WASHINGTON STATE DEPARTMENT OF
NATURAL RESOURCES
HILARY S. FRANZ | COMMISSIONER OF PUBLIC LANDS

DNR Public Safety Checklist for Large Woody Debris Projects

Proposed project: Keys Road Flood Protection

Proponent: Grays Harbor County

Date submitted: **4/14/2020**

Factual background supplied by project proponent

1. **Public Use.**

   a. **What activities take place in the vicinity of the project? Describe the time of year, frequency, and popularity of the site for these uses. Document descriptions in guidebooks for canoeing, rafting, or fishing, or any internet sites. Note whether or not there is a history of accidents in the vicinity of the proposed project.**
   The project vicinity includes the Lower Satsop River and its floodplain from the Monte Elma bridge to the confluence with the Chehalis River. The reach is heavily used by anglers who access it by wading, drift boat and jet sled January through April for winter steelhead and October through December for fall chinook and Coho salmon. The reach has a single thread planform with predominantly long stretches of open water without strainers, rocks, or other obstructions that would create risk to recreational users. There is not a history of accidents for the reach.

   b. **What type of access to the area is available and at what distance from the project site?**
   The reach has a river access point with a boat launch to the Lower Satsop River at Highway 12 approximately 4,500 feet upstream of the first project elements. There is also a river access point with a boat launch to the Chehalis River approximately half a mile upstream of the confluence with the Lower Satsop River.

   c. **Have any public safety studies and/or a risk assessment been completed? Provide them.**
   The project proponent is unaware of any public safety studies that have been conducted for the reach.

   d. **Provide a narrative describing any community and river user-group consultations that have been carried out, if necessary, to address public safety.**
   Members of the Grays Harbor Guides Association were asked to provide information on times of peak recreational use. For Satsop River fishing heaviest use times of use are October through December for salmon and January until April for winter steelhead. One

guide described their perception of risk associated with the installation of in stream engineered log jams as low/moderate stating "most in stream structures will be utilized by the river only during high water events, greater than 2500cfs on . . . what most people consider high or borderline unfishable. So assuming this most structures won't have a huge impact on safety." (personal email communication from Cary Hofmann of CNH Guide Service to Anthony Waldrop included as Attachment A to this form)

2. Site Description.

a. General channel description: gradient, bedform, ordinary high water width and depth, adjacent banks (e.g. steep, flat, high, vegetated, etc.).

The reach has a single thread planform with predominantly long stretches of unobstructed glides. On the terrace floodplain surrounding the river most of the land is used either for grazing or silage production. The river is very flat over the project reach dropping about 18 feet over 2 miles with a slope of 0.0017 percent. The ordinary high/bankfull indicators typically span 200 feet corresponding with a depth of 6 feet. In several locations the floodplain is disconnected from the river due to incision which has exacerbated bank erosion resulting in near vertical banks.

b. Range of conditions, particularly during times of peak use: flow volume and velocity, maximum depth, channel width.

Times of most intense use are October through December for salmon and then January until April for winter steelhead. A table summarizing flows, depths, velocities and channel widths associated with peak use is shown below, (Table 1 from USGS 12035000 gage). At higher flows the river becomes borderline unfishable and thus there are less recreational users during times of highest risk, email communication Grays Harbor Guides Association.

Table 1. Stream attributes during times of peak use (taken from USGS 12035000 gage site).

Month	Avg. Monthly Flow (cfs)	Depth (ft)	Velocity (ft/s)	Channel Width (ft)
January	4,240	4.4	3.9	250
February	3,660	4.1	3.7	240
March	3,060	3.7	3.6	230
April	2,110	2.9	3.2	225
October	1,210	1.8	3.1	220
November	3,190	3.8	3.6	230
December	4,230	4.4	3.8	250

3. Area Description.

a. Identify any dams, water diversions, or other features that may affect the flow regime.

N/A

b. Describe downstream structures such as bridges or docks.

