Final Report

Yakama Nation Renewable Energy Plan

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Acknowledgments

The Yakama Nation and Yakama Power would like to thank the Department of Energy for their support, understanding, and adaptation as we attempted to establish the development of the hydropower generation project at Drop 4 on the Wapato Irrigation Project. We especially appreciate the project officer Lizana K. Pierce, the Project Monitors Kris Venema and Jennifer Luna.

The Yakama Nation would like to thank their DNR Department Phil Rigdon, Andrea Spencer, Latonia Wheeler, and Connie Lewis the DNR Specialist for all the dedicated hours working on this project and coordinating all the entities that had input into this project. We would like thank all the tribal and non-tribal public that participated during the review process of this project.

We would like to recognize the partners that have assisted in the investigation work of the energy resources for the Yakama Nation and Yakama Power that include: Grant County PUD, the Wapato Irrigation Project, Bureau of Indian Affairs, Steve Wangeman, Fulcrum Environmental, YN Tribal Engineering, HDR Engineering Inc., NAES Power Contractors, Knight Piesold and Company, JRONE Enterprises, and many more participants that worked on this project.

Executive Summary

The Confederated Tribes and Bands of the Yakama Nation (YN) are descendents of the 14 tribes and bands that are federally recognized under the Treaty of 1855 with the United States of America. Our mission is to preserve, protect, restore and enhance our aboriginal land base and the natural resources placed on and surrounding the Yakama Reservation for the present and for future generations. The Yakama Tribal Council's duty and responsibility is to protect and preserve the health, security, general welfare, resources and treaty rights of the Yakama Nation.

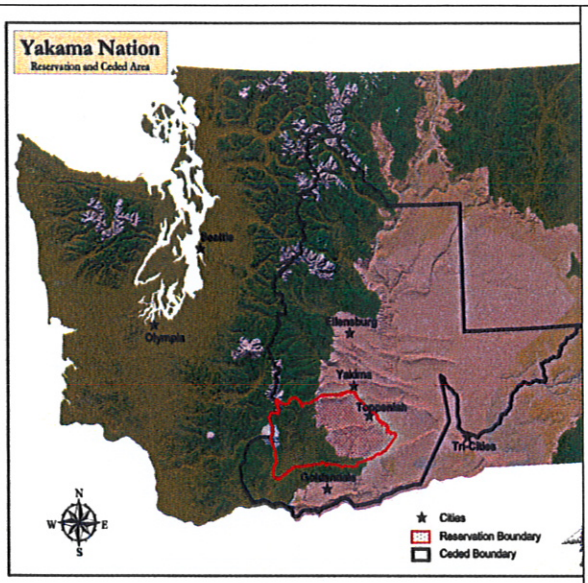
The primary goal of this project was to develop a one megawatt hydroelectric powerhouse at Drop 4 on the Wapato Irrigation Project (WIP) Main Canal. The project site is located two miles southwest of Harrah, Washington, approximately one-half mile southwest of the Harrah Drain Road and McDonald Road intersection, where the irrigation canal undergoes an approximate 20 foot (ft) elevation drop.

The project would of involved construction of a small generator house, inlet located upstream of the existing spillway, outlet located downstream of the existing spillway, electrical substation, an approximate one-quarter mile of overhead transmission line extending between Harrah Drain Road and the newly constructed generator house, and potentially a future downstream diversion structure to divert approximately 50 cfs of water used in power generation into Harrah Drain. Temporary construction easements on adjacent private property would have been required for construction staging and materials laydown areas. Project design was developed by Yakama Power (YP) staff with consultation with electrical and mechanical engineers. If completed the project would have by the YN and operated by YP.

Power generation revenue in excess of operations costs would have been directed back to WIP as a potential funding source for differed maintenance and capital improvement projects. The proposed project is funded by a federal grant with a matching contribution provided by YN and YP.

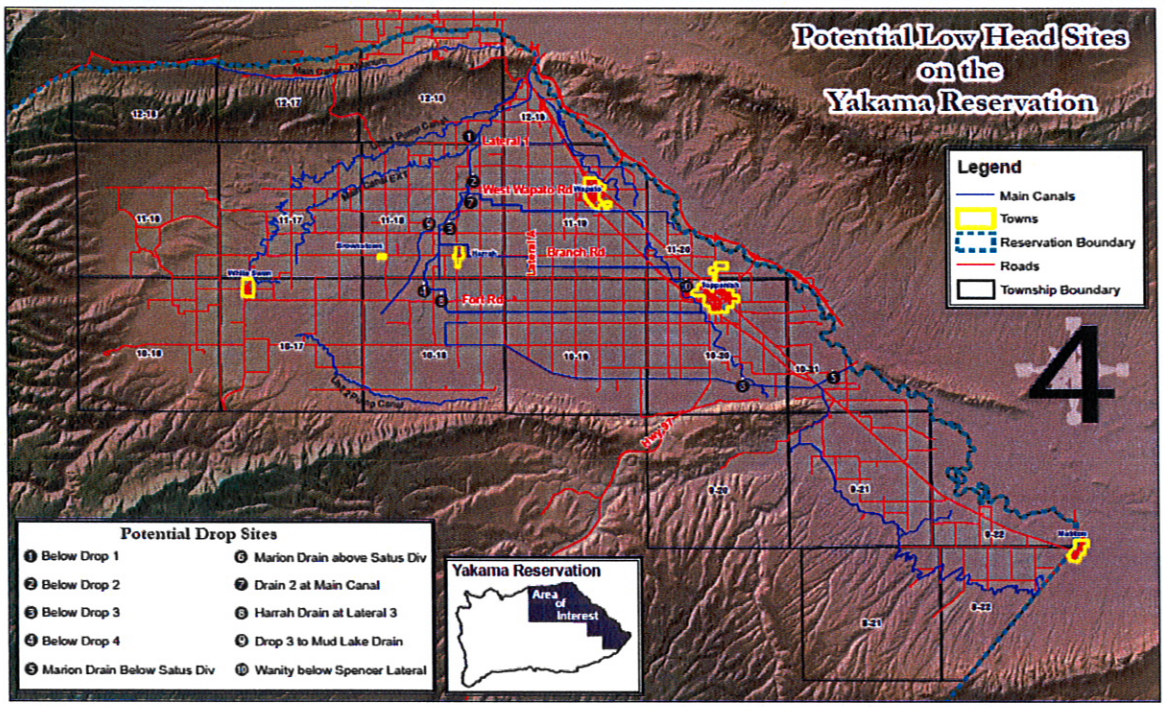
Due to associated costs in excess of $3 million to $4 million the YN put a firm cap not to exceed the collective $2.4 million DOE grant contribution plus the 50% YN/YP in-kind match of the grant and unfortunately no alternatives for the project were able to be under the $2.4 million not to exceed cap. Therefore, the DOE grant contribution sunset clause has expired and the YN has to return the remaining funds to the DOE and Drop 4 will not be developed at this time.

