

**WASHINGTON DEPARTMENT OF ECOLOGY**  
**ENVIRONMENTAL ASSESSMENT PROGRAM**  
**FRESHWATER MONITORING UNIT**  
**STREAM DISCHARGE TECHNICAL NOTES**

**STATION ID:** 03J100  
**STATION NAME:** Hansen Creek near Sedro Woolley  
**WATER YEAR:** 2011  
**AUTHOR:** Don Watt

**Introduction**

Watershed Description

The Hansen Creek drainage extends from the southwest side of Lyman Hill, south to the Skagit River just east of Sedro-Woolley. The gage basin has a mean elevation of about 1240 ft and ranges from about 80 feet above sea level to about 4030 feet at the top of Lyman Hill. Nearly 70 percent of the basin was found to be forested in a 2001 study. The U. S. Geological Survey estimates annual precipitation at about 50 inches.

Gage Location

The gage is located near river mile 4.0 on Hansen Creek, on Skagit County property at the Northern State Recreation Area. The Primary Gage Index is a staff gage mounted near the right bank of the creek at the base of a large tree about 15 feet downstream from the Thompson Drive Bridge. The gage house is located on the left bank, at roughly the same elevation as the roadway.

Table 1.

Drainage Area (square miles)	7
Latitude (degrees, minutes, seconds)	48, 31, 50 N.
Longitude (degrees, minutes, seconds)	122, 12, 02 W.

**Discharge**

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	20
Median Annual Discharge (cfs)	17
Maximum Daily Mean Discharge (cfs)	99
Minimum Daily Mean Discharge (cfs)	2.3
Maximum Instantaneous Discharge (cfs)	125
Minimum Instantaneous Discharge (cfs)	1.5
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	38
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	4.4
Number of Days Discharge is Greater Than Range of Ratings	24
Number of Days Discharge is Less Than Range of Ratings	9

Note: Statistics displayed in Table 2 may not include values in which the predicted discharge exceeds the range of ratings.

**Narrative**

During late winter and early spring, a large amount of large woody debris migrated through the gage reach, causing erratic flow behavior and dramatic movement of channel substrate. As a result, there were several large rating shifts during the year in an attempt to track the rapidly changing conditions.

## Error Analysis

Table 3. Error Analysis Summary.

Logger Drift Error (% of discharge)	8%
Weighted Rating Error (% of discharge)	9%
Total Potential Error (% of discharge)	17%

## Rating Table(s)

Table 4. Rating Table Summary

Rating Table No.	901	12	902
Period of Ratings	10/1 to 10/12/2010	10/1 to 12/12/2010	12/12/10 - 2/12/2011
Range of Ratings (cfs)	1 to 105 cfs	2.8 to 134 cfs	1 to 105 cfs
No. of Defining Measurements	5	2	5
Rating Error (%)	9%	8%	9%

Rating Table No.	13	14	131
Period of Ratings	1/4 to 5/16/2011	5/7 to 7/14/2011	7/14 to 9/13/2011
Range of Ratings (cfs)	2.9 to 132 cfs	8 to 132 cfs	2.9 to 132 cfs
No. of Defining Measurements	8	4	8
Rating Error (%)	10%	7%	10%

Rating Table No.	501	132	
Period of Ratings	8/10 to 9/30/2011	9/22 to 9/30/2011	
Range of Ratings (cfs)	1 to 132 cfs	2.9 to 132 cfs	
No. of Defining Measurements	7	8	
Rating Error (%)	12%	10%	

## Narrative

Logger drift error was calculated using a staff gage as Primary Gage Index (PGI) during the first half of the water year; and the laser gage height method was used as PGI after loss of the staff gage in early April. Time-weighted percent error averages are calculated for the overall logger drift error, as well as for the rating errors for the various rating table periods.

## Stage Record

Table 5. Stage Record Summary

Minimum Recorded Stage (feet)	4.59 ft
Maximum Recorded Stage (feet)	8.89 ft
Range of Recorded Stage (feet)	4.3 ft
Number of Un-Reported Days	24 days
Number of Days Qualified as Estimates	22 days
Number of Days Qualified as Unreliable Estimates	0

## Narrative

A staff gage near the right bank about 10 feet downstream from the bridge served as the PGI from the start of the period of record in June 2005 until the staff was found to be missing on April 5, 2011. After April 5, the laser method became the PGI with no change in gage datum. Of 22 days qualified as estimates in this water year, logger drift error was a contributing factor on 18 days.

## Modeled Discharge

Table 6. Model Summary

Model Type (Slope conveyance, other, none)	None
Range of Modeled Stage (feet)	N/A
Range of Modeled Discharge (cfs)	N/A
Valid Period for Model	N/A
Model Confidence	N/A

## Surveys

Table 7. Survey Type and Date (station, cross section, longitudinal)

Type	Date
Station Survey	4/20/2011

## Activities Completed

On October 27, the gaging system was upgraded to the Design Analysis equipment. On April 20, a second laser pad and four new reference marks were added in preparation for a possible station move