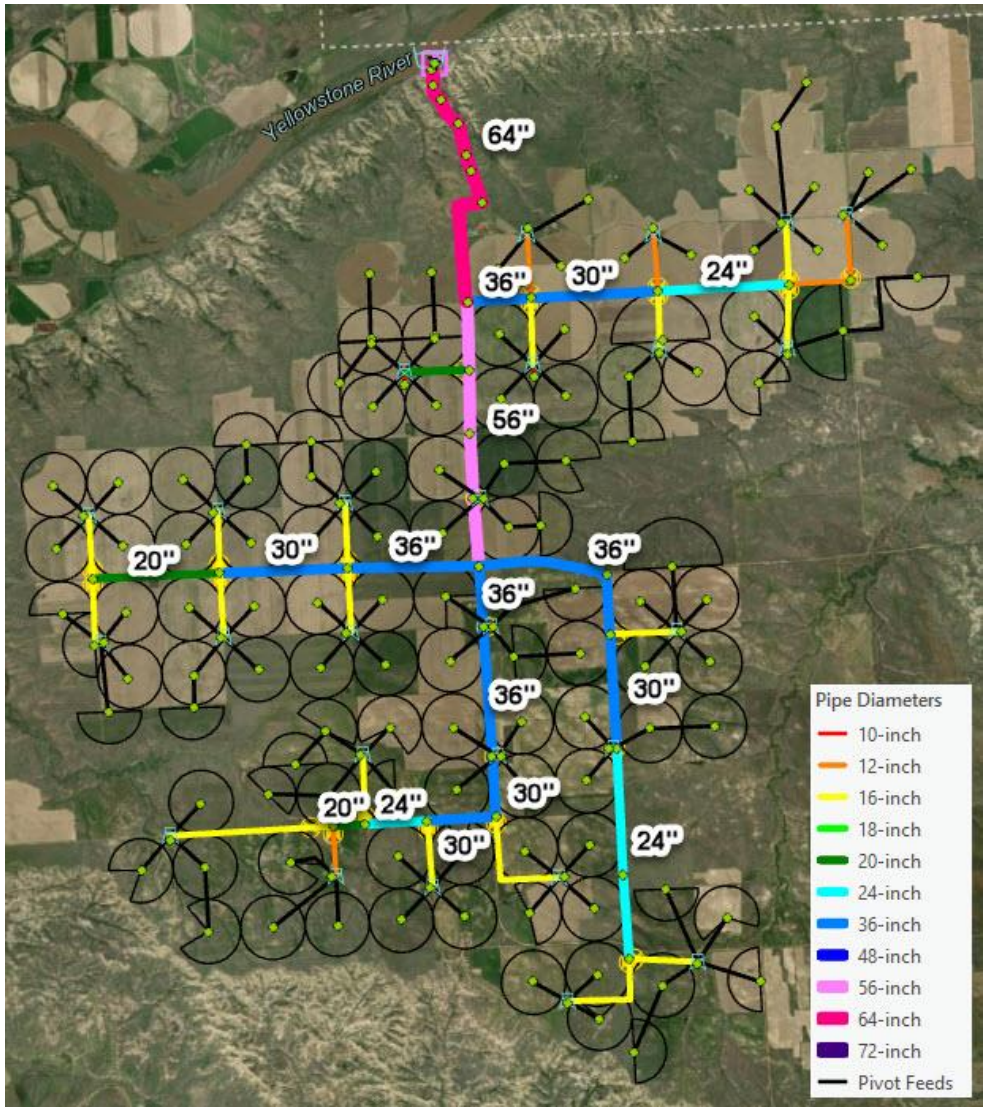
- Assumes direct connection to pivots for operation, operational approaches (zonal flows), and pivot rotation
- Different pump station location upstream of Haidle Intake
- Longer pipeline distance to Fallon Flats

SCENARIO 1
LARGER PIPES AND SMALLER PUMPS



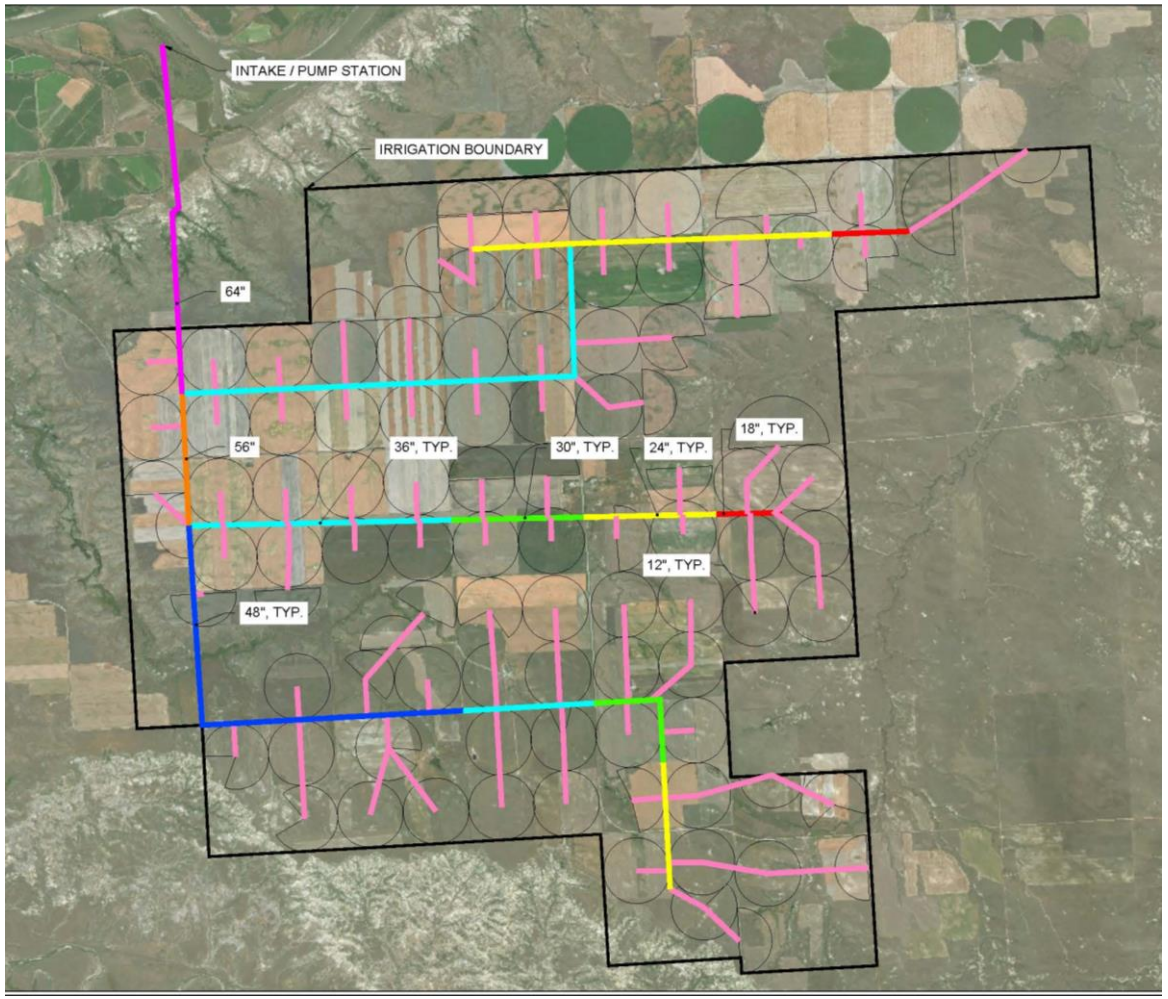
Pipe Size (inches)	Pipe Length (feet)
72	21,957
48	36,622
36	18,130
30	2,571
24	10,010
20	2,977
16	54,232
12	12,302

