

Washington State Department of Ecology

Environmental Assessment Program

Standard Operating Procedure for Conducting Stream Hydrology Site Visits

Version 1.1

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*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.*

SOP Revision History

Revision Date	Rev number	Summary of changes	Sections	Reviser(s)
08/10/2015	1.1	Updated Safety Section	8.0	Jim Shedd
08/10/2015	1.1	Updated References	9.0	Jim Shedd

## Environmental Assessment Program

### Standard Operating Procedure for Conducting Stream Hydrology Site Visits

#### **Purpose and Scope**

#### **1.0 Purpose and Scope**

1.1 This document is the Environmental Assessment Program (EAP) Standard Operating Procedure (SOP) for conducting stream hydrology flow monitoring site visits.

#### **2.0 Applicability**

2.1 This document describes the procedures used when visiting a Department of Ecology stream hydrology monitoring site.

#### **3.0 Definitions**

3.1 FMU - Freshwater Monitoring Unit

3.2 ADCP - Acoustic Doppler Current Profiler

3.3 PST – Pacific Standard Time.

3.4 GMT - Greenwich Mean Time. This is Pacific Standard Time (PST) minus 8 hours.

3.5 ADV- Acoustic Doppler Velocimeter

3.6 Logger/Recording Gage - Typically, an automated bubbler or pressure transducer measures and records the stage to an electronic data logger, maintaining a continuous record of stage through a specified period of time. The bubbler or transducer is calibrated to match the primary gage index.

3.7 Terminal end - The end of the pipe that emits an air bubble to detect water pressure.

3.8 Point of Zero Flow - Stage at which water ceases to flow over the control. The point of zero flow is the lowest point on the control.

3.9 Control - The physical features of a stream that control the relationship between stage and discharge at a gage site.

3.10 Stage/Water Surface Elevation/Gage Height - Stage is the confirmed water surface elevation above a datum. Gage height is the water surface reading on a

particular gage (Rantz, et al., 1982). At most Stream Hydrology stations an arbitrary zero datum is used.

- 3.11 Laser Beam Elevation - The elevation of the plane of the laser emitted by the laser instrument.
- 3.12 Differential - The difference in elevation between the laser rod reading and the water surface rod reading.
- 3.13 Primary Gage Index - The primary gage index (PGI) is the base gage for the station and is directly referenced to the recording gage. The primary gage index is the most stable and reliable gage at a site. All other gages at a station are considered secondary gage indexes.
- 3.14 Secondary Gage Index - Secondary gage indexes are used to confirm the primary gage index. The secondary gage can be used to estimate the value of the primary gage if the primary gage is damaged or missing.

#### **4.0 Personnel Qualifications/Responsibilities**

- 4.1 Personnel using this SOP should have training and field experience in making stream gage site visits, recording and documenting pertinent data on the Stream Gage Logger Notes form and Gaging Station Log form. Personnel should be familiar with other relevant Environmental Assessment Program SOP's.

#### **5.0 Equipment, Reagents, and Supplies**

- 5.1 Copies of EAP-FMU Stream Gage Logger Notes form (ECY 070-183) and the Gaging Station Log form (ECY 070-330)
- 5.2 Necessary equipment for type of actions to be performed while at a flow site (ADCP, ADV, repair equipment, batteries, etc.).

## 6.0 Summary of Procedure



**Figure 1 An example of a Fresh Water Monitoring Unit Flow Monitoring Station (Photo by Washington Dept. of Ecology)**

### 6.1 Trip preparation

- 6.1.1 Department of Ecology staff should refer to the Pre/Post Field Excursion Checklist(attachment A) as well as the Vehicle and Equipment Checklist(attachment B) when preparing for a stream hydrology site visit.

### 6.2 Site Visit

- 6.2.1 Park near the station in a safe location. Set up appropriate traffic control and safety devices as outlined in EAP's Safety Manual (EAP, 2015).
- 6.2.2 Check station exterior for damage to station housing, slant pipe, and staff gage if present.

6.2.3 Take PGI reading prior to checking logger. Upon each site visit, at the very minimum, a primary gage and other stage observations should be noted. See the Standard Operating Procedure for Measuring Gage Height of Streams (Shedd, 2015) for more detailed instructions on gage measurements.