Project Overview



The Yakama Nation Reservation and Ceded area.

The Wapato Irrigation Project (WIP) was authorized by Congress to serve the Yakama Nation (YN) as an irrigation district in 1904. The YN negotiated 3840 acres of YN Reservation land, situated at the forks of the Pisquouse or Wenatshapam River known currently as the confluence of Icicle Creek and Wenatchee River, to the U.S. Government to support the construction of WIP in the amount of almost $29,000. Although there are difficult issues and obstacles (Operation & Maintenance, Idle Land, Water Rights, and Salmon Recovery) in the operation of WIP, the YN continually invests their own resources to help accomplish the intentions of the project.



In 2004 the Bureau of Indian Affair's (BIA) crop report indicated that 56-percent of the 143,000 acres of the project were owned by the YN and or its tribal membership. Today, the majority of that land is now reported as being leased out to non-Natives, earning annual gross revenues of over $250 million.

The Public Utility Regulatory Policies Act of 1978, and the Energy Policy Act of 1992, established the deregulation of the electricity industry. The YN General Council gave approval to the Tribal Council to research the opportunities in the electricity industry (General Council Resolution GC04-98). The Bonneville Power Administration (BPA) recognized the YN as a public body or cooperative, opening the possibility for the YN to form a tribal utility. After several years of planning and inter-governmental negotiations, Yakama Power (YP) was established as a not-for-profit utility. **Yakama Power's mission is to provide affordable and reliable electricity** that will enhance the quality of life for its consumers and provide a stable, safe and competitive work environment for its employees. Consistent with tribal philosophy, YP intends to take only what is needed from natural resources to generate electricity. Yakama Power continues to evaluate wind, water, sun, bio-mass, and geo-thermal as potential sources for electricity. Yakama Power began supplying electrical energy to several tribally operated facilities in May 2006. Ultimately, YP plans to serve the approximately 15,000 people residing on the 1.4 million acres of the Yakama Reservation.

Generating renewable energy and creating efficiencies with the WIP canals, pump houses, power lines, and serving the land owners are the goals of the YN, BIA, and YP. In 1990 WIP and the United Stated Bureau of Reclamation (USBR), under a service agreement, completed an inspection of WIP generation plants and pumping facilities to determine the condition of equipment and structures with the intent of providing recommendations for upgrade, repair or replacement. The report titled *Assessment of Hydroelectric Generation and Transmission Facilities,* dated December 28, 1990 summarized the WIP and USBR findings.

In 1994, YN commissioned Harza Engineers (Harza) to complete a *Feasibility Study to Upgrade Hydroelectric Operations of Wapato Irrigation Project* (1994 Harza), and along with WIP, began evaluating the feasibility of retrofitting the existing two power generation facilities located within the irrigation system to increase efficiency and power output.

Subsequently, YP and WIP continued to evaluate the feasibility of retrofitting the two existing power generation facilities and constructing additional low-head power generation facilities within the existing system. The intention of the feasibility studies was to provide a revenue source that could fund improvements to the WIP and benefit WIP stakeholders. Since the inception of the feasibility studies, the previously constructed hydropower facilities at Drop 2 and Drop 3 have been retrofitted and are again producing electricity during the irrigation season. The repair and retrofitting feasibility assessment of the Drop 1 facility identified engineering and reconstruction challenges that in the short term are not feasible, but remains a viable long term potential project. The feasibility assessment of new hydropower facility construction identified two alternate locations within the WIP system for potential power generation. However, the Drop 4 location was identified as the most viable location within the existing canal system from both a cost of construction and power generation perspective.

Project Objectives

The YN through their Department of Natural Resources (DNR) and Yakama Power investigated power potential opportunities on the WIP and were able to secure Department of Energy (DOE) funding to assist in the development of inflow water turbines on WIP's main canal. The YN prepared an EA to purchase and install new water turbines for hydropower generation of 1 MW. This was potentially a valuable economic development strategy for Yakama Nation that will create new jobs, improve and increase rural electrification and attract private investments. The water system has an untapped low head/low power potential without the need to construct a new dam. The objective of Phase 1 of the project was to complete an EA and obtain approval to proceed with installation of the hydroelectric power system.

The YN was able to obtain approximately $1,100,000 DOE federal grant with a matching contribution of $1,100,000 provided by YN in available funding or in-kind materials and services. Power generation revenue in excess of operating costs would be directed to WIP to fund differed maintenance or capital improvement projects. The initial objectives for the grant were altered from due the inability of YP to find an adequate inflow water turbine for the project. YP was already considering to develop Drop 4 and the DOE accepted the YN proposal to use the grant funding to support they low-head hydro project at Drop 4.

The DOE Tribal Energy Program promotes tribal energy sufficiency and fosters economic development and employment on tribal lands through the use of renewable energy and energy efficiency technologies. The program, part of DOE's Office of Energy Efficiency and Renewable Energy, provides financial and technical assistance to tribes to evaluate and develop their renewable energy resources and reduce their energy consumption through efficiency and weatherization.

The purpose of the proposed project is to utilize the existing WIP systems low-head/low-power potential with new construction to generate approximately one megawatt of supplemental hydroelectric power at the WIPs existing Drop 4 location thereby creating a positive seasonal revenue source that can be reinvested back into WIP's aging infrastructure.

The proposed project would have assisted the YN in meeting one of the economic development strategy goals for hydroelectric power development that will create new jobs, improve and increase rural electrification, and attract private investments.

Providing funding to the YN would partially satisfy the need of both BIA DEMD and DOE Tribal Program in assisting American Indian tribes in developing, promoting, implementing, and managing energy efficiency and conservation projects and programs that:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors;

The Drop 4 project site is located two miles southwest of the Town of Harrah (Harrah), Washington, approximately one-half mile southwest of the intersections of Harrah Drain Road

and McDonald Road where the irrigation canal undergoes an approximate 20 foot (ft) elevation drop through a concrete spillway. The spillway is exhibiting normal wear and tear and is part of WIP's deferred maintenance and will need to be addressed accordingly by WIP. Routing water through a power generation facility with an inlet located slightly upstream of the existing spillway could potentially reduce the amount of wear and tear on the concrete feature.