SCENARIO 2
LARGER PUMPS AND SMALLER PIPES



Pipe Size (inches)	Pipe Length (feet)
64	11,342
54	10,889
36	23,600
30	20,532
24	16,637
20	7,313
16	54,106
12	3,544

SCENARIO 3 – UPSTREAM INTAKE LARGER PUMPS AND SMALLER PIPES



Pipe Size (inches)	Pipe Length (feet)
64	14,195
54	5,330
48	18,752
36	37,055
30	10,511
24	24,964
18	5,743
12	159,907

FLOW SCENARIO NUMBERS

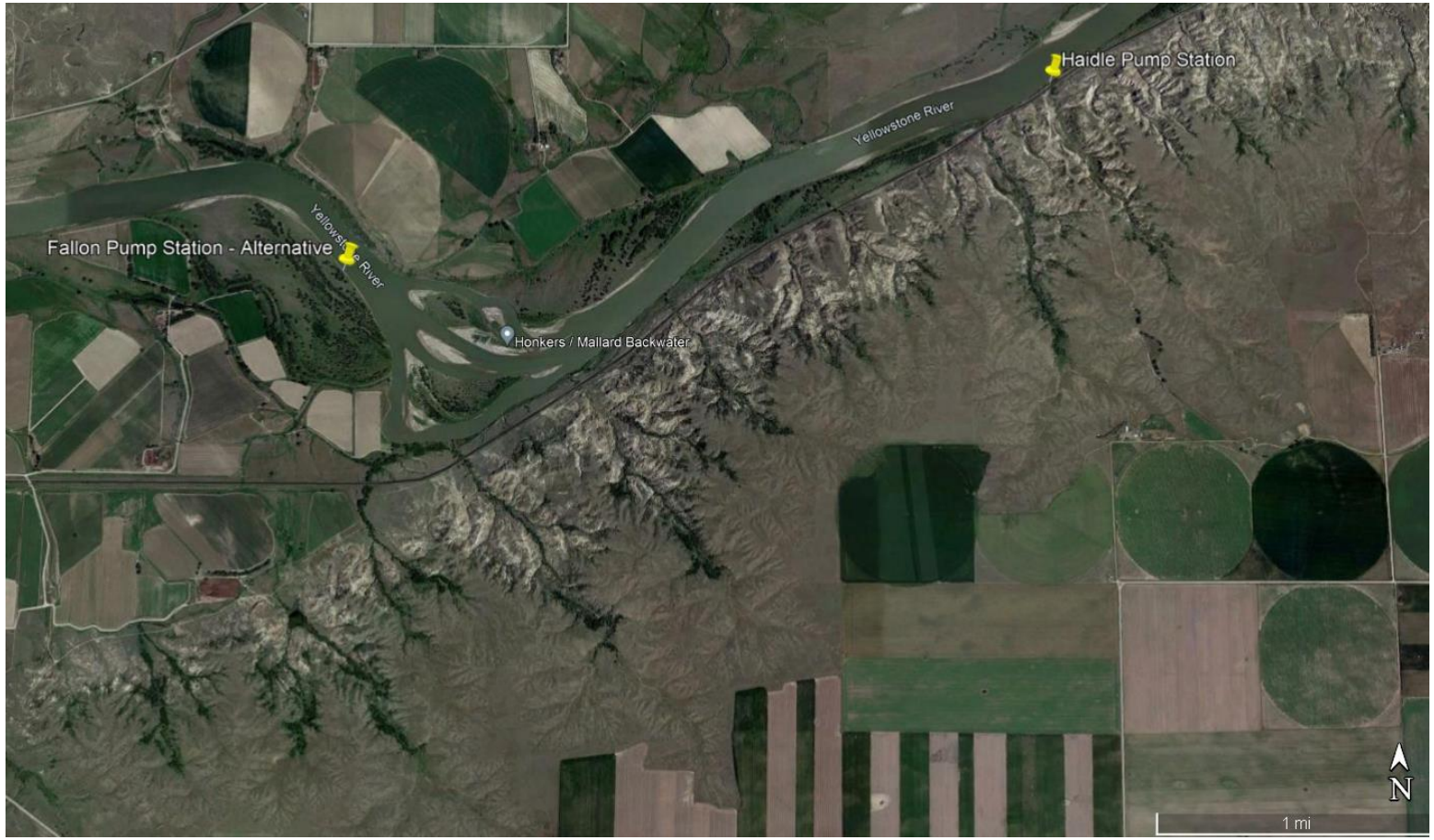
Scenario	Pivot Operations	Total Head (ft)	No. of Pumps	Total GPM	Total CFS	Total HP
1, Large pipe	50%	625	3	60,000	133.7	12,000
1, Large pipe	33%	625	3	37,500	83.6	7,500
2, Small pipe	50%	725	3	60,000	133.7	15,000
2, Small pipe	33%	725	3	37,500	83.6	9,000
3, Small pipe	50%	625	3	60,000	133.7	12,000
3, Small pipe	33%	625	3	37,500	83.6	7,500

- Scenario 1, 2 and 3 are looked at with 50% or 33% of the pivots running at a time

PUMP STATION LOCATIONS AND ROUTING

- Pump Station Location Alternatives
- Route 1
  - Shortest
  - Road Access
  - Permitting Benefits
  - Site Concerns
- Route 3
  - Longest
  - Access Concerns
  - More Permitting
- Same Pumping Requirements

