

DESIGN GUIDELINES APPROVED FOR USE IN DESIGNING WATER CROSSINGS OVER FISH-BEARING WATERS IN WASHINGTON STATE

WSDOT 2014 Design Manual - Chapter 800 Hydraulic Design¹

Notes for appropriate use to comply with WAC 220-660-190

February 18, 2016

Chapter 800 of this document is only four pages in length and primarily contains lists of considerations one should investigate for various types of hydraulic projects, including those involving work in flood plains and stream crossings. It is intended to merely serve as a guide to highway designers so they can identify and consider hydraulic-related factors that impact design. Readers are referred to other design manuals for detailed criteria and methods that govern highway hydraulic design in Washington State.

Although the document does not contain any specific criteria or design elements that explicitly provide for the movement of fish or the protection of their habitat and is not intended to be used as a standalone fish passage manual, it is consistent with current WDFW fish passage guidance. It cannot be used by itself to design a water crossing (bridge or culvert) in fish-bearing waters of Washington State. The comments below relate to use of applicable sections of this manual and Washington state Hydraulic Code rules for water crossings WAC 220-660-190.

Chapter 800 Hydraulic Design

800.01 General

This section emphasizes the significance of identifying effective hydraulic design elements and determining how to incorporate them into the design in the most economical, efficient, and practical manner to ensure reasonable public safety without incurring excessive maintenance costs or appreciably damaging the highway or highway facility, adjacent property, or the total environment. It should be noted that WAC 220-660-190(2)a indicates designs must also accommodate geomorphic processes to avoid impacts fish life and fish habitat:

All water crossings must retain up-stream and downstream connection in order to maintain expected channel processes. These processes include the movement and distribution of wood

¹ WSDOT (2014). **Design Manual**, version M 22-01.11. Washington Dept. of Transportation. (Chapter 800 Hydraulic Design)

and sediment and shifting channel patterns. Water crossings that are too small in relation to the stream can block or alter these processes, although some encroachment of the flood plain and channel migration zone will be approved when it can be shown that such encroachment has minimal impacts to fish life and habitat that supports fish life.

Water crossings designs that create measurable impacts to habitat will have to mitigate.

Users are instructed to begin early project coordination with state and local government, and Indian tribes at the definition phase of the project.

800.02 References

Readers are provided with references to related WSDOT design manuals, including the WSDOT Hydraulics Manual version M 23-03.03 in which WSDOT assumes that the designer will be using WDFW guidelines and methods. The use of WDFW's methods is not required and these notes are part of an extensive list of alternative ways to design a crossing that, when followed correctly, can result in an acceptable structure. Readers are encouraged to contact WSDOT the Headquarters Hydraulics Section for assistance with unique projects.

800.03 Hydraulic Considerations

Guidance consistent with WAC 220-660 is provided for Floodplains, Stream Crossings, Channel Changes, Roadway Drainage, and Subsurface Drainage. Specifically, the reader is encouraged to consider a number of design aspects to maximize the efficiency of the water crossing, such as: locating the crossing where the stream is most stable, effectively conveying the design flow(s) at the crossing, providing for passage of material transported by the stream, determining the effects of backwater on adjacent property, avoiding large skews at the crossing, evaluating the effects on the channel and embankment stability upstream and downstream from the crossing, location of confluences with other streams or rivers, fish and wildlife migration, minimizing disturbance to the original streambed, minimizing wetland impact and restoration of the original stream characteristics as nearly as practicable.

This section also indicates the goals of a water crossing project should include: meandering the channel change to retain its sinuosity; maintaining existing stream slope and geometry (including meanders) so stream velocity and aesthetics do not change in undisturbed areas; excavation, selection, and placement of bed material to promote formation of a natural pattern and prevent bed erosion; retention of streambank slopes; retention or replacement of streamside vegetation; the ability to pass the design flood; the effects on adjacent property; the effects on the channel and embankment upstream and downstream from the channel change; erosion protection for the channel change; environmental requirements such as wetlands; fish migration, and vegetation reestablishment; the drainage pattern; and not redirecting flow from one drainage basin to another and following the historical drainage pattern.