To increase the power generation potential at Drop 4, a potential future modification to the power generation facility being considered is the increase in drop height by 2 to 4 ft. This could be accomplished by raising the elevation of the spillway head gate or potentially backfilling select portions of the upstream canal banks to facilitate an increase in static water level and potentially backfilling select portions of the downstream canal banks to facilitate an increase in irrigation water through flow. As a portion of the potential future increase in drop height and upstream static water level increase, approximately 50 cubic feet per second (cfs) of water that currently is diverted into Harrah Drain may be retained or diverted into the Main Canal north of Harrah at an existing diversion and then diverted back into Harrah Drain south of Drop 4 where the main canal and Harrah Drain cross.

This project is not located in fish bearing waters and will not interfere with the primary purpose of WIP which is to supply irrigation to approximate 146,000 areas of Yakama Reservation land. The project does not change or modify WIP water withdrawal or return practices to the Yakima River. The WIP does not have any proposed significant changes or modifications to water withdrawal or return practices within the foreseeable future.

Tasks to be Performed

1) Project Scoping and Community Outreach Plan

In April of 2009, the Yakama Nation Engineering Program (YNEP) analyzed the WIP system and summarized findings in a memorandum identified as *Additional 1MW on WIP* (2009 YNEP) with the intent of identifying a location that had the potential to produce approximately one megawatt of supplemental hydroelectric power within the stated constraints of minimal environmental impact and proximity to existing WIP transmission lines. The YNEP identified the Main Canal Drain 2, Harrah Drain, and Drop 4 sites as worthy of further consideration. Following is a summary of the assessment findings and conclusions.

Table 1: 2009 YNEP Summary of Potential Hydropower Production

Feature	Drain 2	Harrah Drain	Drop 4
Flow cfs[1] July 2008	150	150	431
Head (ft of drop)	12	18	21
Potential Power Production, kW[2]	153	229	767

[1] cfs means cubic ft per second

[2] kW means kilowatts

The 2009 YNEP memorandum identified the potential presence of steelhead in Harrah Drain as a potential environmental impact that hydropower construction planning would need to take into consideration. Additionally, the 2009 YNEP memorandum indicated that the flume ramp associated with Drain 2 would need to be lowered or replaced with an acoustic doppler to achieve

the drops presented in Table 1. Based on the factors valuated, the YNEP concluded that the Drop 4 site provided the most potential for further hydropower generation assessment.

In August of 2009, HDR Engineering, Inc. (HDR) completed a preliminary feasibility study identified as *Drop 4 Feasibility Study – Preliminary* (2009 HDR) and conceptual design for the potential construction of a small hydroelectric project on WIPs system. The 2009 HDR report took into consideration findings from the 1994 Harza report and identified the Drop 4 location as warranting further evaluation for hydropower generation and is diagramed below.

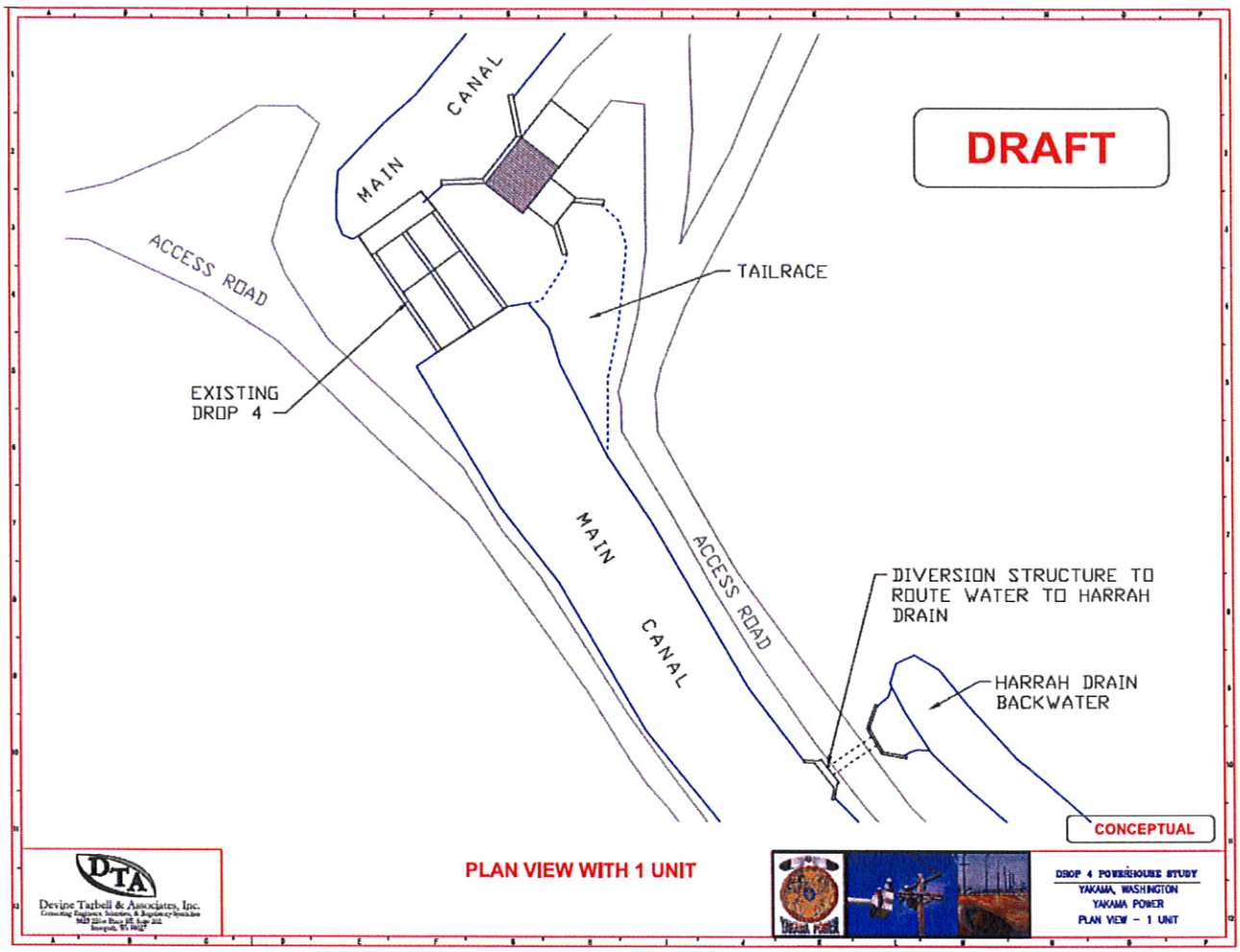


Figure 3

The 2009 HDR report identified the seasonal generation timeframe as being between April and October for purposes of economic feasibility evaluation, developed a conceptual design similar to the previously completed Drop 2 and Drop 3 facilities for purposes of developing preliminary construction cost estimates, and completed a review of potential licensing and permitting requirements. The 2009 HDR report presumed that water currently being diverted into Harrah Drain downstream of Drop 3 would be retained or routed into the Main Canal and then diverted back into Harrah Drain downstream of Drop 4 and would result in an approximate 2 ft increase in hydropower facility head intake. The assessment by HDR indicated that there was sufficient

freeboard upstream to contain the increased flow and static water elevation; however, downstream canal banks may need to be raised to facilitate the additional through flow.