6.2.4 When visiting a flow monitoring site, use the SHU Stream Gage Logger Notes form to note important information as seen on attachment A. Notes should be filled out completely with ALL relevant information.

6.3 Stream Gage Logger Notes Form (Front - See Attachment)

6.3.1 Sta. Name: Fill in the name associated with the site.  
Example: Sta. Name Jimmycomelately @ Hwy. 101

6.3.2 Sta. No. : Fill in the unique 6-digit alphanumeric assigned site I.D.  
Example: Sta. No. 17C075

6.3.3 Party: Fill in last name(s) of personnel visiting site.  
Example: Party Evans/Myers

6.3.4 When filling out the form, begin in the left-hand vertical column. Fill out additional readings in the subsequent columns.

6.3.4.1 Make additional/multiple readings:

6.3.4.1.1 Before and after a flow measurement is taken

6.3.4.1.2 If site visit is for an extended period of time

6.3.4.1.3 When there is a rapid change in stage

6.3.5 Date: Note the day, month and year notes are being made  
Example:

DATE	03/17/2009	03/17/2009			
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6.3.6 Time: Note Pacific Standard Time (PST) for each reading in 24hr method  
Example:

TIME (PST)	13:43	14:27			
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6.3.7 Logger: Note the current stage reading on the data logger if at a telemetry or stand-alone site. For instructions on finding live stage readings on the various loggers see specific model manuals or SOPs.

Example:

LOGGER	5.98	5.96			
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6.3.8 Staff: Take a staff reading, if present, at the start of the visit as well as at the conclusion of the visit at minimum. Note the average water level and any wave action or “bounce” affecting an accurate reading. Note a positive and negative range of the variation above and below the average.

Example:

STAFF	5.99 <sup>+ - 0.03</sup>	5.97			
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6.3.9 Wire Weight: Use wire weight gage, if present, to note water surface elevation. See Measuring Gage Height SOP (Shedd, 2009 Sect. 6.4) for instructions on WWG use.

Example:

WIRE WEIGHT	23.86	23.88			
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6.3.10 Check Bar: Note check bar length prior to using wire weight gage. The check-bar value as read on the counter and disc should be the same every time the check-bar is read. Example:

CHECK BAR	49.22	49.22			
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6.3.11 Tape Down: Note the Tape Down measurement of the water surface height if one is present at the site. Enter this value under TAPE DOWN in the space provided in the Stream Gage Logger notes. Use a numerical reference to specify the estimated amount of error due to wind or wave action.

6.3.11.1 Corr. Factor: Note the number usually written on the tape housing that accounts for the offset from the end of the tape and the length of the weight. Enter this value under CORR. FACTOR in the Stream Gage Logger Notes.

6.3.11.2 Corrected: Add the correction factor to the tape down and enter the sum to CORRECTED TD in both spaces provided in the Stream Gage Logger Notes.

6.3.11.3 TD RP Elevation: Enter the reference point elevation in the space labeled TD RP ELEVATION on the note form.

6.3.11.4 = WS ELEV@TD: Subtract the corrected tape down from the reference point elevation to give the water surface elevation. Enter this value under = WS ELEV@TD on the note form.

TAPE DOWN	18.97	18.99 <sup>+0.05</sup>			
CORR. FACTOR	0.37	0.37			
CORRECTED TD	19.34	19.36			
TD RP ELEVATION:	25.33	25.33			
CORRECTED td	19.34	19.36			
=WS ELEV@TD	5.99	5.97			

6.3.11.5 The FMU uses a self-leveling laser level as another method of determining stage height. For more detailed instructions on determining stage heights using a laser level refer to the Measuring Gage Height of Streams SOP (Shedd, 2015).

6.3.11.6 Before determining stage height using a laser level you must confirm the laser beam elevation. Record the established rod reading and the observed rod reading for each laser level reference mark in the LL RM spaces in the lower right corner of the Stream Gage Logger Notes form.