PUMP STATION LOCATIONS AND ROUTING

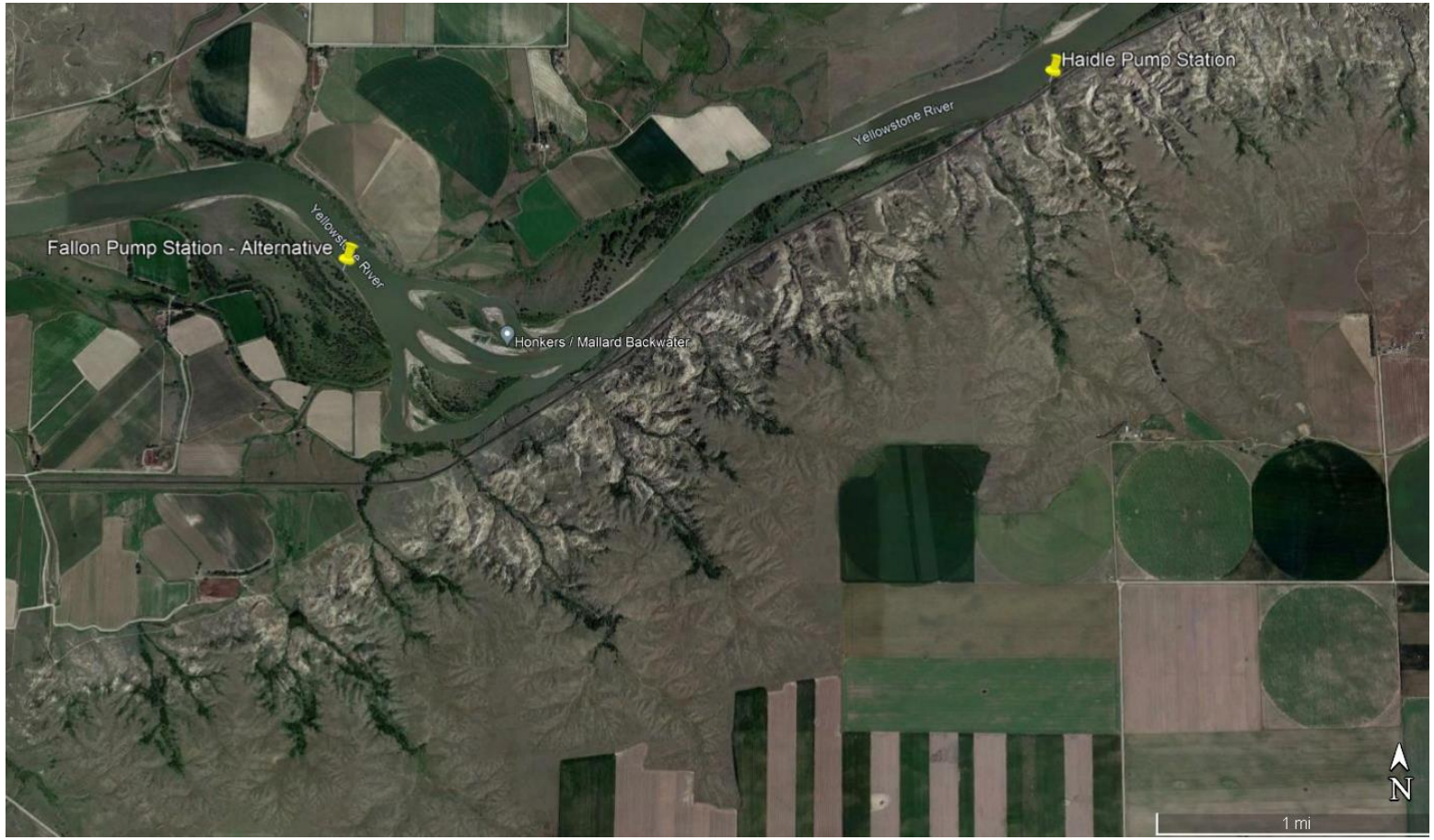


- Alternative 4
  - Longer overall
  - Easier Road Access
  - Permitting Benefits
  - Easier Construction
- Same Pumping Requirements

PUMP STATION LOCATIONS AND ROUTING

- FEMA has no flood data for the area
- All routes have practically the same elevation gain
- The first 400 ft. of elevation gain takes about 55-64% of the pumping power

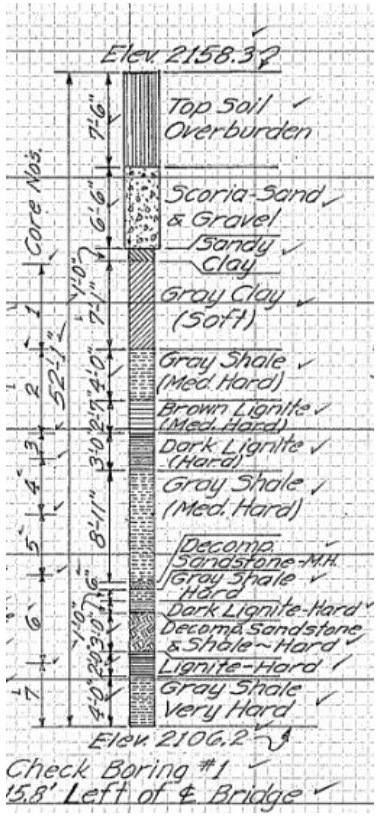
PUMP STATION LOCATIONS AND ROUTING



- BLM owned land will add permitting difficulty with ESA
- FEMA has no flood data for the area
- Similar elevation gain to Scenarios 1 and 2
- The first 400 ft. of elevation gain takes about 55-64% of the pumping power

RIVER INTAKE – River Bed Profile

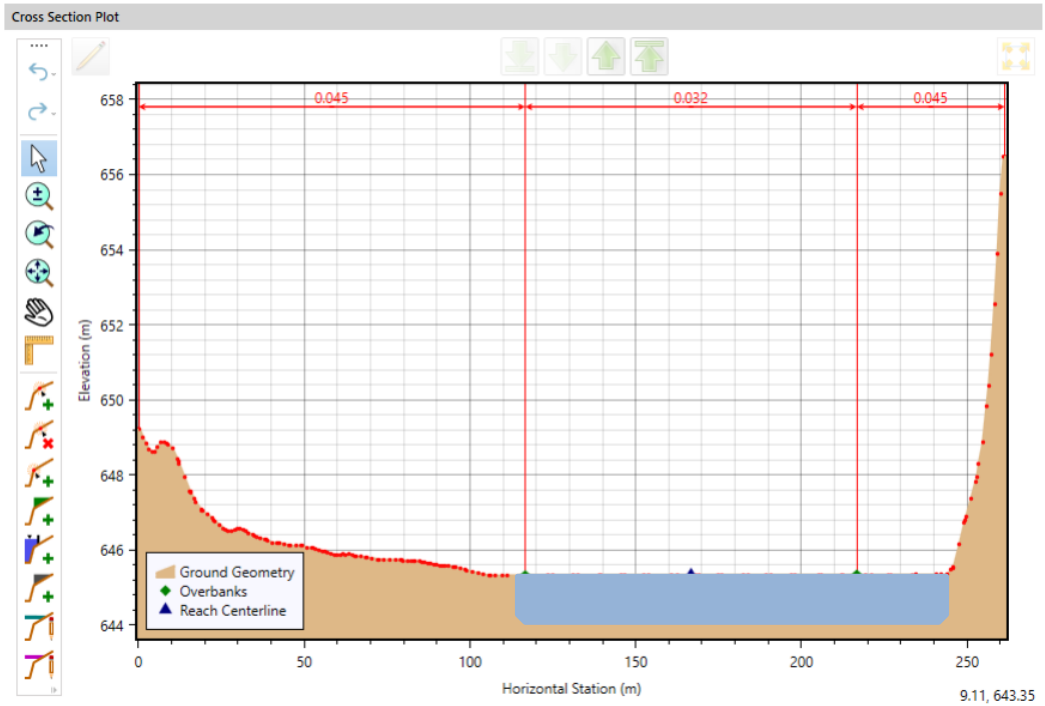
MDT Bridge Cross Section

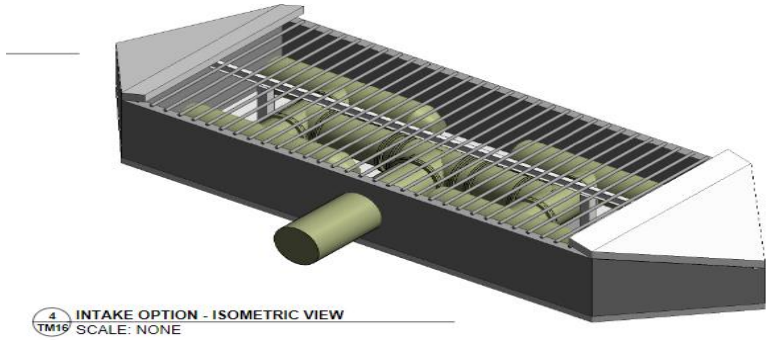


River Conditions

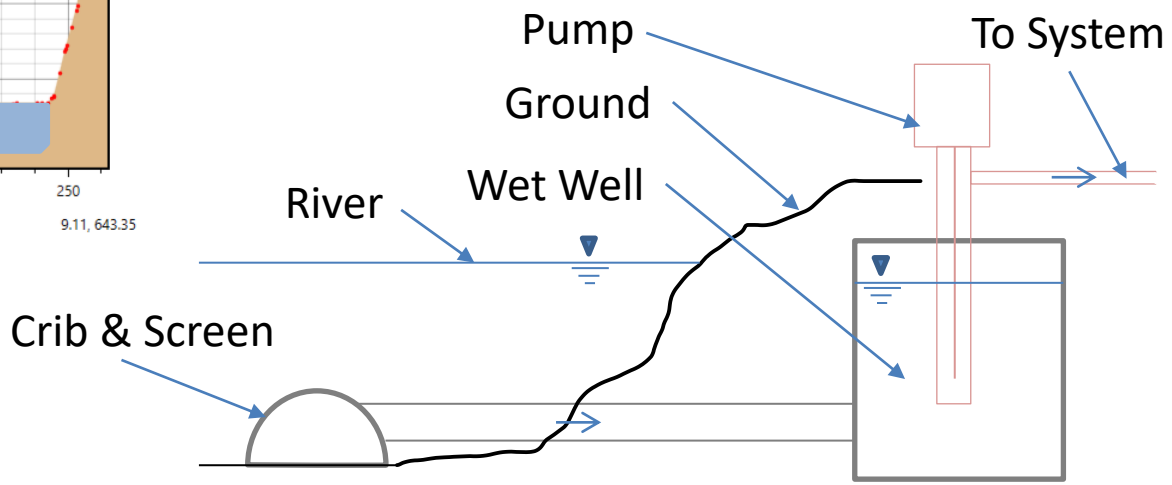
- The Cross Section is looking upstream at the Yellowstone Rive Bridge north of Fallon
- The River is wider here than at the proposed intake location
- A depth of 10’ or more is expected at the proposed intake location
- Sandstones and Shales are common in the area
- The Montana State Library / Yellowstone River Conservation District says that the south bank in the area is confined by sandstone

