RECLAMATION

Managing Water in the West

Final Economics Technical Report

Odessa Subarea Special Study

Columbia Basin Project, Washington

U.S. Department of the Interior
Bureau of Reclamation
Technical Service Center
Denver, Colorado

September 2012

Mission Statements

The U.S. Department of the Interior protects America's natural resources and heritage, honors our cultures and tribal communities, and supplies the energy to power our future.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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Acronyms and Abbreviations

AF	acre-feet
BCA	benefit-cost analysis
BCR	benefit-cost ratio
CRP	Conservation Reserve Program
ECBID	East Columbia Basin Irrigation District
EQ	environmental quality
ERS	Economic Research Service
FEIS	final environmental impact statement
GAC	gross absorption coefficients
GWMA	Columbia Basin Groundwater Management Area
IDC	interest during construction
IMPLAN	IMpact analysis for PLANning
kWh	kilowatthours
mgd	million gallons per day
NASS	National Agricultural Statistics Service
NED	national economic development
NFI	net farm incomes
O&M	operation and maintenance
OMR&P	operating, maintenance, replacement, and power
OSE	other social effects
P&Gs	*Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*
psi	pounds per square inch
RED	regional economic development
TIO	total industry output

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Final Economics Technical Report

Odessa Subarea Special Study

The economic analyses developed for the Odessa Subarea Special Study, Columbia Basin Project, Washington (Study) are comprised of a national economic development (NED) benefit-cost analysis (BCA) and a regional economic development (RED) impact analysis. These two analyses comprise two of the ~~"a~~ccounts" described in the four account analysis of the Final Feasibility-Level Special Study Report, Odessa Subarea Special Study, Columbia Basin Project, Washington (Special Study Report)—the other two accounts are the environmental quality (EQ) account and the other social effects (OSE) account. The results of the RED impact analysis are also presented within the socioeconomic section of the Final Environmental Impact Statement, Odessa Subarea Special Study, Columbia Basin Project, Washington (Reclamation 2012).

The *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (U. S. Water Resources Council, 1983), otherwise referred to as the *P&Gs*, represent the main set of guidelines for Federal water management agency economic analyses. The *P&Gs* describe the NED and RED accounts from the perspective of evaluating of the economic effects of proposed alternative plans. According to the *P&Gs*, a primary distinction between an NED benefit-cost analysis and a RED regional economic impact analysis is geographic. The RED analysis focuses on economic impacts to the local region, whereas NED analysis focuses on economic benefits to the entire Nation. The RED evaluation recognizes the NED benefits accruing to the local region plus the transfers of income into the region. However, since the RED analysis focuses purely on the local region, it does not take into account potential offsetting effects occurring outside the region, as does the NED analysis. As a Federal agency, Reclamation must analyze the NED effects so as not to favor one area of the country over another. Reclamation also analyzes the RED effects to the local economy to provide specific information on the primary impact area. However, economic justification is determined for each alternative solely by the benefit-cost analysis and must be demonstrated on the basis of NED benefits exceeding NED costs.

In addition to the geographic differences between the analyses, the RED analysis includes not only the initial or direct impact on the primary affected industries (as does the NED analysis), but also the secondary or indirect effects on those industries providing inputs to the directly affected industries (referred to as the multiplier effect). This multiplier effect is not included in the NED analysis.

Finally, yet another difference between the analyses relates to the distinction between economic impacts and economic benefits. Economic impacts measure total or gross economic activity within a given region using such indicators as output (sales or gross receipts), income, and employment. Gross measures simply show the amount of money changing hands (e.g., sales reflect income to the business, but expenditures to the purchaser). Economic impacts stem from changes in expenditures/revenues within the region. Conversely, benefits measure economic welfare based on a net value concept. For consumers, economic welfare reflects the value of goods and services consumed above what is actually paid for them (willingness-to-pay in excess of cost; also referred to as consumer surplus). For producers or businesses, economic welfare can be estimated by gross revenues minus operating costs (profit). One way to visualize the difference between impacts and benefits is to consider how each reacts to increases in expenditures only. Regional economic impacts increase as in-region expenditures increase, whereas benefits (i.e., consumer surplus or profitability) tend to decrease as costs or expenditures increase.

While benefits and economic impacts often move in unison (since they typically rise or fall with levels of production), there are many situations where changes in benefits and economic impacts diverge. This potential for divergence, combined with the need to consider both national and regional perspectives, and the fact that different user groups are often interested in different economic measures, creates a need for both NED and RED analyses.

In addition to the No Action Alternative (Alternative 1), the Study is evaluating six proposed or ~~"a~~ction" alternatives for moving irrigated agriculture off of groundwater and on to surface water within the Odessa Study Area. Given the ongoing trend of declining groundwater levels within the study area, moving agriculture on to surface water should provide a more stable water source. The partial replacement alternatives (Alternatives 2A and 2B) will move nearly 57,100 acres on to surface water and the full replacement alternatives (Alternatives 3A and 3B) will move approximately 102,600 acres. Two modified partial replacement alternatives (Alternatives 4A and 4B), which would move over 70,500 acres to surface water, were also analyzed. The main difference between the two scenarios for each replacement alternative is the source of the water supply. Alternatives 2A, 3A, and 4A have the water supply coming from Banks Lake whereas Alternatives 2B, 3B, and 4B have the water supply coming from Banks Lake and Lake Roosevelt. Two other water supply options (option C with water supply coming from Banks Lake and a proposed Rocky Coulee Reservoir and option D with water supply coming from Banks Lake, Lake Roosevelt, and Rocky Coulee Reservoir) were evaluated in earlier documents associated with this study, but were dropped from the latest round of alternatives.

1.0 NATIONAL ECONOMIC DEVELOPMENT (NED) BENEFIT-COST ANALYSIS (BCA)

The purpose of a NED BCA is to compare the benefits of a proposed project to its costs. The total costs of the project are subtracted from the total benefits to measure net benefits. If the net benefits are positive, implying benefits exceed costs, the project could be considered economically justified. Conversely, if net benefits are negative, implying costs exceed benefits, the project would not be economically justified. In studies like this one, where multiple alternatives are being considered, the alternative with the greatest positive net benefit would be preferred from strictly an economics perspective. Another way of displaying this benefit-cost comparison involves dividing total project benefits by total project costs resulting in what is referred to as the benefit-cost ratio (BCR). A BCR greater than one is analogous to a positive net benefit and a BCR less than one is analogous to a negative net benefit.

Before comparisons can be made between costs and benefits, they must be converted to the same dollar year and point in time. Since all the costs and benefits are measured in current dollars, no dollar year adjustment was necessary. However, the costs and benefits will occur at different times. As is standard Reclamation practice, the decision was made to measure all the costs and benefits as of the end of the construction period.

The canal construction period is divided into a series of phases. The end of the canal construction period is defined as the end of the last canal construction phase (year 2025). Since all subsequent canal construction phases were deemed dependent upon the first phase, using a 100-year analysis period, the period of analysis was assumed to end in year 2118, 100 years after the completion of construction on phase one (2019).

Since the same amount of benefits or costs incurred in the future are worth less than they are today (because one could put the required funds in a bank and earn interest on the investment), costs and benefits incurred in the future are discounted (present valued) back to the start of the period of analysis (equivalent to the end of the construction period) using the Federal 2011-2012 water project planning rate of 4.0 percent. Since benefits associated with all those phases other than the last canal construction phase would begin at the end of each phase and not the end of the last canal construction phase, some of those benefits would accrue prior to the end of the canal construction period in year 2025. This implies that these benefits would need to be compounded (future valued) to the end of the construction period. These same present and future valuing concepts are applied to the costs incurred during the canal construction period and period of analysis.

While the canal construction period was assumed to be the same for all alternatives (2015-2025), the number of phases varies by alternative. The Partial Replacement and Modified Partial Replacement Alternatives assume four phases and the Full Replacement Alternatives assume nine phases. Reclamation cost engineers developed the construction period and schedule for each phase as follows: Phase 1: 2015-2019, Phase 2: 2017-2022, Phase 3: 2019-2023, Phase 4: 2021-2025, Phase 5: 2015-2020, Phase 6: 2019-2023, Phase 7: 2021-2025, Phase 8: 2017-2022, and Phase 9: 2021-2025. If this construction period or schedule changes, either in terms of total length or sequence and timing of the phases, the cost and benefit estimates would change and would need to be updated. For example, the construction schedule used for this BCA does not assume the alternatives would be developed and phased using public-private partnerships.

1.1 NED BCA Results

Tables NED_BCA1, NED_BCA2, NED_BCA3, and NED_BCA4 present the results of the benefit-cost analyses for each alternative using different planning rates (4% and 3%) and different cost assumptions (without and with a portion of the costs of the Weber Siphon). The tables display total benefits (agriculture, municipal, industrial), total costs (canal construction and interest during construction (IDC), Weber Siphon costs, land acquisition costs; operating, maintenance, replacement, and power (OMR&P) costs; and lost hydropower benefits), net benefits, and benefit-cost ratios.

Within each table for each alternative, four benefit-cost results are presented based on different hydrologic and benefit assumptions. From a hydrologic perspective, two scenarios are presented – one with Spring Diversions and another with only Limited Spring Diversions. From a municipal benefits perspective, high (Option 1) and low (Option 2) estimates were developed.

The results in tables NED_BCA1 and NED_BCA2 are emphasized given they were generated using the required 2011-2012 federal water project planning rate of 4.0 percent. In addition, the results in table NED_BCA1 (without Weber Siphon) are emphasized over those in NED_BCA2 (with Weber Siphon) given the costs of the Weber Siphon had already been incurred (and were therefore considered sunk) at the time of this analysis. As will be discussed in detail under the cost section of this chapter, there was some rationale for including the costs of the Weber Siphon within the benefit-cost analysis, so in the interest of full disclosure, the results with Weber Siphon costs are also displayed.

As shown in table NED_BCA1, total benefits vary by alternative and range from $1,102.4 to $1,109.3 million for the partial replacement alternatives, $1,982.5 to $2,006.0 million for the full replacement alternatives, and $1,366.9 to $1,378.9 million for the modified partial replacement alternatives. Total costs

Table NED_BCA1.—Results of NED BCA without Weber Siphon costs (based on current planning rate: 4.0%) ($ millions)

Benefit and cost components	Alternative 2A/2B - Partial Replacement Alternative				Alternative 3A/3B - Full Replacement Alternative				Alternative 4A/4B - Modified Partial Replacement Alternative			
	Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion	
	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2
Agricultural benefits:	1,070.0	1,070.0	1,070.0	1070.0	1,884.9	1,884.9	1,884.9	1,884.9	1,315.4	1,315.4	1,315.4	1,315.4
Municipal benefits:	34.1	27.2	34.1	27.2	116.2	92.7	116.2	92.7	58.6	46.6	58.6	46.6
Industrial benefits:	5.2	5.2	5.2	5.2	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Total benefits:	1,109.3	1,102.4	1,109.3	1,102.4	2006	1,982.5	2006	1,982.5	1,378.9	1,366.9	1,378.9	1,366.9
Construction & IDC:	886	886	886	886	3,169.3	3,169.3	3,169.3	3,169.3	942.0	942.0	942.0	942.0
Weber Siphon:	0	0	0	0	0	0	0	0	0	0	0	0
Land acquisition:	3.2	3.2	3.2	3.2	3.9	3.9	3.9	3.9	2.5	2.5	2.5	2.5
OMR&P:	192.5	192.5	192.5	192.5	428.1	428.1	428.1	428.1	228.7	228.7	228.7	228.7
Lost hydropower:	168.3	168.3	190.2	190.2	319.5	319.5	351.1	351.1	194.7	194.7	226.4	226.4
Total costs:	1,250	1,250	1,271.9	1,271.9	3,920.8	3,920.8	3,952.4	3,952.4	1,367.9	1,367.9	1,399.6	1,399.6
Net benefits:	-140.7	-147.6	-162.6	-169.5	-1914.8	-1938.3	-1946.4	-1,969.9	11	-1	-20.7	-32.7
Benefit-cost ratio:	0.887	0.882	0.872	0.867	0.512	0.506	0.508	0.502	1.008	0.999	0.985	0.977

Table NED_BCA2.—Results of NED BCA with Weber Siphon costs (based on current planning rate: 4.0%) ($ millions)

Benefit and cost components	Alternative 2A/2B - Partial Replacement Alternative				Alternative 3A/3B - Full Replacement Alternative				Alternative 4A/4B - Modified Partial Replacement Alternative			
	Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion	
	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2
Agricultural benefits:	1,070.0	1,070.0	1,070.0	1,070.0	1,884.9	1,884.9	1,884.9	1,884.9	1,315.4	1,315.4	1,315.4	1,315.4
Municipal benefits:	34.1	27.2	34.1	27.2	116.2	92.7	116.2	92.7	58.6	46.6	58.6	46.6
Industrial benefits:	5.2	5.2	5.2	5.2	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9
Total benefits:	1,109.3	1,102.4	1,109.3	1,102.4	2006	1,982.5	2,006	1,982.5	1,378.9	1,366.9	1,378.9	1,366.9
Construction & IDC:	886	886	886	886	3,169.3	3,169.3	3,169.3	3,169.3	942.0	942.0	942.0	942.0
Weber Siphon:	10.6	10.6	10.6	10.6	20.9	20.9	20.9	20.9	12.6	12.6	12.6	12.6
Land acquisition:	3.2	3.2	3.2	3.2	3.9	3.9	3.9	3.9	2.5	2.5	2.5	2.5
OMR&P:	192.5	192.5	192.5	192.5	428.1	428.1	428.1	428.1	228.7	228.7	228.7	228.7
Lost hydropower:	168.3	168.3	190.2	190.2	319.5	319.5	351.1	351.1	194.7	194.7	226.4	226.4
Total costs:	1,260.6	1,260.6	1,282.5	1,282.5	3,941.7	3,941.7	3,973.3	3,973.3	1,380.5	1,380.5	1,412.2	1,412.2
Net benefits:	-151.3	-158.2	-173.2	-180.1	-1,935.7	-1959.2	-1,967.3	-1,990.8	-1.6	-13.6	-33.3	-45.3
Benefit-cost ratio:	0.880	0.875	0.865	0.860	0.509	0.503	0.505	0.499	0.999	0.990	0.976	0.968

Table NED_BCA3.—Results of NED BCA without Weber Siphon costs (based on historic authorization planning rate: 3.0%) ($ millions)

Benefit and cost components	Alternative 2A/2B - Partial Replacement Alternative				Alternative 3A/3B - Full Replacement Alternative				Alternative 4A/4B - Modified Partial Replacement Alternative			
	Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion	
	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2
Agricultural benefits:	1,321.40	1,321.40	1,321.40	1,321.40	2,337.50	2,337.50	2,337.50	2,337.50	1,625.50	1,625.50	1,625.50	1,625.50
Municipal benefits:	31	24.6	31	24.6	119.6	94.7	119.6	94.7	56.8	44.8	56.8	44.8
Industrial benefits:	6.6	6.6	6.6	6.6	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20
Total benefits:	1359	1,352.6	1359	1,352.6	2,463.3	2,438.4	2,463.3	2,438.4	1,688.5	1,676.5	1,688.5	1,676.5
Construction & IDC:	831.8	831.8	831.8	831.8	2,972.9	2,972.9	2,972.9	2,972.9	885.1	885.1	885.1	885.1
Weber Siphon:	0	0	0	0	0	0	0	0	0	0	0	0
Land acquisition:	3.2	3.2	3.2	3.2	3.9	3.9	3.9	3.9	2.5	2.5	2.5	2.5
OMR&P:	237.2	237.2	237.2	237.2	529.5	529.5	529.5	529.5	281.9	281.9	281.9	281.9
Lost hydropower:	207.2	207.2	234.2	234.2	395.3	395.3	434.4	434.4	239.8	239.8	278.8	278.8
Total costs:	1,279.4	1,279.4	1,306.4	1,306.4	3,901.6	3,901.6	3,940.7	3,940.7	1,409.3	1,409.3	1,448.3	1,448.3
Net benefits:	79.6	73.2	52.6	46.2	-1,438.3	-1,463.2	-1,477.4	-1,502.3	279.2	267.2	240.2	228.2
Benefit-cost ratio:	1.062	1.057	1.040	1.035	0.631	0.625	0.625	0.619	1.198	1.190	1.166	1.158

Table NED_BCA4.—Results of NED BCA with Weber Siphon costs (based on historic authorization planning rate: 3.0%) ($ millions)

Benefit and cost components	Alternative 2A/2B - Partial Replacement Alternative				Alternative 3A/3B - Full Replacement Alternative				Alternative 4A/4B - Modified Partial Replacement Alternative			
	Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion		Spring Diversion		Limited Spring Diversion	
	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2	Muni - Opt 1	Muni - Opt 2
Agricultural benefits:	1,321.40	1,321.40	1,321.40	1,321.40	2,337.50	2,337.50	2,337.50	2,337.50	1,625.50	1,625.50	1,625.50	1,625.50
Municipal benefits:	31	24.6	31	24.6	119.6	94.7	119.6	94.7	56.8	44.8	56.8	44.8
Industrial benefits:	6.6	6.6	6.6	6.6	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20
Total benefits:	1,359	1,352.6	1359	1,352.6	2,463.3	2,438.4	2,463.3	2,438.4	1,688.5	1,676.5	1,688.5	1,676.5
Construction & IDC:	831.8	831.8	831.8	831.8	2,972.9	2,972.9	2,972.9	2,972.9	885.1	885.1	885.1	885.1
Weber Siphon:	9.2	9.2	9.2	9.2	18.3	18.3	18.3	18.3	11	11	11	11
Land acquisition:	3.2	3.2	3.2	3.2	3.9	3.9	3.9	3.9	2.5	2.5	2.5	2.5
OMR&P:	237.2	237.2	237.2	237.2	529.5	529.5	529.5	529.5	281.9	281.9	281.9	281.9
Lost hydropower:	207.2	207.2	234.2	234.2	395.3	395.3	434.4	434.4	239.8	239.8	278.8	278.8
Total costs:	1,288.6	1,288.6	1,315.6	1,315.6	3,919.9	3,919.9	3959	3959	1,420.3	1,420.3	1,459.3	1,459.3
Net benefits:	70.4	64	43.4	37	-1,456.6	-1,481.5	-1,495.7	-1,520.6	268.2	256.2	229.2	217.2
Benefit-cost ratio:	1.055	1.050	1.033	1.028	0.628	0.622	0.622	0.616	1.189	1.180	1.157	1.149

also vary by alternative and range from $1,250.0 to 1,271.9 million for the partial replacement alternatives, $3,920.8 to $3,952.4 million for the full replacement alternatives, $1,367.9 to $1,399.6 million for the modified partial replacement alternatives. The modified partial replacement alternative under the with Spring Diversions and the high municipal benefit (option1) scenario results in a positive net benefit of $11.0 million and a benefit-cost ratio (BCR) of 1.008. The other scenarios under the modified partial replacement alternative result in negative net benefits and BCRs less than 1 (although the with Spring Diversions and low municipal benefit (option 2) scenario comes very close to a positive result). In addition, all of the scenarios under the partial and full replacement alternatives resulted in negative net benefits and BCRs less than 1. Bottomline, only the modified partial replacement alternative under the with Spring Diversion and high municipal benefit scenario would be considered economically justified.

As can be seen in table NED_BCA2, including a portion of the Weber Siphon costs into the analysis drives the benefit-cost results negative for all alternatives under all scenarios (although the modified partial replacement alternative under the with Spring Diversion and the high municipal benefit scenario falls just into the negative category).

The results in table NED_BCA3 were generated for informational purposes only using the planning rate in place when the Columbia Basin Project was first authorized (3.0 percent). Total benefits vary by alternative and range from $1,352.6 to $1,359.0 million for the partial replacement alternatives, $2,438.4 to $2,463.3 million for the full replacement alternatives, and $1,676.5 to $1,688.5 million for the modified partial replacement alternatives. Total costs also vary by alternative and range from $1,279.4 to $1,306.4 million for the partial replacement alternatives, $3,901.6 to $3,940.7 million for the full replacement alternatives, and $1,409.3 to $1,448.3 million for the modified partial replacement alternatives. When using the historic 3% planning rate, all of the scenarios under the partial replacement alternatives and modified partial replacement alternatives result in positive net benefits and BCRs greater than 1. The full replacement alternative scenarios all generate negative net benefits and BCRs less than 1.

As shown in table NED_BCA4, the results based on the historic 3% planning rate didn't change significantly from those in table NED_BCA3 after including the costs of the Weber Siphon.

1.2 Methodology, Assumptions, and Results

This section describes the methodology, assumptions, and results associated with each benefit and cost component of the BCA.

1.2.1 Benefit Analyses

The primary beneficiary of the proposed project to move agricultural groundwater pumpers off of groundwater and on to surface water is not surprisingly agriculture. Benefits were also estimated for municipal and industrial uses. Municipal and industrial benefits were considered "other direct benefits" since they are "incidental to the purposes for which the water resources plan is being formulated" (U.S. Water Resources Council, 1983).

1.2.1.1 Agricultural Benefits

Methodology and Assumptions – Washington's Adams, Grant, Franklin, and Lincoln Counties make up the analysis area for the irrigated agriculture section. The study area is located within these four counties. This analysis of irrigated agriculture is based on information about the following:

1. Groundwater irrigation in the study area
2. Current crops grown in the study area
3. Projections of changes to the types and amounts of crops that would be grown in the future under the action alternatives

Historical data about the number of acres of cropland, average farm sizes, agricultural land values, and agricultural production were collected for the four-county analysis area. All of this information came from published sources. Some of the general data is published every 5 years in the Census of Agriculture. Other pieces of information, such as average crop yield and average sales prices received for crops, are published annually by the National Agricultural Statistics Service (NASS) for the state of Washington.

A general picture of agricultural production in the four-county area does not provide the depth of information needed to accurately portray the future of farms in the study area; therefore, more detailed information is included to make the agricultural impacts analysis as accurate as possible. In this analysis, the general picture of agricultural production in the four-county area precedes more detailed information. Generally, Census of Agriculture data shows average farm sizes for each of the four counties and land values since 1997. These data record primary crops grown in the four-county area. Additionally, annual data provided by NASS addresses county-average yields and average crop prices.

The Columbia Basin Groundwater Management Area (GWMA) provides the next level of detail for this analysis. The GWMA information is specific to lands within the study area and includes information about crops grown in the study area and irrigation wells. In addition, GWMA offers recommendations about the future of agriculture in the study area.

1.2.1.1.1 Census of Agriculture Data

Census of Agriculture data paints a general picture of agriculture. Very little Census of Agriculture data are used in this analysis, but the data help to understand what is happening in four counties in eastern Washington.

1.2.1.1.1.1 Farms and Farm Size

Census of Agriculture data for Adams, Franklin, Grant, and Lincoln counties in Washington was available for 2007, 2002, and 1997. In 2007, the four-county analysis area had 4,329 farms encompassing 3,885,663 acres of land, for an average farm size of 900 acres. The 2002 Census of Agriculture showed that the four-county analysis area had 4,208 farms with 4,039,405 total acres. Average farm size according to the 2002 Census of Agriculture was 960 acres. The 1997 Census of Agriculture showed 3,882 farms with 4,131,131 total acres and an average farm size of 1,064 acres. The general trend seen from the Census of Agriculture data is that the number of farms is increasing, while farm size is decreasing.

Census of Agriculture information documents the number of farms with irrigated lands. Farms with irrigation range from a low of about 120 farms in Lincoln County to a high of about 1,410 farms in Grant County. The average number of irrigated acres has been decreasing in Adams and Lincoln counties over time. Franklin and Grant counties have seen fairly steady amounts of irrigated land from 1997 to 2007. Overall, the number of irrigated acres per farm averages 333 acres for the four-county analysis area. Over the three Census of Agriculture periods, irrigated lands make up about 22 percent of the total farmland and 62 percent of the total number of farms are irrigated. The number of irrigated acres, according to the Census of Agriculture reports, rose from 863,330 acres in all four counties in 1997, to 900,259 acres in 2002, and then dropped in 2007 to 843,614 acres. Table AgBen1 presents the Census of Agriculture data for number of farms, land in farms, and irrigated farms in the four-county area.

