Pioneer Water Users Association

Gunn Ditch Improvements

30% Engineering Report - July 2010

Prepared for:

Pioneer Water Users Association

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1.0 INTRODUCTION

The Pioneer Water Users Association (PWUA) currently provides irrigation water to 107 users having a total of 527 shares. These users are located on the north and south side of the Wenatchee River. Based on recent survey information, the total estimated area served by PWUA north of the Wenatchee River is 385 acres with 81 users. The acreage is defined as the total parcel acreage and is not limited to irrigated acreage. Crop water requirement estimates indicate an average annual flow to supply the northern users is approximately 3.7 cubic feet per second (cfs) or 1,700 gallons per minute (gpm). It is estimated that the peak flow required to serve the southern PWUA users is approximately 2.0 cfs or 900 gpm.

The existing system primarily consists of the following major elements.

1. ± 25,000 feet of unlined open canal,
2. ± 10,000 feet of piped section,
3. Two (2) siphon roadway crossings,
4. One (1) inverted siphon gulley crossing,
5. One (1) fish screen and diversion structure,
6. One (1) flow measurement flume.

Historical deliveries have ranged from 11 to 15 cfs. Water is diverted from the Wenatchee River north of the Monitor Bridge near Highway 2 through a diversion structure. A fish screen is located just south of the bridge. The current delivery system suffers from significant losses through the unlined sections of the canal. Losses are on the order of 40 to 60 percent leaving a flow delivered to the last point of use of approximately 4 to 5 cfs.

PWUA has considered a variety of alternatives for rehabilitation of the delivery system in the past. These alternatives have included various levels of conversion of the canal system to pipe as well as adjustments to the service area. The primary goals in improving the delivery system are to provide PWUA with a long term low cost water supply, reduce delivery losses and increase in stream flows in the Wenatchee River.

2.0 PROPOSED IMPROVEMENTS

Trout Unlimited/Washington Water Project in cooperation with Chelan County Natural Resources and the Pioneer Water User's Association has determined that conversion of the existing gravity canal system to a pressurized pipe system is the preferred alternative to improve irrigation water delivery efficiency.

Both ground water and surface water source options were investigated as part of this effort. Two potential well locations were reviewed in Olds Station along the Wenatchee River between SR 281 (west) and the railroad (east). Site no. 1 is located on County property adjacent to the railroad about 400 LF north of the river. It was not pump tested as the materials found did not indicate a satisfactory result could be achieved. Site no. 2 is located near the southern terminus of Horan Road in County right-of-way about 75 LF from the river. Its pump test indicated a maximum well capacity of 150 to 200 gpm. This capacity would require an excessive amount of wells and discharge collection infrastructure to achieve the required flow.

Potential surface water diversion sites along the Wenatchee River near Olds Station and the Columbia River in Confluence State Park were also investigated. Considerations included satisfactory access, sufficient channel depth and stability, railroad location, and utility conflicts. The location on the Columbia River was selected.

This study focuses on providing irrigation water to users on the northern side of the Wenatchee River. It is understood that the ability to provide water to users on the southern side of the river may also need to be maintained. Should this be the case the study will need to be revised to include an increase in required capacity.

Implementing improvements for delivery to the northern users only will include the following major elements.

1. Abandonment of the existing diversion and fish screen at Monitor,
2. Development of a new surface water diversion on the Columbia River,
3. Construction of an irrigation pump station and fish screen structure,
4. Conversion of approximately 25,000 linear feet of unlined canal to pressurized pipeline,
5. Construction of approximately 5,000 linear feet of transmission pipeline,
6. Connection to or modification of several existing roadway crossings and siphons,
7. Installation of service connections at existing irrigation delivery points,
8. Installation of required water control and flow measurement devices.

Preliminary pumping calculations indicate the need for approximately 285 horsepower to meet July peak irrigation requirements. It is assumed that a residual pressure of 45 psi will be maintained in the pipeline to eliminate the need for individual service location pumps. The source pump station will include two pumps. The pump station will be housed in a locked concrete masonry unit building for security, noise mitigation and weather protection of meter, motor control and other sensitive equipment. Discharge piping would be welded steel and connect to the transmission pipeline as required.

It is estimated that the delivery pipeline will be constructed of PVC 12 to 21-inch diameter pipe rated at a minimum of 100 psi. Hydraulic modeling will be performed during 100% design to determine final sizing requirements along the pipe alignment. Designs for modification or replacement of roadway crossings and siphons will be included in the final design. Connection valves and appurtenances will be provided as necessary.