RIVER INTAKE SCENARIOS 1 & 2
PROPOSED CONCEPT





Lower Profile Design



- Permanently installed on the riverbed in an ice flow resistant crib
- Won't pull in things floating on the surface of the river

PUMP STATION AND HYDRAULICS

Pump Station Preliminary Design/ Concepts

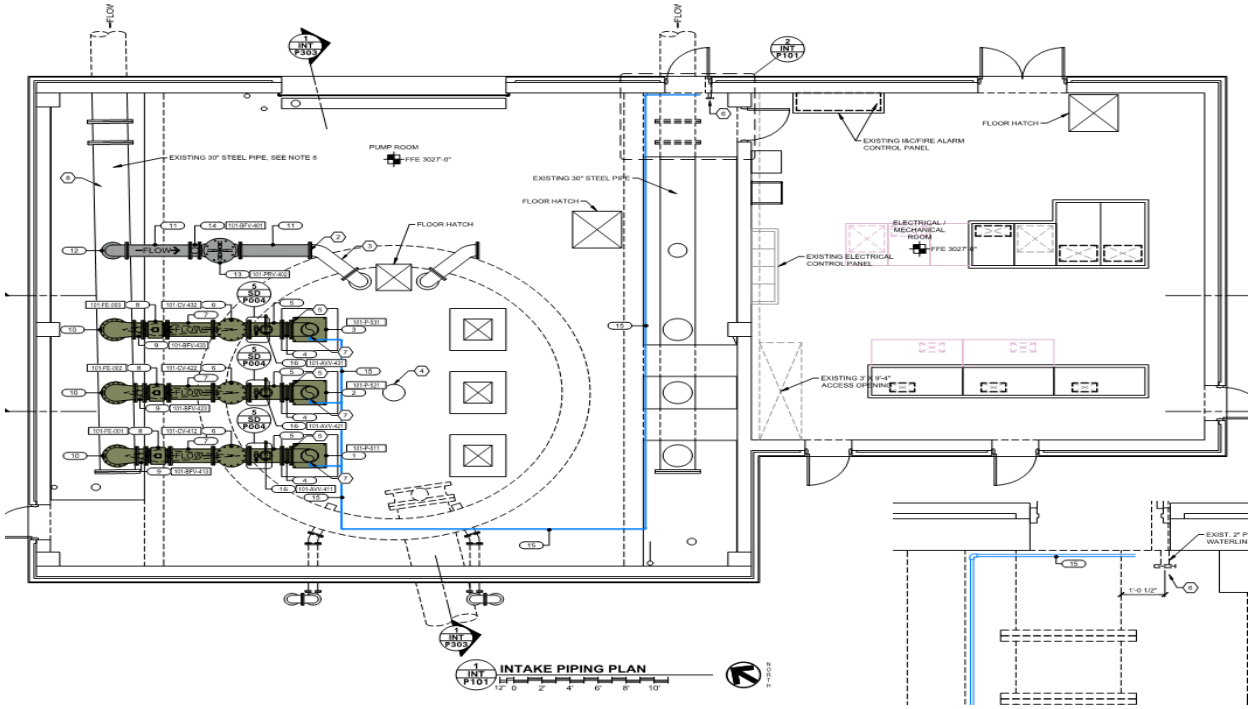
- Wet well pump station
- Raised wet well pump station

35 MGD Wet Well Pump Station Chester, MT

PUMP STATION AND HYDRAULICS

Pump Station Layout

- Pump house on wet well caisson
- Separate electrical rooms
- O&M benefits (bridge cranes, roof access, automation