Example:

	ELEVATION	READING
LL RM1	<b>2.37</b>	<b>2.37</b>
LL RM2	<b>0.88</b>	<b>0.88</b>
LL RM3	<b>3.62</b>	<b>3.62</b>

6.3.12 LASER: STADIA ROD READING: Note the height of the laser beam on the stadia rod.

6.3.12.1 - WATER SURFACE, ROD READING: Observe and record the water surface level on the stadia rod. Note fluctuations or bounce of the water surface against the stadia rod.

6.3.12.2 =DIFFERENTIAL, LASER TO WATER SFC: Subtract the WATER SFC. ROD READING from the LASER: STADIA ROD READING to give the DIFFERENTIAL

6.3.12.3 LASER BEAM ELEVATION: Fill in the laser beam elevation. The laser beam elevation is the elevation of the pad plus the difference between the laser beam plane and the bottom of the laser level instrument mounted on the pad. It is important to distinguish between the elevation of the pad and the laser beam plane. If using a standard FMU laser level the laser beam elevation, including the difference in laser beam height and laser pad, is usually noted on the station door.

6.3.12.4 - DIFFERENTIAL: Fill in the differential calculated between laser and water surface.

6.3.12.5 = STAGE: Subtract the DIFFERENTIAL from the LASER BEAM ELEVATION to get the STAGE.

LASER:STADIA ROD READING	6.25	8.62			
- WATER SURFACE, ROD READING	0.34	2.69			
=DIFFERENTIAL, LASER TO WATER SFC	5.91	5.93			
LASER BEAM ELEVATION	11.90	11.90			
- DIFFERENTIAL	5.91	5.93			
= STAGE	5.99	5.97			

6.3.13 At sites where additional parameters are recorded, such as air and water temperature, appropriate quality checks are made using a thermistor and noted.

6.3.14 Water Temp: This space is used to note the water temperature on stations equipped with water temperature sensors and a logger. For instructions on finding temperature readings on various loggers see specific model manuals or SOPs.

Example:

WATER TEMP	12.6
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6.3.15 Thermistor: The FMU uses a thermistor to record the temperature, which is to be taken as close as is safely possible to the temperature sensor at the terminal pipe end.

Example:

THERMISTOR	12.5
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6.3.16 Air Temp: This space is used to note the air temperature on sites equipped with air thermistor and a logger. For instructions on finding temperature reading on various loggers see specific model manual or SOPs.

Example:

AIR TEMP	24.4
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6.3.17 Thermistor: Measure the air temperature near the station's air probe if one is present and note it.

Example:

THERMISTOR	24.2
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6.4 Stream Gage Logger Notes Form (Back - See attachment C)

- 6.4.1 Batt V: Note the current battery voltage. For instructions on finding battery readings on various loggers see specific model manuals or SOPs.  
Example: Batt V 12.3
- 6.4.1.1 Min: Note the minimum battery voltage listed on the logger.  
Example: Min 11.6
- 6.4.1.2 Max: Note the maximum battery voltage listed on the logger.  
Example: Max 12.9
- 6.4.1.3 Batteries should be replaced when the minimum voltage drops below 11.2v. Damage to batteries and loss of transmissions begins when the voltage is at or below 10.9v.
- 6.4.1.4 Reset Stats: Circle Y or N to indicate if the stats were reset during the station visit. Stats track the maximum and minimum battery voltages and number of logger resets between visits. It is important to reset the stats at each visit. For instructions on finding stat readings on various loggers, see specific model manuals or SOPs.
- 6.4.1.5 Batt replaced: Circle Y or N to indicate if the battery(s) was replaced during the site visit. When replacing batteries, fill out the battery voltage history form attached to the battery. This is used to track a battery's ability to hold a charge and life expectancy.
- 6.4.2 GOES Time OK: When visiting a real-time station, check the GOES time. GOES time is used for synchronizing satellite data transmissions. GOES time is set to GMT (Greenwich Mean Time) and should be synchronized to within 2 seconds to avoid overlapping data transmissions. For directions on locating or correcting GOES time see the specific logger manual or SOP.
- 6.4.3 Data downloaded: Circle Y or N to indicate if data was downloaded from stations with a data logger. During most site visits the latest data set is downloaded from the data logger to a laptop or hand held computer. If a stream discharge measurement is going to be conducted during the visit, data should be downloaded at the conclusion of the measurement.
- 6.4.4 .New file erased Y/N: On stations using Design Analysis loggers the .New data file will be downloaded. Indicate whether the file was erased after downloading. For more details see the specific logger model manual or SOP.
- 6.4.5 Desiccant condition: Note the condition of the desiccant used to keep the electronic components dry. The desiccant consists of color changing silicone that turns from blue to purple to pink as it becomes saturated with moisture.
- 6.4.5.1 Circle Y or N to indicate if the desiccant was changed.

