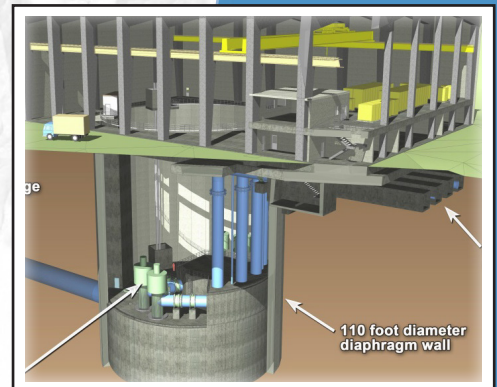
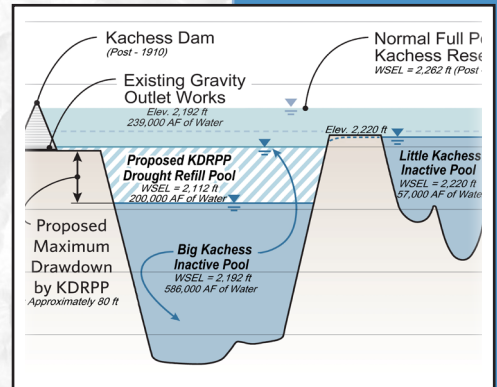
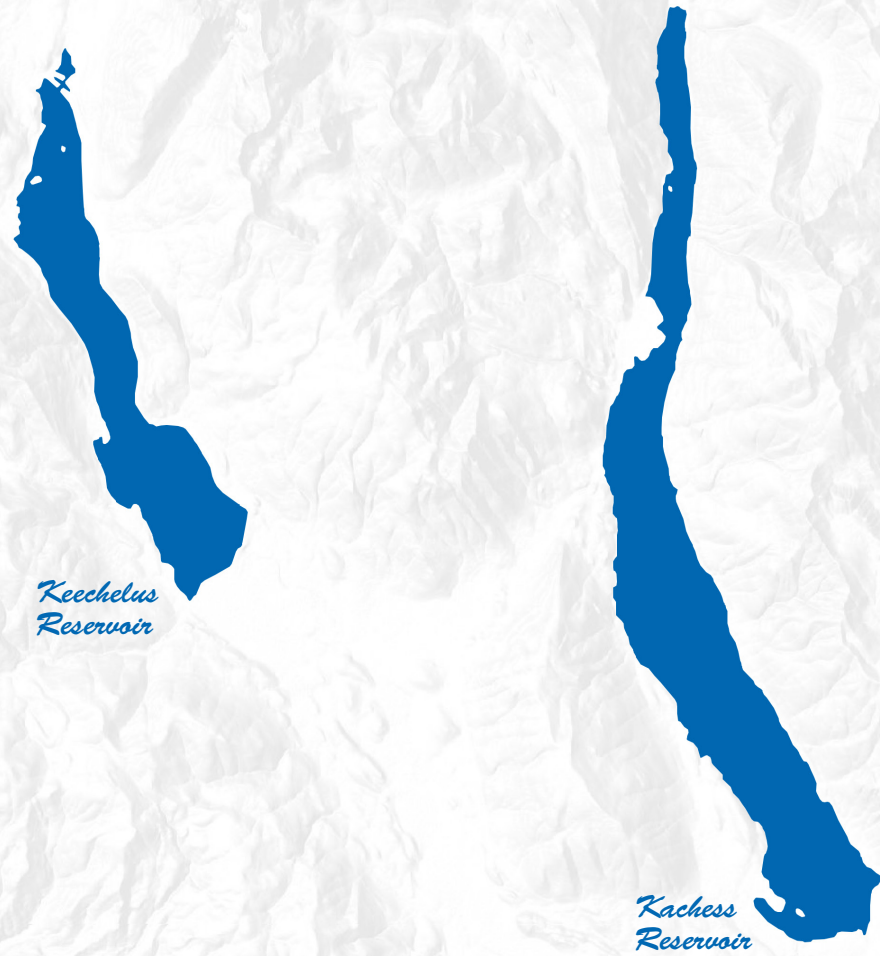


Unit Costs for Proposed Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant

June 2016



THE OFFICE OF COLUMBIA RIVER
Water for Families, Farms, and Fish



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

Central Regional Office - Office of Columbia River
15 West Yakima Avenue, Suite 200 • Yakima Washington 98902 • (509) 575-2490