According to the HDR Report, YNEP had reported that the diversion of Harrah Drain water would not interfere with any of the current consumptive water uses of the irrigation project provided the diverted water was returned to the Harrah Drain downstream of Drop 4. However, the HDR Report did not take into consideration any impact to the potential presence of steelhead in Harrah Drain.

As reported by HDR, the right-of-way (ROW) extends 55 ft on either side of the canal centerline (110 ft total ROW). The canal width near the Drop 4 location is approximately 30 ft in width, providing approximately 40 ft on either side of the canal for powerhouse construction. HDR reported that construction could feasibly be contained within the ROW, however, a temporary easement may be needed for additional working room and construction lay down areas. The 2009 HDR report also identified the 37.5 kilovolt (kV) line trending parallel with Harrah Drain Road approximately one-quarter of a mile east of the Drop 4 location as being owned by WIP and presumed to have available capacity to transmit generated electricity.

HDR's review of potential permits suggests that while under the Federal Power Act (FPA) the Federal Energy Regulatory Commission (FERC) has jurisdiction over new hydroelectric projects. The project as proposed will likely qualify for an application for exemption. HDR also indicated that the project would likely need to file with the U.S. Environmental Protection Agency (EPA) for a Clean Water Act (CWA) Section 401 Certification (401 C). HDR concluded that no additional power sales or interconnection agreements are necessary due to the 2008 power sales agreement between Yakama Nation and the BPA.

While HDR acknowledged that alternate designs should be considered, based on HDR's preliminary design conservative construction costs were estimated at $4,500,000, engineering costs at $450,000 and licensing and permitting at $135,000. Based on a power purchase agreement of $0.06 per kilowatt hour (kWh) HDR estimated that the project could produce revenue of $168,000 per year and predicted at 30 year return on capital investment.
In 2010, the YN retained NAES Power Contractors (NAES) to assess the soils surrounding the project area to facilitate further development of hydropower facility conceptual designs and construction cost estimate. Knight Piesold and Company (KPC) subcontracted to NAES to complete the geotechnical investigation of the proposed Drop 4 project location.

A *Cultural Resources Survey Report of Yakima Power Drop 4 Phase I* was completed by the YN Cultural Resources Program in January 2011 (2011 Cultural Survey), prior to KPC completing the geotechnical work. Subsequently, in January 2011, the YN Cultural Committee approved the Cultural Report for the investigation phase of the proposed project. See Appendix E for a copy of the Cultural Committee Action approval and the associated YP request for cultural resource and archaeological services. The YN Cultural Resource Program issues a subsequent report titled *Cultural Resources Monitoring Report for the Yakima Power Drop 4 Phase I Soil Test Excavations*, authored by Dave M. Woody, M.S., YN Archeologist and dated March 2011 (2011 Cultural Monitoring), that summarized the observation of excavation monitoring by YN Cultural Resource Progarm representatives.

The final geotechnical report titled *Yakima Power – drop 4 Powerhouse Addition Test Pit Program,* was published by KPC February 17, 2012 (2012 KPC). Interview with representatives from the YN, YP, and Pacific Energy Network, Inc. (PEN), the selected engineering firm that provided final design, indicate that the project site soils will support the planned hydropower facility and that existing canal bank construction will support a 2 to 4 ft elevation increase of the upstream backwater.

Based on the geotechnical information, construction budget limitations, and other site specific criteria, PEN revised the HDR conceptual design consisting of a vertical Kaplan turbine to a low profile inline hydropower facility, resulting in a schematic design that is slightly different than the HDR conceptual design. The revised schematic design anticipates inflow occurring along the east side of the canal and upstream from the existing spillway, and outflow into the north side of the canal below the spillway. Additionally, the revised PEN schematic design utilizes a horizontal turbine that is less costly to manufacture, and requires a smaller footprint for generator house construction than the HDR conceptual design. Preliminary construction estimates suggest that construction could be achieved within the $2,200,000 budget. The PEN $2,200,000 budget did not include transformers, transmission lines, and civil work that would have easily increased the entire budget over $3,000,000.

Environmental Assessment

In October 19, 2010, the scoping document associated with the proposed project was presented to the BIA IDT meeting and a site walk was completed October 27, 2010. In addition to interested IDT members, Mr. Kelly, the resident at 1770 Harrah Drain Road, in Harrah, Washington, was invited and participated in the site walk and provided verbal comment. Mr. Kelly's residence is located approximately 250 feet east of the proposed project,

During the IDT meeting and subsequent site walk, in addition to potential issued identified by the statutory review, the following two additional potential issues were identified as requiring additional study: potential impact to presumed steelhead presence in Harrah Drain and geotechnical assessment of soils with regards to planned structure design and existing canal system stability.

