

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedures for Estimating Stream Flows Using a Flume

Version 1.1

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Signatures on File

Please note that the Washington State Department of Ecology's Standard Operating Procedures (SOPs) are adapted from published methods, or developed by in-house technical and administrative experts. Their primary purpose is for internal Ecology use, although sampling and administrative SOPs may have a wider utility. Our SOPs do not supplant official published methods. Distribution of these SOPs does not constitute an endorsement of a particular procedure or method.

Any reference to specific equipment, manufacturer, or supplies is for descriptive purposes only and does not constitute an endorsement of a particular product or service by the author or by the Department of Ecology.

Although Ecology follows the SOP in most instances, there may be instances in which Ecology uses an alternative methodology, procedure, or process.

Environmental Assessment Program

Standard Operating Procedure for Estimating Stream Flows Using a Flume

1.0 Purpose and Scope

- 1.1 This document is for the Environmental Assessment Program Standard Operating Procedure (SOP) for estimating stream flows with a flume. The data may be used to quantify changes in stream flow over time or in response to ecosystem disturbances.

2.0 Applicability

- 2.1 This document was developed as a stream flow estimation procedure for the Type N Experimental Buffer Treatment (Type N) Study. The procedure may be applicable for other studies assessing stream flow in freshwater streams using a flume.

3.0 Definitions

- 3.1 Type N: perennial and seasonal non fish-bearing streams under Washington State's current stream typing system (WAC 222-16-030).

4.0 Personnel Qualifications/Responsibilities

- 4.1 Knowledge of the contents of this SOP.

5.0 Equipment, Reagents, and Supplies

- 5.1 Accura-Flo Parshall Flume, Montana style—see Appendix A for manufacturer specifications
- 5.2 Pressure transducer—Ott Messtechnik pressure sensor OTT PS 1 or equivalent
- 5.3 Electrical conduit pipe, 1.5 inch diameter
- 5.4 Datalogger—Forest Technology Systems HDL1 datalogger or equivalent
- 5.5 Battery—12 volt valve-regulated lead acid battery
- 5.6 Enclosure—Forest Technology Systems enclosure for Turbidity Threshold Sampling station or equivalent
- 5.7 Laptop with serial cable interface
- 5.8 Data management software—Forest Technology Systems StreamTrac software or equivalent

6.0 Summary of Procedure

- 6.1 Install a flume at the downstream end of the study basin per manufacturer's instructions (Figure 1; Accura-Flo 2006; see Appendix A).
- 6.2 Install a pressure transducer following the manufacturer's instructions (Ott Messtechnik, no date). The vertical position of the sensor should be the same as that of the flume crest or the streambed. If not, record the offset and adjust the data post-process. Use a conduit or other device to protect the sensor (Figure 2). Secure the apparatus to a stilling well or another stable structure.
- 6.3 Plug the pressure transducer into a datalogger (Figure 3). Plug the datalogger into a battery. House the electronic components in an enclosure.
- 6.4 Program the datalogger using a laptop with a serial cable interface to record stage height at specified intervals.
- 6.5 Visit the study site periodically to maintain the sensor, download data, and replace batteries. Sensor maintenance includes removing accumulated sediments from the stilling well, re-securing the sensor if needed, and replacing the desiccant in the cable interface. Return the sensor to the manufacturer every three to five years for recalibration.
- 6.6 Use the stage height versus flow relationship for the flume to calculate stream discharge and estimate mean daily flows.

7.0 Records Management

- 7.1 Maintain data in the StreamTrac database or equivalent.

8.0 Quality Control and Quality Assurance

- 8.1 Ensure that datasheets are completely filled out in the field.
- 8.2 Check all data entered into the database for accuracy and completeness.

9.0 Safety

- 9.1 File a field work plan before commencing field activities.
- 9.2 Use a CB radio to communicate with other traffic on one-way logging roads.
- 9.3 Learn how to deal with animals and people encountered in remote areas.

10.0 References

- 10.1 Accura-Flo. 2006. Parshall Flumes Installation Requirements. Available at <http://www.accuraflo.com/flumespec-parshallflumesinstallationrequirements.htm>. Accessed 12/07/2006.
- 10.2 Ott Messtechnik. No date. Operating Manual Pressure Sensor OTT PS 1. Ott Messtechnik, Kempten, Germany. 27 pp.



Figure 1. Flume installed in a Type N study stream. A pressure transducer housed within the conduit and stilling well measures stage height.

