Washington State Department of Ecology

Stream Discharge Technical Notes

Station ID: 05B090
Station Name: North Fork Stillaguamish River at Oso
Water Year: 2016
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Watershed Description

The North Fork Stillaguamish River basin is made up of a narrow lowland valley surrounded by steep forested hillsides and a few snowcapped mountain peaks. Elevation ranges from just over 200 feet at the gage to more than 6800 feet at points along the southern boundary of the basin. The mean basin elevation is 2230 feet. The average slope in the basin is calculated as 41%. Forest canopy is estimated to cover 75% of the basin. Mean annual precipitation is about 85 inches.

- Drainage area (square miles) = 161

Gage Location

The gage is located on the right bank of the North Fork Stillaguamish River at the north end of Whitman Road bridge. The gage house is at the same elevation as the roadway; and the slant-pipe drops about 25 feet along the side of an old bridge abutment into the river. The terminal end of the pipe extends into a deep portion of the channel a few feet offshore.

- Latitude (decimal degrees) = 48.272349
- Longitude (decimal degrees) = -121.887886

Location Photograph(s)

Figure 1: Fog over the North Fork Stillaguamish River.

Discharge Summary

Discharge is the volumetric flow rate of water that passes through a given cross-sectional area of a creek or river, and is measured in cubic feet per second (cfs). The following section summarizes the streamflow conditions at the gage location during the reported water year.

Table 1: Discharge statistics

Discharge attribute	**Number in cfs or number of days**
Mean annual discharge	1200 cfs
Median annual discharge	682 cfs
Maximum daily mean discharge	12200 cfs
Minimum daily mean discharge	144 cfs
Maximum instantaneous discharge	19700 cfs
Minimum instantaneous discharge	141 cfs
Discharge equaled or exceeded 10% of recorded time	2530 cfs
Discharge equaled or exceeded 90% of recorded time	195 cfs
Days discharge is greater than range of ratings	1 day
Days discharge is less than range of ratings	0 days
Un-reported days	1 day
Days qualified as estimates	0 days
Modeled days	0 days

Note: Table 1 may not include values in which the predicted discharge exceeds the range of ratings.

Discussion of discharge statistics

One day was greater than the range of ratings. No days were less than the range of ratings. No days were unreported during water year 2016.

No days were qualified as estimates.

Error Analysis Summary

The following section outlines the main component sources of potential error in the annual discharge record at this station. Logger drift is an undesired change in the continuous stage sensor that is not a function of real changes in the water surface elevation. Weighted rating error is the difference between discharges predicted by the rating curve and measured discharges adjusted to the maximum degree of possible error, based on the field observed measurement quality rating.

Table 2: Summary of errors

Error type	Percent of discharge
Potential logger drift error	4.6%
Potential weighted rating error	17%
Total potential error	22%

Discussion of error analysis

Most of the error during water year 2016 came from rating error. Much of the error was driven by difficulty in measuring discharge at high flows and to a lesser extent low flows. Fast and turbulent water, standing waves, and areas of shear between fast and slow water at higher flows were the largest drivers in error.

Stage Record Summary

Stage is the height of the water surface in a creek, river, or lake above a known datum. The table below summarizes the range of stage observed at this gage during the water year.

Table 3: Summary of recorded stages

Stage record	Feet	Date
Minimum recorded stage	0.53 feet	08/29/16
Maximum recorded stage	13.18 feet	11/17/15
Range of recorded stage	12.65 feet	

Discussion of stage record

Typically, lowest flows in the western part of Washington State occur from late September to early October. The minimum recorded stage occurred in late August which falls outside the normal range. The summer of water year 2016 was dry, which likely contributed to the early occurrence of the minimum recorded stage. The maximum recorded stage occurred in the middle of November 2015 during a series of large storm events.

Ratings Summary

Rating curves are developed to define the relationship between observed stage and measured discharge at a gaging station for a specific period. The table below lists which ratings were used during the water year, followed by a discussion of notable aspects of rating development and progression through the year.

Table 4: Rating summary table

Rating number	Period of ratings	Range of ratings in cfs	Number of defining measurements	Rating error (percent)
502	10/1/15 to 2/2/16	62 to 24800 cfs	22	21.3%
104	10/28/15 to 8/30/16	115 to 24800 cfs	69	15.2%
7	6/8/16 to 9/30/16	87 to 24800 cfs	23	17.9%

Discussion of rating(s)

Rating 502 is a carry-over from water year 2016. Rating 502 makes a shift for scour to rating 104. Rating 104 makes a shift for fill to rating 7. In general, water year 2016 experienced a fairly stable gage pool, which resulted in few changes in ratings.

High Flow Model Summary

In cases where it is not practical to measure the entire range of discharge at a gaging station, a hydrologic model is developed to estimate discharges significantly greater than the measured range.

- Model type (slope conveyance, other, none) = none
- Range of modeled stage (feet) =
- Range of modeled discharge (cfs) =
- Valid period for model =
- Model confidence =

Discussion of modeled data

No model.

Survey Type and Date

Periodic surveys are conducted to establish or validate gage datum continuity, reference marks, and gage height indices. In addition, channel shape and slope are surveyed to develop high flow models.

Table 5: Types of surveys conducted with dates

Survey Type	Date
Levels	07/07/16

Discussion of surveys

A levels survey was conducted to verify the elevation of all the gage indices. The last levels survey was conducted in 2010.

Activities Completed

Routine maintenance was done at the station at six-week intervals throughout the water year. Visits included discharge measurements, data downloads, and changing batteries and desiccant as needed.

Appendix