3.0 PRELIMINARY OPINION OF OPERATION COSTS

As part of this 30% design effort a preliminary opinion of operation costs has been developed. This opinion is based on the costs of the anticipated major project elements and a projected cost opinion for Operation and Maintenance (O&M).

A summary of the project elements that will have major impacts to operation are listed in Table 1. Preliminary opinions of cost for the elements listed in Table 1 have been provided for the purposes of estimating anticipated O&M and future replacement costs. The list in Table 1 is not a complete list of elements required for construction and operation of the overall project.

Table 1 – Major Project Elements

Description	Unit of Measure	Quanity	Unit Costs	Total Cost
12 - 21-inch PVC 100#	LF	30,000	$ 30	$ 900,000
150-hp Turbine Pumps[1]	EA	2	$ 40,000	$ 80,000
Discharge Header/Piping	LF	200	$ 95	$ 19,000
Pump Station Flow Meter	EA	1	$ 10,000	$ 10,000
Electrical/Pump Controls[2]	LS	1	$ 60,000	$ 60,000
Diversion Structure Mechanical Equip.[3]	LS	1	$ 45,000	$ 45,000

Notes: [1]Assumed column depth of 25 feet.
[2]Assumed VFD controls
[3]Includes fish screens, valving, and self cleaning equipment.

3.1 Projected Power Requirements

The proposed pumping facility will deliver water from a surface diversion located on the Columbia River at river mile ±468.85. The pumping facility will need to deliver a peak flow of approximately 7.8 cfs (3,500 gpm) at a total dynamic head of approximately 241 feet. This translates to approximately 285 horsepower. Average annual flow is estimated to be approximately 3.7 cfs (1,700 gpm). Anticipated pumping requirements based on projected water requirements are summarized in Table 2 below. The crop water requirements shown in Table 2 are based on an average net irrigation requirement for various orchard crops, alfalfa, and residential landscaping.

Table 2 – Projected Pumping Costs

	Requirement (in)	Flow[1] (gpm)	Requirement[2]	kw-hr[3]	Cost
Jan	0.00	0	0	0	$ -
Feb	0.00	0	0	0	$ -
Mar	0.00	0	0	0	$ -
Apr	0.24	84	7	3,812	$ 152
May	4.14	1,430	120	64,640	$ 2,586
Jun	7.77	2,687	226	121,438	$ 4,858
Jul	10.03	3,469	292	156,741	$ 6,270
Aug	7.14	2,467	208	111,472	$ 4,459
Sep	4.74	1,637	138	73,981	$ 2,959
Oct	0.43	148	12	6,686	$ 267
Nov	0.00	0	0	0	$ -
Dec	0.00	0	0	0	$ -
Totals	34.49				$ 21,551

Notes: [1]Assumes 385 acres with irrigation efficiency of 70%.
[2]Assumes pumping efficiency of 75%.
[3]Assumes power cost of $0.043/kWhr

Table 2 indicates an estimated annual power cost of approximately $21,600. Assuming 385 shares, this translates to an annual power cost of approximately $56 per share. Horsepower calculations are provided in Appendix A.

3.2 O&M / Equipment Replacement Cost Opinion

The summary of project elements provided in Table 1 was used to develop an opinion of ongoing O&M and project equipment replacements costs over the anticipated life of the project. Table 3 summarizes an estimated replacement interval for the major project elements listed in Table 1. The replacement intervals were used to develop a schedule of future replacement costs and the annual installments needed to ensure funds will be available. This analysis results in an O&M and equipment replacement annual installment cost opinion of approximately $28,400. The replacement costs analysis is provided in Appendix B.

The analysis in Appendix B assumes a project life of 40 years. It is assumed that the transmission and irrigation pipeline will have a service life beyond 40 years. Therefore replacements costs for the pipeline were not included in this analysis. Inflation and interest rates were assumed to be 5% and 6% respectively. It was also assumed that initial construction would be completed in 2011.

Table 3 – Projected Replacement Interval

Description	Replacement Interval (yr)
150-hp Trubine Pumps	15
Discharge Header/Piping	20
Pump Station Flow Meter	10
Electrical/Pump Controls	15
Diversion Structure Mechanical[1]	15
Delivery Point Flow Meters	10

Notes: [1]Assumes only replacement of valving and self cleaning equipment.

