

# INSTREAM PROJECT DESIGN CHECKLIST

*For Design and Construction of Flood and Erosion Protection Facilities and Habitat Restoration Projects that May Include Large Wood Placement or Natural Wood Recruitment*

Project Name Sinnema Quaale Upper Revetment Reconstruction

Project Manager Chase Barton

River/River Mile/Bank Snoqualmie River/17.75-17.9/right bank

Date February 24, 2015

Check one or both:

Project includes placement of large wood elements

Project may influence the recruitment, mobility and accumulation of natural large wood.

**Note:** If the project is comprised of emergency work, then fill out and file this form within 30 days of completion of emergency work.

## **I. Project Background and Preliminary Design (30-40 Percent) Information**

*(Provide general information at a conceptual level)*

1. Describe the overall river management context, strategy and objectives for the river reach. Refer to pertinent plans, policies or documents pertaining to flood hazards, salmon recovery, etc.

River management approaches in this reach are informed by several plans and related documents that provide context for flood hazard management and salmon recovery.

King County's 2013 Flood Hazard Management Plan Update identifies the project reach as part of the Chinook Bend to County Line Meander Segment. This segment is low gradient and low velocity flood flows across the valley are relatively frequent. Flood plain management efforts are focused on reducing flood and erosion risks, supporting sustainable agriculture, and restoring ecological processes.

The Snohomish River Basin Salmon Conservation Plan (2005) provides a snapshot of this mainstem reach on pages 11-29 and 11-43. The recovery focus is to restore watershed processes by restoring forest, increasing floodplain connectivity, and increasing channel complexity. The greatly diminished quantity and quality of rearing habitat, particularly along the channel margins is a problem. For the Snoqualmie River, the lack of large wood in the river is specifically called out.

2. Describe the goals and objectives of the project and its relative importance to the success of DNRP program goals and mandates. Identify funding source(s) and describe any applicable requirements or constraints.

The Sinnema Quaale Upper Revetment Reconstruction Project will reconstruct approximately 750 linear feet of the Sinnema Quaale Upper revetment, protecting the Snoqualmie Valley Trail and the regional fiber optic line, improving slope stability conditions for the embankment supporting State Highway 203, and providing enhanced aquatic habitat conditions. This project provides regional benefits to key transportation, communication, and recreational resources.

The project goals and objectives are the same as those of the King County Flood Hazard Management Plan; to reduce risks from flood and channel migration hazards, avoid or minimize environmental impacts of flood hazard management and to reduce the long term costs of flood hazard management. To this end, a project design was developed to protect regionally important infrastructure in a way that does not increase adverse environmental impact.

The funding for the project is being provided by the King County Flood Control District and King County Department of Natural Resources and Parks. Expenditures to date include analyses of critical areas and geotechnical conditions, engineering design, preparation of permit applications, coordination with neighboring property owners, and community outreach. Permit conditions are pending but it is anticipated that in-water work will be limited to July through September. Postponing the project to the following year would likely entail additional expenses, depending on the degree of continued bank erosion.

3. Describe the existing (and historic, if relevant) site and reach conditions, including structural features, channel form, and the presence of naturally-deposited large wood. Describe known utilization by salmonids and any important or unique biological or ecological attributes.

The Snoqualmie River in the vicinity of the project reach is low gradient and meandering, and predominantly confined to a single threaded channel. Sand bars are present on the inside bank of river meanders and gravel bars are occasionally present where the river is not confined by bank protection and has widened. Naturally deposited large wood is common in the main channel and is also found at the project site. Wood at the project site appears to have recruited locally due to ongoing bank erosion.