The four-county analysis area encompasses the study area, which only has 102,616 acres of land currently irrigated with groundwater authorized to receive CBP water. Thus, irrigated land in the study area would account for about 12 percent of the irrigated land in the four-county analysis area.

1.2.1.1.1.2 Agricultural Land Values

The market value of agricultural land averaged $1,024, $2,161, $2,495, and $996 per acre for Adams, Franklin, Grant, and Lincoln counties, respectively, according to the 2007 Census of Agriculture. In general terms, when average land values from the 1997, 2002, and 2007 Census of Agriculture are examined, average land values show a pronounced upward trend. For example, the 1997 Census of Agriculture showed that Adams County average land values were $714/acre. The average land value for Adams County was $745/acre in the 2002 Census of Agriculture, a 4.3 percent increase. In 2007, land values increased to

Table AgBen1.—Census of agriculture number of farms data for the four-county analysis area

	Adams	Franklin	Grant	Lincoln	Total
2007 data					
Number of farms	782	891	1,858	798	4,329
Land in farms (acres) average	1,098,487	609,046	1,087,952	1,090,178	3,885,663
Farm size (acres)	1,405	684	586	1,366	898
Irrigated land (number of farms)	304	702	1,403	125	2,534
Irrigated land (acres)	124,515	217,238	469,790	32,071	843,614
Average number of irrigated acres	410	309	335	257	333
2002 data					
Number of farms	717	943	1,801	747	4,208
Land in farms (acres)	1,067,079	664,875	1,074,074	1,233,377	4,039,405
Average farm size (acres)	1,488	705	596	1,651	960
Irrigated land (number of farms)	316	744	1,448	141	2,649
Irrigated land (acres)	120,746	241,063	485,459	52,991	900,259
Average number of irrigated acres	382	324	335	376	340
1997 data					
Number of farms	628	848	1,699	707	3,882
Land in farms (acres)	1,096,447	563,716	1,095,099	1,375,869	4,131,131
Average farm size (acres)	1,746	665	645	1,946	1,064
Irrigated land (number of farms)	294	725	1,409	120	2,548
Irrigated land (acres)	148,018	221,145	446,183	47,984	863,330
Average number of irrigated acres	503	305	317	400	339

Source: 1997, 2002, and 2007 Census of Agriculture.

$1,024/acre, a 37.5 percent increase over a 5-year period. This same trend, albeit with differing land values for each county, was seen in all four of the counties in the analysis area. Table AgBen2 presents the Census of Agriculture data relating to average market values for counties in the area.

Table AgBen2.—Average market value of land for the four-county analysis area

	Adams	Franklin	Grant	Lincoln	Average
2007 data					
Market value of land ($)	1,438,309	1,477,309	1,460,726	1,360,226	1,434,143
Average market value ($/acre)	$1,024	$2,161	$2,495	$996	$1,669
2002 data					
Market value of land ($)	1,114,407	982,716	1,115,289	1023866	1,059,070
Average market value ($/acre)	$745	$1,448	$1,923	$606	$1,181
1997 data					
Market value of land ($)	1,307,300	969359	1,001,298	1,078,654	1,089,153
Average market value ($/acre)	$714	$1,469	$1,596	$537	$1,079

Source: 1997, 2002, and 2007 Census of Agriculture.

1.2.1.1.2 National Agricultural Statistics Service Data

NASS gathers and publishes agricultural data specific to the state of Washington every year, including information about the number acres of harvested crops in the analysis area. This source was also used for information about crop yields and prices. A 5-year average was used to determine baseline crop acreage, yield, and price received. Data from NASS are usually the only source of information about acres of harvested crops, yields, and the price received when crops are sold.

Wheat, hay, and potatoes account for almost 91 percent of all crops grown in the four-county analysis area, according to the NASS. Table AgBen3 shows some of the most common crops harvested in the study area from 2004–08. Wheat is by far the most common crop produced in the analysis area, accounting for 63.4 percent of the total acreage harvested. Alfalfa and other hay cover 20.2 percent of total acreage. Potatoes are 7.2 percent. Corn for grain (3.4 percent) and barley (3.4 percent) are the next most commonly produced crops. Corn silage, oats, pinto beans, pink beans, and dry edible beans comprise the remaining 2.5 percent of harvested acres. Harvested acreage over the four-county region totals 1,345,193 acres.

Table AgBen3.—Primary irrigated crop acreages for the four-county analysis area, 2004–08

Crop	2004	2005	2006	2007	2008	Average	Percent
All wheat	914,600	913,200	890,700	833,100	872,000	884,720	63.4%
Corn grain	43,000	47,400	32,700	68,900	45,200	47,440	3.4%
Corn silage	9,700	11,700	10,800	15,500	9,000	11,340	0.8%
Oats	300		400			350	0.0%
All barley	61,400	45,000	41,800	46,900	39,100	46,840	3.4%
Beans – Pinto	2,100	4,300	3,900	4,900	5,000	4,040	0.3%
Beans – Pink	1,800	1,450	1,800			1,683	0.1%
Beans – Sm.- red	1,900	2,500	2,000	2,900	2,100	2,280	0.2%
Beans – Dry-red	15,400	19,300	19,000	10,700	8,900	14,660	1.1%
Alfalfa	259,000	243,000	239,500	230,400	182,500	230,880	16.5%
Hay – Other	40,000	39,500	45,000	67,000	63,000	50,900	3.6%
Potatoes	100,800	95,500	97,500	105,500	101,000	100,060	7.2%
Total	1,450,000	1,422,850	1,385,100	1,385,800	1,327,800	1,395,193	

Source: NASS, 2004–08.

1.2.1.1.2.1 County-Level Crop Yields and Prices

County-average crop yields of representative crops (irrigated and dryland wheat, potatoes, and mixed crops) were obtained from NASS; however, GWMA disagreed with the results finding that the published county-average yield for irrigated wheat, at 101.5 bushels per acre, was too low. This observation was confirmed by the Washington State University Farm Business Management Report EB2029E. Therefore, an average yield of 125 bushels per acre was used for irrigated wheat, based on GWMA's recommendation and substantiated by the published report. All other yields were used in the analysis, as reported in table AgBen4.

Table AgBen4.—Weighted county average yields by crop, 2004–08

Crop	Yield unit	2004	2005	2006	2007	2008	Average
Irrigated wheat	Bushels	91.6	108.3	102.4	103.6	N/A	101.5
Dryland wheat	Bushels	32.9	28.9	43.6	35.6	N/A	35.3
Mixed crops	Pounds	2,753.5	2,261.1	1,615.4	2,433.5	2,355.1	2,247.7
Potatoes	Cwt	590.4	626.2	588.7	624.2	627.6	611.4

Source: NASS, 2004–08.

Prices received for the crops came from the USDA, Economic Research Service (ERS) and NASS. The ERS publishes normalized prices for commodities. The normalized prices are used for evaluating alternative development and management plans for water and related land resources as required by the Water Resources Planning Act of 1965. Normalized prices are only published for basic commodities. When non-basic crops, such as potatoes, are used in an NED benefits analysis, a three-year average of state-average prices are obtained and used. The prices used for this analysis are in table AgBen5.

Table AgBen5.—Normalized prices received by crop, 2009

Crop	Yield unit	Normalized prices used in analysis
Wheat	Bushel	$4.98
Mixed crops	Pounds	$0.2812
Potatoes	Cwt	$6.23

The county-average published statistics were used to determine commonly grown crops in the study area, but a higher level of detail was needed. More detailed information was obtained from GWMA, who provided cropping patterns specific to study area lands irrigated from groundwater sources. NASS county-level yield and state-level price information was incorporated with GWMA acreage data in this analysis.

1.2.1.1.3 GWMA Data

GWMA provided annual data for the types of crops grown in the Study Area and the number of acres of each crop, as well as information regarding irrigation well status. This level of specific detail was needed for this analysis because the Study Area covers parts of four counties.

1.2.1.1.3.1 Crop Acreages in the Study Area

GWMA supplied data about crops and respective acreages for years 2001 to 2005, but GWMA was unable to exactly reproduce the boundaries of the study area as Reclamation has defined them. Therefore, total harvested acres from the GWMA dataset cover 102,370 acres. Since the 2001 to 2005 GWMA data is specific to the study area, it was more appropriate for this analysis than the 2004 to 2008 county-average data available from the NASS. To compensate for the difference in acreages, once the percentage split by crop was determined from the GWMA data, the percentage split was applied to the Reclamation-specified number of acres in the study area.

According to the information provided by GWMA, the primary crops grown in the study area from 2001 to 2005 included potatoes, wheat, corn, alfalfa, peas, grass seed, and a catchall category called –other" crops (onions and dry beans). Potatoes accounted for more than 15 percent of these reported acres; wheat acres and grass seed acres 46.7 percent; and –other" crops 17 percent. Cumulatively, these three crop categories form almost 79 percent of groundwater-irrigated acres.

Total wheat acres in the GWMA dataset, both irrigated and dryland, came to 46.7 percent of the total acres. It was decided at the outset that dryland wheat acres in this analysis would be capped at 5 percent of total study area acres (102,616 acres) initially. This assumption came about because the initial number of acres being served by the most undependable wells was set at 5 percent. Capping the number of initial dryland acres therefore simplified the analysis. The remaining 41.7 percent of wheat acres were assumed to be irrigated. Table AgBen6 shows the GWMA cropping pattern information that contributed to this analysis.

Table AgBen6.—GWMA crop acreages for the study area, 2000–05

Crop	2000	2001	2002	2003	2004	2005	Average	Percent of total acres
Alfalfa	4,264	4,918	6,526	8,079	N/A	5,608	5,879	5.7%
CRP[1]	4,254	3,090	3,532	3,090	N/A	0	2,793	2.7%
Corn	4,307	7,908	9,303	5,721	N/A	12,592	7,966	7.8%
Other	24,088	22,756	13,661	12,252	N/A	15,007	17,553	17.1%
Peas	3,364	4,538	3,793	6,647	N/A	6,333	4,935	4.8%
Potatoes	14,711	18,404	14,004	15,215	N/A	14,927	15,452	15.1%
Dryland wheat	4,403	5,088	9,896	6,189	N/A	3,591	5,833	5.7%
Irrigated wheat/ grass seed	42,979	35,668	41,655	45,177	N/A	44,312	41,958	41.0%
Total acres	102,370	102,370	102,370	102,370		102,370	102,370	

[1] Conservation Reserve Program.

1.2.1.1.3.2 Representative Crops Selected

After examining the GWMA cropping pattern for 2001 to 2005, four representative crops were selected to reflect current farming practices in the study area: irrigated potatoes, irrigated wheat, irrigated mixed crops, and dryland wheat/fallow rotation. These representative crops were selected based on

communication with and cropping patterns provided by GWMA. It should be noted that grass seed was a prevalent crop during the 2001 to 2005 period; however, the importance of grass seed in the study area has since been reduced, because grass seed can no longer profitably compete with irrigated wheat. Therefore, grass seed was not used in the cropping pattern for current conditions.

The category "mixed crops" was used to represent a diverse set of crops that includes corn, alfalfa, conservation reserve program acres, peas, onions, dry beans, and numerous other crops grown in the study area. Collectively the acres of these crops add up to a substantial amount. To expedite the agricultural impact analysis, the acres associated with these crops were categorized as "mixed crops." Representative costs of production and gross income from "mixed crops" came from a dry beans budget prepared by Washington State University. Table AgBen7 shows the crops reported in table AgBen4 that were combined into the four representative crops.

Table AgBen7.—The four representative crops, the combined GWMA crops for each representative crop, each crop's acreage, and percent of total acres, 2000–05

Representative crop name	Crops included	Acres	Percent of total acres
Potatoes	Potatoes	15,452	15.1%
Mixed crops	Peas, corn, alfalfa, CRP, dry beans, etc.	39,126	38.2%
Irrigated wheat	Irrigated wheat, grass seed	42,688	41.7%
Dryland wheat	Dryland wheat/fallow rotation	5,119	5.0%
Total acres		102,370	100.0%

1.2.1.1.3.3 Groundwater Irrigation in the Study Area

Irrigated acres in the study area are currently served by groundwater. The output and dependability of the wells used by farms in the study area were categorized from the most dependable, high output wells to the least dependable, low output wells by GWMA. Additionally, GWMA provided information on the rate of decline of well dependability.

One of the base assumptions used in the agricultural impact portion of this study was the classification of existing wells into five levels of dependability. Another base assumption for the agricultural impact analysis was related to the decline in well dependability and how that declining dependability affected the crops grown in the study area.

1.2.1.1.3.4 Well Status Levels

GWMA (GWMA 2010) describes the status of groundwater wells in the Odessa Subarea. Regarding irrigated agriculture, status level 1 wells (presently serving 5 percent of all study area lands) are suitable for meeting the irrigation requirements of high water use crops such as potatoes for an entire irrigation season. No decline in dependability or output was assumed for status level 1 wells; therefore, no future change in the cropping pattern for status level 1 wells is expected.

Status level 2 wells, currently serving 30 percent of all study area lands, are also suitable for meeting irrigation requirements for high water-use crops. However, status level 2 wells are projected to have reduced output and be less dependable in the future. As status level 2 wells become less dependable, they will be downgraded to be status Level 3 wells and a less water-intensive cropping pattern is assigned to the acres served by those wells. Thus, over time, fewer and fewer acres will be served by status level 2 wells.

Status level 3 and status level 4 wells (currently serving 60 percent of all acres in the study area) may be able to meet irrigation requirements for part of the year, but would not sustain high water use crops for an entire irrigation season. The crops grown on lands served by status level 3 and level 4 wells are irrigated wheat and mixed crops, which need less water than crops such as potatoes. Status level 3 and status level 4 wells are subject to lessened well output and dependability, and 10 percent of lands irrigated with status levels 3 and 4 wells will be taken out of the status levels 3 and 4 cropping pattern each year. Once these lands have lost their ability to pump irrigation water, only a crop such as dryland wheat can be produced, and the well status level category will be downgraded to status level 5.

Lands associated with status level 5 wells (currently 5 percent of all acres in the study area) are assumed to be in a dryland wheat/fallow rotation.

As status level 2, level 3, and level 4 wells reduce output, they sink to the next lowest status level. Over time, this means fewer acres served by each well status level and more and more acres in dryland wheat/fallow rotation. Table AgBen8 shows the present number of acres in the study area served by each well status level, percentage split of acres relative to the total number of acres in the study area, and acres affected by reduced well output.

1.2.1.1.3.5 Representative Farm Budgets

Reclamation values irrigation benefits by using a farm budget methodology. Benefit studies measure the economic consequences to the nation if residual net farm income from irrigation is lost because of a reduction in water supply or a change from one source of irrigation water to another.

Table AgBen8.—Well status levels, initial number of acres served by each well status level, and rate of decline by well status level

Well status level	Output and dependability	Acres served	Percent of total acres served	Percent of acres lost from each well status level annually
Level 1	Highest	5,131	5%	0%
Level 2	High	30,785	30%	10%
Level 3	Low	30,785	30%	10%
Level 4	Low	30,785	30%	10%
Level 5	None	5,131	5%	
Total		102,616	100%	

In agricultural benefit analyses the P&Gs require the interest rate to be the current fiscal year planning rate on the entire value of assets, as if 100 percent debt exists. The planning rate for Fiscal Year 2012 is 4.0 percent.

The benefit analysis also uses a normalized price which is calculated annually by USDA-ERS for farm program commodities.

The return to management in a benefit budget is calculated as 6 percent of variable cost on a benefit study.

A summary of the farm budgeting assumptions is presented in table AgBen9.

Table AgBen9.—Basic assumptions of agricultural benefits budgets

	Benefit budget
Methodology	Comparison of residual net farm income between two budgets
Interest rate	4.0%
Debt-to-asset ratio*	100%
Return to owner's equity	None
Return to management	6% of variable expenses

One farm budget methodology used by Reclamation selects representative crop enterprises and then looks at the costs and returns of producing those representative crops in the local area. For this study, six "without" project and

three –with" project single-crop enterprise budgets were developed to reflect agriculture in the study area. The enterprise budgets reflect the cultural and economic practices of the project. Furthermore, the enterprise budgets reflect a representative crop mix for each of five well status levels. The costs and returns associated with the enterprise budgets were used to generate the results of this study.

The farm size and the cultural practices used in the representative enterprise budgets came from published Washington State University Extension Service reports. After determining the farm size, cropping pattern, average yields and expected prices received for the representative farm, gross returns to the farm were calculated.

After estimating the gross farm income, the variable and fixed costs of producing the crops were subtracted from the gross returns to find net farm income.

Finally, a residual net farm income was derived by subtracting an allowance for a return to management and a return to labor from net farm income. The residual net farm income is usually shown as a dollars per acre value.

The –without" project enterprise budgets were based on expectations of future conditions in the study area if no surface water supply was developed to replace the current groundwater supply. As wells become unusable, irrigated farms will transition into growing only dryland wheat.

An enterprise budget was developed for well status level 5 lands consisting of a dryland wheat/fallow rotation. There is no distinction between –with" and –without" project conditions for a representative farm that only has dryland wheat in the crop mix because there would be no difference in residual net farm income. There is no difference in residual net farm income because irrigation water is not taken away. When acres of land transition from a dryland crop mix to an irrigated crop mix, the benefits will be the difference in residual net farm income of the dryland enterprise budget crop compared to the residual net farm income of the irrigated crop mix.

The –with" project representative farms were assumed to receive a full supply of surface irrigation water at the completion of up to nine construction phases. When a construction phase was completed, acres that had transitioned into a different well status level with less, or no, irrigation deliveries from groundwater sources were assumed to start receiving 3 acre-feet of surface water per acre. Acres receiving 3 acre-feet per acre of surface water were assumed to transition to a cropping pattern similar to the existing cropping pattern in Block 46 of the East Columbia Basin Irrigation District; that cropping pattern includes the

representative crops of irrigated potatoes, alfalfa, and wheat. Irrigated potatoes, alfalfa, and wheat were selected in consultation with ECBID as the representative crops for the multitude of irrigated crops grown in Block 46 of the ECBID.

The representative crop budgets are composed of many types of information from multiple sources. Once the data has been gathered, it is compiled into a farm budget program that takes individual data, aggregates it, and then presents it in a manner that can be easily understood. The collected data for the representative farms includes:

An Estimation of Gross Farm Income—Gross farm income consists of the sale of products produced on the farm and is calculated after finding the appropriate size of the farm, the cropping pattern, yields, and the price that is expected to be received when the crops are sold.

The Representative Farms—This is the information about farm size, crop mix, cultural practices, etc. Both "without" and "with" project farms are depicted.

Crop Yields—Crop yields are based on county-averages for a 5-year period. Crop yields are presented in table AgBen4.

Prices Received—On a benefit budget the USDA normalized price is used. Prices received are presented in table AgBen5.

Farm Expenses—Crop production expenses were taken from Washington State University Extension Farm Budgets, discussions with farmers, and others knowledgeable with agriculture in the area. Some farm expenses are indexed from a previous study or from Extension farm budgets compiled years earlier. These expenses are indexed to 2008, the last year for which indexing and pricing information is available.

Real Estate Investment—Real estate investment is included in the budget to estimate the amount of interest paid on investments and/or loans. Real estate investment includes land, buildings, and improvements. Investment in irrigated land in this study is the market value of land for agricultural purposes. Irrigated land is valued at $1,685 per acre.

Buildings on a full-time farm in the area vary widely in value, size, and numbers per farm. The representative set of farm buildings for this study includes a machine shed valued at $60,000, a storage shed valued at $40,000.

Crop Expenses—Crop expenses include custom work, herbicides, insect control, disease control, fertilizer, seed, and miscellaneous crop expenses. Crop expenses were taken from Extension farm budgets, discussion with local farmers, and from past studies. Most crop expenses were taken from Extension farm budgets and

indexed to 2008. An expense for gypsum and liquid sulfur was added to all –without" project budgets; this expense was estimated to occur on 33 percent of the groundwater irrigated acres. Gypsum was applied at a rate of 500 pounds per acre and liquid sulfur was applied at 30 pounds per acre. Custom work includes application of chemicals and fertilizer, and custom combining the wheat.

Fertilizer is used on most irrigated land for maximum production. This consists of potash, phosphate, and gypsum based fertilizers applied during the production years. Nitrogen based fertilizers are also applied.

Chemicals are used on the representative farm to control weeds and insects and include herbicides, insecticides, and other chemicals needed to produce the crops on the representative farms.

Seed costs are for purchase of high quality seed for maximum germination and production.

Pumping Expenses—Pumping expenses were included in the enterprise budgets for both the with and without project conditions. The pumping lift calculations used to estimate pumping energy costs were obtained from the Review of Groundwater Analysis for Odessa Subarea Special Study (Reclamation 2012 Groundwater).

General Expenses—General expenses include expenses not easily categorized into any of the expense categories listed above.

Labor Distribution—Labor expense is derived from labor required to operate machinery and manual labor for irrigation. Machinery labor is calculated by adding 10 percent to the total power machinery use. Power machinery use for machines, that require a non-power implement, in this case the tractors, is found by adding 10 percent to the total non-power machinery use.

Hired labor is used by the representative farm budgets if the amount of labor hours supplied by the operator and family labor cannot fulfill all the labor requirements.

Wages—Wages are reported by the Bureau of Labor Statistics on a state wide basis. Wages paid in the area are about $7.50 per hour for farm labor. This is the rate used for hired labor and family labor. Skilled labor is figured at $12.50 per hour and is used for operator labor. These rates were obtained from the U.S. Bureau of Labor Statistics.

Social Security and Worker's Compensation—Social Security and Medicare expense, in a farm budget, is calculated only for hired labor. The social security

rate is 15.30 percent, which is divided between the employer and employee, thus, the hired labor rate is 7.65 percent. A Worker's Compensation rate of 12 percent is used in this study.

Machinery Costs—Information on cultural practices, machinery needed, time of use, new costs, depreciation, and repair costs were obtained from several sources including discussions with local irrigators, Extension farm budgets, and University of Minnesota Farm Machinery Economic Cost Estimates for 2005. Machinery values are based on all new machinery and are depreciated over a maximum of 25 years using the sinking fund method. The interest rate used for the sinking fund method is 4.375 percent based on the 60-month average yield of monthly U.S. Treasury marketable securities with maturities of 5 years.

All tractors on the farm are represented by new 150-horsepower, 200-horsepower, and 300-horsepower tractors. The number and types of tractors and other self-propelled machines was obtained from Extension Cost and Return Estimates published by Washington State University.

Telephone and Electricity Expenses—The average annual telephone cost for the western United States is $1,047. This is from the U.S. Bureau of Census Statistical Abstract, 2004. This study assumes one-half of the total telephone bills are attributable to the farm operation. The estimated telephone cost is $524 per year. Most farmers now have cell phones for farm use. An allowance of $40 per month or $480 per year for the farm portion of use increases telephone cost to $1,004 per year.

The U.S. Bureau of Census Statistical Abstract publication was also used for electrical costs. The average residential electrical cost for the western U.S. is $969 per year. It is estimated, for this study, that approximately the same amount of electricity is used for the farm as for the residence; therefore, that amount is used as the electrical cost for the farm operation.

Property Taxes—Property tax information was set at 1.248 percent in the representative farm budgets. Buildings are valued at market value for tax purposes. Building values were adjusted 50 percent to allow for depreciation. Vehicles were assumed to have an annual license fee of $108.

Insurance Costs—Fire and wind insurance costs were set at $6.67 per $1,000 of asset worth. Liability insurance was included as an expense in the farm budgets. Insurance costs can vary greatly depending on location, insurance history, age of property, and other demographic factors.

Liability insurance pays for personal injury and property damage that occurs on the property or is caused by the insured while off the property. A farmer in the area is usually insured for $1,000,000, which costs $300 per year.

Vehicle insurance is quoted in dollar amounts and can also vary depending on several factors. The average insurance cost for a new pickup would be about $700.

Return to Farm Family—The farm operator and farm family are entitled to income from the farm as a result of their investment, management, and labor.

Return to Equity—There is no return to equity in a benefit budget since interest is charged on 100 percent of assets.

