

Condit Hydroelectric Project Decommissioning

FERC Project No. 2342

ANNUAL SEDIMENT ASSESSMENT REPORT - 2016



September 28, 2016

Project Description

The Condit Hydroelectric Project was completed in 1913 on the White Salmon River in Skamania County and Klickitat County, Washington. The Condit Hydroelectric Project has been removed as outlined in the Project Removal Design Report dated March 15, 2011; 12 supporting management plans; the Washington Department of Ecology (Ecology) 401 certification; the US Army Corps of Engineers 404 permit, and the Federal Energy Regulatory Commission (FERC) Surrender Order. Dam removal was completed in September of 2012. Significant revegetation work was completed in March 2013. Supplemental tree planting was performed in March 2014 and in March 2016. The establishment of vegetation is being monitored.

A site specific Sediment Assessment, Stabilization, and Management Plan, (PacifiCorp, 2011) was developed to address sediment stability and management issues that were expected to occur in the decommissioning process. This plan identified general goals and procedures for 1) performing a post-dewatering assessment, 2) mapping the sediment which remains in the reservoir area, 3) estimating the quantity of sediment remaining in the reservoir area, 4) evaluating the stability of sediment slopes and banks in the reservoir area, 5) determining corrective actions as needed, and 6) evaluating fish passage through the former reservoir.

Regulatory Requirements

A Clean Water Act Section 404 permit was issued for this project by the US Army Corps of Engineers, Regulatory Division on May 13, 2011. The 404 permit requires that PacifiCorp implement the Sediment Assessment, Stabilization, and Management Plan as approved by the FERC.

A Clean Water Act Section 401 certificate was issued for this project by the Washington Department of Ecology (Ecology), Water Quality Certification Order No. 8049, of October 12, 2010. The 401 certification also requires that the PacifiCorp implement the Sediment Assessment, Stabilization, and Management Plan.

The FERC April 2011 Surrender Order required PacifiCorp to submit a Sediment Assessment, Stabilization, and Management Plan in accordance with the Ecology 401 certification. The FERC Order Modifying and Approving Sediment Assessment, Stabilization, and Management Plan (FERC, May 12, 2011) incorporated elements of the Sediment Assessment, Stabilization, and Management Plan into the FERC requirements.

PacifiCorp has submitted several reports to FERC and Ecology addressing sediment behavior: a Draft Sediment Behavior Report (December 2011), Post-Reservoir-Dewatering Assessment Report (February 2012), the 2012 Annual Sediment Assessment Report (September 2012), the 2013 Annual Sediment Assessment Report (September 2013), the 2014 Annual Sediment Assessment Report (September 2014), and the 2015 Annual Sediment Assessment Report (September 2015).

Stability of Reservoir Sediment since 2015

Periodic site inspections conducted over the last year have confirmed that graded slopes overlain by sediment deposits in the former reservoir area have remained stable during the current reporting period of October 1, 2015 to September 30, 2016. This can be attributed to the ongoing effectiveness of factors including low slope angles, good herbaceous cover, and the collection of water from the hillsides into natural or graded channels.

During the reporting period, one flow event in December 2015 exceeded the 50-year flood recurrence interval of 9,178 cubic feet per second (cfs) for December. The flow peaked at 10,660 cfs on December 9, 2015. This was the highest flow since the breach of the dam on October 26, 2011. This event eroded riverbanks consistent with expectations for an event of this magnitude, but considerable growth of willows, cottonwoods, and alders along the riparian zone of the White Salmon River contributed to maintaining bank stability throughout most of the project area. There were three areas where the high flow had conspicuous effects.

