

4.0 DEVELOPMENTAL ANALYSIS

In this section, we look at the Priest Rapids Project's use of the Columbia River for hydropower purposes to see what effect various environmental measures would have on the Project's costs and power benefits. Consistent with the Commission's approach to economic analysis, the "power benefit" of the project is defined as the cost of obtaining the same amount of energy and capacity using the likely alternative generating resources available in the region. The "power value" is the unit cost of the selected alternative generating resource and is usually expressed in terms of dollars per megawatthour (\$/MWh) for energy and dollars per kilowatt-year (\$/kW-yr) for capacity. The combined value (or cost) of energy and capacity can also be expressed in terms of \$/MWh for a given amount of energy and capacity. Reducing the cost of licensing alternatives to an average cost per unit of electricity generated provides a convenient metric for assessing the public benefit of the project for power production.

In keeping with Commission's policy as described in Mead, our economic analysis is based on current electric power cost conditions and does not consider future escalation of fuel prices in valuing the hydropower project's power benefits.⁹¹ Our analysis includes: (1) an estimate of the net power benefit of the Project for each of the licensing alternatives, and (2) an estimate of the cost of individual measures considered in the EIS for the protection, mitigation and enhancement of environmental resources affected by the Project.

To determine the net power benefit for each of the licensing alternatives, we subtract the cost of producing power at the Project from the total power benefit, which, as we said above, is the cost of obtaining the same amount of power using a likely alternative source of power. For any alternative, a positive net annual power benefit indicates that the Project costs less than the current cost of alternative generation resources; a negative net annual benefit indicates that project power costs more than the current cost of alternative generation resources. The net benefit helps to support an informed decision concerning what is in the public interest with respect to a proposed licensing alternative, or proposed license condition. However, project economics is only one of many public interest factors the Commission considers in determining whether, and under what conditions, to issue a license.

⁹¹See Mead Corporation, Publishing Paper Division, 72 FERC ¶61,027 (July 13, 1995). In most cases electricity from hydropower would displace some form of fossil-fueled generation, in which fuel cost is the largest component of the cost of electricity production.

In the comprehensive development section, we use the estimated cost of individual measures to help us decide if the environmental benefit to the resource (usually described in qualitative, or non-dollar valuation terms) justifies the cost of the measure. For this purpose, we convert the capital and annual cost of individual measures to equal annual amounts spread over a 30-year period of analysis.

4.1 POWER AND ECONOMIC BENEFITS OF THE PROJECT

For the Priest Rapids Project, we assume the energy value is similar to the cost of purchasing the equivalent generation from BPA at its new resource rate for firm power.⁹² Using the average of the monthly high and low load hourly energy rates for BPA customers buying power for all 5 years of the 5-year rate period, we calculate an average energy value of \$34/MWh. We use BPA's new resource capacity demand rate schedule to value the project's 1,535,000 kW of dependable capacity at \$24 per kW per year (kW-yr). Using the average energy value of \$34/MWh and a capacity value of \$24/kW-yr, the combined power value is \$39/MWh based on the current average annual net generation of 8,608,799 MW.

The current cost economic analysis is not entirely a first-year analysis in that certain costs, such as major capital investments, would not be expended in a single year. The maximum period we use to annualize such costs is 30 years. Also, some future expenses, such as taxes and depreciation, are known and measurable and are, therefore, incorporated in our cost analysis.

Table 39 summarizes the assumptions and economic information we use in our analysis. Most of this information was provided by Grant PUD in its license application. We find that the values provided by Grant PUD are reasonable for the purposes of our analysis. Cost items common to all alternatives include: taxes and insurance costs; net investment (the total investment in power plant facilities remaining to be depreciated); relicensing costs; normal operation and maintenance cost; and Commission fees.

⁹² Bonneville Power Administration, 2002 Wholesale Power Rate Schedules (Revised May 2004).

Table 39. Summary of key parameters for economic analysis of the Priest Rapids Project. (Source: as noted).