June 10, 2016

The Honorable Jay Inslee, Governor
Honorable Members of the Washington State Legislature
Olympia, Washington

RE: Unit Cost for Proposed Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant - January 2016

This 2015 report of Unit Costs for Proposed Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant prepared by the Department of Ecology (Ecology) for the Legislature meets the requirements pursuant to a proviso contained in the Capital Budget, Second Engrossed House Bill 1115, Chapter 3, Laws of 2015, adopted by the Washington State Legislature on June 30, 2015. This proviso relates to the 2015-2017 biennial capital funding provided for the Yakima Basin Integrated Plan. The report is now available at this website: <https://fortress.wa.gov/ecy/publications/SummaryPages/1512006.html>

This report along with the Yakima River Basin Integrated Water Resource Management Plan Implementation Status Report (2015) to be submitted separately documents the State's progress on Integrated Plan implementation. These two reports discuss project-by-project development; involving planning, design, permitting, funding and construction. Ecology will continue to work collaboratively with stakeholders to implement the Integrated Plan and to seek non-state funding to complement the significant investments made by the State of Washington.

If you have any questions regarding this report or would like more information, please contact me by phone at (509) 574-3989 or by email at: thomas.tebb@ecy.wa.gov. If you would like hard copies of the report, contact Colleen Rauert by phone at (509) 454-4239 or email at: colleen.rauert@ecy.wa.gov.

Sincerely,

G. Thomas Tebb, L.Hg., L.E.G.
Director
Office of Columbia River



DEPARTMENT OF
ECOLOGY
State of Washington

Unit Costs for Proposed Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant

submitted by The Office of Columbia River

This Report is available on the Department of Ecology website at:
<https://fortress.wa.gov/ecy/publications/SummaryPages/1612003.html>

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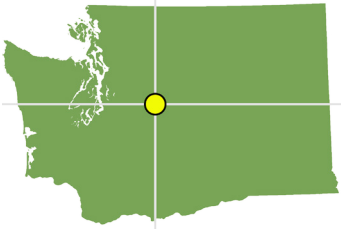
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Executive Summary

The Office of Columbia River was created by the Washington State Department of Ecology (Ecology) to implement the Columbia River Water Supply Development Act (RCW 90.90) passed by the State Legislature in 2006. The RCW directs Ecology to aggressively pursue water supply development for both instream and out-of-stream uses. Solving the water resource and aquatic resource problems of the Yakima River Basin has been among the highest priorities of the Office of Columbia River (OCR). To this end, OCR has partnered with the federal Bureau of Reclamation (Reclamation) and a range of stakeholders in preparing the Yakima River Basin Integrated Water Resource Management Plan (Integrated Plan). The Integrated Plan is a comprehensive program of solutions developed to restore ecological functions in the Yakima River system and to provide reliable and sustainable water resources for the health of riverine environment and for agricultural, municipal, and domestic needs.



Kachess and Keechelus Reservoirs

In 2015, the state Legislature required a report¹ analyzing the cost per acre of land and the cost per acre foot of water for the two specific projects contained within the Integrated Plan, namely Keechelus-to-Kachess Conveyance and Kachess Drought Relief Pumping Plant (KDRPP). The cost analysis for these two projects represent conceptual designs as published in a Draft Environmental Impact Statement² (DEIS) for the projects and a subsequent value engineering study conducted by Reclamation.

The cost per acre of land needed to construct or purchase Keechelus-to-Kachess Conveyance (using the less expensive north tunnel alignment), and the Kachess Drought Relief Pumping Plant is approximately \$517 per acre for the entire federally authorized Yakima Irrigation Project or \$922 per acre for the three proratable districts (Roza, Kittitas, and Wapato) alone. The cost per acre foot of water to construct these same facilities is approximately \$2,535 per acre-foot which includes the volume of water transferred from the Keechelus-to-Kachess Conveyance (average quantity of 95,000 ac-ft per year). The costs calculated herein are a one-time cost, and do not include annual operation and maintenance. The per-acre-foot investment would provide permanent capability to transfer the water.

Due to severe drought impacts of 2015, Roza Irrigation District's (RID) Board of Directors authorized the district to pursue a temporary, one-year emergency pumping facility that could produce 50,000 acre feet of water in 2016 on Kachess Reservoir. The proposal by RID was independent of the Integrated Plan and

¹ 2015-2017 Capital Budget, Second Engrossed House Bill 1115, Section 3070 (2) (b), June 30, 2015.