King County commissioned Collins and Sheikh to map historical conditions in the Snoqualmie River valley (2002). This report (Figure 9) indicates the river has been eroding toward the east (toward present-day SR 203) since 1870. This report also indicates (Figure 5) that large conifers were present in the riparian corridor. This is confirmed by an account from Edward Quaale in *Carnation Verbatim* by Jerry Mader (2008). Mr. Quaale describes methods used to remove big spruce trees that were hundreds of years old from land at or near the project location. The presence of these large conifers on the eroding bank leads to the conclusion that natural large wood was present at the project location. The channel only became navigable to Fall City in the 1880s according to *A History of the Snoqualmie Valley* by Hill (1970).

The Snohomish River Basin Salmon Conservation Plan (2005) describes the reach as the mid-mainstem Snoqualmie sub-basin and it is ranked high priority for protection and restoration by the ecological analysis for salmon restoration done for the plan in part because it downstream of all core Chinook spawning areas in the Snoqualmie. Recommendations in the plan that apply to this project include, improving edge complexity (page 11-45) and using bioengineering for bank stabilization projects (page 10-11). The project design uses wood to stabilize the bank and increase edge complexity. Re-vegetation of upland parts of the project site have also been integrated into the design to address water quality, habitat and permit issues.

4. Describe what is known about adjacent land uses and the type, frequency, and seasonality of recreational uses in the project area. Are there nearby trail corridors, schools or parks? What is the source(s) of your information?

Land use in the vicinity of the project is largely agricultural. The primary recreation in the vicinity of the project site is associated with the Snoqualmie Valley Trail. Trail users include pedestrians, cyclists, and equestrian users. The trail has required multiple repair efforts over the last decade and reconstruction of approximately 1100 feet of the Snoqualmie Valley Trail as part of the project will improve the trail gradient, surfacing and width for all users. The Stillwater Natural Area is upstream of the project site. According to the King County Park's webpage, public use of the Stillwater Natural Area is minimal due to its relatively limited access, generally undeveloped character and lack of formal trails. The closest school is more than 2.5 miles from the site.

The Snoqualmie River is used for several types of recreational activities in the project site vicinity including jet skiing, fishing, casual floating, canoeing, and kayaking. However, recreational use in the Snoqualmie River in the project reach has been classified as generally infrequent (Carol MacIlroy Consulting Corporation 2009; Herrera 2014). Floating of any kind is rare because the put-in locations are widely spaced and the river flows quite slowly, particularly in the summertime, when recreational use is highest. During three overflights of the entire reach between Carnation and Duvall on optimum summertime floating days in 2013, only seven boaters were found (Herrera 2014). Bank and wading access is also limited by private property and steep bank slopes. Therefore, the dominant user group in the project reach is motorized boaters, rated as having a moderate level of use (Carol MacIlroy Consulting Corporation 2009). Given the slow-moving nature of the river in the project reach when motorized boaters are present (primarily in the summer) and the nature of the use (motorized), the proposed project is not expected to affect this user group.

5. If the project includes wood placement, describe the conceptual design of large wood elements of the project, including, if known at this stage in the design, the amount, size, location, orientation, elevation, anchoring techniques, and type of interaction with the river and stream at a range of flows.

Engineered Log Structures (ELS) are one element of the Sinnema Quaale Upper Revetment Reconstruction Project. Three types of ELSs of varying size will be constructed as part of the project.

- Type A structures are a low-profile crib structure intended to add a habitat-generating surface to the wall in an economical fashion. Although they are contoured in such a way as to direct flow away from downstream areas, their primary function is to locally increase roughness and separate the river from the embankment. They are the most common log structure in the project design, with seven in total.
- Type B structures are intended to be a larger crib-type structure to discourage erosion at the base of the embankment. These structures will protrude more than the other log structures to provide increased physical complexity and redirect flow away from the base of the wall. Their intent is to locally direct flow away from the shoring wall via increased roughness and to provide a habitat-generating surface. The design includes four Type B structures.
- Type C, the largest structure, is intended to be the primary mechanism by which the river is redirected to the west, away from the embankment. This structure will be subject to the largest hydraulic forces. There is only one Type C structure in the project design, at the point where the river currently turns west as it hits the existing revetment.