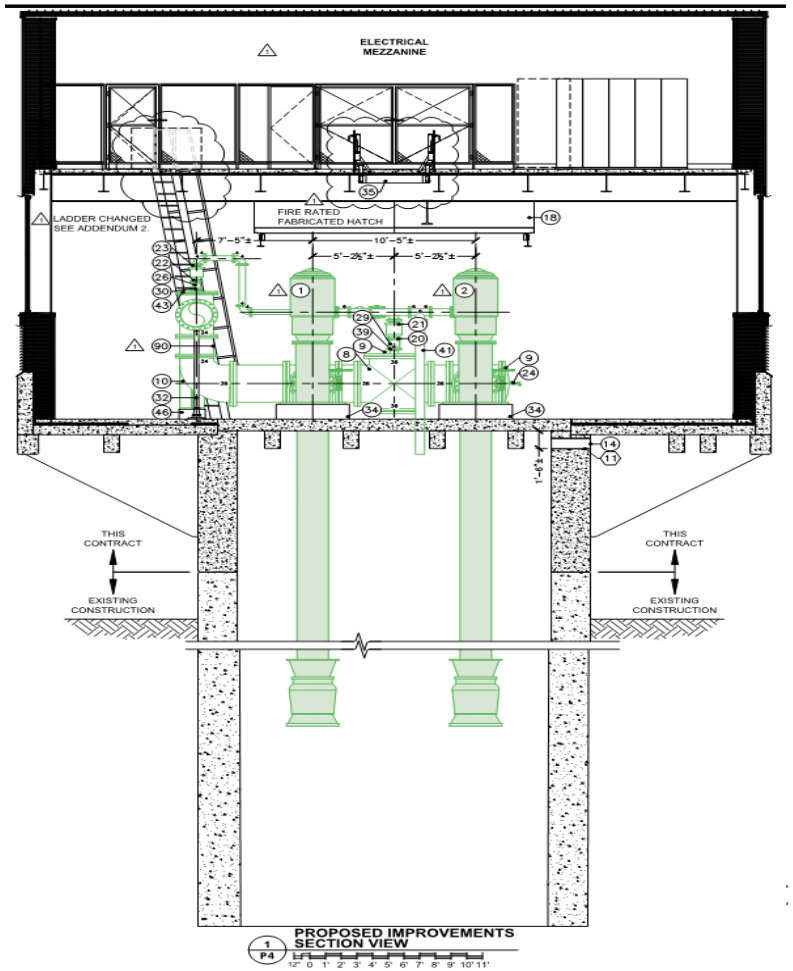


Wet Well Pump Station Layout

PUMP STATION AND HYDRAULICS

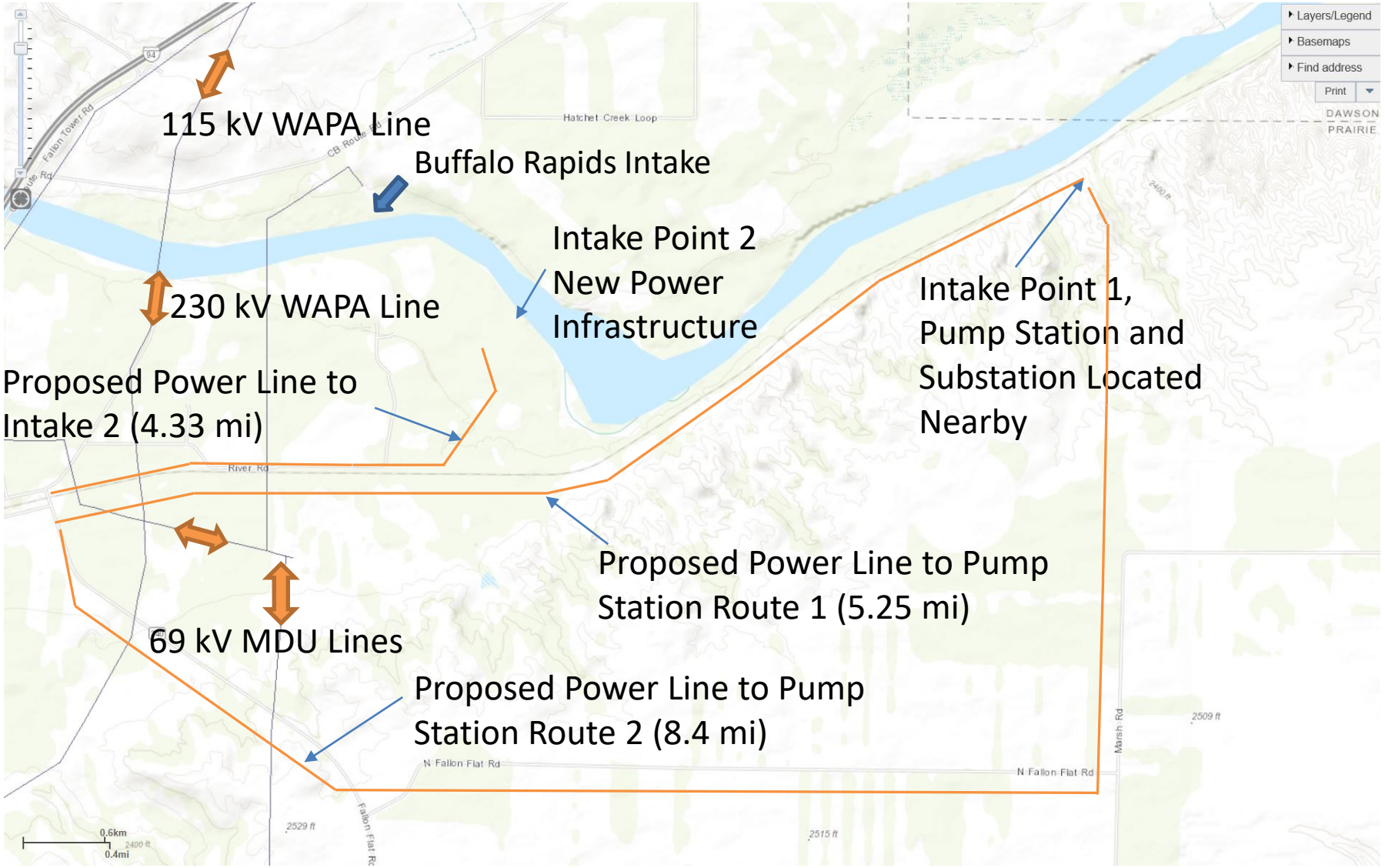
Pump Station Layout

- Pump house on wet well caisson
- Raised electrical rooms
- Reduced footprint

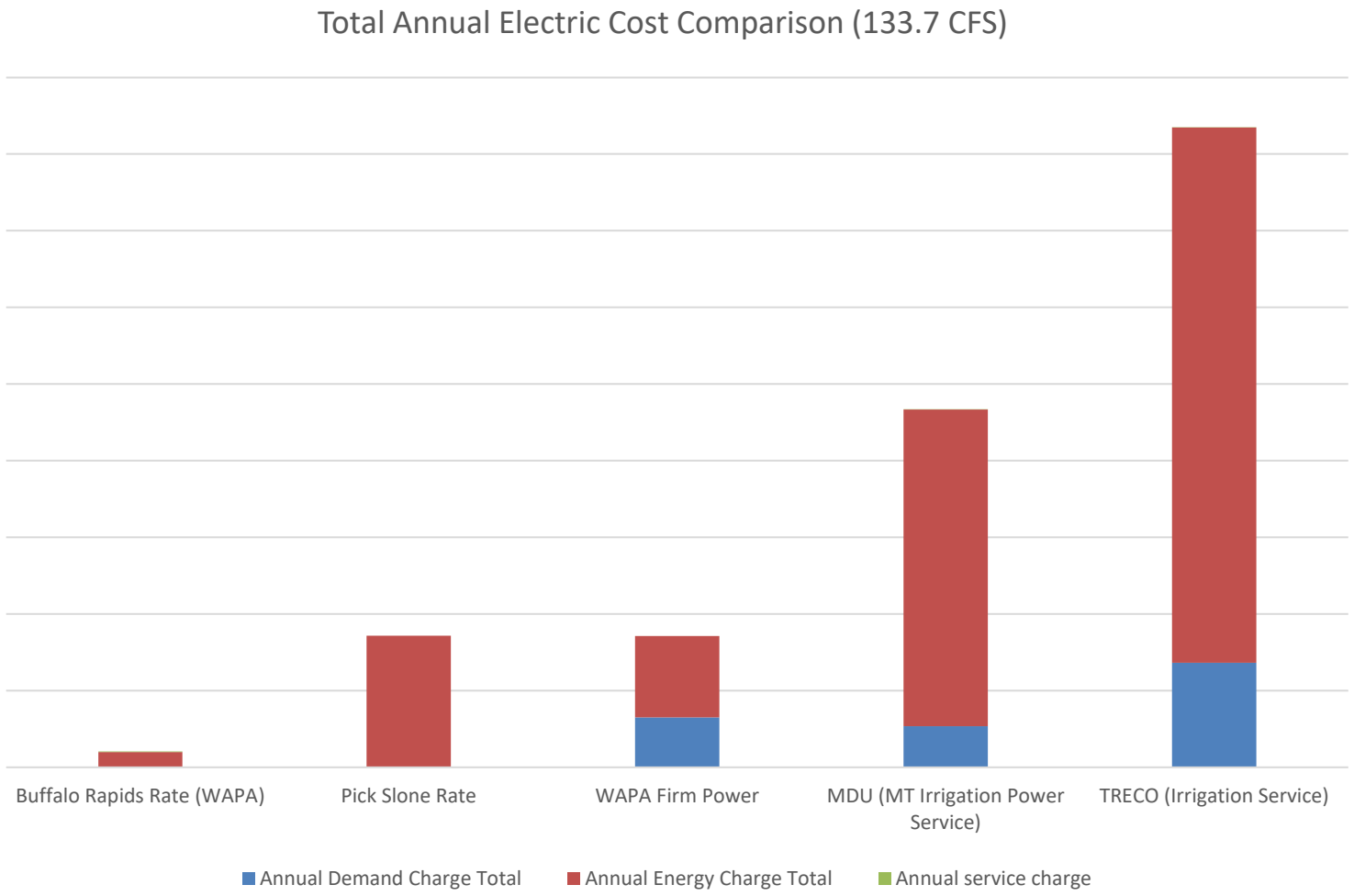


Flood Protected Wet Well Pump Station – Bismarck HCW

ELECTRICAL SITE OVERVIEW



ELECTRICAL RATE COST IMPACTS



- All scenarios are similar for annual cost
- Scenarios 1 & 3 become more significant in operation cost savings without WAPA Firm Power contract
- If a low-cost contract could be negotiated it would result in substantial long-term savings