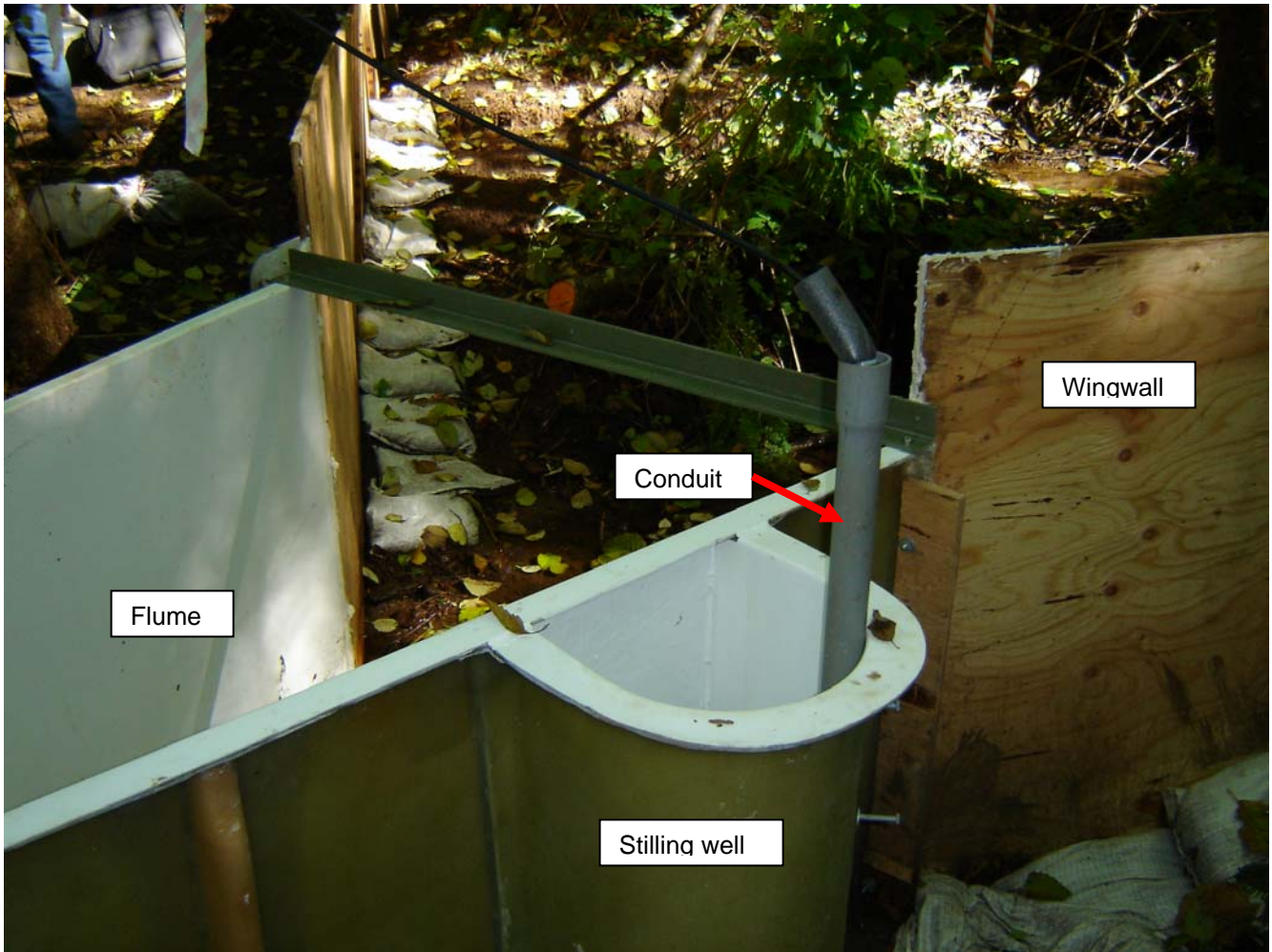


Figure 2. Pressure transducer and conduit in a Type N study stream. Cable ties secure the pressure transducer within the conduit. Holes drilled into the base of the conduit allow water exchange. Bolts secure the conduit to a stilling well and flume.