On December 07, 2011 the Draft EA titled *Drop 4 Hydropower Project National Environmental Policy Act (NEPA) Environmental Assessment (EA)* (2011 Draft EA) was published and distributed to BIA, IDT members, DOE and, as requested during the October 27, 2010 site walk, Mr. Kelly. In addition to a request for comments from BIA, IDT members, DOE, and Mr. Kelly, resource reports were requested from Resources Specialists with both the YN and BIA. Refer to Appendix A for correspondence including received written comments and Appendix E for resource reports related to this EA. Resource reports providing comments on identified issues and concern were received from the following:

1. Yakama Nation Fisheries Resource Management, *No effect determination for Drop 4 hydropower project on Steelhead,* December 20, 2011
2. Yakama Nation Wildlife Resource Management Program, *Drop 4 project – Wildlife Report,* January 4, 2012

3. Yakama Nation Cultural Resource Program, *Cultural Resources Survey Report of Yakima Power Drop 4 Phase I,* January 2011
4. Yakama Nation Cultural Resource Program, *Cultural Resources monitoring Report for the Yakima power Drop 4 Phase I Soil Test Excavations,* March 2011
5. Yakama Nation Fisheries Resource Management, *Fisheries comments on invasive species mitigation in concern to Drop 4,* May 30, 2012
6. United States Department of the Interior, Bureau of Indian Affairs, D*rop 4 Project – Environmental Assessment,* May 30, 2012

The Department of Interior, Bureau of Indian Affairs, Yakama Agency signed and approved the Finding of No Significant Impact and Notice to Decision to Proceed with Drop 4 project on July 17, 2012. All of these reports were submitted to the Department of Energy for their concurrence.

Obtain Power Sale Agreement

Yakama Power has been investigating the power sale agreements for the potential electricity generated from Drop 4 since 2009. Yakama Power has also consulted with Grant County PUD, Puget Sound Energy, HDR-DTA, NAES Power Contractors, and JRONE Enterprises to find a power purchase agreement and/or presale the power and finance the 50% in-kind Yakama Nation match for the project. None of the entities were able to find a secure long-term power sale agreement to implement the project.

In 2008 the United States recession deceased the value of electrical energy drastically in the Pacific Northwest. Since then YP has witnessed power prices well below a $60/average for the peak and below $30 for the off-peak. The development of wind energy and natural gas prices are some of the other reasons why energy markets in the Pacific Northwest have not rebounded.

The incentives or disincentives to develop Drop 4 for the YN and YP are complicated with the interactions with Washington State, the Federal government and BPA. Washington State's incentives and disincentives are with their requirements through I-937 for the large utility's clean energy standards to have at least 15% of their load base come from clean energy. The intent of the policy is sound but the renewable energy markets and the penalties associated with I-937 do not match up. The penalty is a $50/MWh to large utilities that do not meet requirement to have 15% of their load supplied by clean energy. Most clean energy power sale agreements cost above the $50/MWh, so in the long run it would be less expensive for large utilities to pay the penalty to make up the clean energy requirements of the policy.

The Federal Government has created incentives around tax breaks and production tax credits to developers and producers of clean energy. The difficultly tribes have with these incentives are tribes are tax exempt they do not have access to these incentives unless they partner with a taxable entity. The YN is reluctant to partner with taxable entities and Yakama Power is tax exempt too so neither party accessed these incentives while trying to develop Drop 4.

The dynamic between the Yakama Nation's power development and the Tribe's desire for Yakama Power to expand and provide electrical services across the entire Yakama Reservation creates a counterintuitive scenario with the BPA. If the Yakama Nation sold the electricity it generated to YP the BPA would decrement that generation from YP's "high water mark".

Yakama Power's "high water mark" gives YP access to the BPA's "Tiered 1" power rates, the less expensive whole sale power the BPA offers. The economics for YP are not favorable in this scenario and those are the reasons why the YN and YP looked for outside markets for the electricity generated from Drop 4.

The YN and YP along with many advisors and consultants could not find an option that worked well within all the financial limits and economies of the project.

Description of Activities Performed

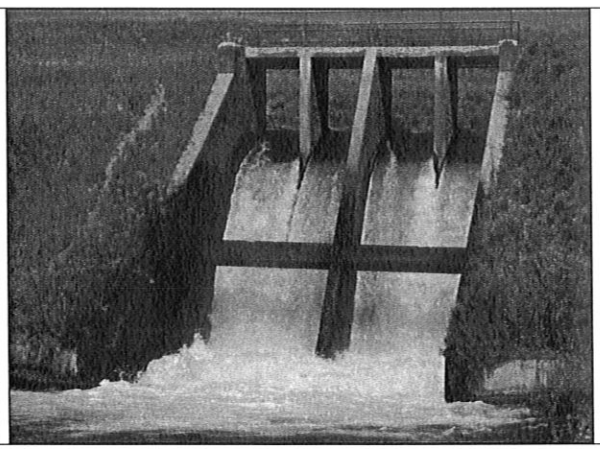
The Yakama Nation through Yakama Power have made improvements on the Wapato Irrigation Project's hydroelectric powerhouses and have currently invested over $3.2 million to repair WIP drop sites #2 and #3 since 2006. Both generators have operated since 2009 and have averaged 2-4 million kilowatt hours of clean energy annually. The revenues from the power generation have not covered the annual maintenance for the drops but the value for passing water to the "down canal users" on the project is much more substantial and the reasoning for the Tribe's initial investment in the drops. The primary water supply for WIP is diverted from the Yakima River at the Wapato Diversion Dam. There is over an estimated 130,000 irrigated acres in agricultural production at this time. The intent of this proposal was to continue the power potential on the WIP with the construction of Drop #4.

The Yakama Nation received over $1,100,000 grant from the Department of Energy with a 50% cost share in 2008 and the term on that grant is expired. The initial estimate of the project was $4,600,000 that was twice as much as the DOE budget. We have investigated the option to reduce the cost by buying the turbine from different manufactures and using existing infrastructure for the spill way and other cost saving options and increasing the power potential of the project with a larger elevation drop.

Drop 4

Drop site #4 comprises the outlet works for the main canal where flow is returned to the river via Drain 4. The structure at drop site #4 is a concrete gravity section with four 5 ft. wide discharge bays. Each bay has stop log slots at the pier noses and narrow gate slots. The stop log slots are used to control discharge at the structure. There are no mechanical or electrical facilities at the site.

To date Yakama Power and the Yakama Nation has invested thousands of dollars investigating the development of Drop 4 and have completed preliminary engineering designs, environmental assessments, and have a Yakama Agency "Notice to Proceed" approval from the Bureau of Indian Affairs Superintendent. The shelf life for the EA and the "Notice to Proceed" is five years and was granted by the BIA Yakama Agency July of 2012.

The Drop 4 is 22 feet with a variable flow through the end of March to the middle of October. The drop, which is located on west of Harrah Drain Road and North of Fort Rd (NW ¼ of Section 4, Township 10, and Range 18), is operated by the WIP. Yakama Power's transmission line is a quarter mile to the east of the site.	

