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October 31, 2016

To: Crystal River Ranch Shoreline Stabilization Committee

From: Lawrence Dominguez, Owner, Sr. Ecologist

RE: River Shoreline Project Evaluation, September 24 – 25, 2016

On September 24 and 25, 2016 EcoAssets provided consultation services for Crystal River Ranch (CRR) in support of ongoing erosion monitoring initiated in October 2012. An associate and myself were joined by 6 members of the CRR Board and/or community to evaluate the rockvanes function and erosion status. In addition to acquiring updated measurements and installing tree markers, an objective was to teach the measurement methods to committee members. We assessed all 14 vane locations using the prescribed methods from the original report (Dominguez 2012; Shoreline Assessment and Staff/Crest Gauge Recommendations, Tech. Memo to CRR). Additional field assessment included site visits and consultations in downstream and upstream reaches to identify priority concerns for long term CRR shoreline management.

In addition to the vane monitoring effort we visited upstream and downstream risk areas and engaged in discussions about interim efforts for bank erosion management as a long-term shoreline management plan is planned for CRR.

We visited the left bank of the White River (CRR side) channel about ½ mile upstream from the power station (Figure 1). The left bank of this area is heavily forested and located on secondary floodplain. There is evidence of historic channels but high bank areas and mature forest suggest that many decades of erosion with the channel abutted against the left bank could establish a moderate risk to avulsion. There is only a low risk given the current channel trend.

We also visited the downstream Crystal River Ranch Rd East entrance to Bridge (Figure 2). The relatively narrow bridge span (79 ft. abutment to abutment) suggests that the constriction could be contributing to higher than normal sediment deposition rates in the CRR reach compared to if the bridge did not constrain the active channel.