- 6.4.6 CSG checked Y/N: Some stations are equipped with Crest Stage Gages. A crest stage gage is a vertical section of pipe that has water intake holes. It will be located in close proximity to the station. When visiting a site after a high flow event, circle Y/N to indicate if the CSG is checked. Take off the top cap from the crest gage pipe and lift out the wooden staff. Use an engineer's measuring tape to measure from the bottom of the stick to the cork dust line. Note this in the space HWM \_\_\_\_\_ FT ON STICK on the back of the Stream Gage Logger Notes form. Take note of the elevation of the reference point in the space REF ELEV \_\_\_\_\_ FT. Note the sum of the high water mark and the reference mark elevation, and note in the =HWM ELEV \_\_\_\_\_ FT space. This is the crest stage height. For more detailed information see the Standard Operating Procedure for Measuring Gage Height of Streams (Shedd, 2015).
- 6.4.6.1 Circle Y or N next to Added cork if cork was added to the CSG.
- 6.4.7 Remarks: This section is to be used to note any relevant information pertaining to the station that was not contained in the rest of the form.
- 6.5 Gaging Station Log (Attachment D)
- 6.5.1 At sites with continuous loggers there will be Gaging Station Log forms inside the station house (See attachment D). Staff and/or basin support should populate each field of this form during each site visit to the best of their ability. This form is a summary of information noted on Discharge Measurement Notes (see Shedd 2014,) and the Stream Gage Logger Notes previously discussed. It is useful to fill this form out at the end of a site visit to ensure that nothing was overlooked.
- 6.5.2 Station name: Fill out the name associated with the site.
- 6.5.3 Station Number: Fill in the unique 6-digit alphanumeric assigned site I.D.
- 6.5.4 Water Year: Fill out the current water year. These forms will be replaced at the beginning of the water year or whenever full.
- 6.5.5 Fill out the form down the vertical column once per site visit.
- 6.5.6 Party: Fill in the initials of the staff or basin support visiting the site.
- 6.5.7 Date: Note the day, month and year notes are being made
- 6.5.8 Time: Note Pacific Standard Time (PST) for each reading in 24hr method
- 6.5.9 PGI: Primary Gage Index- note the primary stage reference used to monitor stage. The primary gage index can vary at different stations and may be a staff, laser level, or wire weight.

- 6.5.10 SGI: Secondary Gage Index- note the secondary stage reference used to monitor stage.
- 6.5.11 Aux: Auxiliary gage- typically a crest stage gage used to verify stage maximums and high water marks; measured shortly after high water events. In some cases, the aux could be a “tertiary” gage index, for example, a scenario where a staff and laser level exist but a tape down is also measured.
- 6.5.12 Logger: Note the current stage reading on the data logger. For instructions on finding live stage reading on various loggers see specific model manuals or SOPs.
- 6.5.13 H<sub>2</sub>O Temp.: Note the water temperature on stations equipped with temperature capabilities.
- 6.5.14 Air Temp.: Note the air temperature when at stations equipped with air temperature logging capabilities.
- 6.5.15 Thermistor: Note the temperature using a calibrated thermistor; measure as a close as safely possible to the sensors that are recording to the data logger.
- 6.5.16 Batt. V: Note the current battery voltage. For instructions on finding battery readings on various loggers see specific model manuals or SOPs.
- 6.5.17 Replaced? (Y/N), V.: Write Y or N to indicate if the battery(s) was replaced during the site visit. If the battery was replaced, note the new battery voltage. Remember to fill out the battery tracking form attached to both the new and replaced batteries.
- 6.5.18 Download (Y/N): Note Y or N to indicate if data was downloaded from stations with a data logger. During most site visits the latest data set is downloaded from the data logger to a laptop or hand held computer. If a stream discharge measurement is going to be conducted during the visit, data should be downloaded at the conclusion of the measurement.
- 6.5.19 Purge (Y/N): Indicate whether a manual purge was performed. Manual purges are performed when a plug in the orifice line is suspected. This is often associated with very high logger readings that do not match gage readings. For instructions on performing a manual purge see the specific logger manual or SOP.