In the area along the right bank between Northwestern Lake Bridge and Buck Creek where measures had been implemented to correct bank erosion that had occurred during previous high-flow events, the December 2015 event caused additional erosion. The bank had been stabilized in the fall of 2014 with the placement of a brush mattress, willow stake plantings and live fascine bundles. The high flow scoured soil beneath the brush mattress and swept away most of the fascine bundles. Following consultation with the Washington Department of Ecology and the U.S. Army Corps of Engineers, during August 2016 the remnants of the brush mattress were removed and the bank was graded to a slope of approximately 2H:1V. To achieve this slope, the location of the top of the bank was moved back from the river and significant sediment deposits were hauled off site. This contrasts with previous efforts on this slope that had been based on maintaining the location of the top of the bank to avoid removing decks associated with cabins and to preserve trees. This constraint had resulted in over-steepened slopes approximating the angle of repose of the remaining sediments. The current finished slope better approximates slope angles that have proven stable in the project area. The bank will be seeded and hydromulch will be applied during October 2016.

At Northwestern Park, the December 2015 high-flow event dislodged riprap slope protection at the boater take-out ramp. On August 8, 2016, concurrent with the slope grading work upstream of the bridge, additional riprap was placed to restore this slope protection.

Erosion and sloughing occurred along the left riverbank from approximately 2,800 feet to 3,500 feet downstream of Northwestern Lake Bridge. The upstream end of this area is a transition zone from a steep, rocky bank with little or no remaining sediment to a graded bank overlain with reservoir sediment. At the base of the slope, erosion of pre-reservoir alluvial deposits occurred. In the transition zone that has not been previously graded or planted, ground movement is

ongoing with offset cracks and stair-stepping scarps up to six feet in height. The base of the slope is steeper than the angle of repose and is susceptible to erosion. Downstream of this transition zone, eroded areas below the graded and planted area have the potential for continued sloughing as the bank evolves to an angle of repose. Observations have not indicated releases of sediment to the river under most flow conditions. While the area may continue to naturally erode over time, sediment releases are generally only expected during high-flow channel-forming events. Regarding public safety, there are neither established nor informal trails to the area and hazard conditions are similar to other steep areas along the riverbank. No corrective actions are proposed.

The limited erosion resulting from the severe conditions of the December 2015 high-flow event demonstrated the effectiveness of the project measures in maintaining the stability of the project area. As the riparian zone vegetation continues to mature throughout the project area, the potential for riverbank scour during high-flow events continues to decrease. The river channel has remained in essentially the same horizontal alignment since the initial downcutting through reservoir sediments in the days after the dam was breached and especially since the grading of the reservoir sediments was completed in August 2012.

Tributary Stream Channels

Tributary stream channels that flow into the White Salmon River within the former reservoir area are a mix of perennial and ephemeral streams. There are ten tributary streams that drain into the reservoir area, eight of which cross sediment deposits, and four of those are ephemeral. None of the tributary stream channels have migrated laterally, cut down significantly, nor have the channels undercut adjacent slope areas. There has been significant development of riparian vegetation in, and adjacent to, these tributary streambeds.

Engineered Log Jams

The seven Engineered Log Jams (ELJ) that were placed to facilitate the development of riparian zones adjacent to the river remain intact and stable. Following the December high-flow event, a single log was found adjacent to the right bank approximately 50 feet downstream of Mill Creek. The log is cabled to two rocks that are adjacent to the bank. The other end of the log, at the roots, is wedged under a boulder in the riverbed. This log is assumed to have come from the log structure at the mouth of Mill Creek, but the point from which it was dislodged is not apparent. The log structure does not exhibit any signs of disturbance, with the only apparent effects of the high flow being the accumulation of additional woody debris. After observations during spring and summer flow conditions, no action related to this log is proposed.

Recreational Cabin Removal

As noted in the 2015 Annual Sediment Assessment Report, a cabin was removed from a site on the right side of the mouth of Buck Creek in the fall of 2014. The slope below the cabin was

graded to a 2H:1V slope and the cabin site and the slope were seeded. The slope remains stable and herbaceous cover has developed.

Two additional cabins located upstream of Northwestern Lake Bridge on the left bank of the river are anticipated to be removed during the fall of 2016. Consistent with the 1912 pre-reservoir topographic map of the project area, the riverbank is steep in this area. The bank is comprised of coarse gravel, cobble and boulder-sized materials. No grading or alteration of the bank below the cabins is planned.