Approximately 584 pieces of large wood are integrated into 12 engineered log structures (ELs) positioned at the base of the bank. These ELs are depicted on sheet 6 of the plan set. All EL types consist of a matrix of multiple layers of interlocking and horizontally oriented large “key” logs (with and without attached rootwads) and smaller racking logs and slash (small branches and twigs). The key logs will be secured in place by vertical timber piles deeply embedded below the anticipated scour depth or drilled into the glacio-lacustrine layer and by earth and rock ballast material placed over and around the key logs within the interior core of the structure. The key logs will protrude from the waterward face of the structure and function to secure smaller racking logs and slash material that is added during construction and any naturally deposited wood and to deflect flow around the waterward sides of the structure. The smaller racking logs and slash are intended to absorb the erosive energy of impinging flow and retain the log ballast material. The ELs are designed to remain stable for all anticipated future conditions during the Snoqualmie River design flow of 86,150 cubic feet per second, which corresponds to the 100-year flood event. Summer low flows (1000 cfs and below) will engage only the lowest layer of logs in any EL and the structures are largely submerged at Ordinary High Water.

6. If the project includes wood placement, what is the intended structural, ecological or hydraulic function of the placed wood? What role does the placed wood have in meeting the project’s goals and objectives? Is the project intended to recruit or trap additional large wood that may be floating in the river?

The Engineered Log Structures (EL) are intended to discourage erosion at the toe of the embankment by reducing the likelihood that the deepest part of the channel becomes entrained along the embankment toe. This function reduces the required depth of the shoring wall providing considerable project costs savings. The EL also add physical complexity to the river bank, enhancing aquatic habitat.

The wood within the ELs is also intended to help address some of the ecological problems described in the Salmon Conservation Plan described in part under item three above. To construct the project, a federal permit (from the US Army Corps of Engineers) is required. This triggers compliance with the Endangered Species Act and elevates the need to address the problems that have been identified for salmonids in the river. The ELs are intended to provide slow water refuge places for fish during all but the lowest flow conditions. The wood will be imbedded in the bank and provide areas for planting riparian vegetation to provide shade and ecologically beneficial detrital inputs. In addition to providing velocity refuge, the wood, in combination with vegetation on the bank, will provide habitat for salmonid prey organisms. Wood from upstream sources may accumulate periodically on the ELs. It is anticipated that naturally occurring large wood will continue to move downstream if it is temporarily deposited on the ELs.

7. Is the project likely to affect the recruitment, mobility or accumulation of natural large wood, e.g., by encouraging wood deposition on or near the site or promoting bank erosion that may cause tree toppling? Describe expected site evolution and its potential effects on natural wood dynamics.

The project will reduce local recruitment of large wood by stabilizing an embankment that is eroding and depositing wood at the margin of the main channel. Current patterns of wood mobility or accumulation are not likely to change as a result of the project. Wood from upstream sources may accumulate periodically at the site. It is anticipated, however, that naturally occurring large wood will again move downstream in the case it is temporarily deposited within the project area.

8. Describe how public safety considerations have been incorporated into the preliminary project design. For placed wood, address each of the considerations:

- a. Type, frequency, and seasonality of recreational use;

The Snoqualmie River is used for several types of recreational activities in the project site vicinity including jet skiing, fishing, casual floating, canoeing, and kayaking. However, recreational use in the Snoqualmie River in the project reach has been classified as generally infrequent (Carol MacIlroy Consulting Corporation 2009; Herrera 2014). Floating of any kind is rare because the put-in locations are widely spaced and the river flows quite slowly, particularly in the summertime, when recreational use is highest. Bank and wading access is also limited by private property and steep bank slopes. Therefore, the dominant user group in the project reach is motorized boaters, rated as having a moderate level of use (Carol MacIlroy Consulting Corporation 2009). Given the slow-moving nature of the river in the project reach when motorized boaters are present (primarily in the summer) and the nature of the use (motorized), the proposed project is not expected to affect this user group. The slow nature of the river flow during summer months will make it easy for any river user to avoid the placed wood.