Parameter	Value	Source
Existing Capacity/Net Dependable Capacity:		
Wanapum (MW)	1038/842	Grant PUD ^a
Priest Rapids (MW)	<u>855/805</u>	
Total (MW)	1,893/1,647	
Proposed Capacity/Net Dependable Capacity:		
Wanapum (MW)	1038/842	Grant PUD ^a
Priest Rapids (MW)	<u>956/900</u>	
Total (MW)	1,994/1,742	
Existing Average Annual Generation:		
Wanapum (MWh/yr)	5,121,289	Grant PUD ^b
Priest Rapids (MWh/yr)	4,558,338	
Less Rock Island Tailwater benefit	<u>-639,993</u>	
Total (MWh/yr)	9,039,634	
Proposed Average Annual Generation:		
Wanapum (MWh/yr)	5,121,289	Grant PUD ^b
Priest Rapids (MWh/yr)	5,258,690	
Less Rock Island Tailwater benefit	<u>-626,301</u>	
Total (MWh/yr)	9,753,677	
Energy value	\$34/MWh	Grant PUD/staff ^c
Capacity value	\$24/kW-year	Staff ^c
Overall cost of money	7 percent	Grant PUD/Staff
Discount rate	7 percent	Staff
Term of financing	20 years	Staff
Period of analysis	30 years	Staff
Annual Operation & Maintenance cost	\$35,745,586	Grant PUD/staff ^c
Net Investment	\$416,904,355	Grant PUD ^f

^a From Exhibit B of license application; net dependable capacity is based on summer flow and load conditions.

^b From Exhibit B of license application; adjustment compensates for Wanapum reservoir encroachment at Rock Island Project's tailwater.

^c Based on BPA's new resource energy and capacity rate schedule.

^e From Grant PUD's 2004 Annual Report: \$17,606,837 for Wanapum (p. 140) and \$18,138,749 for Priest Rapids (p.109).

^f Net plant investment estimated by staff from information contained in Grant PUD's 2004 Annual Report; includes total plant investment less accumulated depreciation for Priest Rapids and Wanapum (\$142,029,777 and \$160,886,947, respectively), plus costs for construction in progress (\$62,107,121) and licensing costs (\$51,880,510), all as of December 31, 2004.

4.2 COMPARISON OF ALTERNATIVES

Table 40 summarizes the annual cost, power benefits, and annual net benefits for the three alternatives considered in this DEIS: no-action, Grant PUD's proposal, and the staff alternative.

Table 40. Summary of the annual cost, power benefits, and annual net benefits for three alternatives for the Priest Rapids Hydroelectric Project. (Source: staff)

	No Action	Grant PUD's Proposal	Staff Alternative
Installed capacity (MW)	1,893	1,994	1,994
Annual generation (MWh)	9,039,634	9,753,677	9,753,677
Annual power value (\$/MWh and mills/kWh)	\$329,546,000 38.28	\$377,346,000 38.69	\$377,346,000 38.68
Annual cost (\$/MWh and mills/kWh)	\$69,341,000 8.06	\$107,799,000 11.05	\$107,775,000 11.05
Annual net benefit (\$/MWh and mills/kWh)	\$260,205 30.22	\$269,546 27.63	\$269,570,000 27.64

4.2.1 No-Action Alternative

Under the no-action alternative, the project would continue to operate as it does now. On July 23, 2004, the Commission issued an order⁹³ amending Grant PUD's license and authorizing the replacement of the 10 turbines at the Wanapum development with ten new, upgraded turbines over a period of about 8 years. The order authorized the replacement of one turbine, followed by a study to test the effect of the advanced turbine design on fish passage survival. Replacement of the remaining 9 turbines would be allowed to proceed only after the Commission informed the licensee that test results were satisfactory. On October 11, 2005, Grant PUD filed a report on fish survival through the first installed turbine and, subsequently, on December 14, 2005, the Commission issued an order⁹⁴ authorizing the installation of the remaining nine advanced design hydro turbines. The new turbines increase the capacity of each turbine generator set by 13.8

⁹³ 108 FERC ¶ 62,075 (2004).