² Kachess Drought Relief Pumping Plant and Keechelus Reservoir Conveyance Draft Environmental Impact Statement, Kittitas and Yakima Counties, Washington, January 2015, US Department of the Interior Bureau of Reclamation, Washington Department of Ecology Office of Columbia River, Yakima Washington, Ecology Publication Number: 15-12-001.

proposed to be funded solely by the district. However, in late December of 2015, RID's Board of Directors voted not to pursue the temporary facility due to increased projected costs.

Reclamation and Ecology plan to reconsider a permanent Kachess Drought Relief Pumping Plant facility, which could include assessing a floating pumping plant similar to RID's emergency temporary 2016 project proposal. Facility capacities less than the original planned capacity of 200,000 ac-ft will likely be explored for comparison. Additional environmental review will be necessary before any decisions are made on project configuration and construction. Reclamation and Ecology anticipate that the primary funding burden for a permanent project will be borne by benefitting water users.

These developments mean that the configuration, cost, and production capacity of the drought relief pumping project, as well as the level of investment by Washington State, remain uncertain. Under these circumstances, Ecology finds that a reliable cost estimates per acre and per acre foot for KDRPP is not available at this time. Ecology will report these quantities to the Legislature in a separate report at such time as the pumping proposal has been redefined and an updated cost estimate becomes available.



Orchard lost to 2015 drought. Photo credit: Roza Irrigation District

Introduction

This report was developed pursuant to a proviso contained in Section 3070(2), Chapter 3, Laws of 2015, 3rd spec. sess. (2nd EHB 1115, the 2015-17 Capital Budget), adopted by the Washington State Legislature on June 30, 2015. The proviso relates to both apportioning financial responsibility for the substantial capital projects proposed under the Yakima River Basin Integrated Water Resources Management Plan (Integrated Plan) and requires Ecology to provide a report to the Legislature to help inform the long-term financial planning of the KKC and KDRPP project beneficiaries.

Subsection (2)(b) By December 15, 2015, the department must prepare and submit a report to the legislature estimating the cost per acre of land and the cost per acre-foot of water to finance the construction of the Keechelus to Kachess pipeline project and the Kachess Reservoir drought relief pumping plant project. The primary objective is to inform the long-term financial planning of the project beneficiaries, the proratable irrigation districts and their ratepayers, who will bear the construction, maintenance and operation costs.

Ecology partnered with the U.S. Department of the Interior, the Bureau of Reclamation (Reclamation) and the Yakima River Basin stakeholders to develop the Integrated Plan in 2011. Reclamation and Ecology issued a Final Programmatic Environmental Impact Statement (FPEIS) on the Integrated Plan in 2012. The Keechelus-to-Kachess Conveyance (KKC) (formerly known as the Keechelus-to-Kachess Pipeline) and the Kachess Drought Relief Pumping Plant (KDRPP) are projects identified in the Integrated Plan. The KKC project falls under the Structural and Operational Changes Element and the KDRPP project falls under the Surface Water Storage Element of the Integrated Plan.

For over a century, working reservoirs at Kachess and Keechelus have supplied irrigation water to farmers in the Yakima River Basin. During drought, demand for irrigation water in the Yakima River Basin exceeds supply, endangering the multi-billion annual agricultural income the region injects into the economy. The Initial 10-year Development Phase of the Integrated Plan provides important drought relief to Yakima River Basin farmers while also improving conditions for salmon, steelhead and bull trout. The KKC and KDRPP projects will result in healthier riparian areas, improved instream flows and drought resiliency for agriculture.

The KKC is a proposed tunnel bored through bedrock and surficial materials that would enable Reclamation to move water from Keechelus Reservoir into Kachess Reservoir. Both reservoirs are owned and operated by Reclamation. The KDRPP is a proposed facility that would enable Reclamation to gain access to a portion of the water that is stored in Kachess Reservoir but is located below the elevation of the existing outlet works. This portion of the stored water in Kachess Reservoir cannot currently be accessed for water supply purposes.