- b. Wood location, positioning, and anchoring techniques;

The ELSs are positioned at the channel margin and will be securely anchored with piles and ballast. The position of the wood is visible from a great distance upstream. The structures will be nonporous and will deflect flow away from the bank.

- c. Maximizing achievement of project goals and objectives while minimizing potential public safety risks;

Inclusion of large wood and the ELSs are integral to a cost effective flood hazard reduction project that reduces risks from flood and channel migration hazards, avoids or minimize environmental impacts of flood hazard management, and reduces the long term costs of flood hazard management.

Public safety risks are minimized by the project design (including stable, non-porous structures) and the slow velocities that characterize this section of the Snoqualmie River.

- d. Use of established and recognized engineering, geological, and ecological expertise.

Professional engineers, geologists and ecologists have been involved in design and review of the project. The methods used to design this project are consistent with best professional practices.

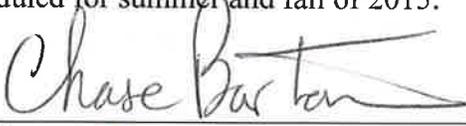
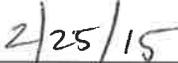
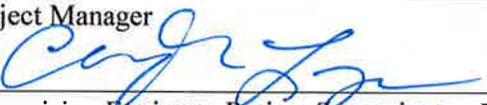
9. Has the project been reviewed and approved by a Licensed Professional Civil Engineer? Please list other licensed technical staff who have reviewed and provided input on the design (e.g., Licensed Geologist and Licensed Engineering Geologist). Specify the Engineer of Record for the design and any other Licensed Professionals who have sealed their portion of the design plans. Were all reviews and approvals completed?

Professional Civil Engineers that are integral to project design include King County Engineer of Record Clint Loper, King County Project Manager Chase Barton, King County Engineer Jay Young, Consultant Design Team Project Manager Jeff Parsons (Herrera Environmental Consultants), Consultant Design Team Lead Engineer Gus Kays (Herrera Environmental Consultants), Consultant Design Team Geotechnical Lead John Bingham (Hart Crowser) and Consultant Design Team Structural Lead Dustin Ong (Civil Tech) and Third Party Reviewer Ed Berschinski (Anchor QEA).

The King County Engineer of Record is Clint Loper and additional professional engineers that will stamp the final design plans include Gus Kays and Dustin Ong. King County Project Manager Chase Barton and Consultant Design Team Project Manager Jeff Parsons are also licensed professional geologists. Project reviews and approvals (including third party review) have been completed at design milestones and management decision points consistent with King County Water and Land Resources Division Project Management Manual (2012).

- 10. Has the project been reviewed and approved by a King County Professional Ecologist (e.g., person with an advanced degree in aquatic and/or biological sciences from an accredited university or equivalent level of experience) if ecological benefits are an intended project objective, to evaluate the consistency of the design with project goals, existing environmental policies and regulations, and expected or known permit conditions? Specify the Reviewing Ecologist for the project. Was this review and approval completed? What is the anticipated schedule for completing project milestones (30-40% design, final design, major construction/earthmoving) and for soliciting public input)?

Yes, Phyllis Meyers, Senior Ecologist on the Snoqualmie basin team within the River and Flood plain Management Section has been on the project development team and has handled permitting. This project requires compliance with federal regulations, including the Endangered Species Act. As a result, several professional biologists reviewed the project. The project was designed with anticipation of these reviews in mind. Review for compliance with the Clean Water Act, Endangered Species Act and Washington State Hydraulic Code are all underway. A 60% plan set is provided for review with this checklist. Final design will be completed in the Spring of 2015. Construction is scheduled for summer and fall of 2015.

	
Project Manager	Date
	
Supervising Engineer, Project Supervisor or Unit Manager	Date