- 6.5.20 Synced (Y/N): For stations that employ older version GPS radios it is necessary for the logger to sync their GPS clocks. This is necessary to avoid overlapping the data transmission time blocks between individual stations. Loggers will typically display the date of the last sync. For stations with newer GOES radios and Trimble GPS antennas or with syncing disabled the display will read as xx/xx or 00/00. If there are known GPS syncing problems, verify that GOES time is accurate to within 2 seconds. Manually set the GOES time (GMT - 8hours) if needed, but do not attempt to sync the system. For specific instructions on setting GOES time see specific logger manual or SOP.



**Trimble GPS Antenna (Photo courtesy of Trimble)**

- 6.5.21 System Resets: Note the number of system resets if there are any. For instructions on finding the system resets see specific logger manual or SOP.
- 6.5.22 Batt. V (Min/Max): Note the current battery voltage. For instructions on finding battery readings on various loggers see specific model SOPs.
- 6.5.23 The following section of notes will normally be filled out solely by Department of Ecology personnel unless otherwise requested by the basin lead.
- 6.5.24 Reset Stat Screens (Y/N): Circle Y or N to indicate if the stats were reset during the station visit. Stats track the maximum and minimum battery voltages and number of logger resets between visits. It is important to reset the stats at each visit. For instructions on finding stat readings on various loggers see specific model manuals or SOPs.
- 6.5.25 Measurement (Y/N): Note Y or N to indicate if a flow measurement was taken during the station visit. If a measurement was taken, continue to fill out the blanks below. If a measurement was not taken, fill out an explanation on the backside of the form under Remarks section.
- 6.5.26 MGH: Note the Mean Gage Height, or the gage height that will be used for the rating.

- 6.5.27 Measured Q: Note the measured or average measured discharge in cfs (cubic feet per second)
- 6.5.28 Professional Rating: Note the field rating given to the flow measurement. This rating is subject to change once reviewed, but best professional judgment should best used when determining the rating at the time. This is usually classified as either excellent (2%), good (5%), fair (8%), poor (over 8%). For more detailed information on rating flow measurements see the Measuring and Calculating Stream Discharge SOP (Shedd, 2014). Notes explaining the rating can be made in the Remarks area on the backside of the form.
- 6.5.29 Method: Note what instrument was used to conduct the flow measurement. (ADCP, ADV 0.2/0.6/0.8, mechanical meter) These notes are useful to aide in determining what equipment to use at different stages during future site visits.
- 6.5.30 Location: Describe where the measurement cross section was located. If more room is needed, continue in the Remarks section on the back.
- 6.5.31 Max Depth: Note maximum depth encountered during measurement.
- 6.5.32 Max Velocity: Note the maximum velocity encountered during the measurement. The Max Depth and Max Velocity notes can be useful in determining if a cross section is wadeable and what type of measurement should be made in future measurements.
- 6.5.33 PZF: Note if a point of zero flow measurement was taken. For instruction on taking a PZF see the Standard Operating Procedure for Measuring and Calculating Stream Discharge. (Shedd, 2014)
- 6.5.34 Control: Note a detailed description of the control type (section, channel, flood plain) and composition (gravel bar, log, rocky outcrop, etc.). Also note information such as distance below gage, condition of the control (partially or fully submerged, debris pile up, effects of vegetation, etc.). Staff should refer to the Measuring and Calculating Stream Discharge SOP (Shedd, 2014) for instructions to accurately describe controls.
- 6.5.35 Remarks: This section is used to fill in extra information worth noting. This can include information that would not fit on the front portion of the form or a further explanation of a preceding notation. This section should also be used to pass on relevant information to the next person visiting the site. This can include unusual flow conditions (ice, weed growth, debris jams), upgrades, maintenance or repairs done to station components, reports of vandalism, reports of station problems, and notes of when surveys were completed.