⁹⁴ 113 FERC ¶ 62,205 (2005)

MW. The Commission's order approving the installation of the remaining 9 turbines increased the authorized capacity of the Wanapum Development from 900 to 1,038 MW. Grant PUD expects to replace the remaining 9 turbines at the rate of about one every 9 months. The capacity and average annual generation for the no-action alternative in this DEIS represents the conditions after replacement of all approved turbine units at the Wanapum Development. Likewise, the cost of the Wanapum turbine replacements is included in the no-action alternative. Grant PUD estimates it will cost \$124,630,387 to replace the Wanapum turbines with the advanced design turbines.

Under the no-action alternative, the planned replacement of the 9 remaining turbines at the Wanapum Development would occur, but Grant PUD would not replace the turbines at the Priest Rapids Development or implement new environmental measures. Upon completion of the approved turbine replacements at Wanapum, the project would have a total authorized installed capacity of 1,893 MW and annually generate an average of 9,049,667 MWh of electricity. Based on our estimate of the current cost of replacing this amount of power with no consideration of inflation over the 30-year period of our analysis, the average annual power value of the project under the no-action alternative would be \$346.9 million (about \$38.7/MWh). The average annual cost of producing this power would be \$78.4 million (about \$8.7/MWh), resulting in an average annual net benefit of \$268.5 million (about \$29.7/MWh).

4.2.2 Grant PUD's Proposal

Grant PUD proposes to replace the 10 existing turbines at the Priest Rapids development with the same advanced turbine design being used for the Wanapum Development. Based on its assessment of the remaining useful life of the existing Priest Rapids turbines, Grant PUD proposes to replace the turbines beginning in 2017 and extending through 2023. The total cost of Priest Rapids turbine replacement is estimated at \$155,374,804. We include this cost and the resulting capacity and generation increases in the proposed action alternative. Upon completion of the replacement of all 10 turbines, the total capacity at the Priest Rapids development would increase from 855 to 955.6 MW, the rated capacity of the existing generators.

Upon completion of the proposed turbine replacement upgrades at both developments, the total Priest Rapids Project capacity would increase to about 1,994 MW, an increase of about 225 MW from the current installed capacity of 1,768.8 MW. With a total capacity of 1,994 MW, a dependable capacity of 1,742 MW and an average annual generation of 9,753,677 MWh, the Priest Rapids Project would have an annual power value of \$377.3 million (\$38.7/MWh), an annual production cost (levelized over the 30-year period of our analysis) of \$107.8 million (\$11.1/MWh), and an annual net benefit of \$269.5 million (\$27.6/MWh).

4.2.3 Staff Alternative

The staff alternative includes the same developmental upgrades as Grant PUD’s proposal and, therefore, would have the same capacity and energy attributes. Table 41 shows the staff recommended additions and modifications to Grant PUD’s proposed environmental protection and enhancement measures and the estimated cost of each. A zero cost for an item in Table 41 means that the cost of the measure is included in Grant PUD’s proposal.

Based on a total capacity of 1,994 MW, a dependable capacity of 1,742 MW and an average annual generation of 9,753,677 MWh, the Priest Rapids Project would have an annual power value of \$377.3 million (\$38.7/MWh), an annual production cost (levelized over the 30-year period of our analysis) of \$107.8 million (\$11.0/MWh), and an annual net benefit of \$269.6 million (\$27.6/MWh) under the staff alternative. The economics of the staff alternative are very nearly the same as for the proposed project. Although the staff alternative proposes some additional measures not included in the Grant PUD’s proposal, the cost of additional measures recommended by staff are offset by the subtraction of costs for some of the measures proposed by Grant PUD that are not recommended by staff. The staff alternative does not include the \$1,000,000 upgrade and \$100,000/yr O&M funds for the Columbia Hatchery; and the \$100,000 annually for Kittitas County security personnel.