4.0 SUMMARY

The projected power cost from Section 3.1 is approximately $21,600 per year. Projected equipment replacement and O&M costs for the system are estimated to be approximately $28,400 per year. This result in an overall estimated annual O&M cost of approximately $50,000 per year or approximately $130 per share per year assuming 385 shares.

This cost would be in addition to existing personnel, services, and utilities costs. Additionally, should the PWUA decide to continue service to the south side of the river these estimates will need to be revised.

Appendix A

Horsepower Calculations

Horsepower Estimate for Pioneer Ditch Pipeline

Pipeline Friction Loss Calculations

Pipe Diameter - Inches	21.0
Flow - GPM	3,500
Distance - Ft	29,625
Hazen - Williams "C"	150

Head Loss - Ft	39.26
Head Loss - PSI	16.99
Area - Ft^2	2.40
Velocity - Ft/S	3.24

Horsepower Calculations

Flow	3,500	gpm	
Friction Loss	39.26	ft	
Elevation head	94.7	ft	elevation difference between fish wheel and minimum water in Columbia
Residual Head	92	ft	provide min 40 psi residual
Minor Loss	15	ft	
Total TDH	241.3	ft	
Horsepower	284.4		assume 75% efficiency

Low water elevation at Columbia River 603.2 feet
Elevation at the existing fish wheel is 697.9

Appendix B

Equipment Replacement Cost Opinion

P = Present Value
F = Future Value
A = Annualized Value
i = Interest or Inflation rate
n = number of years

Assumed Inflation = 5%
Assume Interest = 6%

1. Replacement costs in Today's Dollars

	Year of Replacement							
	5	10	15	20	25	30	35	40
Item	Year 2016	Year 2021	Year 2026	Year 2031	Year 2036	Year 2041	Year 2046	Year 2051
Pumps (two)			$ 80,000			$ 80,000		
Discharge Piping				$ 19,000				$ 19,000
Pump Station Flow Meter		$ 8,000		$ 8,000		$ 8,000		$ 8,000
Electrical / Pump Controls			$ 60,000			$ 60,000		
Diversion Structure Mechanical			$ 10,000			$ 10,000		
Miscellaneous Equipment	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
Total (2011 costs)	$ 20,000	$ 28,000	$ 170,000	$ 47,000	$ 20,000	$ 178,000	$ 20,000	$ 47,000

2.Future Replacement Cost
F = P(F/P,i,n)

	Year 2016	Year 2021	Year 2026	Year 2031	Year 2036	Year 2041	Year 2046	Year 2051
Inflated costs	$ 25,526	$ 45,609	$ 353,418	$ 124,705	$ 67,727	$ 769,306	$ 110,320	$ 330,879

3. Annual installment required to finance;
A = F(A/F,i,n)

Year 2016 Equipment Replacement Costs =	$ 4,528
Year 2021 Equipment Replacement Costs =	$ 3,460
Year 2026 Equipment Replacement Costs =	$ 15,184
Year 2031 Equipment Replacement Costs =	$ 3,390
Year 2036 Equipment Replacement Costs =	$ 1,234
Year 2041 Equipment Replacement Costs =	$ 9,731
Year 2046 Equipment Replacement Costs =	$ 990
Year 2051 Equipment Replacement Costs =	$ 2,138

4. Present (2011) value of installments for;
P = A(P/A,i,n)

Year 2016 Equipment Replacement Costs =	$ 19,074
Year 2021 Equipment Replacement Costs =	$ 25,468
Year 2026 Equipment Replacement Costs =	$ 147,469
Year 2031 Equipment Replacement Costs =	$ 38,884
Year 2036 Equipment Replacement Costs =	$ 15,780
Year 2041 Equipment Replacement Costs =	$ 133,944
Year 2046 Equipment Replacement Costs =	$ 14,353
Year 2051 Equipment Replacement Costs =	$ 32,169

