WASHINGTON DEPARTMENT OF ECOLOGY

ENVIRONMENTAL ASSESSMENT PROGRAM

FRESHWATER MONITORING UNIT

STREAM DISCHARGE TECHNICAL NOTES

STATION ID: 19C060

STATION NAME: West Twin River

WATER YEAR: 2013

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Introduction

Watershed Description

The West Twin River station is a stand-alone, continuously recording gaging station that has been operating since June 2004 in Water Resource Inventory Area (WRIA) 19. Like the other two drainages within the Strait of Juan de Fuca complex (East Twin River and Deep Creek) , West Twin River is very dynamic and carries substantial loads of bed material and large woody debris during precipitation--driven storm events which typically occur from November through February. The basin geology is composed of Crescent Formation volcanic rock in the upper watershed, marine sedimentary rock in the lower watershed, and terraces of glacial deposits in the lower floodplain (ONF 2002).

Gage Location

The gaging station is located in Clallam County, Washington approximately 20 miles west of Port Angeles. The station is on the left bank approximately 0.2 miles upstream from the mouth.

Table 1. Basin Area and Legal Description

Drainage Area (square miles)	12.7
Latitude (degrees, minutes, seconds)	48 09 47
Longitude (degrees, minutes, seconds)	123 57 10

Table 2. Discharge Statistics.

Mean Annual Discharge (cfs)	56
Median Annual Discharge (cfs)	31
Maximum Daily Mean Discharge (cfs)	393
Minimum Daily Mean Discharge (cfs)	1.6
Maximum Instantaneous Discharge (cfs)	493
Minimum Instantaneous Discharge (cfs)	1.2
Discharge Equaled or Exceeded 10 % of Recorded Time (cfs)	144
Discharge Equaled or Exceeded 90 % of Recorded Time (cfs)	4.8
Number of Days Discharge is Greater Than Range of Ratings	4
Number of Days Discharge is Less Than Range of Ratings	0
Number of Un-Reported Days	4
Number of Days Qualified as Estimates	36
Number of Modeled Days	0

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

Table 2 Discussion (Discharge Statistics)

Four days were not factored into the discharge statistics reported in Table 2. These four days were some of the highest discharge values recorded during the water year,so actual values were higher than those reported in the table. Thirty--six days were quality coded estimated due to exceedances of the logger drift error thresholds. The exceedances typically occur during baseflow periods when small differences between the primary gage index and the continuous stage record result in large percent differences in discharge. The largest hydrologic event of the year peaked on January 9, 2013. A series of moderately large events beginning in mid-October 2012 preceded this largest event. Following the peak event, a series of small to moderate events persisted to early July. The seasonal decline to baseflow was brief, due to unusual precipitation events in September.

Table 3. Error Analysis Summary.

Potential Logger Drift Error (% of discharge)	7.4
Potential Weighted Rating Error (% of discharge)	9.8
Total Potential Error (% of discharge)	17.2

Table 3 Discussion (Error Analysis)

Total Potential Error (TPE) is the cumulative value of the potential logger drift error and the potential weighed rating error. Error surrounding any predicted discharge value is acquired in a number of ways, ranging from variability in the quality of any particular discrete discharge measurement to the operational performance of a datalogger and the sonde measuring stage. Total Potential Error defines the expected range for any predicted discharge value. For example, if the TPE is 10.0 % and the predicted discharge value is 100 cfs, the range in which the actual predicted value lies is 90 to 110 cfs. For 239 of the recorded days, the agreement between the stage on the logger and discrete observations of the primary gage index met standards defining stable drift. Thirty--six days were quality coded as estimated due to logger drift error exceedances. The average potential logger drift error was reduced again during the water year, probably due to the hydraulic characteristics of the new station location. The pressure transducer is now in a larger pool.

Table 4. Stage Record Summary

Minimum Recorded Stage (feet)	3.67
Maximum Recorded Stage (feet)	6.73
Range of Recorded Stage (feet)	3.06

Table 4 Discussion (Stage Record)

The stage record for WY2013 is continuous and complete. Five gaps in the stage record were filled using regressed, well-correlated stage data from an adjacent station. The largest gap was six days. Discrepancies between the observed primary gage index and the continuous stage record were reconciled by automated adjustments of the data using the data shift function. Two unusual hydrologic features distinguish WY2013 from others; the absence of large precipitation/discharge events and a wet September. Baseflow conditions persisted into mid-October 2012, carrying the evapotranspiration signal with them. While the recorded signal appears to be accurate, the small differences between the observed primary gage index and the logged stage value during baseflow periods resulted in large differences in the percentage of discharge. The new station location appears well suited for accurate recording of stage.

Table 5. Rating Table Summary

Rating Table No.	14	15	16
Period of Ratings	10/01-01/12	01/08-03/20	03/12-04/12
Range of Ratings (cfs)	0.001-531	0.001-531	0.001-531
No. of Defining Measurements	3	4	6
Rating Error (%)	11.0	10.9	9.8

Rating Table No.	151	17	18
Period of Ratings	04/10-06/18	06/17-09/29	09/28-09/30
Range of Ratings (cfs)	0.001-531	0.001-531	0.001-531
No. of Defining Measurements	4	4	4
Rating Error (%)	10.9	6.9	7.6

Rating Table No.			
Period of Ratings			
Range of Ratings (cfs)			
No. of Defining Measurements			
Rating Error (%)			

Table 5 Discussion (Rating Tables)

Six ratings were required to predict discharge for the water year. The large number of ratings required to predict discharge at West Twin River speaks to the extremely dynamic nature of the channel geometry, especially during a year of moderate storm events. Substrate and large woody debris is mobilized during virtually all moderate and large storm events. Five entirely new ratings were created to predict discharge. In only one instance did the rating shift back to a pre-existing rating and that was to a rating created this water year.

Table 6. Model Summary

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

Table 6 Discussion (Modeled Data)

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

Type	Date

Table 7 Discussion (Surveys)

Activities Completed

A staff gage was installed at the new location on October 17, 2012.