Annual Qualitative Assessment

Periodic site inspections have indicated that occurrences of observable erosion of the remaining reservoir sediments during the past year were few, isolated, and primarily during a high-flow event that exceeded the 50-year recurrence interval. In the FERC Order Modifying and Approving (the) Sediment Assessment, Stabilization and Management Plan (FERC, May 12, 2012), the licensee is required to submit a progress report by September 30 of each year. In addition, the 401 certification issued by Ecology states "a stable condition" will generally be attained when:

- a. Remaining slopes and banks are stable and do not present a public safety risk,
- b. The river within the former reservoir area has attained a stable course and channel width, and
- c. The amount of sediment released from the reservoir is no longer significant, as determined from the water quality (turbidity) measurements and from LiDAR sediment mapping and sediment quantity calculations.

The criteria for a stable course and channel and no significant sediment release were reported as being met in the 2014 Annual Sediment Assessment Report. Inspections of the former reservoir have shown conditions continue to be consistent with the 2012 and 2013 LiDAR surveys and confirmed that the river within the former reservoir has attained a stable course and channel width since August of 2012. Based on monitoring results, water quality was considered acceptable by Ecology and monitoring was discontinued in December 2013.

Similar to the consistency of the river course and channel, graded and planted slopes have been stable in the reservoir area from Northwestern Lake Bridge downstream to the dam site since the fall of 2012. With the exception of the two specific areas of slope instability described on pages 2 and 3 of this report, the project area has attained a stable condition.

Conclusion

Since the breach of Condit dam on October 26, 2011 natural riverine processes and deliberate sediment management actions have brought the White Salmon River and its shoreline within the former reservoir area into a stable, functioning river corridor. Observations over the past few years indicate the stream banks are stable, not a risk to public safety, and not ongoing sources of

sediment. Isolated areas of concern have been addressed or have been found to be inconsequential to the trajectory of the former reservoir area attaining natural conditions. As can be expected of any natural river, high-flow channel-forming events will continue to determine the river pathway, cutting banks in areas and moving sediment deposits like gravels downstream. In light of the positive response to restoration activities and the return of river form and function, PacifiCorp concludes that the criteria for the cessation of active management and monitoring have been attained.



Tributary streams Spring Creek and Little Buck Creek on the right bank approximately 1,000feet upstream of the dam site.

March 16, 2016



View toward the dam site from the right bank approximately 2,000 feet upstream of the dam site.
September 21, 2016



View of the left bank. Center of photo is approximately 2,200 feet upstream of the dam site.
September 21, 2016



View of the right bank. Center of photo is approximately 3,000 feet upstream of the dam site.
April 16, 10, 2016



View downstream from the left bank. Center of photo is approximately 4,000 feet upstream of the dam site. – September 21, 2016



View of the left bank in the vicinity of Graves Road. Center of photo is approximately 5,300 feet upstream of the dam site/3,900 feet downstream of Northwestern Lake Bridge.

March 11, 2016



View of the left bank approximately 3,000 feet downstream of Northwestern Lake Bridge. Ground movement is ongoing since the area was eroded during the December 2015 high-flow event.

March 15, 2016



View of the left bank approximately 3,000 feet downstream of Northwestern Lake Bridge.
September 21, 2016



View of the right bank approximately 3,200 feet downstream of Northwestern Lake Bridge.
September 21, 2016



View of the right bank. Center of photo is approximately 2,500 feet downstream of Northwestern Lake Bridge. – September 21, 2016



View downstream from Northwestern Lake Bridge during 50-year recurrence flow event
December 9, 2015



View downstream from Northwestern Lake Bridge
September 21, 2016



Views of the Northwestern Park boater take-out before and after repairs to the riprap slope protection.
March 3, 2016 and September 21, 2016



View upstream from Northwestern Lake Bridge during 50-year recurrence flow event. Bank repair measures on the right bank were undermined. - December 9, 2015



Right bank from Buck Creek to Northwestern Lake Bridge after grading the bank during August 2016.
September 21, 2016