5. Total Present (2011) value of annual equipment replacement installments = $ 427,141

6. Annual installment required to finance equipment replacement over the next 40 years = A = P(A/P,i,n) $ 28,388

7. Use **$ 28,400**

Equipment Replacement Schedule

Year	Expenditure	Revenue	Balance
2011		$28,400	$28,400
2012		$28,400	$58,504
2013		$28,400	$89,829
2014		$28,400	$122,721
2015		$28,400	$157,257
2016	(25,526)	$28,400	$167,994
2017		$28,400	$204,794
2018		$28,400	$243,433
2019		$28,400	$284,005
2020	(45,609)	$28,400	$280,996
2021		$28,400	$323,446
2022		$28,400	$368,018
2023		$28,400	$414,819
2024		$28,400	$463,960
2025		$28,400	$515,558
2026	(353,418)	$28,400	$216,318
2027		$28,400	$255,534
2028		$28,400	$296,711
2029		$28,400	$339,946
2030		$28,400	$385,344
2031	(124,705)	$28,400	$308,306
2032		$28,400	$352,121
2033		$28,400	$398,127
2034		$28,400	$446,434
2035		$28,400	$497,155
2036	(67,727)	$28,400	$482,686
2037		$28,400	$535,220
2038		$28,400	$590,381
2039		$28,400	$648,300
2040		$28,400	$709,115
2041	(769,306)	$28,400	$3,665
2042		$28,400	$32,249
2043		$28,400	$62,261
2044		$28,400	$93,774
2045		$28,400	$126,863
2046	(110,320)	$28,400	$51,286
2047		$28,400	$82,250
2048		$28,400	$114,762
2049		$28,400	$148,901
2050		$28,400	$184,746
2051	(330,879)	$28,400	($108,497)

Appendix C

Northern Turnout/Parcel Inventory

Turnout STA	NAME	ADDRESS	TAX #	ACRES	DESCRIPTION
3+91	Scott H. McDougal	2420 Mt. View Dr.	232028130090	2.72	
	Nevio E. Tontini	1014 Canyonside Road	232028130080		
±7+53	Pioneer Water Users Association	Chatham Hill Road	232028240470	0.53	vacant land
10+33.4	Olson Revocable Living Trust	137 Chatham Hill Road	232028240550	0.36	
44+03.7	David & Rebecca Dorey	417 Lower Sunnyslope Road	232021330600	2.53	
44+81.3	Jack S. Crowe	545 Lower Sunnyslope Road	232020440510	6.94	
	Jack S. Crowe	545 Lower Sunnyslope Road	232020440510		
52+25.0	Willard D. Fields	505 Lower Sunnyslope Road	232020440150	1.08	
53+64.6	Jack S. Crowe	545 Lower Sunnyslope Road	23202044510	6.45	
56+61.7	Brett R. Mathews	533 Lower Sunnyslope Road	232020440500	1.43	
59+60.5	Bruce E. Smith	515 Lower Sunnyslope Road	232020440100	4.12	
	Douglas W. Cook	529 Lower Sunnyslope Road	232020440200		
60+96.3	Robert N. Dorsey	609 Lower Sunnyslope Road	232020440250	0.51	
62+49.2	Allen Thomas ETAL	611 Lower Sunnyslope Road	232020440450	20.37	
64+18.0	James Canterbury	617 Lower Sunnyslope Road	232020440300	4.29	
	James Canterbury	617 Lower Sunnyslope Road	232020440350		
	Jacinto Valdez	625 Lower Sunnyslope Road	232020430200		
78+34.6	9th Street Waterfront Inv. LLC	PO Box 598	232020420200	13.21	
	9th Street Waterfront Inv. LLC	PO Box 598	232020420210		
±79+14	Greg & Linda Graham	892 Lower Sunnyslope Road	232020420150	3.23	Estimated location
79+83.4	9th Street Waterfront Inv. LLC	PO Box 598	232020430100	41.25	
	9th Street Waterfront Inv. LLC	PO Box 598	232029120050		
83+66.7	9th Street Waterfront Inv. LLC	PO Box 598	232020340100	10.00	
86+48.6	C J Slack	901 Lower Sunnyslope Road	232020310400	5.67	
	Ty E. Marshall	917 Lower Sunnyslope Road	232020310350		
87+15.1	William C. Markey Trustee	925 Lower Sunnyslope Road	232020310300	2.99	
89+11.8	Gary A. Riesen	933 Lower Sunnyslope Road	232020310250	0.99	
94+19.0	Harris Family Trust LLC	1025 Lower Sunnyslope Road	232020310200	5.81	
95+81.4	Terrill Gust	1021 Lower Sunnyslope Road	232020340250	7.69	
	Harris Family Trust LLC	1025 Lower Sunnyslope Road	232020320255		
	Harris Family Trust LLC	1025 Lower Sunnyslope Road	232020320400		
	Kenneth D. Smekofske	1026 Lower Sunnyslope Road	232020310150		
97+83.7	James R. McFerson	1101 Lower Sunnyslope Raod	232020320350	1.03	
97+83.7	Sleepy Hollow Properties	1280 Lower Sunnyslope Road	232020320070	12.82	South of canal
104+47.6	Ryan E. Baker	1113 Lower Sunnyslope Road	232020320300	23.18	
	Frederick P. Kleinschmit	1125 Lower Sunnyslope Road	232020320256		
	Judith Cleveland	1127 Lower Sunnyslope Road	232020320257		
	Judith/Peter Lurie/Burgoon	1137 Lower Sunnyslope Road	232020320250		
110+92.4	Sharon R. McGivern	1263 Lower Sunnyslope Road	232020320120	37.32	
	James R. Oakes	1205 Lower Sunnyslope Road	232019410150		
119+96.3	S. Rand Marquess	1427 Sleepyhollow Road	232019410100	2.00	
123+04.9	John D. Minks Jr	1360 Sleepyhollow Road	232019140300	1.66	
124+79.1	Jack R. Peart	1476 Sleepyhollow Road	232019825010	2.50	
	Daniel R. Reisenauer	3200 Rivers Edge Pl	232019825020		
	Roger L. Nelson	3216 Rivers Edge Pl	232019825030		
133+02.0	Barry Barnes	3232 Rivers Edge Pl	232019825040	1.67	
	Michael Shannon	3248 Rivers Edge Pl	232019825050		
137+72.7	Ray Loreth Trust	1481 Love Lane	232019825060	0.99	
143+02.6	Mark H. Love	2296 Love Lane	232019120450	15.37	