COST ESTIMATE

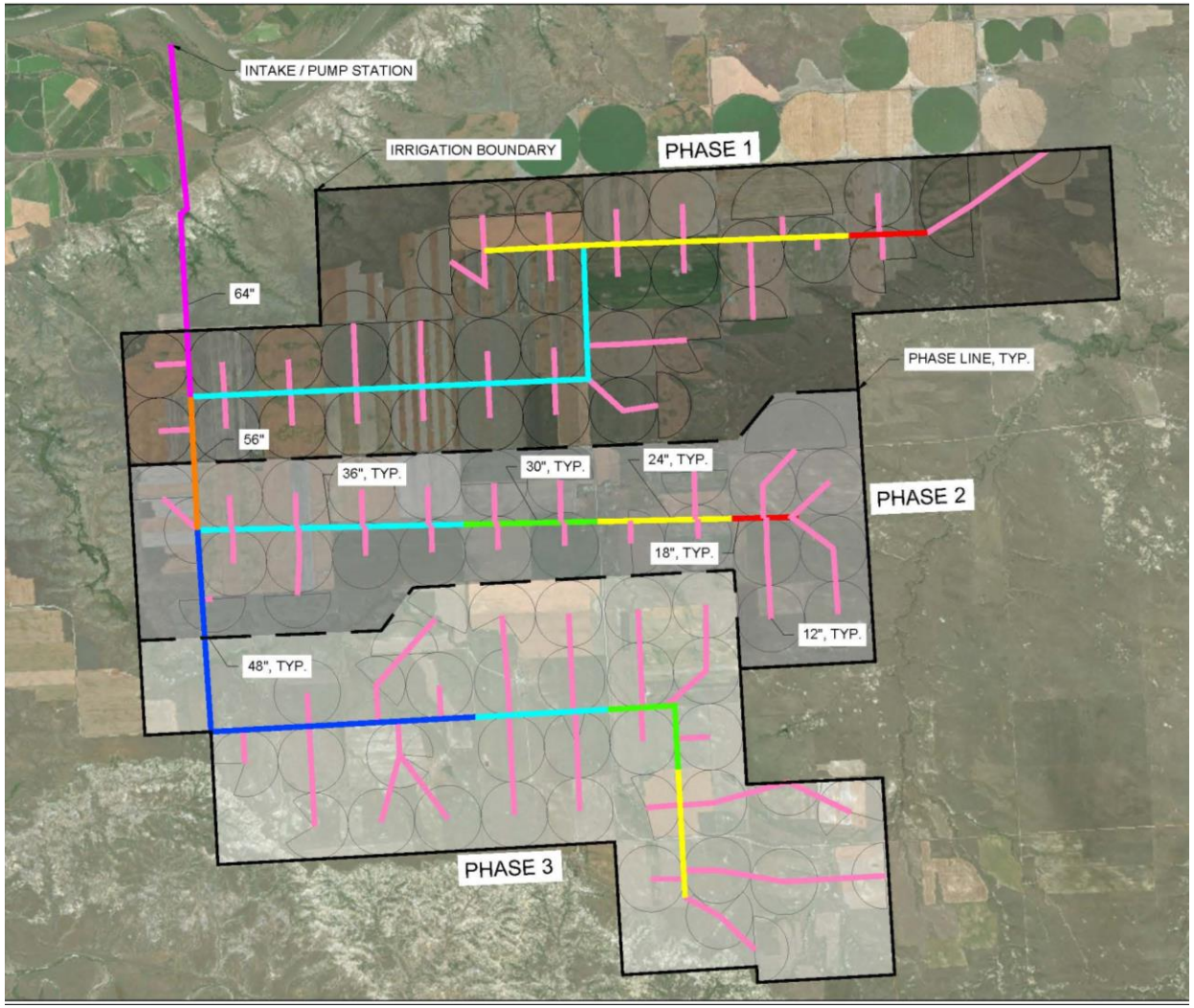
- Preliminary Cost Estimate Range
  - Scenario 1 = $96-135M
  - Scenario 2 = $85-120M
  - Scenario 3 = $79-114M
- On farm vs off farm
- Formation of new irrigation district
- O&M costs will vary based on power consumption per scenario

PERFORMANCE ENGINEERING DRAFT
FALLON FLATS IRRIGATION PROJECT
PRELIMINARY OPINION OF TOTAL PROBABLE PROJECT COST
FALLON MT
SCENARIO 1: LARGER PIPES AND SMALLER HP PUMPS AT 133.7 CFS
November 18, 2020

Fallon Flats Irrigation

ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	SUBTOTAL
A. Mobilization				
Insurance, Bonds, Mobilization, Travel, Subsistence, Etc.			10%	$8,369,317
B. Raw Water Intake & Pump Station				
1.0 Improvements				
a. Yellowstone River Intake Structure including screens (86 MGD)	1	LS	$3,640,000	$3,640,000
b. Site Work, Dewatering Intake, Access Road Improvements and Slope Stability	1	LS	$850,000	$850,000
c. Pump Station and Wet Well (86 MGD) (3600 sq ft)	1	LS	$10,640,869	$10,640,869
d. Pumps (12,250 total hp)	1	LS	$3,345,566	$3,345,566
e. Process Piping, Valves, Surge Control	1	%	30%	$1,003,670
f. WAPA Electrical Substation	1	LS	$5,573,788	$5,573,788
g. Pump Electrical Equipment	1	%	35%	$4,895,252
h. Overhead Power Line Delivery	44,352	LF	$44	$1,933,680
Subtotal Improvements				$31,882,825
C. Pipelines				
1.0 Improvements				
a. 72" Steel Pipeline Above Ground	8,870	LF	$800	$7,096,320
b. 72" Steel Pipeline	13,087	LF	$735	$9,618,651
c. 48" Steel Pipeline	36,622	LF	$351	$12,854,322
d. 36" Steel Pipeline	18,130	LF	$291	$5,275,830
e. 30" Steel Pipeline	2,571	LF	$215	$552,765
f. 24" PVC Pipeline	10,010	LF	$72	$720,720
g. 21" PVC Pipeline	2,977	LF	$69	$205,413
h. 15" PVC Pipeline	54,232	LF	$34	$1,843,888
i. 12" PVC Pipeline	12,302	LF	$18	$221,436
Subtotal Improvements				$38,389,345
D. Pivot system				
1.0 Improvements				
a. Center Pivots	99	Each	$125,000	$12,375,000
b. Supply Ponds	26	Each	$25,000	$650,000
c. Instrumentation and Controls System	99	Each	$4,000	$396,000
Subtotal Improvements				$13,421,000
E. Contingency				
Conceptual Level Contingencies (30%)			30%	$25,107,951
Subtotal - Construction Costs				$117,170,438
F. Non-Construction Costs				
1.0 Improvements				
a. Utility Easements	30.08	MI	$8,000	$240,608
b. Design & CM	1	LS	16%	$14,729,997.92
c. Geotechnical	1	LS	0.5%	$460,312.43
d. Environmental Permitting/ Administrative / Water District Formation / Legal	1	LS	2%	$1,841,249.74
Subtotal Improvements				$17,272,168
Total Probable Project Costs				**$134,400,000**
Total Probable Project Costs (With Pivots and Contingencies Removed)				**$96,900,000**
Estimated Total Cost Range				**$96.9 to $134.4 Million**

SCENARIO 3 – PHASING PLAN



Project Phase	Irrigable Acres (ac)
1	5,800
2	4,200
3	5,200

SCENARIO 3 - PHASING

- Phase I Preliminary Cost Estimate Range
  - W/Pivots = $64.4M
  - W/O Pivots = $47.6M
- Intake & Pump Station Costs Slight Reduction - $18.8M
- Parallel 48-inch Mainlines Reduce Phase I Cost $5M
- Large contingency included due to feasibility level analysis - $12.2M