Return to Management—Return to management is to pay the operator for his ability to manage and operate the unit in an efficient and profitable manner. While this value varies extensively with each operator's ability, 6 percent of variable expenses was used for Benefit budgets.

Return to Labor—The farm operator and his family are also entitled to income for labor they perform on the farm. Return to labor is calculated as wages paid to the farm operator and farm family. In this study operator wages are $12.50 per hour and family wages are $7.50 per hour.

1.2.1.1.3.6 Determining Lost Irrigation Benefits

Irrigation benefits are generally found by taking the change in residual net farm income under a ~~"w~~ith" project condition versus a ~~"w~~ithout" project condition. The ~~"w~~ith" project condition in this study was assumed to have a full supply of irrigation water. The ~~"w~~ithout" project condition was assumed to have a partial supply of irrigation water.

1.2.1.1.3.7 Finding the Change in Irrigated Acres

The annual reduced number of irrigated acres was estimated with a spreadsheet model. The model estimated how many acres of irrigated crops were grown in the study area in 2010. Then, the spreadsheet model, based on assumptions about decreasing well dependability, estimated the reduced number of groundwater irrigated acres annually for the ~~"w~~ithout" project conditions. As acres transitioned from one well level to another, a change in the crop mix occurred along with a resultant change in residual net farm income. As wells became completely unusable, acres were placed into the well status level 5 category and grew only dryland wheat in a wheat/fallow rotation.

The same spreadsheet model, with different assumptions, was used to project the change in the number of irrigated acres and the associated change in residual net farm income for the ~~"w~~ith" project conditions. In this version of the spreadsheet model, acres began to receive a full supply of surface water as construction phases were completed. Acres receiving a full supply of surface water began growing

the crop mix of irrigated potatoes, alfalfa, and wheat. The –with" project version of the spreadsheet model estimated changes in irrigated acres for each of nine construction phases. The alternative being evaluated, Partial-Banks, Full-Banks, or Modified Partial-Banks dictated how many acres would receive agricultural benefits because of the implementation of the project. For example, when the Partial-Banks Alternative was evaluated, 57,070 acres accrued agricultural benefits and 45,545 acres did not. Under the Full-Banks Alternative, 102,616 acres accrued agricultural benefits. The Modified partial-Banks alternative had 70,515 acres accruing agricultural benefits.

In both versions of the spreadsheet model, changes in the number of irrigated acres and associated residual net farm income were estimated each year beginning in 2010 and ending in 2126 with construction phases completed in 2019, 2020, 2023, and 2025. Thus, changes in irrigated acres and residual net farm income were projected 100 years into the future after construction was completed.

1.2.1.1.3.8 Calculating the Change in Net Farm Income

After the spreadsheet models for the No Action, Partial-Banks, Full-Banks, and Modified Partial-Banks Alternatives were completed, it was possible to identify the changes in groundwater irrigated acreage over time.

In this analysis, the primary driver for agricultural benefits comes from a change in pumping costs. Reduced pumping costs lower farm cost, resulting in higher residual net farm incomes. A secondary driver for agricultural benefits comes from an incremental change in crop acres as wells become less dependable and the crop mix is changed. The –with" project condition assumed that groundwater pumping costs were minimized since surface water was delivered for irrigation purposes. The –without" project condition was characterized by full groundwater pumping costs based on different pumping lifts for each no action alternative. The difference between the residual net farm incomes under the –with" and –without" conditions is the benefit to irrigated agriculture.

For example, if the performance of status level 2 wells is reduced and those wells become classified as status level 3 wells, there will be a change in the crops that can be grown on the acres served by those wells. Thus, a change in crop production will occur (different crops will be grown) along with a resultant change in net farm income.

After incorporating the effects on residual net farm income from reducing pumping costs and the incremental change in crop mix into the representative crop mix, a total benefit accruing to agriculture can be estimated.

Results

No Action Alternative – All agricultural irrigation benefits associated with the action alternatives were measured as changes from the No Action Alternative. To start the agricultural benefits calculation, annual residual net farm income was first calculated for each year under the No Action Alternative by taking the annual change in crop acres for each well status level and multiplying by the associated "without" project residual net farm income. This was done for each year of the 100-year period of analysis so that future projections of residual net farm income could be quantified.

Under the No Action Alternative, irrigated agriculture in the study area would be dramatically reduced because groundwater would not be replaced with surface water. As groundwater diminishes, farmers would transition into growing dryland crops in rotation with fallow land. Ultimately, all but status level 1 acres would grow dryland crops under the No Action Alternative because no other source of irrigation water would be available to the acres associated with the other well levels.

After forecasting the future number of irrigated and dryland acres, residual net farm income was estimated. There are 102,616 acres in the study area currently irrigated with groundwater. The crops represented by the NED "without" project benefits budgets include irrigated potatoes, wheat, mixed crops, and a dryland rotation of wheat and fallow.

Information about crops grown in the study area and the status of groundwater wells in the study area was obtained from GWMA. In addition to helping describe current conditions, GWMA also provided guidance and assumptions on the future status of groundwater wells and cropping patterns in the study area under the No Action Alternative.

Groundwater wells in the area were ranked by GWMA according to five status levels (levels 1 to 5) based on output and dependability. Assumptions were made about how long wells would remain in use and what crops would be grown as wells declined in output and dependability.

Pumping lifts for the No Action Alternative came from a groundwater study prepared Reclamation (Reclamation 2012 Groundwater). Different pumping lifts were assumed for the No Action Alternatives associated with each of the Action Alternatives. For example, the pumping lift for the partial replacement alternative was 602 feet. The pumping lift for the full replacement alternative was 548 feet and the pumping lift for the modified partial alternative was 555 feet.

This information was used in a spreadsheet model to predict changes in irrigated acres in the future. Subsequent changes in residual net farm income were estimated by multiplying the number of acres in each well status level by the associated residual net farm income for each well status level.

Table AgBen 10 presents the change in the No Action Alternative groundwater irrigated acres for the years 2019, 2020, 2022, 2023, 2025, 2050, 2075, 2100, and 2125. In each year of the analysis, a lagged transition of acres from one well status level to the next lowest well status level occurred. The lag was introduced into the analysis to show that even though a number of acres would be transitioned into the next lower well status level each year that transition would not occur instantaneously. Instead, the transition of acres from one well status level to the next would occur at the beginning of the next year.

The crop mix for well status level 1 acres had irrigated potatoes and wheat on 5,131 acres (table AgBen 10).

In 2019, well status level 2 lands had irrigated potatoes, mixed crops, and wheat on 11,927 acres.

Acres associated with well status level 3 and well status level 4 had a crop mix of irrigated mixed crops and wheat 53,007 acres

Status level 5 acres were all in a dryland wheat/fallow rotation. As more acres were transitioned into status level 5 acres, they were put into the dryland wheat/ fallow rotation. In 2019, 32,551 acres were in status level 5; by 2125 status level 5 acres numbered 97,461.

Partial Replacement Alternatives –The Partial Replacement Alternatives 2A–2B only differ in which reservoirs provide the main water supply. All of the partial replacement alternatives would provide CBP surface water to the same approximately 57,000 acres currently using groundwater south of I-90. Thus, the agricultural benefits are the same for each of the partial replacement alternatives.

Agricultural benefits were estimated for the partial replacement alternatives by comparing the residual net farm income under the No Action Alternative to the residual net farm income under the partial replacement alternative.

All of the partial replacement alternatives are based on completing four construction phases, encompassing 57,070 acres, between 2019 and 2025. The numbers of acres for each construction phase are shown in table AgBen11.

Table AgBen10.—No Action Alternative: Groundwater irrigated acres and dryland acres by selected years

	2019	2020	2022	2023	2025	2050	2075	2100	2125
Status Level 1	5,131	5,131	5,131	5,131	5,131	5,131	5,131	5,131	5,131
Status Level 2	11,927	10,734	8,695	7,825	6,338	507	37	5	5
Status Level 3-4	53,007	51,285	47,659	45,792	42,021	10,018	1,493	180	19
Status Level 5 (dryland)	32,551	35,466	41,132	43,869	49,126	86,960	95,955	97,300	97,461
Total acres	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616

Table AgBen11.—Partial replacement alternative: Total number of acres receiving surface water deliveries by construction phase and cropped acreage by well status level south of I-90

Construction phase	Acres receiving surface water	Status Level 1 cropped acres	Status Level 2 cropped acres	Status Level 3 and 4 cropped acres	Status Level 5 cropped acres
South of I-90					
1	18,713	936	5,614	11,227	936
2	22,003	1,100	6,601	13,202	1,100
3	8,931	447	2,679	5,357	447
4	7,423	371	2,227	4,454	371
Subtotal of acres south of I-90	57,070	2,854	17,121	34,240	2,854
Groundwater irrigated acres	45,546	2,277	13,664	27,328	2,277
Total acres	102,616	5,131	30,785	61,570	5,131

From 2010 until 2019, when the first construction phase ends, there are no agricultural benefits because there is no difference in residual net farm income between the No Action Alternative and the partial replacement alternative. However, starting in 2019 when construction phase 1 ends, agricultural benefits begin to accrue on the acres served by the construction phase 1 canal(s) and laterals.

Before construction would be completed, there would be a loss of irrigated acreage as wells are taken offline. At the completion of construction, the acres associated with each construction phase are assumed to go into surface water irrigated production. Table AgBen11 presents the number of acres for each of the four construction phases by well status level that would receive surface water deliveries.

When construction phase 1 ends, 18,713 acres will accrue agricultural benefits because those acres will receive surface water and no longer be served by groundwater wells. Additionally, amongst the 18,713 acres, those acres most

affected by well performance reductions will gain from the start of surface water deliveries. Each acre previously irrigated with groundwater would receive 3 acre-feet of surface water.

Under construction phase 2, 22,003 acres will begin to receive surface water deliveries; phase 3, 8,931 acres; and phase 4, 7,423 acres. Thus, as shown in table AgBen12 the cumulative number of acres receiving agricultural irrigation benefits in 2019, 2022, 2023, and 2025 is 18,713, 40,716, 49,647, and 57,070 acres, respectively. As each construction phase is completed, the acres previously served by groundwater wells will begin to receive 3 acre-feet of surface water per acre.

The results for the partial replacement alternatives are presented in table AgBen12, which presents the change in irrigated and dryland acres for the years 2019, 2020, 2023, 2025, 2050, 2075, 2100, and 2125. In each year of the analysis, a lagged transition of acres from one well level to the next lowest well level occurred. The lag was introduced into the analysis to show that even though a number of acres would be transitioned into the next lower well level each year that transition would not occur instantaneously. Instead, the transition of acres from one well level to another would occur at the beginning of the next year.

The difference in residual net farm income between the No Action Alternative and the partial replacement alternative is the estimate of agricultural benefits arising because of the implementation of any one of the partial replacement alternatives. Annual benefits to irrigated agriculture for the partial replacement alternatives are shown in table AgBen 12.

In 2019, 18,713 acres entered into a "with" project condition with a cropping pattern of irrigated potatoes, alfalfa hay, and wheat after construction was completed on phase 1. That was the first year in which benefits accrued to irrigated agriculture ($11.26 million annually). In 2022, another 22,003 acres entered into a "with" project condition and benefits increased to $25.04 million annually. By 2025, four construction phases had been completed and annual benefits were $35.7 million.

Full Replacement Alternatives – The Full Replacement Alternatives 2A-2B only differ in which reservoir provides the main water supply. All of the full replacement alternatives would provide CBP surface water to the same approximately 102,600 acres currently using groundwater in the study area. Thus, the agricultural benefits are the same for each of the full replacement alternatives.

Table AgBen12.—Partial replacement alternative: Surface and groundwater irrigated acres, dryland acres, and expected agricultural benefits for selected years

	Construction phases ending in each year				**Selected years after construction ends**			
	1	2	3	4				
Acres	**2019**	**2022**	**2023**	**2025**	**2050**	**2075**	**2100**	**2125**
WITH project condition								
Surface water irrigated acres	18,713	40,716	49,647	57,070	57,070	57,070	57,070	57,070
WITHOUT project condition								
Groundwater irrigated acres	57,288	37,089	30,324	23,741	6,623	2,903	2,353	2,285
Dryland Acres	26,615	24,811	22,645	21,805	38,923	42,643	43,193	43,261
Total Acres	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616
Annual irrigation benefits	$11,255,351	$25,044,723	$30,740,224	$35,732,641	$37,243,511	$37,334,622	$37,338,288	$37,924,323

Agricultural benefits were estimated for the full replacement alternatives by comparing the residual net farm income under the No Action Alternative to the residual net farm income under the full replacement alternative.

All of the full replacement alternatives are based on completing nine construction phases, encompassing 102,616 acres, between 2019 and 2025. The numbers of acres for each construction phase are shown in table AgBen13. From 2010 until 2019, when the first construction phase ends, there are no agricultural benefits because there is no difference in residual net farm income between the No Action Alternative and the Full-Banks Alternative. However, starting in 2019 when construction phase 1 ends, agricultural benefits begin to accrue on the acres served by the construction phase 1 canal(s) and laterals.

Table AgBen13.—Full replacement alternative: Total number of acres receiving surface water deliveries by construction phase and cropped acreage by well status level south and north of I-90

Construction phase	Acres receiving surface water	Level 1 cropped acres	Level 2 cropped acres	Level 3 and 4 cropped acres	Level 5 cropped acres
South of I-90					
1	18,713	936	5,614	11,227	936
2	22,003	1,100	6,601	13,202	1,100
3	8,931	447	2,679	5,359	447
4	7,423	371	2,227	4,454	371
Subtotal of acres south of I-90	57,070	2,854	17,121	34,242	2,854
North of I-90					
5	7,085	354	2,126	4,251	354
6	11,671	584	3,501	7,002	584
7	6,147	307	1,844	3,689	307
8	12,756	638	3,827	7,653	638
9	7,887	394	2,366	4,733	394
Subtotal of acres north of I-90	45,546	2,277	13,664	27,328	2,277
Total acres	102,616	5,131	30,785	61,570	5,131

Before construction would be completed, there would be a loss of irrigated acreage as wells are taken offline. At the completion of construction, the acres associated with each construction phase are assumed to go into surface water irrigated

production. Table AgBen13 presents the number of acres for each of the nine construction phases by well status level that would receive surface water deliveries.

The results for the full replacement alternative are presented in table AgBen 14, including the change in irrigated and dryland acres and the annual agricultural benefit for each year shown in the table (2019, 2020, 2022, 2023, and 2025). In each year of the analysis, a lagged transition of acres from one well level to the next lowest well level occurred. The lag was introduced into the analysis as a means of showing that even though a number of acres would be transitioned into the next lower well level each year that transition would not occur instantaneously. Instead, the transition of acres from one well level to another would occur at the beginning of the next year.

The difference in residual net farm income between the No Action Alternative and the full replacement alternative is the estimate of agricultural benefits arising because of the implementation of any one of the full replacement alternatives. Annual benefits to irrigated agriculture for the full replacement alternatives are shown in table AgBen 14.

When construction phase 1 ended in 2019, 18,713 acres began to accrue agricultural benefits ($11.12 million annually) because those acres began to receive surface water and were no longer served by groundwater wells. Irrigated potatoes, alfalfa, and wheat were grown on these acres.

The completion date for construction phase 5 was 2020; 7,085 additional acres of groundwater irrigated acres transitioned into surface water deliveries to produce irrigated potatoes, alfalfa, and wheat. Agricultural benefits in 2020 totaled $15.5 million on a combined 25,798 acres.

Construction phases 2 and 8 were completed in 2022; construction phase 2 had 22,003 acres receiving surface water deliveries and construction phase 8 had 12,756 acres receiving surface water deliveries. The total number of acres in a ―with" project condition by 2022 came to 60557 acres. The annual irrigated agricultural benefits in 2022 were about $37 million.

Construction phase 3 had 8,931 acres, and construction phase 6 had 11,671 acres; these construction phases were completed in 2023, increasing the number of acres in a ―with" project condition to 81,158 acres. The annual irrigated agricultural benefits in 2023 were $46.3 million.

Construction phase 4 had 7,423 acres, construction phase 7 had 6,147 acres, and construction phase 9 had 7,887 acres receiving surface water when construction on those phases was completed in 2025. The total number of acres in a ―with" project condition now totaled 102,616 acres. The annual irrigated agricultural benefits came to $63.8 million.

Table AgBen14.—Full replacement alternative: Surface and groundwater irrigated acres, dryland acres, and expected agricultural benefits for selected years

	Construction phases ending in each year					Selected years after construction ends			
	1	5	2 and 8	3 and 6	4, 7, and 9				
Acres	**2019**	**2020**	**2022**	**2023**	**2025**	**2050**	**2075**	**2100**	**2125**
WITH project condition									
Surface water irrigated acres	18,713	25,798	60,557	81,158	102,616	102,616	102,616	102,616	102,616
WITHOUT project condition									
Groundwater irrigated acre	57,288	50,268	25,200	12,285	0	0	0	0	0
Dryland acres	26,615	26,550	16,859	9,173	0	0	0	0	0
Total acres	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616
Annual irrigation benefits	$11,119,922	$15,482,068	$36,954,139	$46,336,354	$63,818,619	$66,825,030	$67,045,289	$67,060,701	$67,060,807

Modified Partial Replacement Alternatives – The Modified Partial Replacement Alternatives 4A–4B only differ in which reservoirs provide the main water supply. All of the modified partial replacement alternatives would provide CBP surface water to the same approximately 70,500 acres currently using groundwater both north and south of I-90. Thus, the agricultural benefits are the same for each of the modified partial replacement alternatives.

Agricultural benefits were estimated for the modified partial replacement alternatives by comparing the residual net farm income under the No Action Alternative to the residual net farm income under the modified partial replacement alternative.

All of the modified partial replacement alternatives are based on completing four construction phases, encompassing 70,515 acres, between 2019 and 2025. The numbers of acres for each construction phase are shown in table AgBen15. From 2010 until 2019, when the first construction phase ends, there are no agricultural benefits because there is no difference in residual net farm income between the No Action Alternative and the modified partial replacement alternative. However, starting in 2019 when construction phase 1 ends, agricultural benefits begin to accrue on the acres served by the construction phase 1 canal(s) and laterals.

Before construction would be completed, there would be a loss of irrigated acreage as wells are taken offline. At the completion of construction, the acres associated with each construction phase are assumed to go back into irrigated production. Table AgBen15 presents the number of acres for each of the four construction phases by well status level that would receive surface water deliveries of three acre-feet per acre.

The results for the modified partial replacement alternatives are presented in table AgBen16, which presents the change in irrigated and dryland acres for the years 2019, 2020, 2023, 2025, 2050, 2075, 2100, and 2125. In each year of the analysis, a lagged transition of acres from one well level to the next lowest well level occurred. The lag was introduced into the analysis to show that even though a number of acres would be transitioned into the next lower well status level each year that transition would not occur instantaneously. Instead, the transition of acres from one well status level to another would occur at the beginning of the next year.

The difference in residual net farm income between the No Action Alternative and the modified partial replacement alternative is the estimate of agricultural benefits arising because of the implementation of any one of the partial replacement alternatives. Annual benefits to irrigated agriculture for the modified partial replacement alternative are shown in table AgBen 16.

Table AgBen15.—Modified Partial replacement alternative: Total number of acres receiving surface water deliveries by construction phase and cropped acreage by well status level north and south of I-90

Construction phase	Acres receiving surface water	Status Level 1 cropped acres	Status Level 2 cropped acres	Status Level 3 and 4 cropped acres	Status Level 5 cropped acres
North of I-90					
1	25,313	1,266	7,594	15,188	1,266
South of I-90					
2	15,902	795	4,771	9,542	795
3	19,544	977	5,863	11,726	977
4	9,758	488	2,927	5,854	488
Subtotal of acres north and south of I-90	70,516	3,526	21,155	42,310	3,526
Groundwater irrigated acres	32,100	1,605	9,630	19,260	1,605
Total acres	102,616	5,131	30,785	61,570	5,131

In 2019, 25,313 acres entered into a ―with" project condition with a cropping pattern of irrigated potatoes, alfalfa hay, and wheat after construction was completed on phase 1. That was the first year in which benefits accrued to irrigated agriculture ($15.06 million annually). In 2022, another 41,255 acres entered into a ―with" project condition and benefits increased to $25.18 million annually. In 2023, 19,544 additional acres entered into a ―with" project condition; annual benefits were $37.38 million. By 2025, four construction phases had been completed and annual benefits were $43.89 million.

1.2.1.2 Other Direct Benefits – Municipal

Methodology and Assumptions –
Municipal benefits were estimated as cost savings for the proposed action alternatives as compared to the No Action Alternative.[1] All of the information used to develop municipal costs by alternative was provided by the Columbia Basin Groundwater Management Area (GWMA). Its report entitled ―General Review of Current Groundwater Supply and Potential Future Water Supply

[1] It is also likely that benefits could accrue to domestic well owners outside the municipal water systems as a result of moving groundwater irrigators on to surface water under the proposed alternatives, but that benefit is not addressed by this municipal analysis.

Table AgBen16.—Modified Partial replacement alternative: Surface and groundwater irrigated acres, dryland acres, and expected agricultural benefits for selected years

	Construction phases ending in each year				**Selected years after construction ends**			
	1	2	3	4				
Acres	**2019**	**2022**	**2023**	**2025**	**2050**	**2075**	**2100**	**2125**
WITH project condition								
Surface water irrigated acres	25,313	41,255	60,759	70,515	70,515	70,515	70,515	70,515
WITHOUT project condition								
Groundwater irrigated acres	52,781	36,750	23,963	16,734	4,791	2,048	1,660	1,613
Dryland Acres	24,522	24,611	17,894	15,367	27,431	30,053	30,441	30,488
Total acres	102,616	102,616	102,616	102,616	102,616	102,616	102,616	102,616
Annual irrigation benefits	$15,060,220	$25,176,947	$37,375,493	$43,894,218	$45,934,146	$46,080,556	$46,090,154	$46,089,800

Options for the Cities of Connell, Lind, Moses Lake, Odessa, Othello, and Warden" (GWMA 2011) provides estimates of the costs of providing deep aquifer well systems and surface water systems for each of the six towns. Table MUNI1 illustrates the per unit costs of drilling, well system O&M, wellhead water treatment, wellhead treatment O&M, surface water filtration/treatment, surface water system O&M, and pipeline interties by town for both a deep aquifer well systems and surface water systems. The number of wells, wellhead treatment systems, filtration/treatment plants, and miles of pipeline for each town and water supply system presented in table MUNI1 also came from the GWMA report. Multiplying the per unit cost by the number of units provides an estimate of the cost of that component for that town (e.g., $1,000,000 cost per well * 4 wells = $4,000,000 well & pump cost for Connell for the deep aquifer well system). Finally, the total annual cost of operating the current system in each town was also provided by GWMA. All of this information was combined to calculate the costs of running the current system and of constructing and running deep aquifer well systems and combination deep aquifer well/surface water systems for each town.

Table MUNI1.—Unit costs by town and system (measured in $1000s)

Cost component	Connell	Lind	Moses Lake	Odessa	Othello	Warden
Current system:						
O&M	75	25	150	50	200	125
Deep aquifer well system:						
Well & pump	1,000	1,000	800	500	900	750
Well O&M	15	20	15	15	25	15
Treatment system	2,000	2,000	2,000	2,000	2,000	2,000
Treatment O&M	75	75	75	75	100	75
# wells: # treatment systems:	4 4	2 2	10 10	2 2	4 4	3 3
Surface water system:						
6 mgd treatment plant	12,000					
2 mgd treatment plant			4,000		4,000	4,000
Surface system O&M	100		100		100	100
Pipeline intertie	1,000		1,000		1,000	0
# 6 mgd treatment systems: # 2 mgd treatment systems: Miles of pipeline:	1 0 10	0 0 0	0 8 10	0 0 0	0 4 4	0 2 0

Data source: GWMA 2011.