## **7.0 Records Management**

- 7.1 Personnel should use the Stream Gage Logger Notes form ECY 070-183(Rev. 7/08) (Attachment A) to note all applicable information. These forms are to be returned to the basin lead, with accompanying flow measurement notes if taken, after each site visit.
- 7.2 The Gaging Station Log form ECY 070-330 (8/08) should be filled out until each column is used and returned to basin leads to be input to databases.

## **8.0 Safety**

- 8.1 All EAP safety policies are followed when obtaining conducting site visits. Refer to the EAP Safety Manual for further information about working in and around streams.
- 8.2 Personal Flotation Devices are required for persons working in or near streams.
- 8.3 Always consider the safety and traffic situations when obtaining gage heights from a bridge, and take appropriate actions, including suspension of the activity if unsafe conditions exist. Consult the EAP Safety Manual (2015, page 37-41) for further guidance regarding bridge safety.
- 8.4 When operating laser levels, do not stare into the beam or direct the beam at other persons. Check the path of the beam and ensure there is no danger of inadvertently pointing the beam at people in the vicinity.

## **9.0 References**

- 9.1 Environmental Assessment Program, 2015. Environmental Assessment Program Safety Manual, March, 2015. Washington State Department of Ecology, Olympia, WA.
- 9.2 Rantz, S.E., and others. 1975. Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge. United States Geological Survey Water-Supply Paper 2175
- 9.3 Shedd, James R. 2014. Standard Operating Procedure (SOP) for Measuring and Calculating Stream Discharge. Version 1.2, Washington State Department of Ecology, Olympia, WA SOP Number EAP056  
<http://www.ecy.wa.gov/programs/eap/quality.html>
- 9.4 Shedd, James R. 2008 Standard Operating Procedure for Measuring Gage Height of Streams. Version 1.0, Washington State Department of Ecology, Olympia, WA SOP Number EAP042 <http://www.ecy.wa.gov/programs/eap/quality.html>

# **Attachment A:**

## **PRE/POST FIELD EXCURSION CHECKLIST**

### ***Before embarking in the field all FMU staff must:***

1. Arrange for lodging (if necessary)
2. Update outlook calendar indicating basin location and duration of trip
3. Prepare current rating curve sheets for basin
4. Notify basin contacts (if necessary)
5. Prepare field/float plan form with emergency contact information for specific trip location and duration
6. Be sure to check van packing lists and pre trip vehicle inspection before embarking from the Operations Center

### ***Pre-Trip Vehicle Inspection:***

1. Inspect tires for wear/damage on both sides of sidewall. Be sure to check tire pressure as well
2. Check fluid levels (oil, transmission, windshield washer, radiator) before embarking in order to minimize possible breakdowns
3. Make sure that the vehicle safety equipment is packed and that a spare tire, jack and lug wrench are in the van and in working order
4. If any of these listed items are not in satisfactory working order please notify Sarah Barrie or Oliver Brock as soon as possible. Do not embark with a vehicle that is in need of service or may be damaged

### ***Upon return from the field:***

#### ***End of Day-***

If staying at a hotel; notify your contact person each evening that you are finished with field sampling so they do not initiate the rescue protocol. If your trip is only a day trip refer to end of trip protocol.

#### ***End of trip-***

- Fill vehicle with fuel before returning to the Operations Center
- Upon return to the Operations Center, please unload your gear and measuring equipment
- Don't forget to download Flow-Tracker files to your laptop
- Unload spent batteries and carefully refill them with DI water if needed
- Place spent batteries on appropriate chargers after servicing them
- Load spent desiccant (packs or loose crystals) into appropriate drying ovens and check to be sure that the oven temperatures are set at the pre-determined levels correctly
- Hang any wet ropes in their designated locations to dry
- Store ADCP's in their designated locations, tethered to the wall to prevent falling over
- Clean the interior of the van (if needed) Wash vehicle if possible
- Close field/float plan and notify contact person that your trip is over