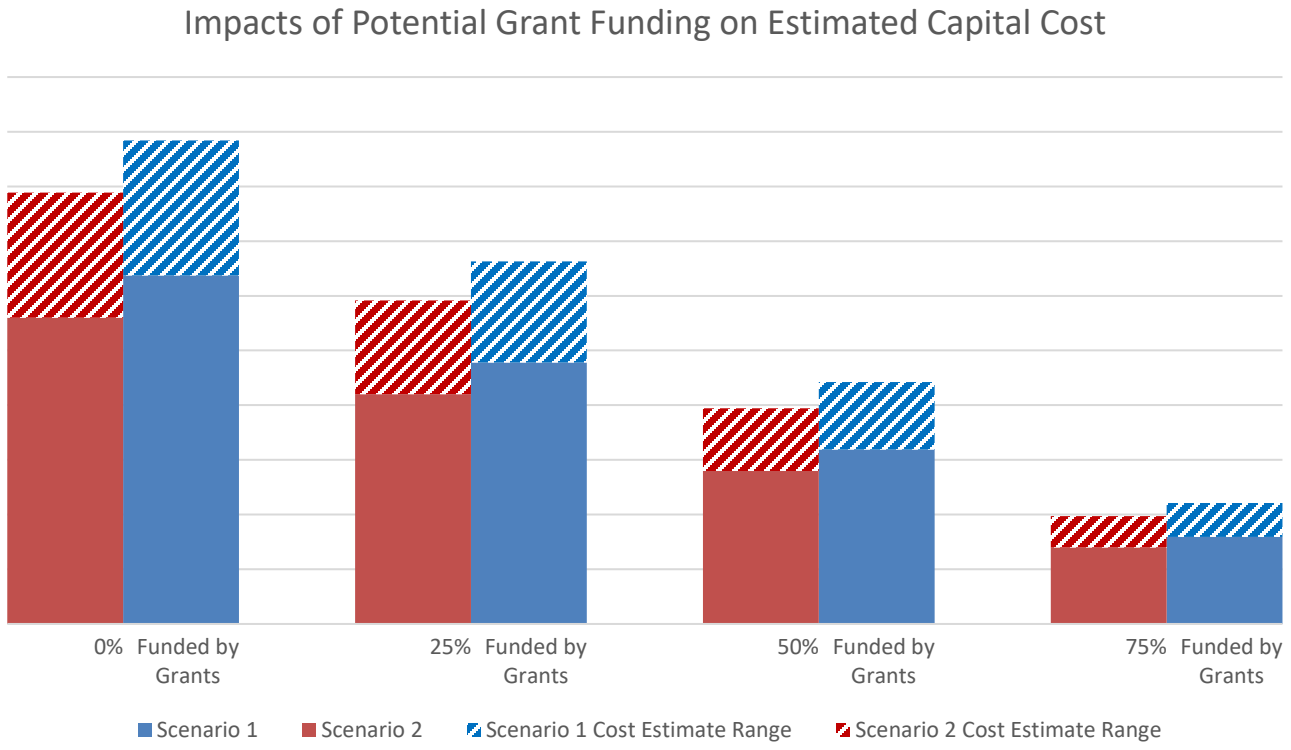
Fallon Flats Irrigation Feasibility Study
Preliminary Opinion of Probable Construction Costs
Scenario 3 - Phase I

11/24/2021

Item No.	Description	Estimated Quantity	Unit	Unit Price	Total Price
A. Mobilization					
	Insurance, Bonds, Mobilization, Travel, Subsistence, Etc	1	-	10%	$4,058,155
B. Raw Water Intake & Pump Station					
a	Yellowstone River Intake Canal (86MGD)	1	LS	$250,000	$250,000
b	Site Work, Dewatering Intake, and Access Road	1	LS	$350,000	$350,000
c	Pump Station and Wet Well (86 MGD) (2000 sqft Footprint)	1	LS	$7,000,000	$7,000,000
d	Pumps (Phase I Only)	1	LS	$1,500,000	$1,500,000
e	Process Piping, Valves, Surge Control	1	LS	$1,000,000	$1,000,000
f	W&PA Electrical Substation	1	LS	$5,572,789	$5,572,789
g	Pump Electrical Equipment	1	LS	$2,000,000	$2,000,000
h	Overhead Power Line Delivery	22,900	LF	$44	$1,007,600
	Subtotal Improvement				$16,881,389
C. Pipelines					
a	64" Steel Pipeline	14,195	LF	$599	$9,922,305
b	30" PVC Pipeline	20,400	LF	$250	$5,100,000
c	24" PVC Pipeline	14,000	LF	$72	$1,008,000
d	18" PVC Pipeline	3,100	LF	$55	$170,500
e	12" PVC Pipeline	47,520	LF	$18	$855,360
	Subtotal Improvement				$17,056,165
D. Pivot System					
a	Center Pivots	36	Ea	$125,000	$4,500,000
b	Instrumentation and Controls System	36	Ea	$4,000	$144,000
	Subtotal Improvement				$4,644,000
E. Contingency					
	Conceptual Level Contingencies (30%)	-	30%	-	$12,174,466
	Subtotal - Construction Costs				$56,814,174
F. Non-Construction Costs					
a	Utility Easements	19	MI	$8,000	$150,328
b	Design C&M	1	LS	15%	$6,493,048
c	Geotechnical	1	LS	0.50%	$179,688
d	Environmental Permitting / Administrative / Water District Formation / Legal	1	LS	2%	$811,631
	Subtotal Non-Construction Costs				$7,634,693
Total Probable Project Costs					$64,448,867
Total Probable Project Costs (w/Pivots and Contingencies Removed)					$47,630,401
Estimated Total Cost Range					$47.6 to $64.4 Million