As discussed in the Review of Groundwater Analysis for Odessa Subarea Special Study (Reclamation 2012 Groundwater), given the study period runs through year 2118, it was assumed that each town would move through a series of water supply systems. Due to uncertainty regarding the future water system transition path of each town, this analysis presents two progression options. Option 1-Varying Path (Dual Water Source) where the water system progression varies by town and Option 2 – Drilling Path (Deep Groundwater Source) where all towns are assumed to continue drilling wells deeper into the future. Both options are considered to be equally likely. Under Option 1-Varying Path, the towns of Connell, Moses Lake, Othello, and Warden were assumed to progress from their current system, to a deep aquifer well system, and finally to a combined deep aquifer well and surface water system. The combined deep aquifer well and surface water system assumed each system would be used for approximately half a year. For the towns of Lind and Odessa under Option 1-Varying Path, it was assumed that the progression would move from their current system to a deep aquifer well system, and finally a deeper well system. Under Option 2 – Drilling Path, all towns were assumed to transition from their current system to a deep aquifer well system and finally to a deeper well system.

To aid in the economic analysis, GWMA was also asked to provide estimates, as shown in table MUNI2, of when the costs of the various water supply systems would likely be incurred for each town under each alternative. Note that the initial deep aquifer well system associated with all towns was assumed to last approximately 20 years, but the subsequent system was assumed to last through the end of the study period.

Table MUNI2.—Conversion years by town and alternative

Alternative	Alternative #	Municipalities	Approximate year of 1st water system conversion (to deep aquifer system)	Approximate year of 2nd water system conversion (to deeper well system or combined deep aquifer well and surface water system)
No Action	1	Connell, Lind, Moses Lake, Odessa, Othello, Warden	2027	2047
Partial Replacement	2A-2B	Moses Lake, Odessa	2031	2051
		Connell, Lind, Othello, Warden	2037	2057
Full Replacement	3A-3B	Connell, Lind, Moses Lake, Odessa, Othello, Warden	2070	2090
Modified Partial	4A (Preferred) -4B	Moses Lake, Odessa	2055	2075
		Connell, Lind, Othello, Warden	2032	2052

Data source: GWMA 2011.

As can be seen from table MUNI2, the towns shift between the four water supply systems (current, deep well, deeper well, combined deep well and surface water) across the study period. Cost differentials arise because the conversion to the various water supply systems occurs at different times for each town under each alternative.

Using the information from tables MUNI1 and MUNI2, costs were estimated by cost component (well drilling and pumps, well operations (O&M), wellhead water treatment, wellhead treatment O&M, surface water filtration/treatment, surface water operations (O&M), and pipeline interties), town, and year (2026-2118) for each water system (current, deep well, deeper well, combined deep well and surface water) and alternative. The results for Option 1 – Varying Path is shown in table MUNI3 and Option 2 – Drilling Path is shown in table MUNI4. The unit costs and number of units are shown on the left side of the table for the deep aquifer well system and the combined deep well/surface water system in table MUNI3, but for only the deep well system in table MUNI4. In both tables the No Action Alternative is presented first, followed by the partial replacement alternative, the full replacement alternative and finally the modified partial replacement alternative. The duration of each water supply system for each town or group of towns is shown above each grouping of towns. For the No Action and Full Replacement Alternatives, all the towns follow the same timing pattern. But for the Partial Replacement and Modified Partial Replacement Alternatives, Moses Lake and Odessa follow a different timing pattern from the other towns.

Finally, the costs in tables MUNI3 and MUNI4 are summed across cost components and towns within the same year for each alternative. The costs by year are then discounted back to the end of the construction period (end of year 2025, beginning of year 2026) to be consistent with all the other costs and benefits presented in this study. For the proposed action alternatives, cost savings were calculated by deducting the estimated discounted costs of the proposed alternatives from the estimated discounted cost of the No Action Alternative (so that a positive net value would reflect a cost savings).

Note that in some years, negative net values occur indicating that the proposed alternative resulted in a higher cost that year. The presence of negative values combined with the effect of discounting explains why the sum of the discounted cost differentials (No Action minus current alternative) are greater than the sum of the undiscounted cost differentials (No Action minus current alternative).

Results

Results are presented separately for each alternative and the two water supply system progression paths: Option 1-Varying Path and Option 2 - Drilling Path. Again, neither option is considered preferred or more likely.

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			Year #	1	2	3	4	5	6	7	8	9	10
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	Year	2026 *	2027	2028	2029	2030	2031	2032	2033	2034	2035
No Action Alternative								Current	Grande Ronde Deep Aquifer Well System								
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000			4,000,000								
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000			60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000			8,000,000								
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000				300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000											
Lind	Drill & Equip Well & Pump	2	1,000,000						2,000,000								
	Annual Well Operations	2	20,000				25,000			40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000						4,000,000								
	Annual Treatment Operations	2	75,000							150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000			8,000,000								
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000			150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000			20,000,000								
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000				750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000											
Odessa	Drill & Equip Well & Pump	2	500,000						1,000,000								
	Annual Well Operations	2	15,000				50,000			30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000						4,000,000								
	Annual Treatment Operations	2	75,000							150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000			3,600,000								
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000			100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000			8,000,000								
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000				400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000											
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000			2,250,000								
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000			45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000			6,000,000								
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000				225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000											
				Total Undiscounted Costs:		364,675,000	625,000	70,850,000		2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
				Discounted Costs:		156,894,329	600,962	65,504,808		2,133,591	2,051,530	1,972,625	1,896,755	1,823,803	1,753,656	1,686,208	1,621,354

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			11	12	13	14	15	16	17	18	19	20
	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
No Action Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		364,675,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
				Discounted Costs:		156,894,329	1,558,994	1,499,033	1,441,378	1,385,940	1,332,635	1,281,380	1,232,096	1,184,707	1,139,142	1,095,329

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051	27 2052	28 2053	29 2054	30 2055
No Action Alternative								System varies by town as shown below...								
								Combined Half Year Surface Water System and Half Year Deep Well System								
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000		12,000,000								
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000		10,000,000								
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Deeper Grand Rhonde Aquifer Well System								
Lind	Drill & Equip Well & Pump	2	1,000,000					2,000,000								
	Annual Well Operations	2	20,000				40,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000					0								
	Annual Treatment Operations	2	75,000				150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Combined Half Year Surface Water System and Half Year Deep Well System								
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000		32,000,000								
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000		10,000,000								
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000		375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
								Deeper Grand Rhonde Aquifer Well System								
Odessa	Drill & Equip Well & Pump	2	500,000					1,000,000								
	Annual Well Operations	2	15,000				30,000		30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000					0								
	Annual Treatment Operations	2	75,000				150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Combined Half Year Surface Water System and Half Year Deep Well System								
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000		16,000,000								
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000		200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000		4,000,000								
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000		200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
								Combined Half Year Surface Water System and Half Year Deep Well System								
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000		8,000,000								
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000		0								
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000		112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,400,000	96,015,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	1,053,201	40,514,046	866,226	832,909	800,874	770,072	740,453	711,974	684,591	658,260

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
No Action Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	632,943	608,599	585,191	562,684	541,042	520,233	500,224	480,984	462,485	444,697

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			41	42	43	44	45	46	47	48	49	50
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075
No Action Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	427,593	411,147	395,334	380,129	365,509	351,451	337,933	324,936	312,438	300,421

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			51	52	53	54	55	56	57	58	59	60	61
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086
No Action Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	288,867	277,757	267,074	256,802	246,925	237,427	228,296	219,515	211,072	202,954	195,148

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			62	63	64	65	66	67	68	69	70	71
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096
No Action Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	187,642	180,425	173,486	166,813	160,397	154,228	148,296	142,593	137,108	131,835

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			72	73	74	75	76	77	78	79	80	81	82
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
No Action Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	126,764	121,889	117,201	112,693	108,359	104,191	100,184	96,331	92,626	89,063	85,638

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			83	84	85	86	87	88	89	90	91	92	93
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118
No Action Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		364,675,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		156,894,329	82,344	79,177	76,131	73,203	70,388	67,681	65,077	62,574	60,168	57,854	55,628

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
No Action Alternative							Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000	One-time cost for surface water treatment plant
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	Annual operations for surface system
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000	One-time cost for pipeline connections
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	Assumes same 4 wells would remain operational without further drilling, or should we assume further deepening?
				Annual Treatment Operations	4	75,000	Assumes all 4 wells would have wellhead treatment
Lind	Drill & Equip Well & Pump	2	1,000,000				Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	2	20,000				Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	2	2,000,000				Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	2	75,000				Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000	One-time cost for surface water treatment plant
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	Annual operations for surface system
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000	One-time cost for pipeline connections
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	
				Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000				Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	2	15,000				Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	2	2,000,000				Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	2	75,000				Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000	One-time cost for surface water treatment plant
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	Annual operations for surface system
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000	One-time cost for pipeline connections
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	Assumes same 4 wells would remain operational without further drilling, or should we assume further deepening?
				Annual Treatment Operations	4	100,000	Assumes all 4 wells would have wellhead treatment
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000	One-time cost for surface water treatment plant
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	Annual operations for surface system
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000	One-time cost for pipeline connections
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	Assumes same 4 wells would remain operational without further drilling, or should we assume further deepening?
				Annual Treatment Operations	3	75,000	Assumes all 4 wells would have wellhead treatment
				Total Undiscounted Costs:		364,675,000	
				Discounted Costs:		156,894,329	

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	Year # 1 Year 2026 *	2 2027	3 2028	4 2029	5 2030	6 2031	7 2032	8 2033	9 2034	10 2035
Partial Replacement Alternative																
							Current System									
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000										
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
							Current System					Grande Ronde Deep Aquifer System				
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000						8,000,000				
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000						20,000,000				
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000							750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000									1,000,000				
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000		30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000									4,000,000				
	Annual Treatment Operations	2	75,000										150,000	150,000	150,000	150,000
							Current System									
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000										
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000										
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		354,555,000	625,000	625,000	625,000	625,000	625,000	33,425,000	1,505,000	1,505,000	1,505,000	1,505,000
				Discounted Costs:		122,801,576	600,962	577,848	555,623	534,253	513,704	26,416,263	1,143,676	1,099,689	1,057,393	1,016,724
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	0	70,225,000	1,775,000	1,775,000	1,775,000	-31,025,000	895,000	895,000	895,000	895,000
				Discounted Costs (No Action - Current Alternative):**		34,092,753	0	64,926,960	1,577,969	1,517,277	1,458,921	-24,519,508	680,126	653,968	628,815	604,630

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	11 2036	12 2037	13 2038	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045
Partial Replacement Alternative																
								Grande Ronde Deep Aquifer System								
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000		4,000,000								
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000		8,000,000								
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000			300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000					2,000,000								
	Annual Well Operations	2	20,000				25,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000					4,000,000								
	Annual Treatment Operations	2	75,000						150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Grande Ronde Deep Aquifer System								
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000		3,600,000								
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000		8,000,000								
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000			400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000		2,250,000								
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000		6,000,000								
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000			225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		354,555,000	1,505,000	38,930,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
				Discounted Costs:		122,801,576	977,619	24,315,563	1,441,378	1,385,940	1,332,635	1,281,380	1,232,096	1,184,707	1,139,142	1,095,329
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	895,000	-36,530,000	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		34,092,753	581,375	-22,816,530	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			21	22	23	24	25	26	27	28	29	30
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
												Combined Half Year Surface Water System and Half Year Deep Well S				
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000						32,000,000				
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000		400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000						10,000,000				
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000						375,000	375,000	375,000	375,000	375,000
												Deeper Grand Ronde Well System				
Odessa	Drill & Equip Well & Pump	2	500,000									1,000,000				
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000		30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000									0				
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		354,555,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	44,770,000	2,350,000	2,350,000	2,350,000	2,350,000
				Discounted Costs:		122,801,576	1,053,201	1,012,693	973,743	936,292	900,280	16,148,057	815,019	783,672	753,531	724,549
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	0	93,615,000	-265,000	-265,000	-265,000	-42,635,000	-215,000	-215,000	-215,000	-215,000
				Discounted Costs (No Action - Current Alternative):**		34,092,753	0	39,501,354	-107,517	-103,382	-99,406	-15,377,985	-74,566	-71,698	-68,940	-66,289

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			31	32	33	34	35	36	37	38	39	40
	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065
Partial Replacement Alternative																
								Combined Half Year Surface Water System and Half Year Deep Well System								
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000		12,000,000								
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000		50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000		10,000,000								
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Deeper Grand Ronde Well System								
Lind	Drill & Equip Well & Pump	2	1,000,000					2,000,000								
	Annual Well Operations	2	20,000				40,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000					0								
	Annual Treatment Operations	2	75,000				150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								ystem								
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
								Combined Half Year Surface Water System and Half Year Deep Well System								
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000		16,000,000								
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000		200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000		4,000,000								
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000		200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
								Combined Half Year Surface Water System and Half Year Deep Well System								
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000		8,000,000								
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000		0								
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000		112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
			Total Undiscounted Costs:			354,555,000	2,350,000	53,595,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
			Discounted Costs:			122,801,576	696,682	15,277,680	585,191	562,684	541,042	520,233	500,224	480,984	462,485	444,697
			Undiscounted Costs (No Action - Current Alternative):**			10,120,000	-215,000	-51,460,000	0	0	0	0	0	0	0	0
			Discounted Costs (No Action - Current Alternative):**			34,092,753	-63,739	-14,669,082	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075
Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
			Total Undiscounted Costs:			354,555,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
			Discounted Costs:			122,801,576	427,593	411,147	395,334	380,129	365,509	351,451	337,933	324,936	312,438	300,421
			Undiscounted Costs (No Action - Current Alternative):**			10,120,000	0	0	0	0	0	0	0	0	0	0
			Discounted Costs (No Action - Current Alternative):**			34,092,753	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			51	52	53	54	55	56	57	58	59	60	61
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086
Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		354,555,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		122,801,576	288,867	277,757	267,074	256,802	246,925	237,427	228,296	219,515	211,072	202,954	195,148
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		34,092,753	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095	71 2096
Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
			Total Undiscounted Costs:			354,555,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
			Discounted Costs:			122,801,576	187,642	180,425	173,486	166,813	160,397	154,228	148,296	142,593	137,108	131,835
			Undiscounted Costs (No Action - Current Alternative):**			10,120,000	0	0	0	0	0	0	0	0	0	0
			Discounted Costs (No Action - Current Alternative):**			34,092,753	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	72 2097	73 2098	74 2099	75 2100	76 2101	77 2102	78 2103	79 2104	80 2105	81 2106	82 2107
Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		354,555,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		122,801,576	126,764	121,889	117,201	112,693	108,359	104,191	100,184	96,331	92,626	89,063	85,638
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		34,092,753	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			83	84	85	86	87	88	89	90	91	92	93
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118
Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		354,555,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		122,801,576	82,344	79,177	76,131	73,203	70,388	67,681	65,077	62,574	60,168	57,854	55,628
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		34,092,753	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
Partial Replacement Alternative							Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000	Same assumptions as under No Action Alternative, only difference is the timing of the transitions.
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	
				Annual Treatment Operations	4	75,000	
Lind	Drill & Equip Well & Pump	2	1,000,000				
	Annual Well Operations	2	20,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000	
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	
				Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000				
	Annual Well Operations	2	15,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000	
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000	
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	
				Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000	
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000	
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	
				Annual Treatment Operations	3	75,000	
				Total Undiscounted Costs:		354,555,000	
				Discounted Costs:		122,801,576	
				Undiscounted Costs (No Action - Current Alternative):**		10,120,000	
				Discounted Costs (No Action - Current Alternative):**		34,092,753	

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			Year #									
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	1 Year 2026 *	2 2027	3 2028	4 2029	5 2030	6 2031	7 2032	8 2033	9 2034	10 2035
Full Replacement Alternative																
							Current System									
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000										
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000										
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000										
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		299,745,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
				Discounted Costs:		40,650,391	600,962	577,848	555,623	534,253	513,704	493,947	474,949	456,681	439,117	422,228
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	0	70,225,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	0	64,926,960	1,577,969	1,517,277	1,458,921	1,402,808	1,348,854	1,296,975	1,247,091	1,199,126

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	11 2036	12 2037	13 2038	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045
Full Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000										
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000										
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000										
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		299,745,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
				Discounted Costs:		40,650,391	405,988	390,373	375,359	360,922	347,040	333,693	320,858	308,518	296,652	285,242
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	1,153,006	1,108,660	1,066,019	1,025,018	985,594	947,687	911,238	876,190	842,490	810,087

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			21	22	23	24	25	26	27	28	29	30
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Full Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000										
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000										
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000										
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		299,745,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
				Discounted Costs:		40,650,391	274,271	263,722	253,579	243,826	234,448	225,431	216,760	208,423	200,407	192,699
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	1,775,000	95,390,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	778,930	40,250,324	612,647	589,083	566,426	544,641	523,693	503,551	484,184	465,561

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
Full Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000										
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000										
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000										
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		299,745,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
				Discounted Costs:		40,650,391	185,288	178,161	171,309	164,720	158,385	152,293	146,436	140,803	135,388	130,181
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000	1,510,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	447,655	430,437	413,882	397,964	382,657	367,940	353,788	340,181	327,097	314,516

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075
Full Replacement Alternative																
											Grande Ronde Deep Aquifer System					
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000					4,000,000					
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000		60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000					8,000,000					
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000						300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000								2,000,000					
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000		40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000								4,000,000					
	Annual Treatment Operations	2	75,000									150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000					8,000,000					
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000					20,000,000					
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000						750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000								1,000,000					
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000		30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000								4,000,000					
	Annual Treatment Operations	2	75,000									150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000					3,600,000					
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000		100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000					8,000,000					
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000						400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000					2,250,000					
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000		45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000					6,000,000					
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000						225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		299,745,000	625,000	625,000	625,000	625,000	70,850,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
				Discounted Costs:		40,650,391	125,174	120,359	115,730	111,279	12,129,407	395,073	379,878	365,267	351,219	337,710
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	1,510,000	1,510,000	1,510,000	1,510,000	-68,715,000	-265,000	-265,000	-265,000	-265,000	-265,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	302,420	290,788	279,604	268,850	-11,763,899	-43,623	-41,945	-40,332	-38,780	-37,289

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	51 2076	52 2077	53 2078	54 2079	55 2080	56 2081	57 2082	58 2083	59 2084	60 2085	61 2086
Full Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000											
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000											
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000											
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000											
				Total Undiscounted Costs:		299,745,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
				Discounted Costs:		40,650,391	324,721	312,232	300,223	288,676	277,573	266,897	256,632	246,762	237,271	228,145	219,370
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000	-265,000
				Discounted Costs (No Action - Current Alternative):**		116,243,938	-35,855	-34,476	-33,150	-31,875	-30,649	-29,470	-28,336	-27,247	-26,199	-25,191	-24,222

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			62	63	64	65	66	67	68	69	70	71
	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096
Full Replacement Alternative																
										Combined Half Year Surface Water System and Half Year Deep Well System						
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000				12,000,000						
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000		50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000				10,000,000						
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000
										Deeper Grand Ronde Well System						
Lind	Drill & Equip Well & Pump	2	1,000,000							2,000,000						
	Annual Well Operations	2	20,000				40,000	40,000	40,000		40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							0						
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000
										Combined Half Year Surface Water System and Half Year Deep Well System						
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000				32,000,000						
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000		400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000				10,000,000						
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000				375,000	375,000	375,000	375,000	375,000	375,000	375,000
										Deeper Grand Ronde Well System						
Odessa	Drill & Equip Well & Pump	2	500,000							1,000,000						
	Annual Well Operations	2	15,000				30,000	30,000	30,000		30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000							0						
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000
										Combined Half Year Surface Water System and Half Year Deep Well System						
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000				16,000,000						
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000		200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000				4,000,000						
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000				200,000	200,000	200,000	200,000	200,000	200,000	200,000
										Combined Half Year Surface Water System and Half Year Deep Well System						
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000				8,000,000						
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000		100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000				0						
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000				112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		299,745,000	2,400,000	2,400,000	2,400,000	96,015,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		40,650,391	210,933	202,820	195,019	7,501,913	160,397	154,228	148,296	142,593	137,108	131,835
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	-265,000	-265,000	-265,000	-93,880,000	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		116,243,938	-23,291	-22,395	-21,533	-7,335,100	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			72	73	74	75	76	77	78	79	80	81	82
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
Full Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		299,745,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		40,650,391	126,764	121,889	117,201	112,693	108,359	104,191	100,184	96,331	92,626	89,063	85,638
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		116,243,938	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	83 2108	84 2109	85 2110	86 2111	87 2112	88 2113	89 2114	90 2115	91 2116	92 2117	93 2118
Full Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		299,745,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		40,650,391	82,344	79,177	76,131	73,203	70,388	67,681	65,077	62,574	60,168	57,854	55,628
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		116,243,938	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
Full Replacement Alternative							Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000	Same assumptions as under No Action Alternative, only difference is the timing of the transitions.
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	
				Annual Treatment Operations	4	75,000	
Lind	Drill & Equip Well & Pump	2	1,000,000				
	Annual Well Operations	2	20,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000	
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	
				Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000				
	Annual Well Operations	2	15,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000	
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000	
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	
				Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000	
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000	
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	
				Annual Treatment Operations	3	75,000	
				Total Undiscounted Costs:		299,745,000	
				Discounted Costs:		40,650,391	
				Undiscounted Costs (No Action - Current Alternative):**		64,930,000	
				Discounted Costs (No Action - Current Alternative):**		116,243,938	

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	Year # 1 Year 2026 *	2 2027	3 2028	4 2029	5 2030	6 2031	7 2032	8 2033	9 2034	10 2035
Modified Partial Replacement Alternative																
							Current System						Grande Ronde Deep Aquifer System			
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000							4,000,000			
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	75,000	75,000	75,000	75,000	75,000	75,000		60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000							8,000,000			
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000								300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000										2,000,000			
	Annual Well Operations	2	20,000				25,000	25,000	25,000	25,000	25,000	25,000		40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000										4,000,000			
	Annual Treatment Operations	2	75,000											150,000	150,000	150,000
							Current System									
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
							Current System						Grande Ronde Deep Aquifer System			
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000							3,600,000			
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000		100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000							8,000,000			
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000								400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000							2,250,000			
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	125,000	125,000	125,000	125,000	125,000	125,000		45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000							6,000,000			
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000								225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		338,035,000	625,000	625,000	625,000	625,000	625,000	625,000	38,050,000	1,520,000	1,520,000	1,520,000
				Discounted Costs:		98,267,815	600,962	577,848	555,623	534,253	513,704	493,947	28,914,873	1,110,649	1,067,932	1,026,858
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	0	70,225,000	1,775,000	1,775,000	1,775,000	1,775,000	-35,650,000	880,000	880,000	880,000
				Discounted Costs (No Action - Current Alternative):**		58,626,514	0	64,926,960	1,577,969	1,517,277	1,458,921	1,402,808	-27,091,070	643,007	618,276	594,496

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current system.

**A positive number reflects a cost savings as compared to the No Action Alternative. A negative number reflects an aditional cost compared to the No Action Alternative.