Table 41. Staff recommended additions and modifications to Grant PUD’s proposed environmental protection and enhancement measures for the Priest Rapids Project. (Source: Staff)

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Develop a detailed fishery operations plan	\$7,500	N/A	\$600
Investigate the gate seals at Wanapum dam as a source of mortality	\$50,000	N/A	\$4,030
Develop and implement a Fish Habitat Plan	\$5,000	Unknown	\$400

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Develop and implement a performance evaluation plan for salmon and steelhead measures	Unknown	Unknown	Unknown
Conduct hatchery effectiveness monitoring	N/A	\$100,000	\$100,000
Report all occurrences of bull trout in the project area to Interior	\$0	\$0	\$0
Develop and implement a white sturgeon management plan	N/A	\$50,000	\$50,000
Develop and implement an invasive species plan for aquatic and terrestrial species	\$0	\$0	\$0
Develop and implement a fire suppression program	\$0	\$0	\$0
Conduct recreational use monitoring on BLM lands	\$0	\$0	\$0
Provide additional signage at identified recreation sites	\$5,000	\$0	\$400
Include a provision (<i>e.g.</i> , signs) at Quilomene Dune and Bay day-use area to address wake size by boaters	\$1,000	\$0	\$80

4.3 COST OF ENVIRONMENTAL MEASURES

Certain measures proposed by Grant PUD and other parties would affect project economics because they can increase the production cost by requiring new capital expenditures or additional annual costs for O&M. Other measures would affect the project's power production capability or average annual generation. Table 42 summarizes the costs of environmental measures proposed by Grant PUD and Table 43 summarizes the costs of measures recommended by staff or others. For measures where

all or a portion of the cost is based on the cost of replacing project power benefits, the amount and assumed value of foregone power is given in the table footnotes.

Table 42. Cost of environmental protection, mitigation and enhancement measures proposed by Grant PUD for the Priest Rapids Hydroelectric Project. (Source: Grant PUD, 2003a, modified by staff.)

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Geology and Soils			
Monitor Reservoir Shoreline Erosion Sites and Implement Controls When Needed	Unknown	Unknown	Unknown
Develop and Implement Plans to Protect Cultural Resource Sites from Erosion ¹	Unknown	Unknown	Unknown
Water Quantity and Quality			
TDG and GBT Monitoring	N/A	\$48,000	\$48,000
Temperature and WQ Monitoring Program	N/A	\$140,000	\$140,000
TDG features of Priest Rapids fish bypass system	Unknown	Unknown	Unknown
TDG features of Wanapum fish bypass system	Unknown	Unknown	Unknown
Tailrace pumping to replace gravity fishway attraction water supply	\$3,676,450	N/A	\$296,000
Aquatic Macrophyte Monitoring	N/A	\$25,000	\$25,000
Nuisance aquatic macrophyte removal	N/A	\$7,000	\$7,000

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Zebra mussel monitoring	N/A	\$2,000	\$2,000
Fisheries Resources			
Sluiceway Spill for fallback at Priest Rapids and Wanapum Dams	N/A	\$2,204,371 ²	\$2,204,371
Priest Rapids and Wanapum Fishways	N/A	\$771,693	\$771,693
Adult trapping facilities at Priest Rapids	\$980,878	\$5,000	\$84,000
Adult Pit-tag facilities at Priest Rapids Dam	\$319,830	\$10,000	\$35,800
Video Fish Counting Systems at both dams	\$1,250,000	\$200,000	\$300,700
Lamprey Passage Measures	\$219,122	\$10,000	\$27,700
Fishway automation, improvements and junction pool modifications	\$2,700,000	N/A	\$217,600
Downstream Bypass System Phase 1 & 2 at Priest Rapids	\$17,977,740	\$16,326,768 ³	\$17,775,000
Gatewell Exclusion Screens at both dams	\$500,000	\$20,000	\$60,300
Downstream Bypass System at Wanapum Dam	\$26,874,403	\$11,124,864 ⁴	\$13,290,000
Northern Pike Minnow removal Program	N/A	\$199,987	\$199,987
Avian Predator Control Program	N/A	\$166,520	\$166,520
Anadromous Fish Monitoring and Evaluation Studies	N/A	\$2,000,000	\$2,000,000