In August of 2009 Yakama Power contract HDR/DTA to analyze the electricity potential for Drop 4 with 2008 flow measurements with a vertical Kaplan turbine and the results were as follows:

Plant Summary		Conceptual Turbine Parameter	
Rated Power	970 kW	Single Unit Vertical Kaplan Configuration	
Estimated Annual Energy	2,836,000 kWhrs	Type	Kaplan
Plant Factor	0.33	Rated Head	22 feet
		Max Flow	600 cfs
		Peak Efficiency	92%

In 2011-12 Yakama Power investigated developing Drop 4 again with NAES Power Contractors, Knight Piesold, JRONE Enterprise, and PEN Inc. in a combined effort to reduce the costs of the project and stay within budget. Yakama Power solicited a "not to exceed" proposal from the consultants but there were many assumptions built into it and the budget still exceeded the $2,200,000 limit. The groups design for the power was more consolidated and required less civil work and had a less expensive turbine, controls, and powerhouse.

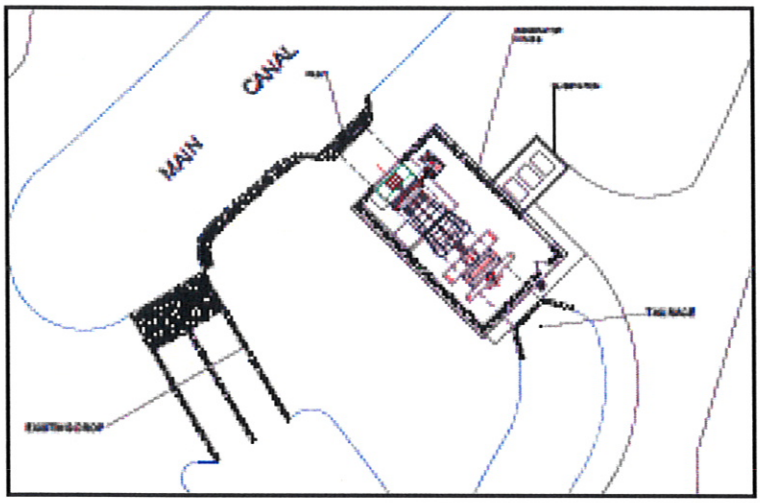
One of the main accomplishments from the group was the soil testing samples taken from Drop 4. The test included, 1) Natural Moisture Content, 2) Sieve Analysis, 3) Down to #200, Minus #200 Content, Wet Wash, 4) Atterberg Limits, 5) Triaxial Shear, Consolidated-Undrained w/Pore Pressure Measurements (TX-ICU), 6) Flexible Wall Permeability, Combined w/Triaxial Shear Test 7) Sample Trimming, 8) Relative Density (Min./Max.-Wet Method) and 9) Final Reporting. The test results allowed the project to move forward with the associated civil work costs and necessary requirements for the Environmental Assessment.

YP personnel Kyle Clemens and Ken Jamison backfilling TP-1 with powdered Bentonite.

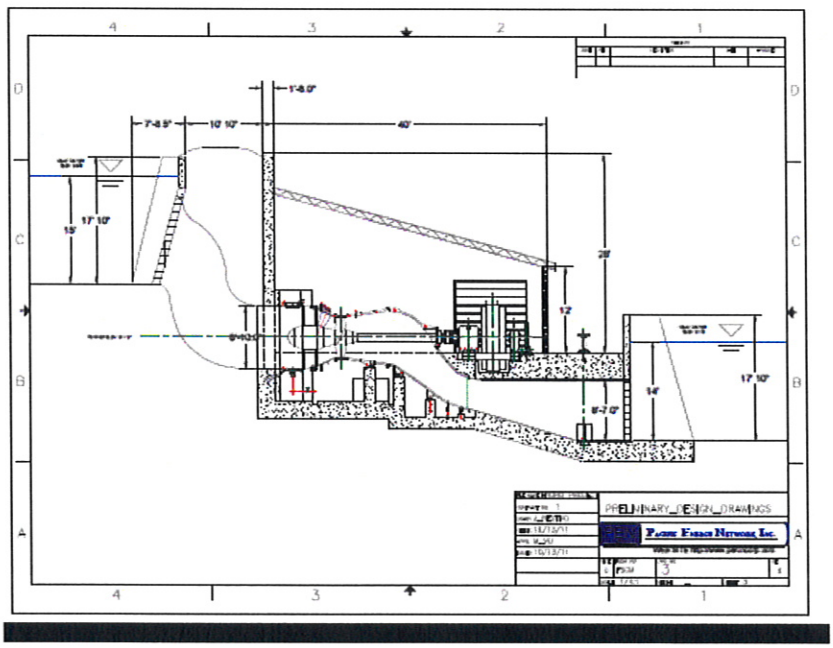
Yakama Power wished to acquire more cfs for Drop 4 and increase the elevation so the power potential for the site increased. The WIP engineers stated that 50 cfs that is taken from the from the Main canal and put into Drain 2 can be left in the Main canal until it passes by Drop 4 and then it can be diverted back into the Harrah Drain where it was originally intended for. The extra 50 cfs will increase the power generation at Drop 4.

The proposed power generation facility would have included construction of the following primary components and associated ancillary features:

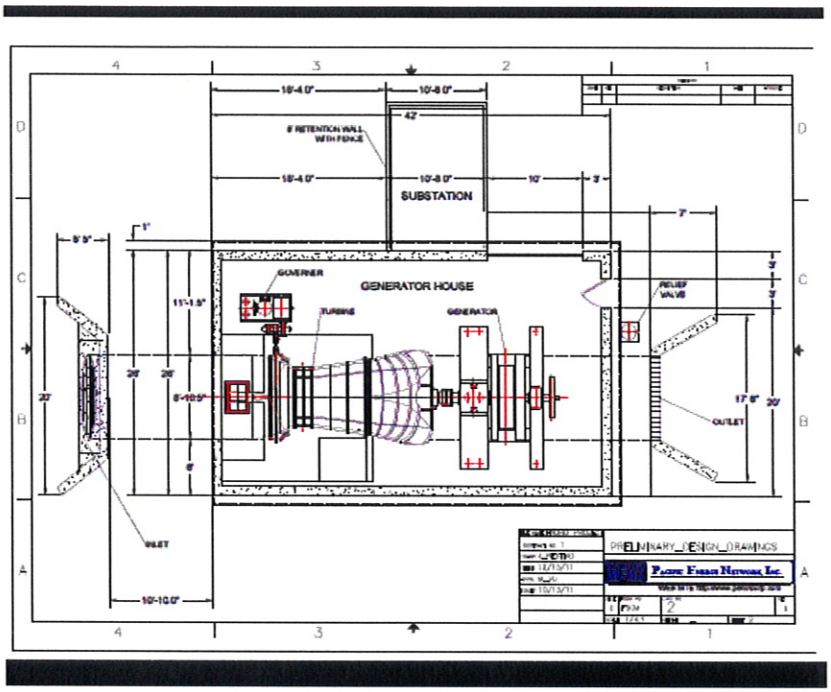
- A water inlet. The inlet will be located immediately upstream of the Drop 4 spillway on the east face of the WIP Main Canal and will result in an approximately 20 ft by 18 ft opening in the canal bank that will be constructed of a combination of reinforced concrete and metal. The inlet would extend approximately 19 ft southeastwards towards the turbine housed in the generator house and will allow a controlled amount of irrigation water to pass through the turbine resulting in generation of electricity rather than passage over the spillway resulting in no power generation.