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	11 2036	12 2037	13 2038	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045
Modified Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
				Annual Treatment Operations	4	75,000										
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
				Annual Treatment Operations	4	100,000										
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
				Annual Treatment Operations	3	75,000										
				Total Undiscounted Costs:		338,035,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000
				Discounted Costs:		98,267,815	987,363	949,388	912,873	877,762	844,002	811,540	780,327	750,315	721,456	693,708
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000
				Discounted Costs (No Action - Current Alternative):**		58,626,514	571,631	549,645	528,505	508,178	488,633	469,839	451,768	434,393	417,685	401,621

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current s

**A positive number reflects a cost savings as compared to the No Action Alternative. A negative number reflects an aditional cost compared to the No Action Alterr

TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051	27 2052	28 2053	29 2054	30 2055
Modified Partial Replacement Alternative																
													Combined Half Year Surface Water System and Half Ye			
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000							12,000,000			
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	60,000	60,000	60,000	60,000	60,000	60,000		50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000							10,000,000			
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	300,000	300,000	300,000	300,000	300,000	300,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000							150,000	150,000	150,000	150,000
													Deeper Grand Ronde Well System			
Lind	Drill & Equip Well & Pump	2	1,000,000										2,000,000			
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000		40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000										0			
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000
																Grande Ronde
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										8,000,000
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										20,000,000
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000										
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													1,000,000
	Annual Well Operations	2	15,000				50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	
	Wellhead Treatment System	2	2,000,000													4,000,000
	Annual Treatment Operations	2	75,000													
													Combined Half Year Surface Water System and Half Ye			
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000							16,000,000			
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	100,000	100,000	100,000	100,000	100,000	100,000		200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000							4,000,000			
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	400,000	400,000	400,000	400,000	400,000	400,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000							200,000	200,000	200,000	200,000
													Combined Half Year Surface Water System and Half Ye			
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000							8,000,000			
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	45,000	45,000	45,000	45,000	45,000	45,000		100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000							0			
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	225,000	225,000	225,000	225,000	225,000	225,000	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000							112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		338,035,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	52,765,000	1,305,000	1,305,000	34,105,000
				Discounted Costs:		98,267,815	667,027	641,372	616,704	592,985	570,178	548,248	18,299,776	435,188	418,450	10,515,208
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	880,000	94,495,000	615,000	615,000	615,000	615,000	-50,630,000	830,000	830,000	-31,970,000
				Discounted Costs (No Action - Current Alternative):**		58,626,514	386,174	39,872,674	249,522	239,925	230,697	221,824	-17,559,323	276,786	266,141	-9,856,948

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
Modified Partial Replacement Alternative																
							ear Deep Well System									
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
							e Deep Aquifer System									
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
				Annual Treatment Operations	10	75,000										
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
							ear Deep Well System									
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
							ear Deep Well System									
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		338,035,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000
				Discounted Costs:		98,267,815	647,766	622,852	598,896	575,861	553,713	532,416	511,939	492,249	473,316	455,112
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000
				Discounted Costs (No Action - Current Alternative):**		58,626,514	-14,823	-14,253	-13,705	-13,178	-12,671	-12,183	-11,715	-11,264	-10,831	-10,414

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			41	42	43	44	45	46	47	48	49	50
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075
Modified Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
																Combined Hal
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										32,000,000
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										10,000,000
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	75,000
				Annual Treatment Operations	10	75,000										375,000
																Deeper Grand
Odessa	Drill & Equip Well & Pump	2	500,000													1,000,000
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	
	Wellhead Treatment System	2	2,000,000													0
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		338,035,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	2,185,000	44,555,000
				Discounted Costs:		98,267,815	437,607	420,776	404,593	389,031	374,069	359,681	345,847	332,546	319,755	6,269,451
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-50,000	-42,420,000
				Discounted Costs (No Action - Current Alternative):**		58,626,514	-10,014	-9,629	-9,258	-8,902	-8,560	-8,231	-7,914	-7,610	-7,317	-5,969,029

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			51	52	53	54	55	56	57	58	59	60	61
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086
Modified Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
							f Year Surface Water System and Half Year Deep Well System										
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
							Ronde Well System										
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
			Total Undiscounted Costs:			338,035,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
			Discounted Costs:			98,267,815	288,867	277,757	267,074	256,802	246,925	237,427	228,296	219,515	211,072	202,954	195,148
			Undiscounted Costs (No Action - Current Alternative):**			26,640,000	0	0	0	0	0	0	0	0	0	0	0
			Discounted Costs (No Action - Current Alternative):**			58,626,514	0	0	0	0	0	0	0	0	0	0	0

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095	71 2096
Modified Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000										
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000										
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000										
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000										
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000										
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000										
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000										
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
			Total Undiscounted Costs:			338,035,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
			Discounted Costs:			98,267,815	187,642	180,425	173,486	166,813	160,397	154,228	148,296	142,593	137,108	131,835
			Undiscounted Costs (No Action - Current Alternative):**			26,640,000	0	0	0	0	0	0	0	0	0	0
			Discounted Costs (No Action - Current Alternative):**			58,626,514	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current s

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			72	73	74	75	76	77	78	79	80	81	82
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
Modified Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		338,035,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		98,267,815	126,764	121,889	117,201	112,693	108,359	104,191	100,184	96,331	92,626	89,063	85,638
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		58,626,514	0	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current s

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

	Deep Aquifer Well System			Surface Water/Deep Aquifer Well Systems			83	84	85	86	87	88	89	90	91	92	93
Alternative/ Town	Cost Element	# Units	Per Unit Cost	Cost Element	# Units	Per Unit Cost	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118
Modified Partial Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000											
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
				Annual Treatment Operations	4	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000				40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000											
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000											
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
				Annual Treatment Operations	10	75,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000	375,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000				30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000				150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000											
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000											
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
				Annual Treatment Operations	4	100,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000											
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000											
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500	22,500
				Annual Treatment Operations	3	75,000	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500	112,500
				Total Undiscounted Costs:		338,035,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000	2,135,000
				Discounted Costs:		98,267,815	82,344	79,177	76,131	73,203	70,388	67,681	65,077	62,574	60,168	57,854	55,628
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	0	0	0	0	0	0	0	0	0	0	0
				Discounted Costs (No Action - Current Alternative):**		58,626,514	0	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current s

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TABLE MUNI3: Municipal Water Supply Costs by Town and Alternative - Option 1 (Varying Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer Well System: Cost Element	# Units	Per Unit Cost	Surface Water/Deep Aquifer Well Systems: Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
Modified Partial Replacement Alternative							Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	6 mgd filtration/treatment plant	1	12,000,000	Same assumptions as under No Action Alternative, only difference is the timing of the transitions.
	Annual Well Operations	4	15,000	Annual Surface Water System Operations	1	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	4	75,000	Annual Well Operations	4	15,000	
				Annual Treatment Operations	4	75,000	
Lind	Drill & Equip Well & Pump	2	1,000,000				
	Annual Well Operations	2	20,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Moses Lake	Drill & Equip Well & Pump	10	800,000	2 mgd filtration/treatment plant	8	4,000,000	
	Annual Well Operations	10	15,000	Annual Surface Water System Operations	8	100,000	
	Wellhead Treatment System	10	2,000,000	Pipeline Interties	10	1,000,000	
	Annual Treatment Operations	10	75,000	Annual Well Operations	10	15,000	
				Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000				
	Annual Well Operations	2	15,000				
	Wellhead Treatment System	2	2,000,000				
	Annual Treatment Operations	2	75,000				
Othello	Drill & Equip Well & Pump	4	900,000	2 mgd filtration/treatment plant	4	4,000,000	
	Annual Well Operations	4	25,000	Annual Surface Water System Operations	4	100,000	
	Wellhead Treatment System	4	2,000,000	Pipeline Interties	4	1,000,000	
	Annual Treatment Operations	4	100,000	Annual Well Operations	4	25,000	
				Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	2 mgd filtration/treatment plant	2	4,000,000	
	Annual Well Operations	3	15,000	Annual Surface Water System Operations	2	100,000	
	Wellhead Treatment System	3	2,000,000	Pipeline Interties	0	1,000,000	
	Annual Treatment Operations	3	75,000	Annual Well Operations	3	15,000	
				Annual Treatment Operations	3	75,000	
				Total Undiscounted Costs:		338,035,000	
				Discounted Costs:		98,267,815	
				Undiscounted Costs (No Action - Current Alternative):**		26,640,000	
				Discounted Costs (No Action - Current Alternative):**		58,626,514	

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current s

**A positive number reflects a cost savings as compared to the No Action Alternative. A negative number reflects an aditional cost compared to the No Action Alterr

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Drilling Path)

Discount Rate: 0.04

Alternative/ Town	Cost Element	# Units	Per Unit Cost	Year # 1 Year 2026 *	2 2027	3 2028	4 2029	5 2030	6 2031	7 2032	8 2033	9 2034	10 2035	11 2036	12 2037	13 2038
No Action Alternative				Current	Grande Ronde Deep Aquifer Well System											
Connell	Drill & Equip Well & Pump	4	1,000,000		4,000,000											
	Annual Well Operations	4	15,000	75,000		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000		8,000,000											
	Annual Treatment Operations	4	75,000			300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000		2,000,000											
	Annual Well Operations	2	20,000	25,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000		4,000,000											
	Annual Treatment Operations	2	75,000			150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000		8,000,000											
	Annual Well Operations	10	15,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000		20,000,000											
	Annual Treatment Operations	10	75,000			750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000		1,000,000											
	Annual Well Operations	2	15,000	50,000		30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000		4,000,000											
	Annual Treatment Operations	2	75,000			150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000		3,600,000											
	Annual Well Operations	4	25,000	200,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000		8,000,000											
	Annual Treatment Operations	4	100,000			400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000		2,250,000											
	Annual Well Operations	3	15,000	125,000		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000		6,000,000											
	Annual Treatment Operations	3	75,000			225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	625,000	70,850,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	600,962	65,504,808	2,133,591	2,051,530	1,972,625	1,896,755	1,823,803	1,753,656	1,686,208	1,621,354	1,558,994	1,499,033	1,441,378

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051
No Action Alternative												Deeper Grande Rhonde Well Systems				
Connell	Drill & Equip Well & Pump	4	1,000,000									4,000,000				
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000		60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000									0				
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000		300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000									2,000,000				
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000		40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000									0				
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000									8,000,000				
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000									0				
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000		750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000									1,000,000				
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000		30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000									0				
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000									3,600,000				
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000									0				
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000		400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000									2,250,000				
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000		45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000									0				
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000		225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	20,850,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	1,385,940	1,332,635	1,281,380	1,232,096	1,184,707	1,139,142	1,095,329	1,053,201	8,797,770	973,743	936,292	900,280	865,654

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	27 2052	28 2053	29 2054	30 2055	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
No Action Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000														
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000														
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000														
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000														
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000														
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000														
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000														
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000														
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	832,360	800,346	769,563	739,965	711,505	684,139	657,826	632,525	608,197	584,805	562,312	540,685	519,889	499,894

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075	51 2076	52 2077	53 2078	54 2079	55 2080
No Action Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000															
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000															
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000															
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	480,667	462,180	444,404	427,311	410,876	395,073	379,878	365,267	351,219	337,710	324,721	312,232	300,223	288,676	277,573

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	56 2081	57 2082	58 2083	59 2084	60 2085	61 2086	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095
No Action Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000															
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000															
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000															
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	266,897	256,632	246,762	237,271	228,145	219,370	210,933	202,820	195,019	187,519	180,306	173,371	166,703	160,292	154,127

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	71 2096	72 2097	73 2098	74 2099	75 2100	76 2101	77 2102	78 2103	79 2104	80 2105	81 2106	82 2107	83 2108	84 2109	85 2110	86 2111
No Action Alternative																			
Connell	Drill & Equip Well & Pump	4	1,000,000																
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000																
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000																
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000																
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000																
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000																
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000																
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000																
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	148,199	142,499	137,018	131,748	126,681	121,808	117,124	112,619	108,287	104,122	100,118	96,267	92,564	89,004	85,581	82,289

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	87 2112	88 2113	89 2114	90 2115	91 2116	92 2117	93 2118
No Action Alternative										
Connell	Drill & Equip Well & Pump	4	1,000,000							
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000							
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000							
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000							
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000							
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000							
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000							
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000							
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		308,325,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		127,800,889	79,124	76,081	73,155	70,341	67,636	65,035	62,533

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
No Action Alternative				Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	4	15,000	Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	4	2,000,000	Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	4	75,000	Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Lind	Drill & Equip Well & Pump	2	1,000,000	
	Annual Well Operations	2	20,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Moses Lake	Drill & Equip Well & Pump	10	800,000	
	Annual Well Operations	10	15,000	
	Wellhead Treatment System	10	2,000,000	
	Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000	
	Annual Well Operations	2	15,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Othello	Drill & Equip Well & Pump	4	900,000	
	Annual Well Operations	4	25,000	
	Wellhead Treatment System	4	2,000,000	
	Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	
	Annual Well Operations	3	15,000	
	Wellhead Treatment System	3	2,000,000	
	Annual Treatment Operations	3	75,000	
	Total Undiscounted Costs:		308,325,000	
	Discounted Costs:		127,800,889	

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Drilling Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	Year # 1 / Year 2026 *	2 / 2027	3 / 2028	4 / 2029	5 / 2030	6 / 2031	7 / 2032	8 / 2033	9 / 2034	10 / 2035	11 / 2036	12 / 2037	13 / 2038
Partial Replacement Alternative																
				Current System											Grande Ronde Deep Aquifer	
Connell	Drill & Equip Well & Pump	4	1,000,000												4,000,000	
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000		60,000
	Wellhead Treatment System	4	2,000,000												8,000,000	
	Annual Treatment Operations	4	75,000													300,000
Lind	Drill & Equip Well & Pump	2	1,000,000												2,000,000	
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000		40,000
	Wellhead Treatment System	2	2,000,000												4,000,000	
	Annual Treatment Operations	2	75,000													150,000
				Current System					Grande Ronde Deep Aquifer System							
Moses Lake	Drill & Equip Well & Pump	10	800,000						8,000,000							
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000						20,000,000							
	Annual Treatment Operations	10	75,000							750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000						1,000,000							
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000		30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000						4,000,000							
	Annual Treatment Operations	2	75,000							150,000	150,000	150,000	150,000	150,000	150,000	150,000
				Current System											Grande Ronde Deep Aquifer	
Othello	Drill & Equip Well & Pump	4	900,000												3,600,000	
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000		100,000
	Wellhead Treatment System	4	2,000,000												8,000,000	
	Annual Treatment Operations	4	100,000													400,000
Warden	Drill & Equip Well & Pump	3	750,000												2,250,000	
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000		45,000
	Wellhead Treatment System	3	2,000,000												6,000,000	
	Annual Treatment Operations	3	75,000													225,000
Total Undiscounted Costs:			295,855,000	625,000	625,000	625,000	625,000	625,000	33,425,000	1,505,000	1,505,000	1,505,000	1,505,000	1,505,000	38,930,000	2,400,000
Discounted Costs:			100,580,128	600,962	577,848	555,623	534,253	513,704	26,416,263	1,143,676	1,099,689	1,057,393	1,016,724	977,619	24,315,563	1,441,378
Undiscounted Costs (No Action - Current Alternative):**			12,470,000	0	70,225,000	1,775,000	1,775,000	1,775,000	-31,025,000	895,000	895,000	895,000	895,000	895,000	-36,530,000	0
Discounted Costs (No Action - Current Alternative):**			27,220,760	0	64,926,960	1,577,969	1,517,277	1,458,921	-24,519,508	680,126	653,968	628,815	604,630	581,375	-22,816,530	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051
Partial Replacement Alternative																
				System												
Connell	Drill & Equip Well & Pump	4	1,000,000													
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
																Deeper Grand
Moses Lake	Drill & Equip Well & Pump	10	800,000													8,000,000
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
	Wellhead Treatment System	10	2,000,000													0
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	
Odessa	Drill & Equip Well & Pump	2	500,000													1,000,000
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	
	Wellhead Treatment System	2	2,000,000													0
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	
				System												
Othello	Drill & Equip Well & Pump	4	900,000													
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000													
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000													
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	10,320,000
Discounted Costs:			100,580,128	1,385,940	1,332,635	1,281,380	1,232,096	1,184,707	1,139,142	1,095,329	1,053,201	1,012,693	973,743	936,292	900,280	3,722,313
Undiscounted Costs (No Action - Current Alternative):**			12,470,000	0	0	0	0	0	0	0	0	18,450,000	0	0	0	-7,920,000
Discounted Costs (No Action - Current Alternative):**			27,220,760	0	0	0	0	0	0	0	0	7,785,077	0	0	0	-2,856,659

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	27 2052	28 2053	29 2054	30 2055	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
Partial Replacement Alternative																	
									Deeper Grand Rhonde Well Systems								
Connell	Drill & Equip Well & Pump	4	1,000,000						4,000,000								
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000						0								
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000		300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000						2,000,000								
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000						0								
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
				Rhonde System													
Moses Lake	Drill & Equip Well & Pump	10	800,000														
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000														
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
									Deeper Grand Rhonde Well Systems								
Othello	Drill & Equip Well & Pump	4	900,000						3,600,000								
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000						0								
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000						2,250,000								
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000						0								
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000		225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	12,930,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		100,580,128	832,360	800,346	769,563	739,965	711,505	3,685,799	657,826	632,525	608,197	584,805	562,312	540,685	519,889	499,894
	Undiscounted Costs (No Action - Current Alternative):**		12,470,000	0	0	0	0	0	-10,530,000	0	0	0	0	0	0	0	0
	Discounted Costs (No Action - Current Alternative):**		27,220,760	0	0	0	0	0	-3,001,660	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075	51 2076	52 2077	53 2078	54 2079	55 2080
Partial Replacement Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000															
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000															
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000															
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			100,580,128	480,667	462,180	444,404	427,311	410,876	395,073	379,878	365,267	351,219	337,710	324,721	312,232	300,223	288,676	277,573
Undiscounted Costs (No Action - Current Alternative):**			12,470,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			27,220,760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	56 2081	57 2082	58 2083	59 2084	60 2085	61 2086	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095
Partial Replacement Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000															
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000															
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000															
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			100,580,128	266,897	256,632	246,762	237,271	228,145	219,370	210,933	202,820	195,019	187,519	180,306	173,371	166,703	160,292	154,127
Undiscounted Costs (No Action - Current Alternative):**			12,470,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			27,220,760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	71 2096	72 2097	73 2098	74 2099	75 2100	76 2101	77 2102	78 2103	79 2104	80 2105	81 2106	82 2107	83 2108	84 2109	85 2110	86 2111
Partial Replacement Alternative																			
Connell	Drill & Equip Well & Pump	4	1,000,000																
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000																
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000																
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000																
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000																
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000																
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000																
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000																
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:				295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:				100,580,128	148,199	142,499	137,018	131,748	126,681	121,808	117,124	112,619	108,287	104,122	100,118	96,267	92,564	89,004	85,581	82,289
Undiscounted Costs (No Action - Current Alternative):**				12,470,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**				27,220,760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	87 2112	88 2113	89 2114	90 2115	91 2116	92 2117	93 2118
Partial Replacement Alternative										
Connell	Drill & Equip Well & Pump	4	1,000,000							
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000							
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000							
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000							
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000							
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000							
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000							
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000							
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			295,855,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			100,580,128	79,124	76,081	73,155	70,341	67,636	65,035	62,533
Undiscounted Costs (No Action - Current Alternative):**			12,470,000	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			27,220,760	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
		Deep Aquifer System		
Partial Replacement Alternative				Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	4	15,000	Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	4	2,000,000	Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	4	75,000	Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Lind	Drill & Equip Well & Pump	2	1,000,000	
	Annual Well Operations	2	20,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Moses Lake	Drill & Equip Well & Pump	10	800,000	
	Annual Well Operations	10	15,000	
	Wellhead Treatment System	10	2,000,000	
	Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000	
	Annual Well Operations	2	15,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Othello	Drill & Equip Well & Pump	4	900,000	
	Annual Well Operations	4	25,000	
	Wellhead Treatment System	4	2,000,000	
	Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	
	Annual Well Operations	3	15,000	
	Wellhead Treatment System	3	2,000,000	
	Annual Treatment Operations	3	75,000	
	Total Undiscounted Costs:		295,855,000	
	Discounted Costs:		100,580,128	
	Undiscounted Costs (No Action - Current Alternative):**		12,470,000	
	Discounted Costs (No Action - Current Alternative):**		27,220,760	

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Drilling Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	Year # 1 Year 2026 *	2	3	4	5	6	7	8	9	10	11	12	13
					2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Full Replacement Alternative				Current System												
Connell	Drill & Equip Well & Pump	4	1,000,000													
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	75,000													
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000													
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000													
	Annual Treatment Operations	10	75,000													
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000													
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	100,000													
Warden	Drill & Equip Well & Pump	3	750,000													
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000													
	Annual Treatment Operations	3	75,000													
	Total Undiscounted Costs:		232,000,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
	Discounted Costs:		35,122,557	600,962	577,848	555,623	534,253	513,704	493,947	474,949	456,681	439,117	422,228	405,988	390,373	375,359
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	0	70,225,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000
	Discounted Costs (No Action - Current Alternative):**		92,678,332	0	64,926,960	1,577,969	1,517,277	1,458,921	1,402,808	1,348,854	1,296,975	1,247,091	1,199,126	1,153,006	1,108,660	1,066,019

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051
Full Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000													
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	75,000													
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Moses Lake	Drill & Equip Well & Pump	10	800,000													
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000													
	Annual Treatment Operations	10	75,000													
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000													
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	100,000													
Warden	Drill & Equip Well & Pump	3	750,000													
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000													
	Annual Treatment Operations	3	75,000													
	Total Undiscounted Costs:		232,000,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
	Discounted Costs:		35,122,557	360,922	347,040	333,693	320,858	308,518	296,652	285,242	274,271	263,722	253,579	243,826	234,448	225,431
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	20,225,000	1,775,000	1,775,000	1,775,000	1,775,000
	Discounted Costs (No Action - Current Alternative):**		92,678,332	1,025,018	985,594	947,687	911,238	876,190	842,490	810,087	778,930	8,534,048	720,164	692,466	665,832	640,223

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	27 2052	28 2053	29 2054	30 2055	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
Full Replacement Alternative																	
Connell	Drill & Equip Well & Pump	4	1,000,000														
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Wellhead Treatment System	4	2,000,000														
	Annual Treatment Operations	4	75,000														
Lind	Drill & Equip Well & Pump	2	1,000,000														
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000														
Moses Lake	Drill & Equip Well & Pump	10	800,000														
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000														
	Annual Treatment Operations	10	75,000														
Odessa	Drill & Equip Well & Pump	2	500,000														
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000														
	Annual Treatment Operations	2	75,000														
Othello	Drill & Equip Well & Pump	4	900,000														
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
	Wellhead Treatment System	4	2,000,000														
	Annual Treatment Operations	4	100,000														
Warden	Drill & Equip Well & Pump	3	750,000														
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000	125,000
	Wellhead Treatment System	3	2,000,000														
	Annual Treatment Operations	3	75,000														
	Total Undiscounted Costs:		232,000,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000	625,000
	Discounted Costs:		35,122,557	216,760	208,423	200,407	192,699	185,288	178,161	171,309	164,720	158,385	152,293	146,436	140,803	135,388	130,181
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000	1,775,000
	Discounted Costs (No Action - Current Alternative):**		92,678,332	615,599	591,923	569,156	547,266	526,217	505,978	486,517	467,805	449,812	432,512	415,877	399,882	384,502	369,713

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075	51 2076	52 2077	53 2078	54 2079	55 2080
Full Replacement Alternative								Grande Ronde Deep Aquifer System										
Connell	Drill & Equip Well & Pump	4	1,000,000					4,000,000										
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000					8,000,000										
	Annual Treatment Operations	4	75,000						300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000					2,000,000										
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000					4,000,000										
	Annual Treatment Operations	2	75,000						150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000					8,000,000										
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000					20,000,000										
	Annual Treatment Operations	10	75,000						750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000					1,000,000										
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000		30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000					4,000,000										
	Annual Treatment Operations	2	75,000						150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000					3,600,000										
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000					8,000,000										
	Annual Treatment Operations	4	100,000						400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000					2,250,000										
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000					6,000,000										
	Annual Treatment Operations	3	75,000						225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		232,000,000	625,000	625,000	625,000	625,000	70,850,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		35,122,557	125,174	120,359	115,730	111,279	12,129,407	395,073	379,878	365,267	351,219	337,710	324,721	312,232	300,223	288,676	277,573
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	1,775,000	1,775,000	1,775,000	1,775,000	-68,450,000	0	0	0	0	0	0	0	0	0	0
	Discounted Costs (No Action - Current Alternative):**		92,678,332	355,493	341,821	328,674	316,032	-11,718,531	0	0	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	56 2081	57 2082	58 2083	59 2084	60 2085	61 2086	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095
Full Replacement Alternative													Deeper Grand Ronde Well Systems					
Connell	Drill & Equip Well & Pump	4	1,000,000										4,000,000					
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000		60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000										0					
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000		300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000										2,000,000					
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000		40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000										0					
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000										8,000,000					
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000										0					
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000		750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000										1,000,000					
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000		30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000										0					
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000										3,600,000					
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000		100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000										0					
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000		400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000										2,250,000					
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000		45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000										0					
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000		225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		232,000,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	20,850,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		35,122,557	266,897	256,632	246,762	237,271	228,145	219,370	210,933	202,820	195,019	1,629,067	180,306	173,371	166,703	160,292	154,127
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	0	0	0	0	0	0	0	0	0	-18,450,000	0	0	0	0	0
	Discounted Costs (No Action - Current Alternative):**		92,678,332	0	0	0	0	0	0	0	0	0	-1,441,549	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	71 2096	72 2097	73 2098	74 2099	75 2100	76 2101	77 2102	78 2103	79 2104	80 2105	81 2106	82 2107	83 2108	84 2109	85 2110	86 2111
Full Replacement Alternative																			
Connell	Drill & Equip Well & Pump	4	1,000,000																
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000																
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000																
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000																
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000																
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000																
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000																
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000																
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		232,000,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		35,122,557	148,199	142,499	137,018	131,748	126,681	121,808	117,124	112,619	108,287	104,122	100,118	96,267	92,564	89,004	85,581	82,289
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Discounted Costs (No Action - Current Alternative):**		92,678,332	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	87 2112	88 2113	89 2114	90 2115	91 2116	92 2117	93 2118
Full Replacement Alternative										
Connell	Drill & Equip Well & Pump	4	1,000,000							
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000							
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000							
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000							
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000							
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000							
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000							
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000							
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		232,000,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
	Discounted Costs:		35,122,557	79,124	76,081	73,155	70,341	67,636	65,035	62,533
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	0	0	0	0	0	0	0
	Discounted Costs (No Action - Current Alternative):**		92,678,332	0	0	0	0	0	0	0