Keechelus-to-Kachess Conveyance

The Keechelus-to-Kachess Conveyance (KKC) project would provide Reclamation greater operational flexibility in managing stored water in the upper Yakima River Basin. The project would enable Reclamation to transfer water from Keechelus Reservoir to Kachess Reservoir.

Reclamation and Ecology have been collaborating on a feasibility study of KKC. Three potential benefits of water being transferred between reservoirs were assessed:

- Reduction of high-flows in the 11-mile Keechelus to Easton Reach (also known as the “Easton Reach”) of the upper Yakima River during the summer months when the river channel is used to convey water for water supply purposes. Improving the flow regime would produce benefits for listed steelhead.
- Improved water supply for water users in the Yakima River Basin. The Feasibility Study indicates that this benefit would be minimal, due to the various constraints on when water could be transferred combined with the availability of unutilized storage capacity in Kachess Reservoir.
- In the event that KDRPP is constructed, KKC would accelerate refill of Kachess Reservoir following drought years when the Kachess Reservoir inactive pool has been utilized.

Reclamation and Ecology have agreed to complete the analyses in the ongoing environmental compliance process.

KKC construction costs are shown in Table 1

Table 1 – Construction Costs for KKC

Cost Categories	North Tunnel Alignment (\$)	South Tunnel Alignment (\$)
Project Development Cost (construction materials, equipment, labor, etc.)	206,413,000	237,633,000
Project Management and Engineering Oversight	34,400,000	34,400,000
Total Project Implementation Costs (Development Costs + Oversight Costs = Total Costs)	240,813,000	272,033,000

Source: *Feasibility Planning Report, Keechelus Reservoir-to-Kachess Reservoir Conveyance (Draft)*, April 2015³.

Note: The additional federal cost category “Interest during Construction” is excluded, since it is not applicable to State budgeting.

³The table above has not been issued publicly as it is from a Bureau of Reclamation report that is still considered a draft.

⁴One acre-foot is the volume of water needed to cover one acre of land to a depth of one foot. An acre-foot is approximately 326,000 gallons.

KKC is a multipurpose project providing different types of benefits, and these benefits would apply to different beneficiaries. The fisheries benefits from improving habitat in the Easton Reach of the Yakima River would apply broadly to the Washington State (and national) public. The water supply benefits (though minimal) would apply to the proratable water users receiving the water.

The proviso in the 2015 State Capital Budget requires Ecology to report construction costs on the basis of cost per acre land and cost per acre-foot of water⁴. In order to report the cost per acre, it is necessary to establish how many acres should be counted for the KKC. For purposes of this report, Ecology will report the value based on two different acreages:

1. The acreage of agricultural land currently served by the entire Yakima Irrigation Project.
2. The acreage of agricultural land within three irrigation districts served by the Yakima Irrigation Project, that receive “proratable” water supply. These are the Roza Irrigation District (RID), Kittitas Reclamation District (KRD), and Wapato Irrigation Project (WIP)⁵.

The reason both of these acreages are used is that KKC is a multipurpose project providing different types of benefits, and these benefits would apply to different beneficiaries. The fisheries benefits from improving habitat in the Easton Reach of the Yakima River would apply broadly to the Washington State (and national) public.

The acreage values discussed above are:

- Entire Yakima Project: 465,000 acres
- RID, KRD and WIP: 261,236 acres

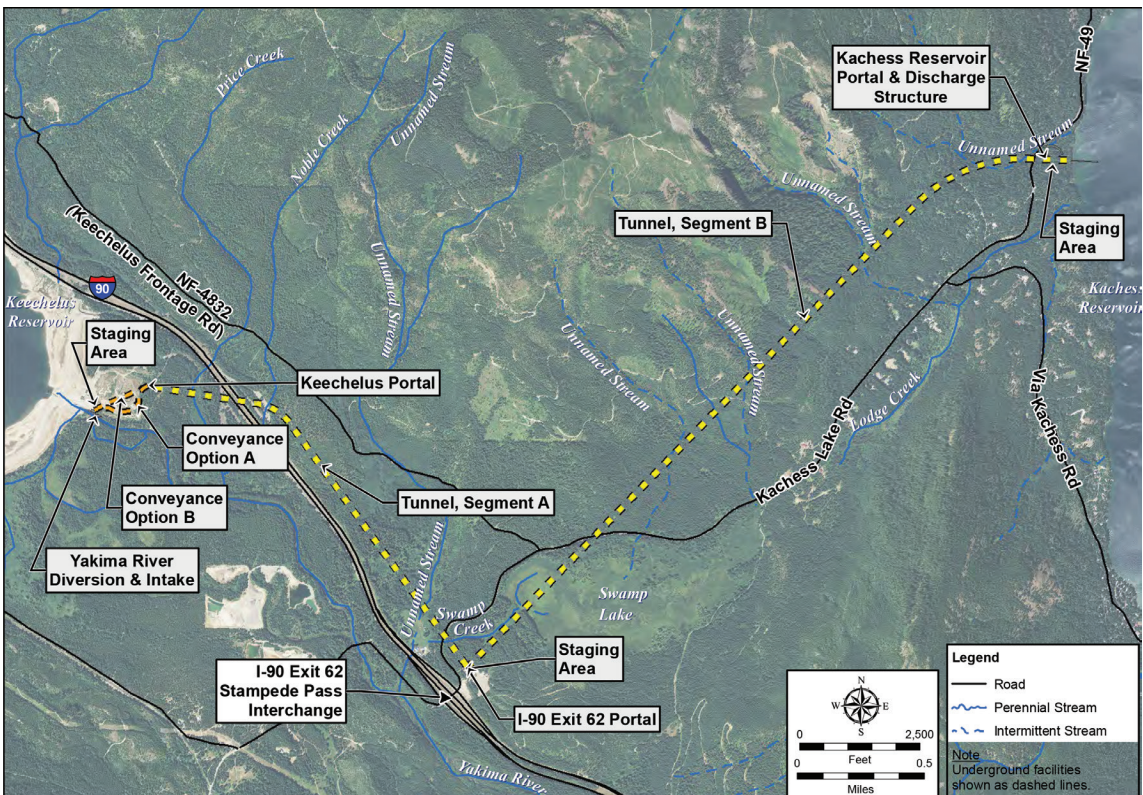
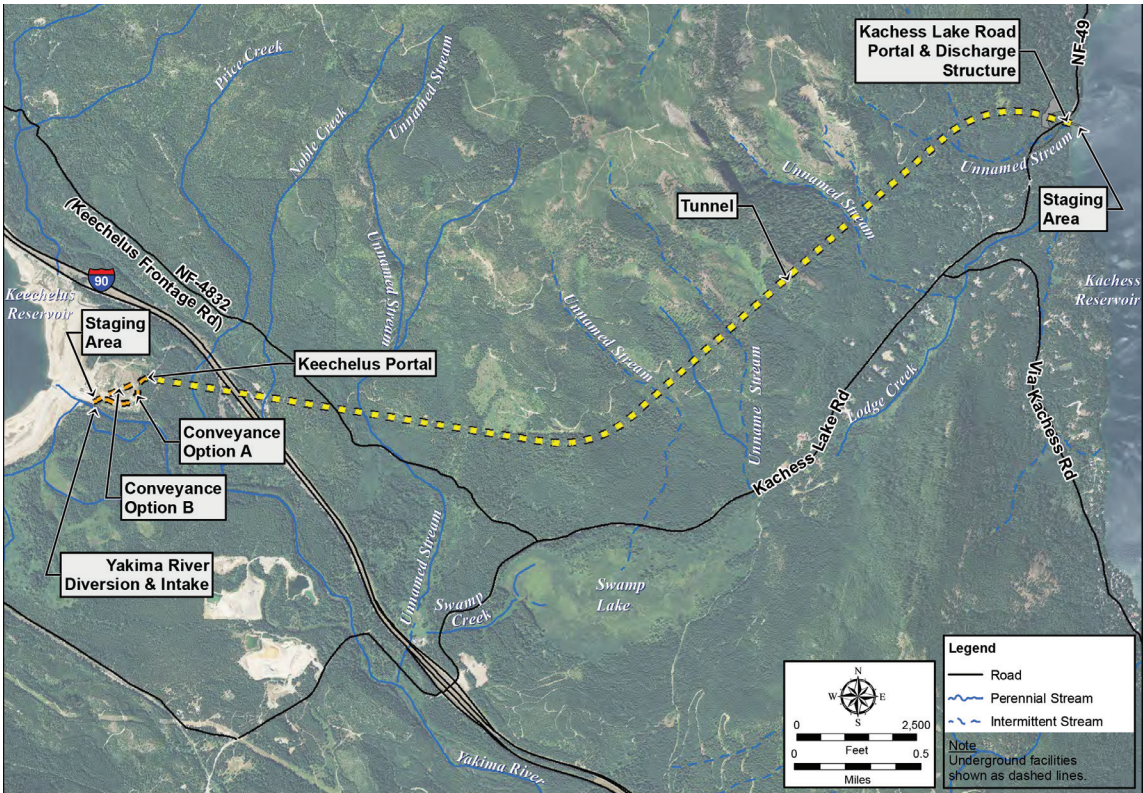
The construction cost is \$517/acre for the entire Yakima Irrigation Project; or \$922/acre for the three proratable districts alone. These values assume the less costly North Tunnel Alignment is selected. Costs would be 13 percent higher if the South Tunnel Alternative were selected. Costs reported here are in 2015 dollars and do not include annual operational and maintenance.