**Attachment B:**  
**Vehicle and Equipment Checklist**

**Standard Vehicle Equipment:**

*This equipment should be present anytime the vehicle is used.*

- Cell Phone and Charger

**Vehicle Folder containing**

- Mileage Logs
- Emergency Information
- Fuel Card
- Maps

**Safety Equipment**

- First Aid Kit
- MUTCD compliant Safety Vests (2)
- CG Approved PFD (1 per person)
- PFD CO<sub>2</sub> Refill
- Road Cones
- Signs
- Hard Hats (2)
- Orange Strobe

**Tools / Other**

- Mechanic's Toolbox
- Shovel
- Loppers/Clippers/Machete
- Tire Chains
- 2- 150 ft. Ropes
- Spare Key
- Jack, jack handle, adequate spare
- Flashlight
- Lighter
- Electrical Tool Box
- Pens
- Pencils
- Note Paper
- Flagging Tape
- Orange Spray Paint
- Spare Bucket

**Standard Flow Gear**

**Flow Box:**

- Weighted Tape for Tape Down
- Tag Line
- 300 ft. Transect Tape
- Line Clamps
- Swiffer Kit w/ Cables and Fans
- Swiffer Meter
- Bridge Depth Sounding Correction Sheets (2/10, 6/10, 8/10's)
- Survey Pins and Hammer
- Flow Tracker
- Wading rod
- Laser Level
- Stadia Rod

- Thermistor
- Spare Batteries for All Devices
- Battery Chargers
- Discharge Measurement Sheets

**Station Visit**

- Station Visit Data Flash Card
- Multi-meter
- Logger Menu Flow Chart
- Desiccant
- Station Key
- USGS key
- Other Keys as needed
- Appropriate DCP Batteries

**ADCP Gear**

- ADCP Unit
- PDA (CHECK BATTERY STATUS )
- SD card for PDA
- Tow Ropes and Carabiners
- ADCP Data Sheet

**Bridge Gear (If Needed)**

- Lead Flow Weights, all sizes
- Bridge Board
- T-bar
- Reel w/ Swiffer Cable

**3-Wheel Crane**

- Reel
- Crane Assembly

**4-Wheel Crane**

- HS Meter Box
- Props
- Meter Body w/Fiber-Fin
- Cleaning Soln.
- Lubricant
- Reel
- Crane Assembly/Boom
- Counterweights
- Wheel Chocks

**Personal Equipment**

- Water
- Food
- Dry Clothes
- Rain Gear
- Sunscreen
- Gloves
- Waders/Hip Boots
- Up to Date Ratings Sheets
- Maps/Station Directions
- Notebook w/ Extra Data Sheets

**Decontamination Equipment**

- To Be Determined

# Attachment C (front)



Washington State Department of Ecology

## EAP-FMU Stream Gauge Logger Notes

Sta. Name \_\_\_\_\_

Sta. No. \_\_\_\_\_ Party \_\_\_\_\_

DATE					
TIME (PST)					
LOGGER					
STAFF					
WIRE WEIGHT					
CHECK BAR					
TAPE DOWN					
CORR. FACTOR					
CORRECTED TD					
TD RP ELEVATION:					
CORRECTED td					
=WS ELEV@TD					
LASER: STADIA ROD READING					
- WATER SURFACE, ROD READING					
= DIFFERENTIAL, LASER TO WATER SFC					
LASER BEAM ELEVATION					
- DIFFERENTIAL					
= STAGE					
WATER TEMP				ELEVATION	READING
THERMISTOR			LL RM1		
AIR TEMP			LL RM2		
THERMISTOR			LL RM3		

ECY 070-183 (Rev. 7/08)

**Attachment C (back)**

Batt V \_\_\_\_\_ Min \_\_\_\_\_ Max \_\_\_\_\_

Reset Stats Y/N                      Batt replaced Y/N

GOES Time OK Y/N

Data downloaded Y/N              .NEW file erased Y/N

Desiccant condition \_\_\_\_\_ Changed Y/N

CSG checked Y/N

HWM \_\_\_\_\_ ft on stick + Ref Elev \_\_\_\_\_ ft

= HWM Elev \_\_\_\_\_ ft.              Cleaned Y/N

Added cork Y/N

Remarks: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



# Attachment D:

Back

Party												
Date												
Remarks (Flow conditions, additional tasks performed, etc.)												