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	Notes/Assumptions related to Second System Transition
Full Replacement Alternative				Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	4	15,000	Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	4	2,000,000	Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	4	75,000	Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Lind	Drill & Equip Well & Pump	2	1,000,000	
	Annual Well Operations	2	20,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Moses Lake	Drill & Equip Well & Pump	10	800,000	
	Annual Well Operations	10	15,000	
	Wellhead Treatment System	10	2,000,000	
	Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000	
	Annual Well Operations	2	15,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Othello	Drill & Equip Well & Pump	4	900,000	
	Annual Well Operations	4	25,000	
	Wellhead Treatment System	4	2,000,000	
	Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	
	Annual Well Operations	3	15,000	
	Wellhead Treatment System	3	2,000,000	
	Annual Treatment Operations	3	75,000	
	Total Undiscounted Costs:		232,000,000	
	Discounted Costs:		35,122,557	
	Undiscounted Costs (No Action - Current Alternative):**		76,325,000	
	Discounted Costs (No Action - Current Alternative):**		92,678,332	

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Drilling Path)

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	Year # 1 Year 2026 *	2 2027	3 2028	4 2029	5 2030	6 2031	7 2032	8 2033	9 2034	10 2035	11 2036	12 2037	13 2038
Modified Partial Replacement Alternative																
				Current System						Grande Ronde Deep Aquifer System						
Connell	Drill & Equip Well & Pump	4	1,000,000							4,000,000						
	Annual Well Operations	4	15,000	75,000	75,000	75,000	75,000	75,000	75,000		60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000							8,000,000						
	Annual Treatment Operations	4	75,000								300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000							2,000,000						
	Annual Well Operations	2	20,000	25,000	25,000	25,000	25,000	25,000	25,000		40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							4,000,000						
	Annual Treatment Operations	2	75,000								150,000	150,000	150,000	150,000	150,000	150,000
				Current System												
Moses Lake	Drill & Equip Well & Pump	10	800,000													
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000													
	Annual Treatment Operations	10	75,000													
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
				Current System						Grande Ronde Deep Aquifer System						
Othello	Drill & Equip Well & Pump	4	900,000							3,600,000						
	Annual Well Operations	4	25,000	200,000	200,000	200,000	200,000	200,000	200,000		100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000							8,000,000						
	Annual Treatment Operations	4	100,000								400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000							2,250,000						
	Annual Well Operations	3	15,000	125,000	125,000	125,000	125,000	125,000	125,000		45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000							6,000,000						
	Annual Treatment Operations	3	75,000								225,000	225,000	225,000	225,000	225,000	225,000
	Total Undiscounted Costs:		279,210,000	625,000	625,000	625,000	625,000	625,000	625,000	38,050,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000
	Discounted Costs:		81,167,041	600,962	577,848	555,623	534,253	513,704	493,947	28,914,873	1,110,649	1,067,932	1,026,858	987,363	949,388	912,873
	Undiscounted Costs (No Action - Current Alternative):**		29,115,000	0	70,225,000	1,775,000	1,775,000	1,775,000	1,775,000	-35,650,000	880,000	880,000	880,000	880,000	880,000	880,000
	Discounted Costs (No Action - Current Alternative):**		46,633,848	0	64,926,960	1,577,969	1,517,277	1,458,921	1,402,808	-27,091,070	643,007	618,276	594,496	571,631	549,645	528,505

* While it reflects year 2026 for discounting purposes, it could also be seen as representative of all years prior to year 2026 in that it represents costs of the current system.

**A positive number reflects a cost savings as compared to the No Action Alternative. A negative number reflects an aditional cost compared to the No Action Alternative.

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	14 2039	15 2040	16 2041	17 2042	18 2043	19 2044	20 2045	21 2046	22 2047	23 2048	24 2049	25 2050	26 2051
Modified Partial Replacement Alternative																
Connell	Drill & Equip Well & Pump	4	1,000,000													
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000													
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000													
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000													
	Annual Treatment Operations	10	75,000													
Odessa	Drill & Equip Well & Pump	2	500,000													
	Annual Well Operations	2	15,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
	Wellhead Treatment System	2	2,000,000													
	Annual Treatment Operations	2	75,000													
Othello	Drill & Equip Well & Pump	4	900,000													
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000													
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000													
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000													
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000	1,520,000
Discounted Costs:			81,167,041	877,762	844,002	811,540	780,327	750,315	721,456	693,708	667,027	641,372	616,704	592,985	570,178	548,248
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000	880,000	19,330,000	880,000	880,000	880,000	880,000
Discounted Costs (No Action - Current Alternative):**			46,633,848	508,178	488,633	469,839	451,768	434,393	417,685	401,621	386,174	8,156,398	357,039	343,307	330,103	317,407

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	27 2052	28 2053	29 2054	30 2055	31 2056	32 2057	33 2058	34 2059	35 2060	36 2061	37 2062	38 2063	39 2064	40 2065
Modified Partial Replacement Alternative																	
				Deeper Grand Ronde Well Systems													
Connell	Drill & Equip Well & Pump	4	1,000,000	4,000,000													
	Annual Well Operations	4	15,000		60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000	0													
	Annual Treatment Operations	4	75,000		300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000	2,000,000													
	Annual Well Operations	2	20,000		40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000	0													
	Annual Treatment Operations	2	75,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
							Grande Ronde Deep Aquifer System										
Moses Lake	Drill & Equip Well & Pump	10	800,000				8,000,000										
	Annual Well Operations	10	15,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000				20,000,000										
	Annual Treatment Operations	10	75,000					750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000				1,000,000										
	Annual Well Operations	2	15,000	50,000	50,000	50,000		30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000				4,000,000										
	Annual Treatment Operations	2	75,000					150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
				Deeper Grand Ronde Well Systems													
Othello	Drill & Equip Well & Pump	4	900,000	3,600,000													
	Annual Well Operations	4	25,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000														
	Annual Treatment Operations	4	100,000		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000	2,250,000													
	Annual Well Operations	3	15,000		45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000	0													
	Annual Treatment Operations	3	75,000		225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	12,050,000	1,520,000	1,520,000	34,320,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			81,167,041	4,179,140	506,886	487,390	10,581,497	711,505	684,139	657,826	632,525	608,197	584,805	562,312	540,685	519,889	499,894
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	-9,650,000	880,000	880,000	-31,920,000	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			46,633,848	-3,346,780	293,460	282,173	-9,841,532	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	41 2066	42 2067	43 2068	44 2069	45 2070	46 2071	47 2072	48 2073	49 2074	50 2075	51 2076	52 2077	53 2078	54 2079	55 2080
Modified Partial Replacement Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
													Deeper Grand Ronde Well Systems					
Moses Lake	Drill & Equip Well & Pump	10	800,000										8,000,000					
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000										0					
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000		750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000										1,000,000					
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000		30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000										0					
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000		150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	10,320,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			81,167,041	480,667	462,180	444,404	427,311	410,876	395,073	379,878	365,267	351,219	1,452,154	324,721	312,232	300,223	288,676	277,573
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	0	0	0	0	0	0	0	0	0	-7,920,000	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			46,633,848	0	0	0	0	0	0	0	0	0	-1,114,444	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	56 2081	57 2082	58 2083	59 2084	60 2085	61 2086	62 2087	63 2088	64 2089	65 2090	66 2091	67 2092	68 2093	69 2094	70 2095
Modified Partial Replacement Alternative																		
Connell	Drill & Equip Well & Pump	4	1,000,000															
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000															
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000															
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000															
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000															
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000															
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000															
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000															
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000															
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000															
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			81,167,041	266,897	256,632	246,762	237,271	228,145	219,370	210,933	202,820	195,019	187,519	180,306	173,371	166,703	160,292	154,127
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			46,633,848	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System: Cost Element	# Units	Per Unit Cost	71 2096	72 2097	73 2098	74 2099	75 2100	76 2101	77 2102	78 2103	79 2104	80 2105	81 2106	82 2107	83 2108	84 2109	85 2110	86 2111
Modified Partial Replacement Alternative																			
Connell	Drill & Equip Well & Pump	4	1,000,000																
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000																
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000																
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000																
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000																
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000																
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000																
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000																
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000																
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000																
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			81,167,041	148,199	142,499	137,018	131,748	126,681	121,808	117,124	112,619	108,287	104,122	100,118	96,267	92,564	89,004	85,581	82,289
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			46,633,848	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Deep Aquifer System Cost Element	# Units	Per Unit Cost	87 2112	88 2113	89 2114	90 2115	91 2116	92 2117	93 2118
Modified Partial Replacement Alternative										
Connell	Drill & Equip Well & Pump	4	1,000,000							
	Annual Well Operations	4	15,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	75,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lind	Drill & Equip Well & Pump	2	1,000,000							
	Annual Well Operations	2	20,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Moses Lake	Drill & Equip Well & Pump	10	800,000							
	Annual Well Operations	10	15,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
	Wellhead Treatment System	10	2,000,000							
	Annual Treatment Operations	10	75,000	750,000	750,000	750,000	750,000	750,000	750,000	750,000
Odessa	Drill & Equip Well & Pump	2	500,000							
	Annual Well Operations	2	15,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
	Wellhead Treatment System	2	2,000,000							
	Annual Treatment Operations	2	75,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Othello	Drill & Equip Well & Pump	4	900,000							
	Annual Well Operations	4	25,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
	Wellhead Treatment System	4	2,000,000							
	Annual Treatment Operations	4	100,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Warden	Drill & Equip Well & Pump	3	750,000							
	Annual Well Operations	3	15,000	45,000	45,000	45,000	45,000	45,000	45,000	45,000
	Wellhead Treatment System	3	2,000,000							
	Annual Treatment Operations	3	75,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Total Undiscounted Costs:			279,210,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000
Discounted Costs:			81,167,041	79,124	76,081	73,155	70,341	67,636	65,035	62,533
Undiscounted Costs (No Action - Current Alternative):**			29,115,000	0	0	0	0	0	0	0
Discounted Costs (No Action - Current Alternative):**			46,633,848	0	0	0	0	0	0	0

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

TABLE MUNI4: Municipal Water Supply Costs by Town and Alternative - Option 2 (Dril

Discount Rate: 0.04

Alternative/ Town	Cost Element	Deep Aquifer System # Units	Deep Aquifer System Per Unit Cost	Notes/Assumptions related to Second System Transition
Modified Partial Replacement Alternative				Timing of transitions provided by GWMA.
Connell	Drill & Equip Well & Pump	4	1,000,000	Assumes a second well deepening for each town. No additional deepening costs after second deepening.
	Annual Well Operations	4	15,000	Assumes well O&M would continue after second well deepeniing.
	Wellhead Treatment System	4	2,000,000	Assumes only one-time cost for wellhead treatment systems on all wells.
	Annual Treatment Operations	4	75,000	Assumes wellhead treatment system O&M would maintain & replace the treatment system over the entire period of analysis.
Lind	Drill & Equip Well & Pump	2	1,000,000	
	Annual Well Operations	2	20,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Moses Lake	Drill & Equip Well & Pump	10	800,000	
	Annual Well Operations	10	15,000	
	Wellhead Treatment System	10	2,000,000	
	Annual Treatment Operations	10	75,000	
Odessa	Drill & Equip Well & Pump	2	500,000	
	Annual Well Operations	2	15,000	
	Wellhead Treatment System	2	2,000,000	
	Annual Treatment Operations	2	75,000	
Othello	Drill & Equip Well & Pump	4	900,000	
	Annual Well Operations	4	25,000	
	Wellhead Treatment System	4	2,000,000	
	Annual Treatment Operations	4	100,000	
Warden	Drill & Equip Well & Pump	3	750,000	
	Annual Well Operations	3	15,000	
	Wellhead Treatment System	3	2,000,000	
	Annual Treatment Operations	3	75,000	
	Total Undiscounted Costs:		279,210,000	
	Discounted Costs:		81,167,041	
	Undiscounted Costs (No Action - Current Alternative):**		29,115,000	
	Discounted Costs (No Action - Current Alternative):**		46,633,848	

* While it reflects year 2026 for discounting purposes, it could also be seen as represent

**A positive number reflects a cost savings as compared to the No Action Alternative. A

No Action Alternative – Option 1-Varying Path: As shown in table MUNI3, the total discounted costs of the combined current, deep well, and combined deep well/surface water or deeper well systems across the 2026-2118 study period for the six towns under the No Action Alternative were estimated at $156.9 million. Since the No Action Alternative is the basis of comparison, no cost savings estimate was developed for this alternative.

Option 2-Drilling Path: As shown in table MUNI4, the total discounted costs of the combined current, deep well, and deeper well systems across the 2026-2118 study period for the six towns under the No Action Alternative were estimated at $127.8 million. Since the No Action Alternative is the basis of comparison, no cost savings estimate was developed for this alternative.

Partial Replacement Alternatives - Option 1-Varying Path: As shown in table MUNI3, the total discounted costs of the combined current, deep well, and combined deep well/surface water or deeper well systems across the 2026-2118 study period for the six towns under the Partial Replacement Alternatives (2A and 2B) were estimated at $122.8 million. That reflects a discounted cost savings or benefit of $34.1 million compared to the No Action Alternative.

Option 2-Drilling Path: As shown in table MUNI4, the total discounted costs of the combined current, deep well, and deeper well systems across the 2026-2118 study period for the six towns under the Partial Replacement Alternatives (2A and 2B) were estimated at $100.6 million. That reflects a discounted cost savings or benefit of $27.2 million compared to the No Action Alternative.

Full Replacement Alternatives – Option 1-Varying Path: As shown in table MUNI3, the total discounted costs of the combined current, deep well, and combined deep well/surface water or deeper well systems across the 2026-2118 study period for the six towns under the Full Replacement Alternatives (3A and 3B) were estimated at $40.7 million. That reflects a discounted cost savings or benefit of $116.2 million compared to the No Action Alternative.

Option 2-Drilling Path: As shown in table MUNI4, the total discounted costs of the combined current, deep well, and deeper well systems across the 2026-2118 study period for the six towns under the Full Replacement Alternatives (3A and 3B) were estimated at $35.1 million. That reflects a discounted cost savings or benefit of $92.7 million compared to the No Action Alternative.

Modified Partial Replacement Alternatives – Option 1-Varying Path: As shown in table MUNI3, the total discounted costs of the combined current, deep well, and combined deep well/surface water or deeper well systems across the 2026-2118 study period for the six towns under the Modified Partial Replacement Alternatives (4A and 4B) were estimated at $98.3 million. That reflects a discounted cost savings or benefit of $58.6 million compared to the No Action Alternative.

Option 2-Drilling Path: As shown in table MUNI4, the total discounted costs of the combined current, deep well, and deeper well systems across the 2026-2118 study period for the six towns under the Modified Partial Replacement Alternatives (4A and 4B) were estimated at $81.2 million. That reflects a discounted cost savings or benefit of $46.6 million compared to the No Action Alternative.

1.2.1.3 Other Direct Benefits – Industrial

Methodology and Assumptions – Other direct benefits for industrial water have been identified for the Study. These benefits are associated with increased flexibility in the operation of water supply conveyance facilities under the action alternatives compared to the No Action alternative.

There are several agricultural processing plants in the study area, including those utilizing potatoes grown within the study area. The nutrient content of agricultural processing water is too high to be disposed of or used for other purposes without dilution. Under the direction of the processing plants, the processing water is diluted with clean water from other sources to meet discharge requirements then applied to irrigated crops. Several processors have interruptible contracts with Reclamation totaling 4,700 acre-feet for industrial water to dilute their process water. The water is delivered through East Columbia Basin Irrigation District (ECBID) facilities. However, under the No Action Alternative, the without project condition, the industrial deliveries are interrupted because even though adequate water supplies are available, there is not sufficient capacity within the canal for delivery to all users along the canal during the summer months. Under the partial, full, and modified partial replacement alternatives, sufficient capacity would be provided to allow uninterrupted delivery of the 4,700 acre-feet of industrial water. Information based on discussions with local experts.

Since the 4,700 acre-feet of industrial water is diluted and applied to irrigated crops, the benefit for industrial water was based on the agricultural benefit per acre-foot of water which varies by alternative. The average agricultural value per acre foot was estimated at $91.72 for the partial replacement alternatives, $88.83 for the full replacement alternatives, and $89.20 for the modified partial replacement alternatives. Subtracting off the cost per acre foot of project water ($48) provides the industrial value per acre foot for each alternative. Multiplying the industrial value per acre foot by alternative times the 4,700 acre feet estimates the average annual industrial benefit for each alternative.

Results

No Action Alternative – No industrial benefits.

Partial Replacement Alternatives – The benefit for industrial water was based on the agricultural benefit per acre-foot of water less the cost of project water. This yields a benefit of $47.72 per acre-foot for industrial water or an annual benefit of $205,500. For use in the benefit-cost analysis, the annual industrial benefit was discounted to the end of the canal construction period (year 2025) using the 2011-2012 water project planning rate of 4.0 percent. For all partial replacement alternatives, this discounted stream of industrial benefits equates to $5.2 million in year 2025 dollars based on the 4% planning rate.

Full Replacement Alternatives – The benefit for industrial water under the Full Replacement Alternatives was estimated at $40.83 per acre foot or an annual industrial benefit of $191,900. For all full replacement alternatives, this discounted stream of industrial benefits equates to $4.9 million in year 2025 dollars based on the 4% planning rate.

Modified Partial Replacement Alternatives – The benefit for industrial water under the Modified Partial Replacement Alternatives was estimated at $41.20 per acre foot or an annual industrial benefit of $193,600. For all full replacement alternatives, this discounted stream of industrial benefits equates to $4.9 million in year 2025 dollars based on the 4% planning rate.

1.2.2 Cost Analyses

Project costs are composed not only of construction, IDC, land acquisition and annual OMR&P costs, but also lost project benefits related to hydropower.

1.2.2.1 Construction Costs, Interest During Construction (IDC), Land Acquisition and Annual Operating, Maintenance, Replacement, and Power (OMR&P) Costs

Methodology and Assumptions – Canal construction costs were estimated by Reclamation cost engineers and include field costs of construction contracts and non-contract costs (lands purchases, construction facilities, studies/investigations/ design data collection, engineering design, construction management and contract administration, etc.).

Since the majority of construction activities are associated with different canal segments, the construction period was broken down into a number of phases. Partial replacement alternatives 2A and 2B were broken down into four canal construction phases. The full replacement alternatives 3A and 3B were broken down into nine canal construction phases. The modified partial replacement alternatives 4A and 4B were broken down into four canal construction phases. The canal construction period runs from 2015 to 2025 across all phases.

IDC is charged on both field costs and non-contract costs, but only during the construction period. A significant portion of the non-contract costs are incurred prior to the start of the construction period. As a result, non-contract costs incurred prior to the start of the construction period for each phase were aggregated into the first year of the construction period for that phase before calculating IDC.

IDC was calculated on the canal construction and non-contract costs incurred annually within each construction phase. Total IDC by phase was added to the total construction and non-contract costs by phase to estimate costs at the end of each phase. These phase specific construction/non-contract and IDC costs were then compounded/future valued to the end of the overall canal construction period in year 2025 (except for those phases which were already at the end of the construction period – phases 4, 7, 9).

In addition to canal construction, a portion of the costs of constructing an expansion of the Weber Siphon were included as second cost scenario. The Weber Siphon expansion was completed using American Recovery and Reinvestment Act (ARRA) funds to meet the needs of the Lake Roosevelt Incremental Storage Releases Project (LRISRP). Given the siphon expansion was sized to exceed the needs of LRISRP, it also supports the proposed Odessa Subarea Special Study alternatives by allowing more water to flow under Interstate 90. Since the costs of the Weber Siphon expansion had already been incurred at the time of this analysis, economic theory suggests considering those costs sunk and, therefore, not include them in the economic analysis. However, since the costs of the Weber Siphon had never been included within a benefit-cost analysis (such analysis was not required to obtain ARRA funding) and the Weber Siphon expansion is needed to pursue the proposed Odessa alternatives, a case could be made for including at least a portion of the costs of the Weber Siphon expansion within the costs of this study. The benefit-cost analysis developed for this study therefore presents results both without and with a portion of the costs of the Weber Siphon expansion.

Total design and construction costs for the Weber Siphon equal approximately $33.2 million. Under the with Weber Siphon scenario, each alternative was assigned a portion of the Weber Siphon costs based on water deliveries through the siphon by alternative as a percentage of the total capacity of the siphon across a 180 day irrigation period. Total capacity of the Weber Siphon was estimated at 749,700 AF during the irrigation season. The partial replacement alternative was estimated to deliver 138,000 AF via the siphon which reflects 18.4% of the siphon's total capacity. The full and modified partial replacement alternatives were estimated to deliver 273 and 164 KAF respectively through the Weber Siphon which reflects 36.4% and 21.9% of the capacity of the siphon. The percentage associated with each alternative was multiplied by the $33.2 million total Weber Siphon cost to estimate the portion of costs assigned to each

alternative (Partial: $6.1 million, Full: $12.1 million, and Modified Partial: $7.3 million). Since these costs were assigned to year 2011, they were compounded to year 2025 to be consistent with the other costs and benefits. These alternative specific Weber Siphon costs were added into the overall cost under the with Weber Siphon scenario, but no IDC was charged since the siphon has already been constructed.

Costs of land acquisition were included in the analysis in lieu of constructing drainage systems. Annual costs for land acquisition were initially estimated by study team engineers for the modified partial replacement alternatives as a function of the number of acres assumed to hold excess water (wet acres). Costs for the partial and full replacement alternatives were then estimated based on the ratio of wet acres for those alternatives to the estimate of wet acres for the modified partial alternatives. The modified partial alternatives were estimated to result in 1,034 wet acres and the partial and full replacement alternatives 1,328 and 1,646 wet acres respectively. Therefore the ratio for the partial alternative is 1.284 and 1.592 for the full replacement alternative. These ratios for the partial and full replacement alternatives were then multiplied by the annual costs estimated for the modified partial replacement alternative to estimate the annual land acquisition costs for the partial and full replacement alternatives.

Average annual OMR&P costs were also estimated by Reclamation cost engineers for the partial and full replacement alternatives. For the modified partial replacement alternatives, OMR&P costs from the partial replacement alternative were increased based on the ratio of average annual water deliveries associated with the two alternatives (164KAF modified partial alternative divided by 138KAF partial alternative provides a ratio of 1.1884). Multiplying the ratio by the OMR&P costs for the partial replacement alternative provides the estimate of OMR&P costs for the modified partial replacement alternatives (4A and 4B).

Since the construction phases would be completed at different times and OMR&P costs were assumed to begin immediately after completion of each construction phase, the OMR&P costs were estimated separately for each construction phase. Annual OMR&P costs were included for each year from the end of construction on each phase until year 2118 (end of the period of analysis[2]). The canal OMR&P costs incurred prior to the end of the canal construction period (year 2025) were compounded to the end of the canal construction period. The canal OMR&P costs incurred during the period of analysis (2026-2118) were discounted back to the end of the canal construction period.