The budget proviso also requires costs to be reported on a per-acre-foot basis. To perform this calculation, the volume of water transferred from Keechelus Reservoir to Kachess Reservoir was determined by hydrologic modeling. The model indicates that the volume transferred would fluctuate substantially from year to year. For the 84-year period modeled, 93,000 ac-ft would be transferred in the median year, or 95,000 ac-ft per year on average for all years. (The 10th percentile and 90th percentile years are 72,000 and 124,000 ac-ft, respectively). Using the average quantity, and the cost of the North Tunnel Alternative, the estimated construction cost is \$2,535 per acre-foot. The per-acre-foot investment would provide permanent capability to transfer the water.

It should be noted that the quantity transferred does not mean that quantity would become available for water supply. As noted above, the water supply benefits from of KKC are minimal and Ecology and Reclamation have concluded the water supply benefits do not provide a basis for project construction. The quantity listed

⁵ Kennewick Irrigation District is not currently included in our calculation. If included it would add approximately 20,201 acres

above represents the reduction in high flows in the Easton Reach of the Yakima River in late summer and early fall months.



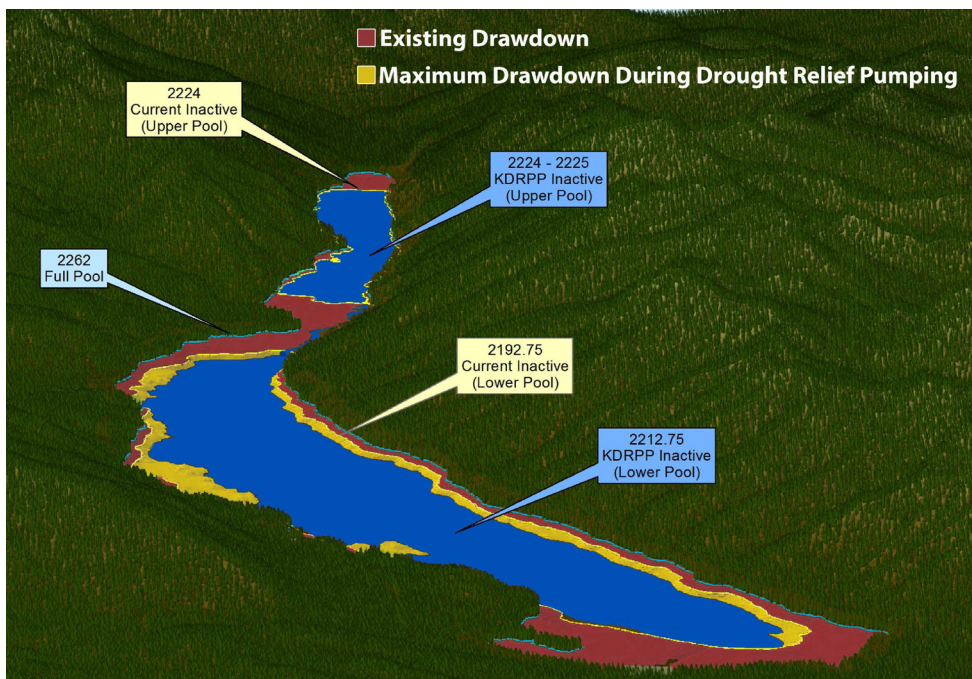
North and south tunnel alignments

Kachess Drought Relief Pumping Plant

Reclamation performed a feasibility study of the KDRPP, which would involve extracting water from the inactive storage pool of Kachess Reservoir. The feasibility study estimated the cost of the project and the project benefits, for either a stand-alone project or a project in combination with the KKC. In addition Reclamation and Ecology prepared a DEIS issued in January 2015, covering both KKC and KDRPP.