There are 3 bridges upstream of the project which cross the Lower Satsop River. Starting at the boat launch upstream of the project and moving up river these are the Highway 12

bridge, the Satsop River Pacific Rail bridge and the Monte Elma bridge. These three bridges are all actively used. There are no bridges or docks immediately downstream of the project reach.

c. Describe land use in the immediate vicinity (e.g. residential, forest land, etc.).
Most of the land in the reach is privately owned and used for grazing or silage production. There are two river access points with boat ramps on Washington Department of Fish and Wildlife property. The Port of Grays Harbor has a potable water well on the east bank of the river at the downstream end of the reach.

d. Identify relationship to towns, cities, or other population centers.
The project reach is approximately 2 miles East of Montesano, WA and 0.5 miles south of Elma, WA. The main project access point is off Keys Road 0.75 miles south of Highway 12.

4. Project Description.
The proposed project is a bank protection project focused on improving floodplain connectivity, stabilizing river flow paths, protecting Keys Road and the Port of Grays Harbor's well, and reducing rates of erosion along the lower 1.5 miles of the Satsop River upstream of its confluence with the Chehalis River. The project will use ecologically sensitive solutions consistent with ongoing habitat restoration projects in the basin. Specifically, the project would construct two setback revetments comprised of 18 engineered log jams (ELJs) on the floodplain to protect Keys Road. The project also includes construction of a 1,200-foot-long temporary bypass/side channel, 7 floodplain roughness ELJs, 17 ELJs in the river, and 320 feet of timber complex ELJ directly in front of the Port of Grays Harbor's potable water well. The project objectives are to reduce high rates of erosion by improving floodplain connectivity and reducing stream power and main channel velocities.

a. Where is the project relative to the water body? (e.g. at the bend of river; at the margin of a channel; in a backwater; how far from the shoreline; etc.).
Proposed project elements would be placed in the channel at meander bends to reduce stream power and on the floodplain to protect the Port of Grays Harbor potable water well and Keys Road from erosion. The floodplain structures (setback revetment) are set off the river approximately 200 feet and will be buried so that they are at the thalweg elevation of the river. Once the setback revetment is installed it will not be visible.

b. How is the project designed to interact with the channel and the flow?
The project is designed to reduce stream power and erosion by reducing velocities, creating local backwater effects and increasing inundation frequency and extent on floodplains. Structure layout has been planned with the intent of scouring pools for habitat, sorting stable gravels, and aggrading material at banks where erosion has been an issue.

c. What is the minimum line of sight distance navigating up and down stream?
The minimum line of sight along the reach to project elements is approximately 500 feet and occurs at a river bend where deflector structures are proposed to be constructed on the bank.

d. How long will it take floating users to reach the project during the most frequent or expected use (taking into account the most likely direction of travel)?

The nearest access point is 4,500 feet upstream from the first project elements that a user would encounter. Using the maximum velocity in Table 1 of 3.9 ft/s that translates to a 20 minute float to reach project features.

e. Is the project located in a position where people can readily avoid the structure and other nearby hazards?

Project elements with minimum line of sight, 500 feet, are positioned on banks with the majority of the channel unobstructed. In these cases, users could easily navigate around the structures. In locations where the structures are placed in mid-channel groupings the line of sight is much greater, 1,100 feet, and users would have greater reaction time and the option to pull their craft to shore to portage or scout their route through the structure groups.

f. Describe how the project will protect public safety. Project proponents are encouraged to develop designs consistent with the State of Washington Integrated Streambank Protection Guidelines and Stream Habitat Restoration Guidelines, which promote public safety. Describe how these documents were used in the project design and any known deviations from them, if applicable.

The project design has drawn upon the guidelines presented in the ISPG and SHRG documents for addressing public safety concerns related to direct interaction with large wood structures, erosion reduction measuers and protection of public and private infrastructure. Since interaction of public river users and in-stream obstructions carries the highest risk line-of-sight, reaction time, availability of eddies for portage/scouting, and average velocitites during peak use were all considerations that informed the design. This project will protect public safety by reducing stream power and velocitites, saving public and private lands from erosion and protecting Keys Road and the Satsop Business Park drinking water well.

g. Licensed engineers with fluvial geomorphological and/or hydrology experience in safely designing large wood restoration projects are strongly encouraged as part of the restoration team. What is the experience of the designer?

The design team is multidisciplinary and includes professional engineers, licensed geologists, stream and plant ecologists, and fluvial geomorphologists. The design leads are principals of the design firm with decades of experience in the riverine environment with a focus on large wood restoration projects.

h. Specify what flood event the project is designed to withstand.