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Spring Chinook Hatchery Supplementation Program	\$10,722,172	\$700,000	\$1,564,000
Summer Chinook Hatchery Supplementation Program	\$8,756,339	\$800,000	\$1,505,000
Priest Rapids Hatchery Fall Chinook Program	\$11,754,801	\$881,166	\$1,828,000
Sockeye Hatchery Feasibility or Alternative Program	\$12,119,304	\$218,834	\$1,195,000
Steelhead Hatchery Supplementation Program	\$3,870,181	\$200,000	\$511,900
Biological Assessment & Management Plan Program Development and Ancillary Facilities	\$9,000,000	\$200,000	\$925,300
Acclimation & Broodstocking Facilities	\$9,939,694	N/A	\$801,000
Habitat Mitigation Fund	N/A	\$1,096,552	\$1,096,552
Fall Chinook Spawning Habitat Enhancements	N/A	\$50,000	\$50,000
Hanford reach Fall Chinook Protection Program	N/A	\$4,346,607	\$4,346,607
White Sturgeon restoration & Enhancement Program	\$1,905,368	\$150,000	\$303,547
Columbia Basin Hatchery Funding	\$1,000,000	\$100,000	\$180,600
Terrestrial Resources			
Lower Crab Crk Mgmt Plan	\$7,200,000	\$30,000	\$610,200
Colockum/Whiskey Dick/Quilomene Enhancements	\$2,000,000	\$70,000	\$231,200

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Land Acquisition Fund	\$1,000,000	N/A	\$80,586
Northern Wormwood Conservation Plan	N/A	\$40,000	\$40,000
Transmission line avian protection measures	\$500,000	N/A	\$40,300
Transmission line RTE botanical protection	N/A	\$7,000	\$7,000
RTE Plant Monitoring Program	N/A	\$35,000	\$35,000
RTE Plant Research Program	N/A	\$13,500	\$13,500
Fire Suppression Program	N/A	\$60,000	\$60,000
Bald Eagle perch/roosting tree enhancements	N/A	\$17,500	\$17,500
Perch Pole and Duck Box Maintenance	N/A	\$15,500	\$15,500
Cultural Resources			
Implementation of Historic Properties Management Plan	\$10,000,000	\$75,000	\$880,900
Cultural Resources Management Facilities	\$10,000,000	N/A	\$805,900
Recreation Resources			
Interpretation and Education Plan	\$83,500	\$8,000	\$14,730
Law Enforcement, Resource Protection, Visitor Management	N/A	\$100,000	\$100,000
Implementation of RRMP	N/A	\$26,000	\$26,000
Periodic Monitoring Surveys	N/A	\$75,000 ⁵	\$7,500

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Nuisance Aquatic Plant Management	\$15,000	\$7,000	\$8,200
Dispersed Recreation Site Maintenance/Management	\$15,000	\$3,000	\$4,200
Airstrip Site (New)	\$7,892,500	N/A	\$636,000
Apricot Orchard Boat Launch	\$156,400	\$2,000	\$14,600
Beverly Dunes OHV Park	\$5,000	\$3,000	\$3,400
Buckshot Ranch Boat Launch	\$42,200	\$1,500	\$4,900
Crab Creek Corridor	\$452,320	\$8,000	\$44,450
Crescent Bar Public Use Sites	\$1,800,850	\$12,500	\$157,600
Desert Aire Boat Launch	\$705,450	\$3,250	\$60,100
Frenchman's Coulee	\$224,100	\$1,500	\$19,600
Getty's Cove	\$511,750	N/A	\$41,240
Huntzinger Road Boat Launch	\$684,000	\$3,000	\$58,100
Huntzinger Road Fishing Access	\$88,500	\$2,000	\$9,100
Kittitas County Boat Launch	\$138,900	\$15,000	\$26,200
Lower Wanapum Dam Boat Launch	\$64,000	\$3,000	\$8,100
Mattawa RV Park (New)	\$830,410	\$2,500	\$69,400
Priest Rapids Park (New)	\$656,500	\$11,000	\$63,900
Quilomene Bay and Dune/West Bar	N/A	\$3,000	\$3,000
Rocky Coulee	\$193,700	\$6,000 ⁷	\$21,600