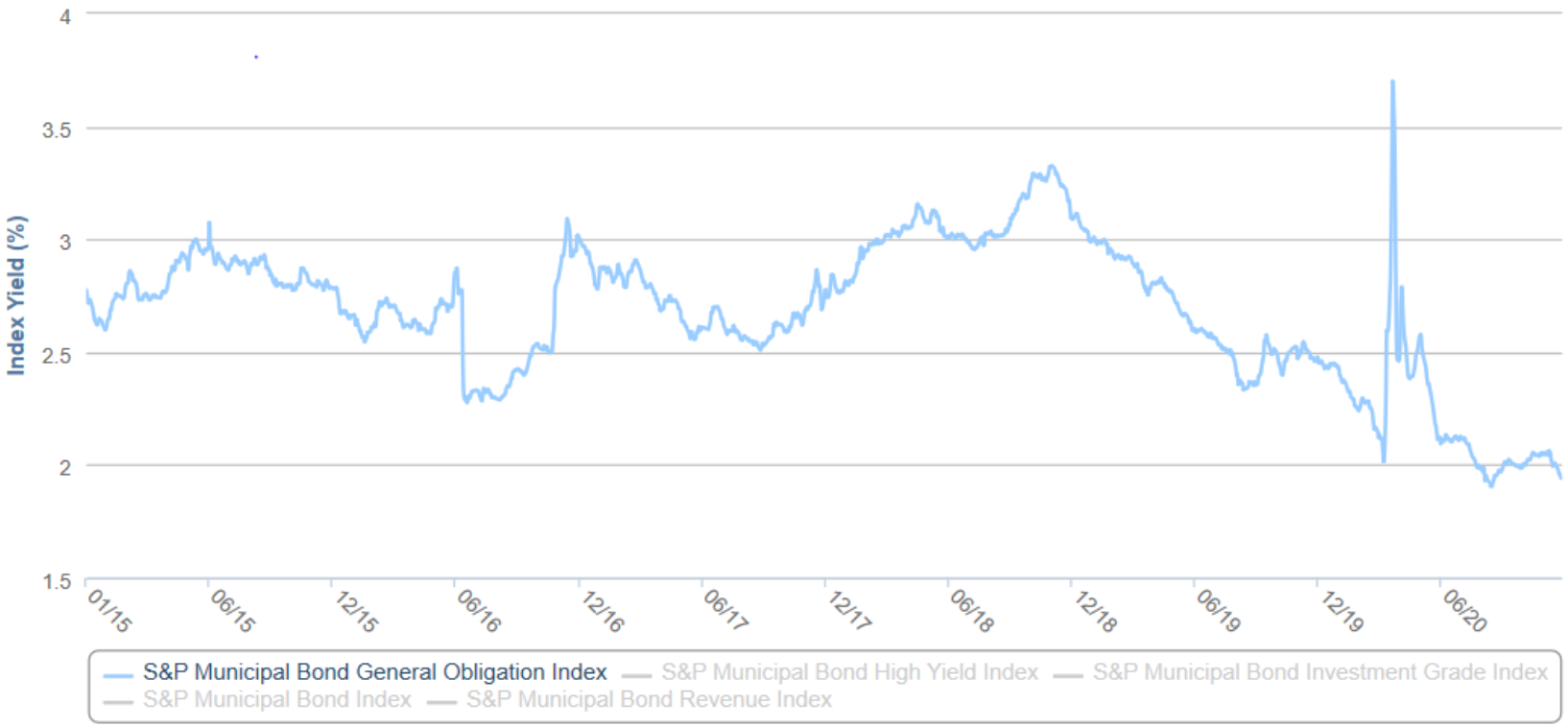
FUNDING DEVELOMENT

- Funding Programs
  - Private bonds
  - BOR (Electrical)
  - USDA-RD (low-cost loans)
  - RRGL (Planning from the state of MT)
  - Federal-Water Resources Development Act
  - New Market Tax Credits



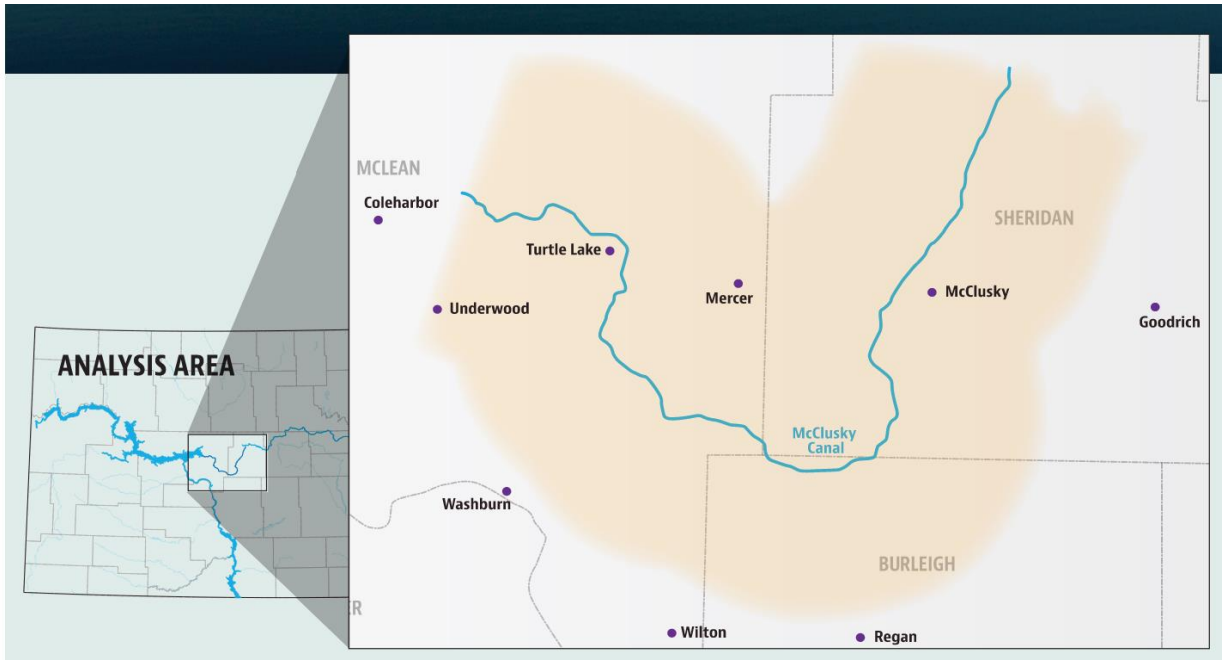
BOND RATES

S&P Municipal Bond Index From 2015 to Present



GARRISON DIVERSION-EXAMPLE

- An Irrigation project in ND
- 51,700 acers of land are authorized for irrigation form the McClusky Canal
- A study on the regional economic effects was done by AE2S & NDSU
  - Increased crop revenue
  - Other regional economic benefits

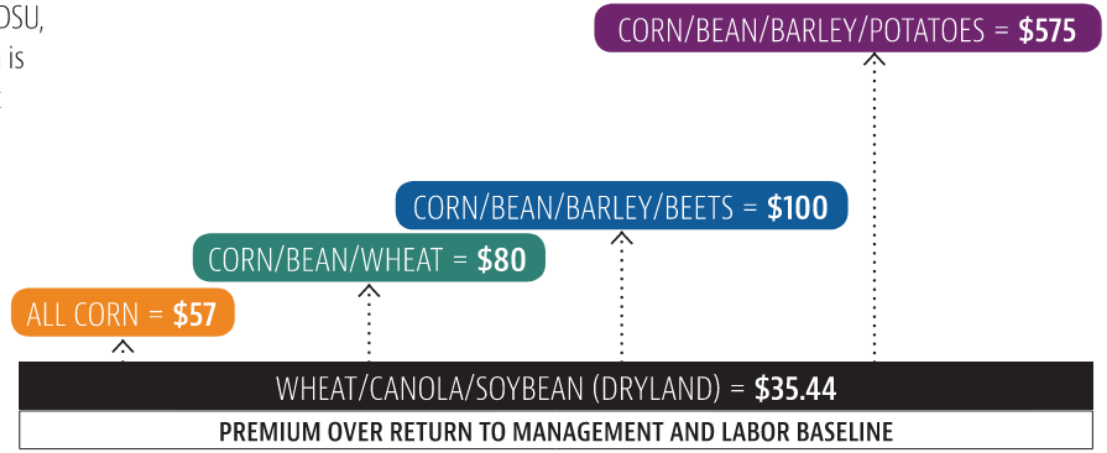


GARRISON DIVERSION-EXAMPLE

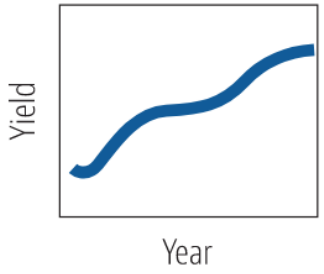
NDSU STUDY RESULTS SHOW BENEFITS OF IRRIGATION

According to a 2014 analysis completed by NDSU, continued farm level investment in irrigation is expectedto bring positive returns over select dryland crop rotations:

- Considering 2014 crop budgets, the average annual increased benefit over select dryland rotations from producing irrigated corn was estimated at $57/acre.



- Applying this increased return over the entire authorized acreage along the canal, local producers would have seen a combined increase in crop sales of $18.4M.



Examples of Changes in Yield and Price Variability

CHANGES IN GROSS REVENUE - ALL CORN ROTATION			
	$3.00/Bushel	$3.50/Bushel	$4.00/Bushel
140 Bushels	-$140.00	-$70.00	$0.00
160 Bushels	-$80.00	$0.00	$80.00*
180 Bushels	-$20.00	$70.00	$160.00
200 Bushels	$40.00	$140.00	$240.00

*2014 Irrigated Crop Budget Baseline

KEY POINTS

- A system that can supply 133.7 CFS could be built on the site
- Site logistics = substantial capital cost
- Phasing possible but does not provide significant cost reduction initially
- Electricity rate has substantial impact on the operating costs
- O&M Cost - $105/ac
- Capital Cost Range - $7,400-$9,000/acre