Responding to concerns from the proratable irrigation districts about the cost of the project, Reclamation led a Value Analysis Study in June 2015 to explore alternate project configurations and sizes. Results from the Value Analysis Study led RID to propose to finance and develop a temporary project that could produce 50,000 acre feet of water to offset drought impacts in 2016, possibly in conjunction with other irrigation entity partners. This effort was driven by the severe drought experienced in 2015, and a desire to avoid even more severe shortages in 2016 if drought conditions were to persist for a second year. For the temporary facility, RID has indicated a preference for a floating pumping plant configuration that would avoid costs of a deep tunnel.

While RID's Board of Directors authorized the district to pursue a temporary, one-year emergency facility in October. The Board concluded in December to not pursue the temporary emergency floating pumping plant facility due to increased projected costs. However, RID continues to support a permanent KDRPP project.

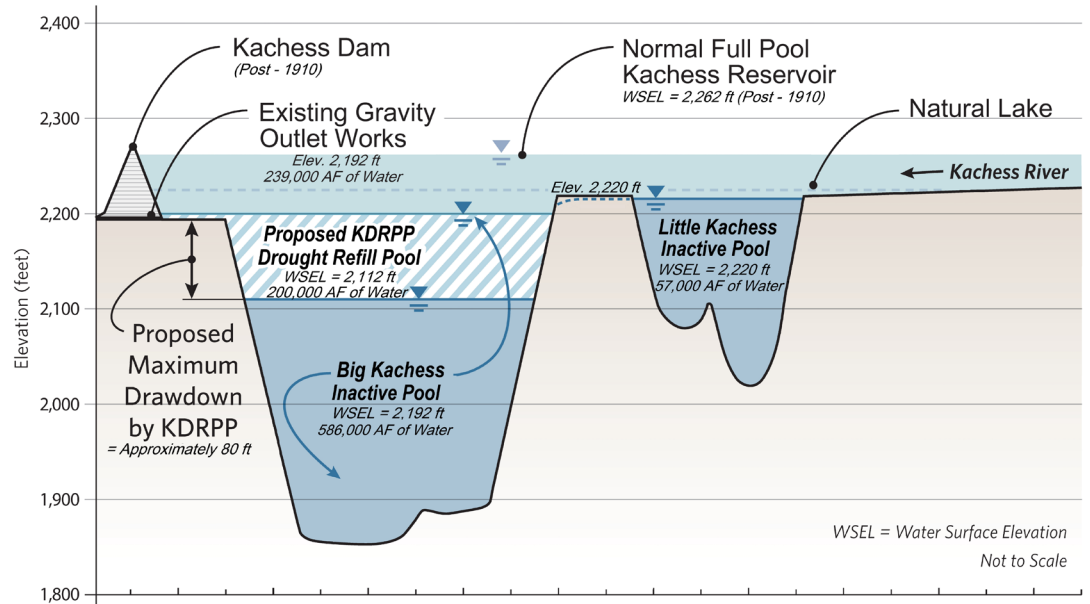


Reclamation and Ecology plan to renew consideration of a permanent KDRPP facility, which may include reassessment of a floating pumping plant similar to the RID emergency temporary project. Project capacities less than the original planned capacity of 200,000 ac-ft will likely be explored for

comparison. Additional environmental assessment will be necessary before any decisions are made on project construction. Reclamation and Ecology anticipate that the primary funding burden for a permanent project will be borne by water users that would benefit from the project.

These developments during 2015 mean that the configuration, cost, and production capacity of KDRPP, as well as the level of investment by Washington State, remain uncertain. Under these circumstances, Ecology's Office of the Columbia River finds that a reliable estimate for the cost per acre of land and cost per acre foot of water for of KDRPP is not available at this time. Ecology's Office of Columbia River will report an updated cost estimate to the Legislature when KDRPP proposal has been redefined and an updated cost estimate is available.

Schematic Hydraulic Profile Showing Inactive Pool, Natural Lakes, Existing Kachess Dam & Reservoir, and Proposed KDRPP Drawdown



Kachess Reservoir during irrigation season