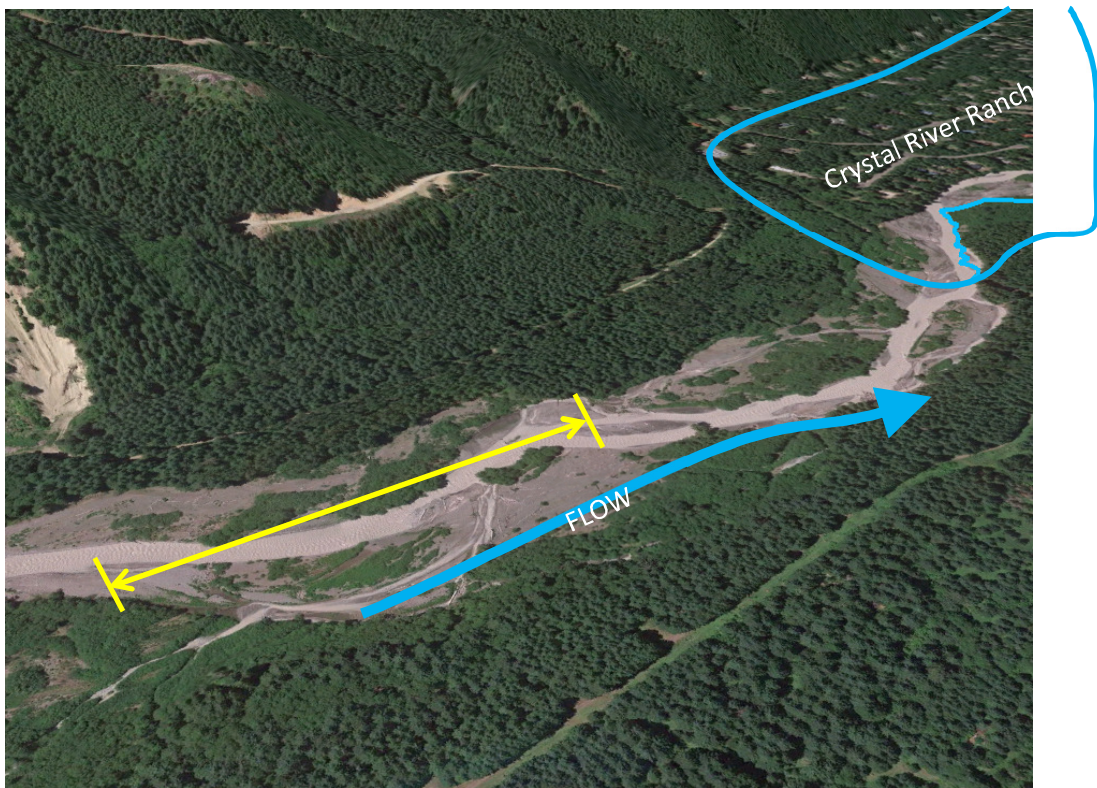


Figure 1. Upstream area visited by CRR Assessment team to determine level of channel avulsion risk and exposure risk to Elk Trail Way area of Crystal River ranch. Yellow line indicates site visit area September 25, 2016.



Figure 2 Crystal River Ranch Road crossing of White River

## Summary

1. The team completed assessments on 14 vanes which included distance measurements, placement of new tree markers where needed and rated the vane functionality and bank erosion.
2. EcoAssets provided the data in an Excel spreadsheet. This spreadsheet can serve as the year-to-year monitoring data records. Calculations for annual erosion estimates can be built into it for reporting purposes.
3. There is evidence of backwater during certain flood stages at the entrance bridge upstream of the CRR road. The team agreed that placing crest gauges in the floodplain below the bridge would provide good baseline information about the effects of an undersized bridge. The team suggested that EcoAssets help install the low-cost gauges this fall and provide the survey and map work.
4. The team agreed that it would be a responsible act to provide regular correspondence to the Pierce County Planning and Land Services (PALS) office. This correspondence would go on the record for CRR as stewardship and monitoring activities which will serve to support future maintenance actions and content for long term Shoreline Erosion Management Plans. Attached is an example draft that could be used to provide updates to PALS.
5. Regarding the high bank at the upper extent, CRR maintains a concern for bank toe erosion and erosion from local overland runoff. This “plateau” floodplain retains a lot of water from overland flow and wall-base flows out of the adjacent hills. The chronic saturation of these lahar-derived sediments, although not necessarily at ground water levels, could be a liquefaction hazard during an earthquake since water is perched and retained in the surface layers. A channel feature is evident at this Elk Trail Way area and may be the early activity of a large slump or slide since it appears that water may be infiltrating through this feature.
6. Some interim measures were suggested to continue addressing the erosion problem. The team noted that the vegetation establishment at the toe of the two in-channel emergency permitted rock vanes at the Knoll property on Willow Tree Way is a great example of stabilizing soils so that vegetation can grow. Larger diameter willow stakes can be used for starting vegetation clusters at the toe of a number of shoreline reach locations. Areas where

drift logs have provided a place for sediment to settle out are good locations for planting since they are low energy and vegetation can be established.

## EXAMPLE LETTER TO DOCUMENT MONITORING TO COUNTY

To: Pierce County Planning and Land Services

Attn: Kim Van Zwalenburg, Pierce County Shoreline Management

From: Crystal River Ranch Homeowners Association

Date: October 31, 2016

Subject: Monitoring Crystal River Ranch Shoreline Management; Erosion

### Overview

Since Fall 2012 Crystal River Ranch (CRR) has been monitoring erosion and bank conditions after a wellhead protection project was completed. The CRR membership and Board has determined that we would provide brief annual reports to Pierce County Planning and Land Services as a record of our shoreline stewardship and wellhead protection project status. This is an important part of our long-term monitoring and management of shoreline stability and would like the County to make this information available to communities and regulatory agencies for assisting in White River management. If possible please assign a long-term reference number for our monitoring project so that could be on file with the County. You may wish to include it with our previous package (*Cite the permits or application number of the Vane project*) to ensure private and community property and wellhead protection. During 2012-2104 CRR desired to create baseline information for long-term monitoring of rock vane performance as a means to track the locations and rate of natural and vane-associated erosion in the erosion control project reach.

Please see the attached updated survey.