Environmental Measure	Capital and One-time Costs	Annual Costs, Including O&M	Total Annualized Cost
Sand Hollow – North	\$127,000	\$3,000	\$13,200
Sand Hollow – South	\$1,223,500	\$13,000	\$111,600
Shoreline below Priest Rapids Dam	\$96,000	\$3,000	\$10,700
Sunland Boat Launch	\$90,900	\$6,000	\$13,300
Sunland Day-Use area (new)	\$412,500	\$4,000	\$37,200
John Wayne Pioneer Trail River Crossing (50% of total capital cost)	\$445,000	N/A	\$35,900
Vantage Area Trail	\$67,250	\$5,000	\$10,400
Upper Wanapum Dam Boat Launch	\$71,400	\$3,000	\$8,800
Vernita Bridge Boat Launch	\$500,000	N/A	\$40,300
Wanapum Dam Heritage Center	\$112,000	\$4,000	\$13,000
Wanapum Dam Overlook	\$66,500	\$2,000	\$7,400
Wanapum Dam Picnic area	\$80,900	\$4,000	\$10,600
Wanapum Recreation Area	\$1,853,300	N/A	\$149,300

¹ This measure is included in Grant PUD's proposed Cultural Resource Management Plan.

² Based on the cost of replacing 59,578 MWh of power at \$37/MWh.

³ Based on the cost of replacing 441,264 MWh of power at \$37/MWh.

⁴ Based on the cost of replacing 300,672 MWh of power at \$37/MWh.

⁵ Required every 12 years; assumed by staff to occur 3 times over the 30-year period of our analysis.

Table 43. Cost of additional environmental protection, mitigation and enhancement measures recommended by agencies, staff and others for the Priest Rapids Project.
(Source: Staff)

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Fisheries Resources				
Restrict Hanford Reach flows to 10,000-cfs weekly fluctuation	Interior, CRITFC, Yakima	\$46,200,000 ¹	\$112,500,000 ¹	\$116,223,000
Develop a Detailed Fishery Operations Plan	CRITFC	\$7,500	N/A	\$600
Study of Wanapum Gate Seals	NOAA Fisheries	\$50,000	N/A	\$4,030
Habitat Mitigation Plan	NOAA Fisheries WDFW CRITFC	\$5,000	N/A	\$403
Hatchery Effectiveness Monitoring	NOAA Fisheries WDFW	N/A	\$100,000	\$100,000
Bull Trout Reporting	Staff	\$0	\$0	\$0
Lamprey Management Plan – Hydraulic Study	Interior Staff	\$100,000	N/A	\$8,060
Lamprey Management Plan – Modifications to Fish Ladders	Interior	\$700,000	N/A	\$56,400
Lamprey Management Plan – Telemetry Study	Interior WDFW	\$200,000	N/A	\$16,100

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Lamprey Management Plan – Fishway Stranding Protocol	Interior WDFW Staff	\$5,000	N/A	\$403
White Sturgeon Management Plan - Annual Monitoring	Interior WDFW CRITFC Staff	N/A	\$50,000	\$50,000
Alternative Passage Standards	CRITFC	Unknown	Unknown	Unknown
PIT Tag Detection at Wanapum	CRITFC	\$319,830	\$10,000	\$35,800
Measures-Based Passage Plan	CRITFC	Unknown	Unknown	Unknown
Study of Peaking Effects on Passage	CRITFC	\$200,000	N/A	\$16,100
Spill at Wanapum for Downstream Passage until completion of dedicated spill bay	NOAA Fisheries		\$18,00,000 (temporary)	Unknown
Index Test all turbines	CRITFC	Unknown	Unknown	Unknown
Upgrade to State-of-the-Art Hatchery facilities	CRITFC ADFG	Unknown	Unknown	Unknown
No Net Income Fund	NOAA Fisheries WDFW	N/A	\$2,562,206	\$2,562,206
Future Populations	WDFW	Unknown	Unknown	Unknown