Turnout STA	NAME	ADDRESS	TAX #	ACRES	DESCRIPTION
±146+45	Katherine M. Wilder	1611 Love Lane	232019120350	14.55	Estimated location
±151+53	Phil Brown	1635 Love Lane	232019120330	10.72	Estimated location
178+75.6	Brenda Hoefner	1921 Lower Monitor Road	232018817070	11.01	
190+71.7	Randall Steensma	2101 Lower Monitor Road	231913440150	15.33	
	Gary Kinzebach	3201 Lower Monitor Road	231913440160		
±199+61	E N Sampson	2426 Iroquiois Lane	231913440100	6.10	
221+66.4	Ronald W. Myers	2496 Iroquis Lane	231913625065	16.48	
	Robert S. Robinson Etal	2595 Easy Street	231913625008		
	Ronald W. Myers	2496 Iroquis Lane	231913625005		
224+56.5	Gary Samples	3701 Iroquise Lane	231913625060	1.70	
	Robert Rust	3891 Iroquios Lane	231913625062		
	Kyle Stong	3705 Iroquios Lane	23193625055		
230+12.5	Robert & Janet Rust	3891 Iroquios Lane	231913625015	3.12	
230+87.8	Robert & Janet Rust	3741 Iroquiois Lane	231913625015	11.16	
	Robert & Janet Rust	3741 Iroquiois Lane	231913625015		
231+23.3	Ajit S. Arora	3756 Iroquois Lane	231913625046	0.29	
232+29.9	Loyd Gullett	2701 Easy Street	231913625040	1.42	
232+59.2	Ajit S. Arora	3846 Iroquois Lane	231913625045	2.01	
234+60.5	Juan Zamudio	3758 Iroquois Lane	231913625054	2.16	
	Stancil Investments	3774 Iroquois Lane	231913625053		
235+43.1	Robert & Janet Rust	2741 Easy Street	231913625035	0.35	
	Larry G. Sexton	2793 Easy Street	231913625030		
237+65.9	Larry G. Sexton	2793 Easy Street	231913625030	0.42	
238+09.3	Corp of the Presiding Bishop	50 E. North Temple, SLC, UT	231913320050	8.93	
	Corp of the Presiding Bishop	50 E. North Temple, SLC, UT	231913625036		
	Corp of the Presiding Bishop	50 E. North Temple, SLC, UT	231913320200		
242+76.2	Ganelle Graves-York etal	2849 Easy Street	231913320100	0.11	
244+46.2	Wiggins Boswell LLC	2915 Easy Street	231913320250	5.33	
	Wiggins Boswell LLC	2915 Easy Street	231913320150		
	Wiggins Boswell LLC	2915 Easy Street	231914410500		
251+57.0	Chelan County	400 Douglas Street	231914410325	33.09	
	Chelan County	400 Douglas Street	231913330150		
			TOTAL:	**385**	