The project has been designed to withstand forces associated with the 100-year flood event. To be conservative the project has also been evaluated over bankfull conditions which typically occur at lower flows but where hydraulic forces are at maximum as all the stream power is concentrated in the channel.

5. Anticipated Outcomes.

a. Describe how the project is anticipated to affect geomorphic characteristics of the water body at, upstream, and downstream of the proposed project as previously

described in number 4 above. As applicable, identify how the project will interact with existing hazards or create new hazards by altering the channel/banks, water depths, currents, wood migration, or flooding.

Project design elements will have a local effect on water surface elevations, velocities, and inundation extents of the floodplain. These changes to hydraulics will promote deposition of stable gravels adjacent to and in the lee of structures, promote deposition of fine material on the floodplain as more flow is routed to the floodplain, scour pools upstream of structures, and deposit sediment in areas where stream power has been reduced by increasing depth and reducing velocities. These local effects will extend approximately 500 feet upstream and downstream of project elements. Over time as bank erosion is reduced channel bank slopes will soften, channel length will increase further reducing channel gradient, and floodplain connectivity will increase.

b. How will the project affect people's ability to safely access and exit the water?

The project will not affect existing access to and from the waterbody as the locations where structures are proposed coincide with severe erosion and near vertical banks. Proposed structures in these locations will create downstream eddies at the channel edge where a boat could safely pull away from the main current.

c. Does the project increase the relative risk to the typical user at this portion of the water body?

The project has been designed and project elements sized so that structures are fully engaged at bankfull flows when channel depths are between 6-8 feet. Times of greatest use coincide with flow depths of 2-4 feet. Under typical peak use conditions structures will be clearly visible above the water line and users will have sufficient line of sight and distance to navigate around proposed project elements.

d. What public safety and resource risks are associated with structural failure?

Structural failure of installed project elements could adversely affect recreational opportunities and public safety associated with drift and jet sled fishing by making the river less navigable in areas near the failure.

6. Mitigation Measures.

a. What structural or design elements were applied to this project to minimize public safety risks?

The US Bureau of Reclamation's 2014 Large Woody Material – Risk Based Design Guidelines (RBDG) were used to assess risk to the public and property associated with ELJ elements of the project. The RBDG make use of two risk matrices which quantify risk associated with ELJ project elements: The Property Damage Risk Matrix, and the Public Safety Risk Matrix. The Matrices quantify general characteristics of the project reach, structure setting, recreational use, and channel characteristics to categorize risk to the public and property as a result of project actions. These matrix ratings result in a recommened factor of safety (FOS) for structure buoyancy, pile breakage, and sliding of 1.75, 1.5, and 1.5 respectively. The design FOS for each structure type were evaluated by sampling hydraulics from a 2-dimensional model developed to simulate proposed conditions. For each structure type the calculated FOS's exceed the recommended value proposed bythe RBDG.

b. What is the frequency and term of post-construction monitoring to assess structural integrity of the project and ease of avoidance by water users? What is the performance threshold for success or failure? How will this information be reported? What is the contingency plan if problems are detected or for failed performance?

Post construction monitoring should occur bi-annually after fall and spring storm peaks in the system. As long as structures remain in place no action will be necessary, any change in location would be cause for concern. If significant amounts of wood have racked on structures consideration of additional piles to stabilize wood accumulations should be considered. Notification of structure failure should be made by email or telephone to Grays Harbor County. In the event of structure failure a failure assessment would be completed to determine why the failure occurred and if the event was outside of the design threshold for the structure. Once a failure assessment was completed recommendations for repair could be made.

c. Provide a narrative describing the public awareness/education strategy, if necessary, to address public safety. Identify proposed public safety notices.

Boater safety signage will be placed at the Lower Satsop and Chehalis River boat ramps in the vicinity of the project. No other public safety education strategy is proposed.

d. How and where will safety signage be used to protect in-water users? This detail should be included on the plan view of the design.

Boater safety signage will be placed at the Lower Satsop and Chehalis River boat ramps in the vicinity of the project. Signage will have information on the purposed of the structures, how to report structure failure, and best boating practices to ensure safety of users in the reach.