[2] The period of analysis was ended for all phases at year 2118, 100 years after the completion of construction of the first canal phase. This end date was selected because it was determined by study team construction engineers that all construction phases were dependent on the existence of the first construction phase, so that once the first construction phase reached the end of its useful life, the project would reach the end of its useful life. Had the canal phases been deemed independent, each phase would have been allowed to provide benefits for a full 100 years. Had this been the case, up to seven more years of phased benefits would have accrued to the project.

Results

No Action Alternative – There are no construction or IDC costs associated with the No Action Alternative. However, OMR&P costs are currently incurred on the existing system. Since all construction, IDC, and OMR&P costs associated with the action alternatives were measured as changes from the No Action Alternative, it is not necessary to estimate construction, IDC, and OMR&P costs for the No Action Alternative.

Partial Replacement Alternatives – Combined canal construction, noncontract, and IDC costs, land acquisition costs, annual OMR&P costs, and Weber Siphon costs for the partial replacement alternatives are summarized in table NED_COST1.

Table NED_COST1.—Total costs for partial replacement alternatives
(Measured in $ millions at the end of the canal construction period [2025])

Cost components	2A	2B
Canal construction, noncontract, and IDC	886.0	886.0
Canal OMR&P	192.5	192.5
Land acquisition	3.2	3.2
Total (without Weber Siphon):	1,081.7	1,081.7
Weber Siphon	10.6	10.6
Total (with Weber Siphon):	1,092.3	1,092.3

Construction, IDC, Land Acquisition, and OMR&P Costs – Table NED_COST2 presents the canal construction, noncontract, and IDC costs; land acquisition; and annual OMR&P costs for the two partial replacement alternatives. Note that the costs for these components are the same for Alternatives 2A/2B.

As shown in table NED_COST2 for partial replacement Alternatives 2A and 2B, canal construction and noncontract costs were estimated by Reclamation engineers at $688.1 million. IDC, in the amount of $89.1 million, was calculated on the annual construction and noncontract costs, added to annual construction and noncontract costs totals, and then compounded to the end of the canal construction period to obtain a canal cost estimate of $886.0 million. Annual canal OMR&P costs were assumed to start at the end of each canal construction phase and continue through the end of the period of analysis in year 2118. Compounding and discounting these costs to the end of the canal construction period resulted in an estimate of $192.5 million. Land acquisition costs were

Table NED COST2: Partial Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

Without Weber Siphon Scenario				Years to End of Construction Period:	14	13	12	11	10	9	8	7	6	5
				Year #:	1	2	3	4	5	6	7	8	9	10
		Discount Rate:												
		0.04		Year:	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Phase #	Future & Present Value Totals	Undiscounted Totals											
A.1: Construction & Noncontract Costs:	Weber Siphon				0									
	1		194,202,138						42,533,124	48,053,447	46,051,363	46,051,363	11,512,841	
	2		288,718,366								55,686,471	57,102,848	54,132,015	54,132,015
	3		107,899,652										23,728,470	26,667,864
	4		97,310,569											
	Total by Year:		688,130,725					0	42,533,124	48,053,447	101,737,834	103,154,211	89,373,325	80,799,878
A.2: Interest During Construction (IDC):	1		23,085,141						850,662	2,696,420	4,686,373	6,715,883	8,135,802	
	2		41,582,116								1,113,729	3,414,065	5,775,325	8,171,618
	3		12,835,429										474,569	1,501,479
	4		11,619,234											
			89,121,921											
A.3: Construction & IDC Costs:	1		217,287,279										217,287,279	
	2		330,300,482											
	3		120,735,082											
	4		108,929,803											
			777,252,646	0				0	0	0	0	0	217,287,279	0
Compounded to Year 2025:		885,997,715		0	0	0	0	0	0	0	0	0	274,937,727	0
B.1: Land Acquisition Costs:			3,230,000					0	0	260,000	0	0	0	390,000
Future Valued & Discounted to Year 2025:		3,178,972								370,061	0	0	0	474,495
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):														
	1		196,743,100										1,967,431	1,967,431
	2		251,364,733											
	3		114,004,032											
	4		82,712,010											
			644,823,875					0	0	0	0	0	1,967,431	1,967,431
Future Valued & Discounted:		192,471,186						0	0	0	0	0	2,489,428	2,393,681
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		1,081,647,873												

Table NED COST2: Partial Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

Without Weber Siphon Scenario			Years to End of Construction Period:	4	3	2	1	0			
			Year #:	11	12	13	14	15			
		Discount Rate:									
		0.04	Year:	2021	2022	2023	2024	2025	2026	2027	2028
	Phase #	Future & Present Value Totals	Undiscounted Totals								
A.1: Construction & Noncontract Costs:	Weber Siphon										
	1		194,202,138								
	2		288,718,366	54,132,015	13,533,004						
	3		107,899,652	25,557,031	25,557,031	6,389,258					
	4		97,310,569	21,856,643	23,905,151	22,910,567	22,910,567	5,727,642			
	Total by Year:		688,130,725	101,545,688	62,995,185	29,299,825	22,910,567	5,727,642			
A.2: Interest During Construction (IDC):	1		23,085,141								
	2		41,582,116	10,663,764	12,443,615						
	3		12,835,429	2,606,036	3,732,559	4,520,787					
	4		11,619,234	437,133	1,369,854	2,360,963	3,371,824	4,079,461			
			89,121,921								
A.3: Construction & IDC Costs:	1		217,287,279								
	2		330,300,482		330,300,482						
	3		120,735,082			120,735,082					
	4		108,929,803					108,929,803			
			777,252,646	0	330,300,482	120,735,082	0	108,929,803			
Compounded to Year 2025:		885,997,715		0	371,543,121	130,587,064	0	108,929,803			
B.1: Land Acquisition Costs:			3,230,000	0	0	0	0	1,280,000	130,000	130,000	130,000
Future Valued & Discounted to Year 2025:		3,178,972		0	0	0	0	1,280,000	125,000	120,192	115,570
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):											
	1		196,743,100	1,967,431	1,967,431	1,967,431	1,967,431	1,967,431			
	2		251,364,733		2,591,389	2,591,389	2,591,389	2,591,389			
	3		114,004,032			1,187,542	1,187,542	1,187,542			
	4		82,712,010					879,915			
			644,823,875	1,967,431	4,558,820	5,746,362	5,746,362	6,626,277	… to year 2118		
Future Valued & Discounted:		192,471,186		2,301,616	5,128,053	6,215,265	5,976,216	6,626,277	… to year 2118		
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		1,081,647,873									

Table NED COST2: Partial Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

Without Weber Siphon Scenario

				Years to End of Construction Period:							
				Year #:							
		Discount Rate:									
		0.04		Year:	2029	2030	2031	2032	2033	2034	2035
	Phase #	Future & Present Value Totals	Undiscounted Totals								
A.1: Construction & Noncontract Costs:	Weber Siphon										
	1		194,202,138								
	2		288,718,366								
	3		107,899,652								
	4		97,310,569								
	Total by Year:		688,130,725								
A.2: Interest During Construction (IDC):	1		23,085,141								
	2		41,582,116								
	3		12,835,429								
	4		11,619,234								
			89,121,921								
A.3: Construction & IDC Costs:	1		217,287,279								
	2		330,300,482								
	3		120,735,082								
	4		108,929,803								
			777,252,646								
Compounded to Year 2025:		885,997,715									
B.1: Land Acquisition Costs:			3,230,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	
Future Valued & Discounted to Year 2025:		3,178,972		111,125	106,851	102,741	98,789	94,990	91,336	87,823	
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):											
	1		196,743,100								
	2		251,364,733								
	3		114,004,032								
	4		82,712,010								
			644,823,875								
Future Valued & Discounted:		192,471,186									
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		1,081,647,873									

estimated by Reclamation engineers at $3.2 million which after compounding and discounting also results in an estimate of $3.2 million. These canal construction, noncontract, IDC, land acquisition, and OMR&P costs, measured as of the end of the canal construction period in year 2025, sum to a total of $1,081.7 million.

Full Replacement Alternatives – Canal construction, noncontract, and IDC costs; land acquisition costs; annual OMR&P costs and Weber Siphon costs for the full replacement alternatives are summarized in table NED_COST3.

Table NED_COST3.—Total costs for full replacement alternatives (Measured in $ millions at the end of the construction period [2025])

Cost components	3A	3B
Canal and reservoir construction, noncontract, and IDC	3,169.3	3,169.3
Canal and reservoir OMR&P	428.1	428.1
Land Acquisition	3.9	3.9
Total (without Weber Siphon):	3,601.3	3,601.3
Weber Siphon	20.9	20.9
Total (with Weber Siphon):	3,622.2	3,622.2

Construction, IDC, Land Acquisition, and OMR&P Costs: Table NED_COST4 presents the canal construction, noncontract, and IDC costs; land acquisition costs, and annual OMR&P costs for the two full replacement alternatives. Note that the costs for these components are the same for Alternatives 3A/3B.

As shown in table NED_COST4 for full replacement Alternatives 3A and 3B, canal construction and noncontract costs were estimated by Reclamation engineers at $2,453.7 million. IDC, in the amount of $327.8 million, was calculated on the annual construction and noncontract costs, added to annual construction and noncontract costs totals, and then compounded to the end of the canal construction period to obtain a canal cost estimate of $3,169.3 million. Annual canal OMR&P costs were assumed to start at the end of each canal construction phase and continue through the end of the period of analysis in year 2118. Compounding and discounting these costs to the end of the canal construction period resulted in an estimate of $428.1 million. Land acquisition costs were estimated by Reclamation engineers at $4.0 million. Compounding and discounting those costs to the end of the construction period in year 2025 results in an estimate of $3.9 million. These canal construction, noncontract, IDC, land acquisition, and OMR&P costs, measured as of the end of the canal construction period in year 2025, sum to a total of $3,601.3 million.

Modified Partial Replacement Alternatives - Canal construction, noncontract, and IDC costs; land acquisition; annual OMR&P costs; and Weber Siphon costs for the modified partial replacement alternatives (4A and 4B) are summarized in table NED_COST5.

Table NED_COST5.—Total costs for modified partial replacement alternatives (Measured in $ millions at the end of the construction period [2025])

Cost components	Alternative 4A	Alternative 4B
Canal construction, noncontract, and IDC	942.0	942.0
Canal OMR&P	228.7	228.7
Land Acquisition	2.5	2.5
Total (without Weber Siphon):	1,173.2	1,173.2
Weber Siphon	12.6	12.6
Total (with Weber Siphon):	1,185.8	1,185.8

Construction, IDC, Land Acquisition, and OMR&P Costs: Table NED_COST6 presents the construction, noncontract, and IDC costs; land acquisition costs; and annual OMR&P costs for the modified partial replacement alternatives (4A and 4B).

As shown in Table NED_COST6 for modified partial replacement Alternatives 3A and 3B, canal construction and noncontract costs were estimated by Reclamation engineers at $734.2 million. IDC, in the amount of $91.0 million, was calculated on the annual construction and noncontract costs, added to annual construction and noncontract costs totals, and then compounded to the end of the canal construction period to obtain a canal cost estimate of $942.0 million. Annual canal OMR&P costs were assumed to start at the end of each canal construction phase and continue through the end of the period of analysis in year 2118. Compounding and discounting these costs to the end of the canal construction period in year 2025 resulted in an estimate of $228.7 million. Land acquisition costs were estimated by Reclamation engineers at $2.5 million which after compounding and discounting also resulted in an estimate of $2.5 million. These canal system construction, noncontract, IDC, land acquisition, and OMR&P costs, measured as of the end of the canal construction period in year 2025, sum to a total of $1,173.2 million.

1.2.2.2 Annual Lost Benefits

Losses in average annual benefits reflecting primarily changes in hydropower generation were estimated for each alternative based on alternative specific

Table NED COST4: Full Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

			Years to End of Construction Period:	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
			Year #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Discount Rate:																
		0.04	Year:	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Phase #	Future & Present Value Totals	Undiscounted Totals															
A.1: Construction & Noncontract Costs:	Weber Siphon			0														
	1		194,202,138				0	42,533,124	48,053,447	46,051,363	46,051,363	11,512,841	0	0	0	0	0	0
	2		288,718,366				0	0	0	55,686,471	57,102,848	54,132,015	54,132,015	54,132,015	13,533,004	0	0	0
	3		107,899,652				0	0	0	0	0	23,728,470	26,667,864	25,557,031	25,557,031	6,389,258	0	0
	4		97,310,569				0	0	0	0	0	0	0	21,856,643	23,905,151	22,910,567	22,910,567	5,727,642
	5		855,294,388					164,321,070	169,319,465	160,508,878	160,508,878	160,508,878	40,127,219					
	6		302,072,038									67,051,340	74,460,215	71,360,215	71,360,215	17,840,054		
	7		219,769,122											48,463,788	54,274,237	52,013,820	52,013,820	13,003,455
	8		275,908,071							53,042,532	54,611,989	51,770,323	51,770,323	51,770,323	12,942,581			
	9		112,570,717											28,607,927	26,594,801	25,496,884	25,496,884	6,374,221
	Total by Year:		2,453,745,061	0	0	0	0	206,854,193	217,372,912	315,289,244	318,275,078	368,703,866	247,157,636	301,747,941	228,167,018	124,650,583	100,421,272	25,105,318
A.2: Interest During Construction (IDC):	1		23,085,141				0	850,662	2,696,420	4,686,373	6,715,883	8,135,802	0	0	0	0	0	0
	2		41,582,116				0	0	0	1,113,729	3,414,065	5,775,325	8,171,618	10,663,764	12,443,615	0	0	0
	3		12,835,429				0	0	0	0	0	474,569	1,501,479	2,606,036	3,732,559	4,520,787	0	0
	4		11,619,234				0	0	0	0	0	0	0	437,133	1,369,854	2,360,963	3,371,824	4,079,461
	5		123,104,958					3,286,421	10,090,689	17,090,883	24,194,874	31,583,024	36,859,067					
	6		35,992,768									1,341,027	4,224,899	7,310,304	10,457,124	12,659,415		
	7		26,155,826											969,276	3,062,807	5,311,081	7,604,077	9,208,585
	8		39,716,368							1,060,851	3,256,375	5,514,276	7,805,660	10,188,700	11,890,506			
	9		13,757,479											572,159	1,699,099	2,808,897	3,941,128	4,736,196
			327,849,320															
A.3: Construction & IDC Costs:	1		217,287,279									217,287,279						
	2		330,300,482												330,300,482			
	3		120,735,082													120,735,082		
	4		108,929,803															108,929,803
	5		978,399,346										978,399,346					
	6		338,064,807													338,064,807		
	7		245,924,948															245,924,948
	8		315,624,439												315,624,439			
	9		126,328,196															126,328,196
			2,781,594,381	0	0	0	0	0	0	0	0	217,287,279	978,399,346	0	645,924,920	458,799,888	0	481,182,947
Compounded to Year 2025:		3,169,308,727		0	0	0	0	0	0	0	0	274,937,727	1,190,372,404	0	726,577,690	496,237,959	0	481,182,947
B.1: Land Acquisition Costs:			3,990,000				0	0	320,000	0	0	0	480,000	0	0	0	0	1,590,000
Future Valued & Discounted to Year 2025:		3,927,196							455,460	0	0	0	583,993	0	0	0	0	1,590,000
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):																		
	1		196,743,100				0	0	0	0	0	1,967,431	1,967,431	1,967,431	1,967,431	1,967,431	1,967,431	1,967,431
	2		251,364,733				0	0	0	0	0	0	0	0	2,591,389	2,591,389	2,591,389	2,591,389
	3		114,004,032				0	0	0	0	0	0	0	0	0	1,187,542	1,187,542	1,187,542
	4		82,712,010				0	0	0	0	0	0	0	0	0	0	0	879,915
	5		219,575,070										2,217,930	2,217,930	2,217,930	2,217,930	2,217,930	2,217,930
	6		176,046,144													1,833,814	1,833,814	1,833,814
	7		110,737,546															1,178,059
	8		221,427,138												2,282,754	2,282,754	2,282,754	2,282,754
	9		79,234,292															842,918
			1,451,844,065				0	0	0	0	0	1,967,431	4,185,361	4,185,361	9,059,504	12,080,860	12,080,860	14,981,752
Future Valued & Discounted:		428,065,928					0	0	0	0	0	2,489,428	5,092,132	4,896,280	10,190,710	13,066,658	12,564,094	14,981,752
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		3,601,301,851																

Table NED COST4: Full Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

				Years to End of Construction Period:										
				Year #:										
			Discount Rate:											
			0.04	Year:	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	Phase #	Future & Present Value Totals		Undiscounted Totals										
A.1: Construction & Noncontract Costs:	Weber Siphon													
	1			194,202,138										
	2			288,718,366										
	3			107,899,652										
	4			97,310,569										
	5			855,294,388										
	6			302,072,038										
	7			219,769,122										
	8			275,908,071										
	9			112,570,717										
	Total by Year:			2,453,745,061										
A.2: Interest During Construction (IDC):	1			23,085,141										
	2			41,582,116										
	3			12,835,429										
	4			11,619,234										
	5			123,104,958										
	6			35,992,768										
	7			26,155,826										
	8			39,716,368										
	9			13,757,479										
				327,849,320										
A.3: Construction & IDC Costs:	1			217,287,279										
	2			330,300,482										
	3			120,735,082										
	4			108,929,803										
	5			978,399,346										
	6			338,064,807										
	7			245,924,948										
	8			315,624,439										
	9			126,328,196										
				2,781,594,381										
Compounded to Year 2025:		3,169,308,727												
B.1: Land Acquisition Costs:				3,990,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000	160,000
Future Valued & Discounted to Year 2025:		3,927,196			153,846	147,929	142,239	136,769	131,508	126,450	121,587	116,910	112,414	108,090
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):														
	1			196,743,100										
	2			251,364,733										
	3			114,004,032										
	4			82,712,010										
	5			219,575,070										
	6			176,046,144										
	7			110,737,546										
	8			221,427,138										
	9			79,234,292										
				1,451,844,065	… to year 2118									
Future Valued & Discounted:		428,065,928			… to year 2118									
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		3,601,301,851												

Table NED COST6: Modified Partial Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

				Years to End of Construction Period:	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
				Year #:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		Discount Rate:																	
		0.04	Year:		2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	Phase #	Future & Present Value Totals		Undiscounted Totals															
A.1: Construction & Noncontract Costs:	Weber Siphon				0														
	1			244,530,000				0	52,638,117	60,814,233	58,256,733	58,256,733	14,564,183	0	0	0	0	0	0
	2			158,080,000				0	0	0	29,801,662	31,447,452	29,794,119	29,794,119	29,794,119	7,448,530	0	0	0
	3			237,737,500				0	0	0	0	0	51,175,947	59,124,949	56,638,491	56,638,491	14,159,623	0	0
	4			93,860,000				0	0	0	0	0	0	0	20,204,530	23,342,837	22,361,170	22,361,170	5,590,293
	5			0				0	0	0	0	0	0	0	0	0	0	0	0
	6			0				0	0	0	0	0	0	0	0	0	0	0	0
	7			0				0	0	0	0	0	0	0	0	0	0	0	0
	8			0				0	0	0	0	0	0	0	0	0	0	0	0
	9			0				0	0	0	0	0	0	0	0	0	0	0	0
	Total by Year:			734,207,500	0	0	0	0	52,638,117	60,814,233	88,058,395	89,704,186	95,534,249	88,919,068	106,637,139	87,429,857	36,520,793	22,361,170	5,590,293
A.2: Interest During Construction (IDC):	1			28,981,533				0	1,052,762	3,363,920	5,879,896	8,445,361	10,239,594	0	0	0	0	0	0
	2			22,685,841				0	0	0	596,033	1,844,857	3,143,483	4,460,987	5,831,191	6,809,291	0	0	0
	3			28,176,491				0	0	0	0	0	1,023,519	3,270,478	5,716,566	8,210,768	9,955,161	0	0
	4			11,124,225				0	0	0	0	0	0	0	404,091	1,291,202	2,256,930	3,241,654	3,930,349
	5			0				0	0	0	0	0	0	0	0	0	0	0	0
	6			0				0	0	0	0	0	0	0	0	0	0	0	0
	7			0				0	0	0	0	0	0	0	0	0	0	0	0
	8			0				0	0	0	0	0	0	0	0	0	0	0	0
	9			0				0	0	0	0	0	0	0	0	0	0	0	0
				90,968,090															
A.3: Construction & IDC Costs:	1			273,511,533								273,511,533							
	2			180,765,841											180,765,841				
	3			265,913,991												265,913,991			
	4			104,984,225															104,984,225
	5			0										0					
	6			0													0		
	7			0															0
	8			0												0			
	9			0															0
				825,175,590	0	0	0	0	0	0	0	0	273,511,533	0	0	180,765,841	265,913,991	0	104,984,225
Compounded to Year 2025:		942,013,129			0	0	0	0	0	0	0	0	346,079,345	0	0	203,336,987	287,612,572	0	104,984,225
B.1: Land Acquisition Costs:				2,500,000				0	0	200,000	0	0	0	300,000	0	0	0	0	1,000,000
Future Valued & Discounted to Year 2025:		2,460,748								284,662	0	0	0	364,996	0	0	0	0	1,000,000
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):																			
	1			233,810,641				0	0	0	0	0	2,338,106	2,338,106	2,338,106	2,338,106	2,338,106	2,338,106	2,338,106
	2			298,723,306				0	0	0	0	0	0	0	0	3,079,622	3,079,622	3,079,622	3,079,622
	3			135,483,053				0	0	0	0	0	0	0	0	0	1,411,282	1,411,282	1,411,282
	4			98,295,432				0	0	0	0	0	0	0	0	0	0	0	1,045,696
	5			0				0	0	0	0	0	0	0	0	0	0	0	0
	6			0				0	0	0	0	0	0	0	0	0	0	0	0
	7			0				0	0	0	0	0	0	0	0	0	0	0	0
	8			0				0	0	0	0	0	0	0	0	0	0	0	0
	9			0				0	0	0	0	0	0	0	0	0	0	0	0
				766,312,431				0	0	0	0	0	2,338,106	2,338,106	2,338,106	5,417,728	6,829,010	6,829,010	7,874,706
Future Valued & Discounted to Year 2025:		228,733,874						0	0	0	0	0	2,958,451	2,844,664	2,735,254	6,094,207	7,386,257	7,102,170	7,874,706
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		1,173,207,750																	

Table NED COST6: Modified Partial Replacement Alternative Costs (Construction, IDC, Land Acquisition, and OMR&P only)

				Years to End of Construction Period:										
				Year #:										
		Discount Rate:												
		0.04	Year:		2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	Phase #	Future & Present Value Totals	Undiscounted Totals											
A.1: Construction & Noncontract Costs:	Weber Siphon													
	1		244,530,000											
	2		158,080,000											
	3		237,737,500											
	4		93,860,000											
	5		0											
	6		0											
	7		0											
	8		0											
	9		0											
	Total by Year:		734,207,500											
A.2: Interest During Construction (IDC):	1		28,981,533											
	2		22,685,841											
	3		28,176,491											
	4		11,124,225											
	5		0											
	6		0											
	7		0											
	8		0											
	9		0											
			90,968,090											
A.3: Construction & IDC Costs:	1		273,511,533											
	2		180,765,841											
	3		265,913,991											
	4		104,984,225											
	5		0											
	6		0											
	7		0											
	8		0											
	9		0											
			825,175,590											
Compounded to Year 2025:		942,013,129												
B.1: Land Acquisition Costs:			2,500,000		100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Future Valued & Discounted to Year 2025:		2,460,748			96,154	92,456	88,900	85,480	82,193	79,031	75,992	73,069	70,259	67,556
C.1: Operations, Maintenance, Replacement, & Power (OMR&P):														
	1		233,810,641											
	2		298,723,306											
	3		135,483,053											
	4		98,295,432											
	5		0											
	6		0											
	7		0											
	8		0											
	9		0											
			766,312,431	… to year 2118										
Future Valued & Discounted to Year 2025:		228,733,874		… to year 2118										
Total Construction, IDC, Land Acquisition, and OMR&P Costs:		1,173,207,750												

hydrology. Lost benefits were also initially estimated for recreation, but given the majority of recreation losses were assumed to be mitigated, they were not included in the BCA.