- A small generator house. The generator house will have an approximately footprint of 30 ft by 40 ft with substantial portion of the concrete footings and foundations situated below ground surface. The visible elevation portion of the generator house will be approximately 28 ft with the upper elevation of the retaining wall commencing at the approximate upper elevation of the existing canal bank. The generator house will reside against the southeastern face of the canal embankment and will likely not be visible as viewed from either of the residents located approximately 575 ft to the northwest and northeast. The resident located approximately 250 ft east of the proposed project may be able to view the generator house when accessing their property via the shared access road, however, due to tree and other landscape planting will likely not be able to view the structure from their house. The generator house will house the in-flow turbine, governor, generator and ancillary materials and equipment. The generator house exterior building materials will likely consist of metal, wood or concrete similar in color and style with agricultural buildings located in the vicinity.

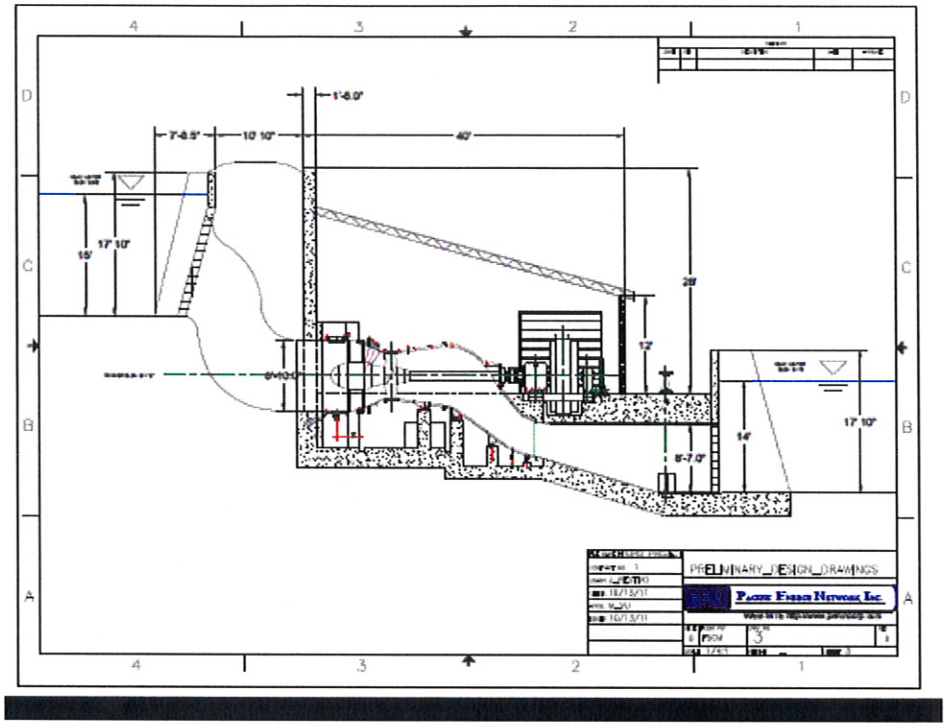


- The inflow turbine. The inflow turbine will be capable of generating approximately one megawatt of supplemental hydroelectric power that will be capable of producing approximately $168,000 per year of seasonal revenue at $60/MWh with a predicted 30 year return on capital investment. The inflow turbine is designed such that irrigation water is not in direct contact with fluid containing components.



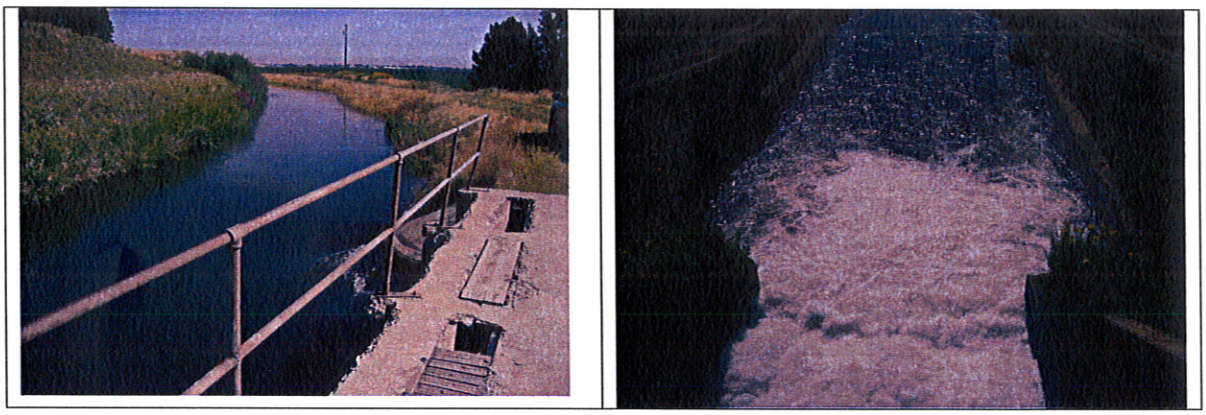
- The substation. The substation will be located on an approximate 11 ft by 17 ft fenced concrete pad situated northeast and adjacent to the generator house. The transformers would contain a biodegradable environmentally friendly dielectric fluid and would reside within a curbed concrete pad designed for spill containment.

- The outlet and tailrace. The outlet would be constructed southeast of the generator building and would extend through the tailrace to the northeast face of the Main Canal located below the spillway. The outlet feature will be approximately 20 ft by 18 ft in dimension and would extend approximately 80 ft from the generator house to the northeast face of the Main Canal embankment.