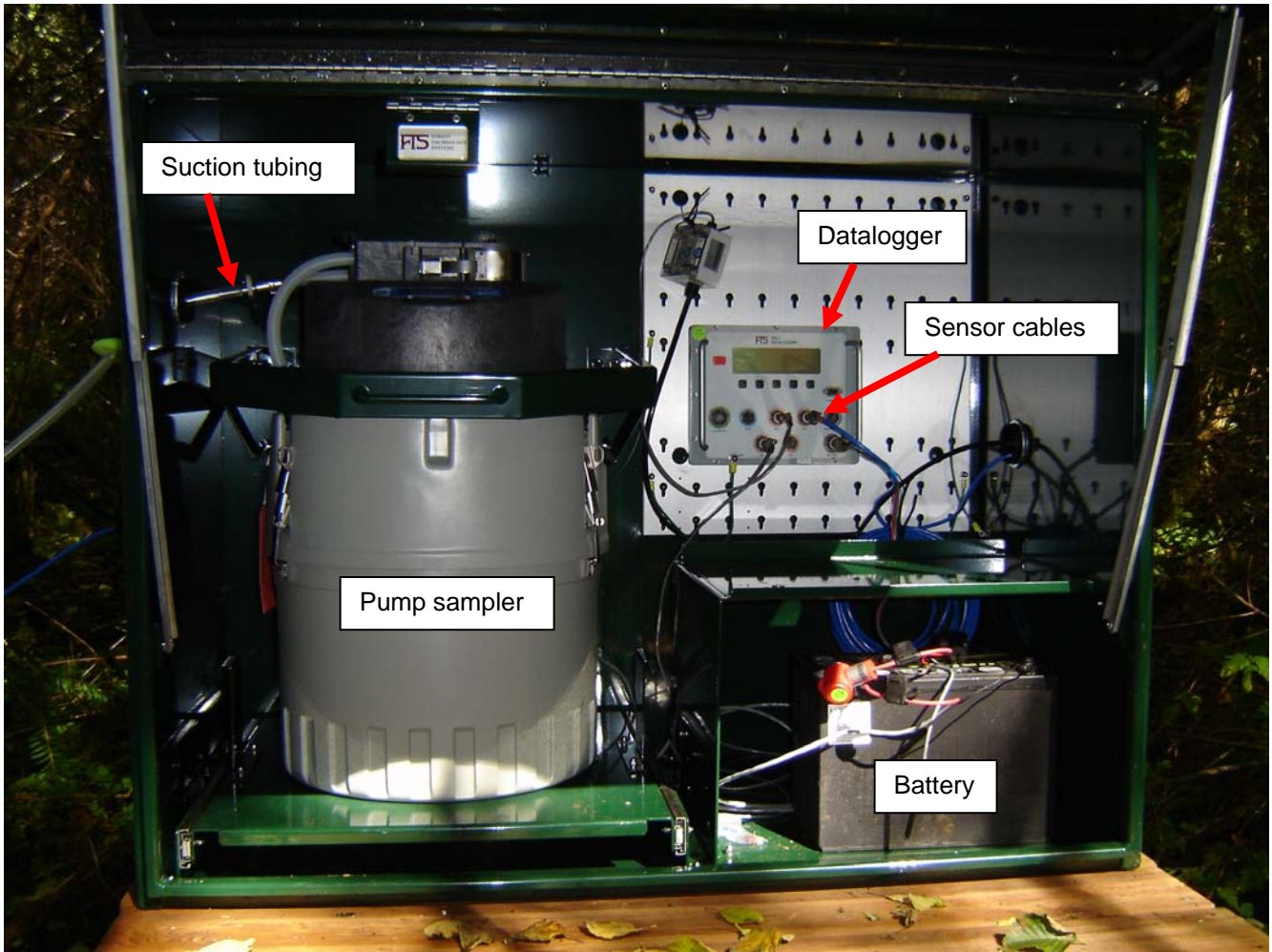


Figure 3. Datalogger with attached components. The datalogger obtains stage height readings from the pressure transducer at specified intervals.

Appendix A. Accura-Flo Parshall Flume Specifications and Installation Requirements

Plastic Laminate:	Isophthalic resin reinforced with fiberglass
Tensile strength at break:	17,000 PSI min, ASTM D638
Flexural strength:	30,000 PSI min, ASTM D790
Flexural modulus of elasticity:	12,000,000 PSI min, ASTM D790
Glass Content:	30% minimum
All Surfaces:	Sealed with 15 mils of smooth white gel coat
Concrete Anchor Clips (optional):	Fiberglass
Stilling Wells (optional):	Same as flume
Bubbler Tube (optional):	Type 304 Stainless Steel
Staff Gages (optional):	White with black markings; graduated in feet and tenths of feet. Integrally molded in flume wall.
Wall thickness:	Standard 1/4" nominal, 3/8" for large flume wall surface.

Flumes shall be supplied with integral Foam Reinforcing Ribs and Top Stiffener Angles as required by Flume size.

The Parshall flume is intended for use in open channels such as irrigation ditches. Use extreme care when adapting Parshall flumes for use with round pipes. The flume's crest is usually set at an elevation higher than the floor of the upstream channel. A variety of factors influence the selection of the crest elevation. When designing a metering station it is best to follow the recommendations of a knowledgeable professional in the field.

Parshall flumes may be set in earth or concrete or bolted to companion structures using the 2-inch flange provided on each end. When pouring concrete it is advisable to brace the flume internally with 2" x 4" blocks cut to size. This temporary bracing will prevent bulging of the sidewalls. Remove the braces after the concrete has set.