1.2.2.2.1 Lost Hydropower Benefits

Methodology and Assumptions – Losses in Columbia River system hydropower benefits were anticipated for the proposed alternatives due to the increased pumping from the Columbia River to provide surface water supplies for agriculture. Bonneville Power Administration (BPA) ran their Columbia River System hydropower model based on full diversion monthly operational changes associated with each proposed alternative as compared to the No Action Alternative to estimate changes in average monthly generation. Since there are two hydrologic scenarios (with Spring Diversions and with only Limited Spring Diversions), BPA had to run their model twice for each proposed alternative.

Note that since both partial (2A and 2B) replacement alternatives would imply the same level of additional pumping out of the Columbia River, there is no difference in terms of downstream hydropower effects between the two partial replacement alternatives. The same holds true for the full replacement alternatives (3A and 3B) and modified partial replacement alternatives (4A and 4B).

For each action alternative and hydrology scenario, BPA multiplied the changes (as compared to the No Action Alternative) in average monthly hydropower generation from the Columbia River System hydropower model by average monthly power values from the Final 2012 BPA Rate Case Flat Market Prices to estimate changes in average monthly hydropower benefits. The changes in monthly hydropower benefits were then aggregated into losses in average annual hydropower benefits. In addition, the costs of pumping the additional water up into Banks Lake were included in the BPA analysis (and not the OMR&P costs estimated by the cost engineers) and were added to the losses in hydropower benefits.

The average annual hydropower losses and pumping costs estimated by BPA reflect full diversion effects and were assumed to occur each year from 2025 to 2118 (end of the period of analysis). Since hydropower losses and additional pumping costs would begin at the same time as the agricultural diversions and those agricultural diversions are phased in as each canal construction phase is completed, it is logical to assume that hydropower losses and additional pumping would also be phased in. To estimate the percentage of the full hydropower loss and additional pumping which would be phased in each year prior to 2025 for each alternative and hydrologic scenario, the percent of agricultural acres

associated with each phase were divided by the agricultural acreage associated with all phases as shown in table HYDRO1. Note that one could convert the acreage into acre feet of water to better reflect water diversion out of the Columbia River, but that adjustment would have resulted in exactly the same percentages.

A gradually increasing cumulative percentage was calculated based on each year phases are expected to end, reflecting points of phasing in of the lost hydropower benefit. For example, the partial replacement alternative starts at the end of phase one in year 2019. Phase one includes 18,713 of the 57,070 acres irrigated under the partial replacement alternative which represents 32.8 percent of the total acreage. It was therefore assumed that 32.8% of the full hydropower annual loss would occur in year 2019 (and in years 2020-2021). Phase two includes 22,002 of the 57,070 acres irrigated under the partial replacement alternative. It was therefore assumed that 71.3% of the full hydropower annual loss would occur in year 2022 ((18,713+22,002)/57,070). Phase three includes 8,932 of the 57,070 acres irrigated under the partial replacement alternative. It was therefore assumed that 87.0 of the full hydropower annual loss would occur in year 2023 (and year 2024). As noted above, by year 2025, the full hydropower annual loss would occur. The same logic applies to the other alternatives. Note that for the full replacement alternatives, multiple phases end in the same year, so to obtain the cumulative percentages, one has to add across multiple phases.

In addition to the lost benefits estimated by BPA associated with losses in downstream hydropower generation and increased pumping costs, estimates were also made of the increased generation and value associated with on-project hydropower facilities. Two hydropower generation facilities exist within the Odessa study area – one on the main canal and another at Summer Falls. The Grand Coulee Project Hydroelectric Authority (GCPHA), which manages these facilities, was provided hydrologic on-project flow data for an average year (1995) for each alternative (including No Action) from which they estimated increases in daily and monthly generation. Applying the same average monthly values as used in the BPA hydropower analysis to the estimated gains in monthly on-project generation provides estimates of the gains in monthly on-project hydropower value. Aggregating the monthly increases in hydropower value provides an estimate of the average annual increase in on-project hydropower value. These gains in average annual on-project hydropower were combined with the losses in systemwide hydropower & pumping costs estimated by BPA to provide an average annual net loss in hydropower. The annual net hydropower and pumping cost loss was included as a lost benefit within the benefit cost analysis. These net annual lost benefits were phased in, as discussed above, and then compounded and discounted to year 2025.

Table HYDRO1.—Hydropower benefit phasing

Phase	Construction cost period	Acres by phase and alternative											
		Partial (2A&B)				Full (3A&B)				Modified Partial (4A&B)			
		Acres	%	Year	Cumulative %	Acres	%	Year	Cumulative %	Acres	%	Year	Cumulative %
1	2015-2019	18,713	32.8	2019	32.8	18,713	18.2	2019	18.2	25,313	35.9	2019	35.9
2	2017-2022	22,002	38.6	2022	71.3	22,002	21.4	2020	25.1	15,902	22.6	2022	58.4
3	2019-2023	8,932	15.7	2023	87.0	8,932	8.7	2022	59.0	19,544	27.7	2023	86.2
4	2012-2025	7,423	13.0	2025	100.0	7,423	7.2	2023	79.1	9,758	13.8	2025	100.0
5	2015-2020	0	0.0			7,085	6.9	2025	100.0	0	0.0		
6	2019-2023	0	0.0			11,671	11.4			0	0.0		
7	2021-2025	0	0.0			6,147	6.0			0	0.0		
8	2017-2022	0	0.0			12,756	12.4			0	0.0		
9	2021-2025	0	0.0			7,887	7.7			0	0.0		
		57,070	100.0			102,616	100.0			70,517	100.0		

Results

No Action Alternative – All lost hydropower benefits associated with the action alternatives were measured as changes from the No Action Alternative. While there are hydropower benefits associated with the No Action Alternative, those benefits would not change over time with declining groundwater levels as would the agricultural benefits. As a result, it is not necessary to estimate hydropower benefits for the No Action Alternative.

Partial Replacement Alternatives – Under the "Limited Spring Diversion" hydrologic scenario, the average annual loss in hydropower benefits and additional pumping costs was estimated by BPA at $7.091 million for both partial replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.576 million) results in a net average annual loss of $6.515 million. Compounding and discounting the 100-year stream of annual lost net hydropower benefits to the end of the construction period results in a total hydropower loss of $190.2 million for both partial replacement alternatives.

Under the "With Spring Diversion" hydrologic scenario, the average annual loss in hydropower benefits and additional pumping costs was estimated by BPA at $6.341 million for both partial replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.576 million) results in a net average annual loss of $5.765 million. Compounding and discounting the 100-year stream of annual lost net hydropower benefits to the end of the construction period results in a total hydropower loss of $168.3 million for both partial replacement alternatives.

Full Replacement Alternatives – Under the "Limited Spring Diversion" hydrologic scenario, the same average annual loss in hydropower benefits and additional pumping costs, $12.980 million, was estimated by BPA at for both full replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.671 million) results in a net average annual loss of $12.310 million. Compounding and discounting the 100-year stream of average annual lost hydropower benefits to the end of the construction period results in a total hydropower loss of $351.1 million for both full replacement alternatives.

Under the "With Spring Diversion" hydrologic scenario, the same average annual loss in hydropower benefits and additional pumping costs, $11.872 million, was estimated by BPA at for both full replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.671 million) results in a net average annual loss of $11.201 million. Compounding and discounting the 100-year stream of average annual lost hydropower benefits to the end of the construction period results in a total hydropower loss of $319.5 million for both full replacement alternatives.

Modified Partial Replacement Alternatives – Under the "Limited Spring Diversion" hydrologic scenario, the average annual loss in hydropower benefits and additional pumping costs was estimated by BPA at $8.339 million for the modified partial replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.571 million) results in a net average annual loss of $7.768 million. Compounding and discounting the 100-year stream of average annual lost hydropower benefits to the end of the construction period results in a total hydropower loss of $226.4 million for the modified partial replacement alternatives.

Under the "With Spring Diversion" hydrologic scenario, the average annual loss in hydropower benefits and additional pumping costs was estimated by BPA at $7.253 million for the modified partial replacement alternatives. Adding in the increased average annual on-project hydropower benefit ($0.571 million) results in a net average annual loss of $6.682 million. Compounding and discounting the 100-year stream of average annual lost hydropower benefits to the end of the construction period results in a total hydropower loss of $194.7 million for the modified partial replacement alternatives.

1.2.2.2.2 Lost Recreation Benefits

Methodology and Assumptions – The analysis presented in section 4.14 Recreation of the Odessa FEIS indicates boat ramps at Banks Lake will become unavailable more frequently under the action alternatives as compared to the No Action Alternative. This would likely lead to reductions in recreation visitation and adverse recreation economic effects for these alternatives. To address this potential adverse effect, Reclamation and Ecology have committed to necessary recreation mitigation measures as described in section 4.14.9 Mitigation of the Odessa FEIS. This mitigation assumption results in the virtual elimination of the majority of the anticipated boating access based adverse recreation economic effects. While this boat ramp mitigation may not eliminate all losses in recreation activity and economic value at Banks Lake due to water level decline, it is assumed that it would alleviate the majority of the losses. Affected parties will be given ample opportunity to provide input into any recreation mitigation plans at Banks Lake.

Results

No Action Alternative – All lost recreation benefits associated with the action alternatives were measured as changes from the No Action Alternative. While there are recreation benefits associated with the No Action Alternative, those benefits would not change over time with declining groundwater levels as would the agricultural benefits. As a result, it is not necessary to estimate recreation benefits for the No Action Alternative.

Partial Replacement Alternatives – With the assumed mitigation, losses in recreation activity and recreation economic value at Banks Lake were assumed to be minimal under the Partial Replacement Alternatives (2A and 2B).

Full Replacement Alternatives – With the assumed mitigation, losses in recreation activity and recreation economic value at Banks Lake were assumed to be minimal under the Full Replacement Alternatives (3A and 3B).

Modified Partial Replacement Alternatives – With the assumed mitigation, losses in recreation activity and recreation economic value at Banks Lake were assumed to be minimal under the Modified Partial Replacement Alternatives (4A and 4B).

2.0 REGIONAL ECONOMIC DEVELOPMENT (RED) IMPACT ANALYSIS

This section briefly describes the methodology used to estimate the regional economic impacts presented in the RED account as found in the Study. The modeling package used to assess the regional economic effects stemming from construction expenditures, operation and maintenance (O&M) expenditures, agricultural gross value of production and the associated potato processing for each alternative is IMPLAN (IMpact analysis for PLANning). IMPLAN is an economic input-output modeling system that estimates the effects of economic changes in a defined analysis area.

IMPLAN is a static model that estimates impacts for a snapshot in time when the impacts are expected to occur, based on the makeup of the economy at the time of the underlying IMPLAN data. Therefore it's difficult to address dynamic impacts such as a decline in gross farm income due to wells going out of production as a function of time using IMPLAN. As wells become less productive, farmers adapt perhaps by using new technology or new crop varieties. As the economy adapts to changing farm practices, labor and capital inputs employed in the analysis area would move to alternative uses. IMPLAN measures the initial impact to the economy but does not consider long term adjustments as labor and capital move into alternative uses.

The common measures of regional economic impacts include employment, regional income, and regional output (sales). Input output models measure commodity flows from producers to intermediate and final consumers. Purchases for final use (final demand) drive the model. Industries produce goods and services for final demand and purchase goods and services from other producers. These other producers, in turn, purchase goods and services. This buying of goods and services (indirect purchases) continues until leakages from the analysis area (imports and value added) stop the cycle. These indirect and induced effects

(the effects of household spending) can be mathematically derived using a set of multipliers. The multipliers describe the change in output for each regional industry caused by a one dollar change in final demand.

IMPLAN data files are compiled from a variety of sources for the analysis area including the U.S. Bureau of Economic Analysis, the U.S. Bureau of Labor, and the U.S. Census Bureau. This analysis uses 2008 IMPLAN data for the four counties within the analysis area (Adams, Grant, Franklin, and Lincoln Counties of Washington State).

2.1 Construction Costs

The construction costs associated with each alternative were divided into the phases described in chapter 2. The construction related expenditures for each phase were divided into expenditures that would be made inside the analysis area. The construction expenditures inside the analysis area were used in IMPLAN to estimate employment, labor income, and regional sales stemming from construction related activities for each phase. Construction expenditures made outside the analysis area were considered "leakages" and would have no impact on the local economy.

Reclamation's construction cost engineers allocated the costs associated with major construction activities to within-region expenditures as shown in table RED_TA1, and table RED_TA2 shows the regional construction expenditures by phase which were used in the IMPLAN analysis.

The analysis assumes that the onsite construction workforce would be hired from within the analysis area or commute to the area from nearby communities. It is also assumed that the majority of the construction expenditures would be funded from sources outside the analysis area. Money from outside the analysis area that is spent on goods and services within the analysis area contributes to regional economic impacts, while money that originates from within the analysis area is much less likely to generate regional economic impacts. Spending from sources within the analysis area represents a redistribution of income and output rather than an increase in economic activity.

The impacts by phase would be spread over the length of the construction period and would vary year-by-year proportionate to actual expenditures. The regional impacts associated with each phase cannot be summed across years into a total construction impact for the particular alternative to avoid double counting.

Table RED_TA1.—Allocations by construction activity within the analysis area

Construction activity	In region expenditures (%)
Canal enlargement and linings	75
Water service contracts	75
Pump station modifications	75
Wasteways	30
Siphons	60
Laterals	45
Drains subsurface	50
Pumping plants	35
Switchyards and transmission lines	25
Maintenance buildings	40
SCADA systems	20
Mobilization and preparatory work	60

Table RED_TA2.—In region IMPLAN construction expenses by phase

Construction phase	Alternatives 2 and 3 ($)	Alternative 4 ($)
Phase 1	67,386,354	90,156,316
Phase 2	103,895,821	58,392,784
Phase 3	36,710,452	87,435,395
Phase 4	36,710,452	34,714,117
Phase 5	404,190,357	–
Phase 6	125,286,196	–
Phase 7	92,230,234	–
Phase 8	101,130,955	–
Phase 9	39,243,631	–

2.2 O&M Costs

Expenditures that are made inside the study region related to O&M will also generate a positive economic output to the regional economy. Annual O&M for each alternative is summarized in table RED_TA3. For the purpose of this analysis, it's assumed that 80 percent of these O&M expenditures are made inside the four-county area. As construction phases are completed, annual O&M expenditures begin to accrue, however this analysis measures annual O&M impacts after all the construction phases are implemented. The analysis does not quantify the positive impacts resulting from replacement costs given they are spread out over the entire study period. Like the construction-related expenditures, O&M expenditures made inside the study area associated with each alternative were placed into categories related to the each sector of the economy and run through IMPLAN to estimate impacts to the regional economy.

Table RED_TA3.—Total in region O&M expenditures

	Partial A and B	Full A and B	Modified Partial A and B
Total	3,345,285	6,253,332	3,977,545

2.3 Agriculture

Gross farm income estimates are used in IMPLAN to measure changes in regional impacts related to agricultural crop production. The analysis also measures regional economic impacts stemming from potato processing activities associated with potato production in the study area. The following describes the procedure used to estimate the regional impacts stemming from irrigated agricultural production and the associated potato processing.

Impacts were measured for year 2010 and year 2025 when all construction phases are completed for each alternative including the No Action Alternative. Regional impacts were not estimated beyond the end of the construction phases, because of the uncertainties related to the re-employment of labor and capital.

2.3.1 Gross Farm Income

A spreadsheet model was used to forecast the future number of irrigated and dryland acres and the resulting gross farm income for each alternative. The spreadsheet model is described in the NED section. Gross farm income was calculated by multiplying the number of acres of each crop by yield per acre and

the price received for each unit of yield. The data used to derive the gross farm income is described in the NED section. However the price received to generate the gross farm income used in the RED analysis differ from the prices used in the NED analysis. The difference is because the P&Gs require the use of USDA normalized prices for benefit analyses. The prices used in the RED analysis are presented below in table RED_TA4.

RED_TA4.—Prices received by crop, 2005–09

Crop	Yield unit	State average prices ($)					
		2005	2006	2007	2008	2009	Average
Wheat	Bushel	3.21	4.35	7.51	6.25	4.85	5.23
Mixed crops	Pounds	0.218	0.229	0.4069	0.308	0.286	0.2894
Potatoes	Cwt	5.60	6.00	6.70	7.95	7.40	6.63

Source: USDA 2010.

The average gross farm income generated on the approximately 102,600 acres in the study area is shown, for each alternative, in table RED_TA5. The numbers shown in table RED_TA5 were used in IMPLAN to estimate regional impacts.

2.3.2 Potato Processors (Forward Linked Activity)

Irrigated potatoes grown in the study area are desirable to local processors due to their high quality and storage characteristics. Local processors use all of the potatoes grown in the study area. Potatoes grown in other areas of the Columbia Basin have a shorter storage life and are used first by the local processors. The potatoes grown in the study area have a long storage life and allow the local processors to operate on a year round basis. For these reasons local area experts assert that losing potatoes grown in the study area cannot be replaced by production in any other area.

This analysis assumes that the loss of potato production in the study area cannot be replaced by production other areas resulting in a high end estimate of regional impacts. It's likely in the long run that potato growers and processors will adjust leading to potatoes grown in other areas or adjustments in the processing processes. This may be necessary independent of ground water conditions as new ground is also necessary to break disease cycles.

Table RED_TA5.—Gross farm income by crop and alternative for years 2010 and 2025

Gross farm income by crop	Year 2010	Year 2025
No Action Alternative gross farm income		
Potato	$62,527,000	$16,983,000
Wheat	$23,727,000	$18,955,000
Mixed crops	$24,854,000	$14,421,000
Total	**$111,108,000**	**$54,550,100**
Alternative 2A-D : Partial—banks gross farm income		
Potato	$62,527,000	$102,021,000
Wheat	$23,727,000	$18,644,000
Mixed crops	$24,854,000	$25,044,000
Alfalfa	$0	$23,429,000
Total	**$111,108,000**	**$169,138,000**
Alternative 3A-D: Full—banks gross farm income		
Potato	$62,527,000	$169,886,000
Wheat	$23,727,000	$16,341,000
Mixed crops	$24,854,000	$0
Alfalfa	$0	$42,127,000
Total	**$111,108,000**	**$228,354,000**
Alternative 4A-B: Modified Partial –Banks gross farm income		
Potato	$62,527,000	$122,059,000
Wheat	$23,727,000	$17,964,000
Mixed crops	$24,854,000	$4,511,000
Alfalfa	$0	$28,949,000
Total	**$111,108,000**	**$173,483,000**

Gross value of potato production was estimated using a spreadsheet model, discussed in the NED section, these results are shown in table RED_TA6.

Table RED_TA6.—Gross farm incomes for potatoes for each alternative

Gross farm income by crop	Year 2010	Year 2025
No Action Alternative gross farm income	$62,527,000	$16,983,000
Alternative 3A: Partial gross farm income	Same as No Action	$102,021,000
Alternative 3A: Full gross farm income	Same as No Action	$169,886,000
Alternative 4A Modified Partial gross farm income	Same as No Action	$122,059,000

According to the Washington Potato Commission 10 percent of potatoes grown in study area are sold to the fresh market. Seventy five percent of the study area potatoes are sold to processors for frozen food products. Ten percent are sold for dehydrated potato products. The remaining 5 percent are marketed for chipping potatoes. Because the IMPLAN dataset for the 4 county area indicated that no chipping potatoes exist in the area, the 5 percent assumed to be chipping potatoes was added to the dehydrated category. Table RED_TA7 summarizes the percentages of potatoes sold to each marketing category.

Table RED_TA7.—Percentage of potatoes sold by market category

Fresh market	10
Frozen food products	75
Dehydrated food products	15

Source: Personal communication with WA Potato Commission.

2.3.2.1 Gross Absorption Coefficient Approach

Because farmers sometimes get some of their inputs from other farmers it is necessary to adjust the gross farm income or farm gate output for final demand. An example of this may be potato farmers buying seed potatoes from other operators. Change in final demand is calculated using the equation below.

$$\text{Final demand factor} * \text{gross farm income} = \text{final demand}$$

$$\text{Final demand factor} = 1/\text{intersect value}$$

The intersect value is found in IMPLAN under "Explore Multipliers" and selecting the Detail Multipliers tab. In the "Detail Multipliers" section the intersect is the Type SAM multiplier for the particular processor industry. If the intersect value is small it indicates that there is very little inter-industry demand is embodied in the multipliers so no double counting occurs, in this case this step can be ignored. The intersect value for IMPLAN industry vegetables and melon farming (sector 3) equals 1.04967.

Final demand for potatoes used in this analysis to calculate forward links is equal to $59,568,245.

Using percentages of potatoes sold by market category shown in table RED_TA7, the gross farm income associated with growing potatoes in the study area is divided into the market categories for the purpose of this analysis. It's likely this overstates the value of the product sold to the processors sectors because the inability to estimate the prices of each market category. The monetary values are shown in table RED_TA8.

Table RED_TA8.—Value of potatoes by market category for each alternative for years 2010 and 2025

Year 2010	**Frozen food products**	**Dehydrated food products**
No Action Alternative	$49,895,000	$9,379,000
Alternative 3A: Partial	Same as No Action	Same as No Action
Alternative 3A: Full	Same as No Action	Same as No Action
Alternative 4A: Modified Partial	Same as No Action	Same as No Action
Year 2025	**Frozen food products**	**Dehydrated food products**
No Action Alternative	$12,737,250	$2,547,450
Alternative 3A: Partial	$76,515,750	$15,303,150
Alternative 3A: Full	$127,414,500	$25,482,900
Alternative 4A: Modified Partial	$91,544,250	$18,308,850

Input-output models like IMPLAN rely on monetary inputs in terms of producer prices. The gross absorption coefficients (GAC) provided by IMPLAN are used to convert the monetary values in table RED3 to producer prices, referred to as the Gross Absorption Coefficient Approach.

The approach uses the averaged industry production functions provided by IMPLAN for the potato processing sectors. The GACs display how much money an industry spends on inputs for every dollar of total industry output. For example, the GAC for Frozen Food Products (IMPLAN sector 53) as an input to potato production is a ratio of input value (potatoes farm gate) to output value. Because we know the farm gate prices of potatoes, the total industry output (TIO) for the frozen food sector is estimated using the following equation.

$$\text{Frozen food TIO} = \text{total revenue (potatoes)} * (1 + \text{GAC})$$

The GAC equals 6.11% for frozen food products (IMPLAN industry 54) and the GAC for dehydrated food products (IMPLAN industry 55) equals 5.23%.

The purpose of this calculation is to account for markups like transportation and marketing costs. These results are shown in table RED_TA9.

Table RED_TA9.—Total industry output

Year 2010	**Frozen food products**	**Dehydrated food products**
No Action Alternative	$49,761,957	$9,869,574
Alternative 3A: Partial	Same as No Action	Same as No Action
Alternative 3A: Full	Same as No Action	Same as No Action
Alternative 4A: Modified Partial	Same as No Action	Same as No Action
Year 2025	**Frozen food products**	**Dehydrated food products**
No Action Alternative	$13,515,878	$2,680,682
Alternative 3A: Partial	$81,193,158	$16,103,505
Alternative 3A: Full	$135,203,348	$26,815,656
Alternative 4A: Modified Partial	$97,140,350	$19,266,403

Table RED_TA10 shows the final demand numbers which are the used in IMPLAN to calculate the regional impacts stemming from potatoes grown in the Study area by alternative.

RED_TA10.—Final demand by alternative for years 2010 and 2025

Year 2010	**Frozen food products**	**Dehydrated food products**
Year 2010		
No Action Alternative	$49,504,976	$9,662,441
Alternative 3A: Partial	Same as No Action	Same as No Action
Alternative 3A: Full	Same as No Action	Same as No Action
Alternative 4A- Modified Partial	Same as No Action	Same as No Action
Year 2025	**Frozen food products**	**Dehydrated food products**
No Action Alternative	$13,446,080	$2,624,422
Alternative 3A: Partial	$80,773,861	$15,765,529
Alternative 3A: Full	$134,505,132	$26,252,873
Alternative 4A- Modified Partial	$96,638,699	$18,862,057

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