- Downstream weir. A manual water flow weir is located downstream of Drop 4 spillway. As a portion of construction the downstream weir may be relocated or converted to a remote irrigation water monitoring system. Removing the weir would allow for an additional 1 ½ to 2 feet drop in elevation for more potential power generation at Drop 4.

- Potential increase in headwater elevation. To increase the power generation potential at Drop 4, a potential future modification to the power generation facility includes the increase in headwater height by 2 to 4 ft. This could be accomplished by increasing the spillway overflow height or potentially backfilling select portions of the upstream canal banks to facilitate an increase in static water level and potentially backfilling select portions of the downstream canal banks to facilitate an increase in irrigation water through flow. Should a turbine outage occur the additional headwater would bypass the turbine inlet and flow over the spillway into the lower canal before being diverted back into Harrah Drain, or the source water upstream would be diverted from the Main Canal into Harrah Drain.



- Potential water diversion. As a portion of the potential future increase in headwater height and upstream static water level increase, approximately 50 cubic feet per second (cfs) of water currently being diverted into Harrah Drain may be retained or diverted to the Main Canal north of Harrah at an existing feature designed for this purpose and then diverted back into Harrah Drain south of Drop 4 where the main canal and Harrah Drain cross approximately 1,700 feet east of the proposed project. The distance between the exiting upstream directional water diversion feature and the proposed downstream diversion is approximately 2 miles. At the proposed downstream diversion location the WIP Main Canal crosses over Harrah Drain at the intersection with Harrah Drain Road. At the crossover location a small pump or gravity flow gate system would be installed that would allow water from the WIP Main Canal to be diverted back into Harrah Drain.

- The transmission line. Four to six additional power poles and transmission wire will be installed adjacent to the shared Drop 4 and east adjacent resident access road and will connect the newly constructed transformer bank with the existing 34.5 kV line present at Harrah Drain Road. The new overhead transmission line will extend approximately 1,700 ft eastward from the newly constructed substation and connecting to the existing transmission line paralleling Harrah Drain road.

- Temporary construction and material lay down areas. Temporary areas for construction staging and materials lay down will be located east and adjacent to the proposed project. According to the Yakima County GIS Washington Land Portal web site the proposed temporary construction staging and lay down area is private land owned by K Green Family Land Trust.

- Employment. The project would have resulted in the temporary employment of approximately 3 design and inspection professionals, and approximately 20 local workers spanning 8 separate trades during the estimated 8 to 9 month construction project. At the conclusion of the project approximately one additional permanent full time equivalent employee and one additional part time employee will be employed as a result of this project.

- Rural Electrification Improvement. The project will result in the seasonal generation (April to October) of approximately one megawatt of electricity that can be supplied through the existing YP owned transmission line system, assisting in offsetting summer peak electricity demands, and reducing the need to operate BPAs Alfalfa substation in overheated conditions that result from maximum capacity usage over extended periods of time.

- The performa for the Drop 4 project

Design Engineering Services – PEN Inc.	$200,000
OEM T/G Package incl. duties	$669,500
Construction Materials incl. elec.	$420,000
CraftLabor	$680,000
Management incl. subsistence	$174,500
Equipment Rental	$62,000
Subcontracts	$53,000
Contingency	$34,000
MU	$144,000
Below Line Costs	$58,000
Total Project Budget Estimate	**$2,495,000**

Financing	$1,295,000.000
Costs	
10 year payback annual payments	$170,000
30 year payback annual payments	$97,000
Revenues	
$60/average/price during Peak	$112,000
$30/average/price during Off Peak	$14,000
	Total $126,000
Available for Operation and Maintenance for 30 year payback financing:	**$29,000**

The $2,295,000.00 estimate did not include the costs for the quarter mile of transmission line, civil work, funds to remove flume and put cfs back into Harrah Drain below the Drop 4.

- The Yakama Nation and Yakama Power did very little investigation for a FERC exemption application for the project.

Conclusion and Recommendations

The conclusion of this project is the Yakama Nation is returning the funding associated with the "hydroelectric projects" on the Wapato Irrigation Back to the Department of Energy due to the inability of the project to be feasible. The YN is unwilling to move forward on the project for various reasons. The power purchase agreement is the most limiting factor because without a solid power purchase agreement the project will not be implemented.

The government's influence on energy has also create a depressed market with natural gas fraking and having more natural generation, and wind production tax credits creating more clean energy in the region. The recession of 2008 reduced electric energy prices to rates that made developing Drop 4 unviable. Washington's State I-937 didn't create enough disincentives for more clean energy in the region and the more lucrative energy markets on in California. However, California is not allowing outside of their state renewable energy resources to be counted toward their renewable energy portfolios so those lucrative markets are inaccessible.

The local market has been dismal. In 2013the Mid C power market where Grant County PUD markets their power has demonstrated such low power prices Yakama Power had to request with BPA to schedule the power used from Drop 2 just to alleviate the cfs impacting the retaining wall during high water use months in June and July. YP is unable to use the electricity generated for their own units due to the Northwest Power act and how the power is generated with federal facilities.

The Yakama Nation approached Puget Sound Energy and they were somewhat interested a few years ago but nothing developed from the interactions. The interactions and solicitation from Grant County PUD has suffered the same fate due maintenance issues with their large dams.

Tribal energy projects are difficult to develop due to the barriers of the Government and access to resources not available to tribes. Tax incentives by the Government in the form of energy production tax credits are not available to the Yakama Nation or Yakama Power due to their tax exempt status. The YN is reluctant to partner with entities that can use the tax production credits because once again the Tribe's resource would be being utilized that an outside entity would be benefiting from. The Northwest Power Act also makes it difficult for Yakama Power to use federal facilities for power production and then use the resource for their own load because BPA would decrement YP's "high water mark".

Lessons Learned

The Yakama Nation faced many barriers in the development of hydroelectric on the Wapato Irrigation Project. The YN was successful in reconstructing the infrastructure of Drop 2 and Drop 3 on WIP and were encouraged at the possibilities of developing Drop 4. In the end, Drop 4 had issues the YN could not solve.

Unresolved barriers on the Drop 4 include:

Power purchase agreement.

Land use agreement with WIP.

Order of hydro unit.

Civil work for Drop 4.

Flume and canal work above headgate.

Lessons Learned

Analyze energy resource and obtain a power purchase resource before investing significantly on the engineering and design of project.

Developing renewable energy resources is difficult due to market barriers, natural gas competition, no tax incentives for tribes, power purchase agreement, and available resources for tribes to do so.

The Yakama Nation and Yakama Power learned about most of the necessary issues that need to be addressed for electric power generation development.