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Fund Regional Salmon Stock Evaluations	CRITFC	Unknown	Unknown	Unknown
Tributary Steelhead Surveys	WDFW	N/A	\$70,000	\$70,000
Flows to Accommodate Fall Chinook Escapement	Interior CRITFC ADFG	Unknown	Unknown	Unknown
Flows to Protect Fall Chinook Salmon Eggs	Interior CRITFC ADFG	Unknown	Unknown	Unknown
Flows to Protect Rearing Fall Chinook Salmon	Interior CRITFC ADFG	\$46,200,000 ¹	\$112,500,000 ¹	\$116,223,000
Spawning Behavior Studies	Interior CRITFC ADFG	\$200,000	N/A	\$16,100
Primary & Secondary Production Studies	Interior CRITFC	\$450,000	N/A	\$36,200
Conduct Annual Stranding & Entrapment Surveys in Hanford Reach	Interior CRITFC ADFG	N/A	\$150,000	\$150,000
Implement Salmon and Steelhead Passage Measures for Bull Trout	Interior WDFW	\$0	\$0	\$0

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Develop and Implement a Bull Trout Management Plan	Interior WDFW	\$575,000	N/A	\$46,300
Pacific Lamprey Studies	Interior WDFW CRITFC	\$1,250,000	N/A	\$100,700
Lamprey Passage Standards	Interior WDFW CRITFC	unknown	unknown	Unknown
Alternative Lamprey Passage Methods – Capture & Haul	Interior	N/A	\$80,000	\$80,000
Alternative Lamprey Passage Methods – Dedicated Fishway	Interior	\$2,000,000	Unknown	\$161,200
Lamprey Research and Regional Coordination	Interior WDFW CRITFC	unknown	unknown	Unknown
Lamprey Biologist	WDFW	N/A	\$30,000	\$30,000
White Sturgeon research and Regional Coordination	Interior WDFW CRITFC	Unknown	Unknown	Unknown
White Sturgeon Biologist	WDFW	N/A	\$30,000	\$30,000
Pikeminnow Removal/Resident Fish Study	CRITFC	\$300,000	N/A	\$24,200

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Terrestrial Resources				
Develop and implement an invasive species plan for BOR lands	Interior	\$0	\$0	\$0
Cultural Resources				
Develop a Cultural Resource Protection, Mitigation and Monitoring Plan for BLM lands	Interior	Unknown	Unknown	Unknown
Recreation Resources				
Develop a Coordinated Recreation & Wildlife Management Plan for BLM lands	Interior	Unknown	Unknown	Unknown
Develop a Recreation Monitoring Plan for intermingled BLM lands	Interior	Unknown	Unknown	Unknown
Fund 100% of the Restoration and Maintenance of the Beverly Bridge (John Wayne Trail)	WDNR	\$439,750	\$13,000	\$48,400

Environmental Measure	Recommending Entities	Capital and One Time Cost	Annual Cost, Including O&M	Total Annualized Cost
Improvements and Additions to Vantage Boat Launch	Kittitas County Public Works	Unknown	Unknown	Unknown
Provide Funding to Kittitas County for 2 Sheriff Deputies and vessel, May-Oct	Kittitas County	N/A	\$100,000	\$100,000

¹Based on cost of providing 1,320-MW Simple Cycle Combustion Turbine for operation from March 1 – June 15 and gas prices of \$4/MMBtu (currently gas prices are over \$6/MMBtu).

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