BCWA Field Method

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To: BCWA

From: **Russell N. Clayshulte, Manager**

Re: **Field Flow Estimation Method**

Real Time Flow Estimations

The BCWA primary flow meter is a OTT MF pro. The portable velocity system is used in the field. Turbulent, noisy and low flows can be measured with this meter. When the sensor is placed in flowing water, a magnetic field around the sensor creates a voltage proportional to the flow velocity. This voltage amplitude, which represents the rate of water flow around the sensor, is detected by electrodes in the sensor and processed by the sensor microprocessor. The processed signal is digitally transmitted through the sensor cable to the portable meter and the information is shown on the meter display. Generally, the BCWA measures real-time velocity and depth in a stream profile. The BCWA is looking for a reasonable estimate of flow. The BCWA method is within 2-10% of estimates taken at USGS gaging stations, when a comparative test series was done at diffent stream velocities.

Measurement estimation quality is dependent on the selection of a reasonable cross-section. Select a section of stream with the following characteristics:

- The flow directions at measurement points across the stream are generally parallel to the bank and perpendicular to the cross-section.
- The streambed is generally stable and free of large rocks, weeds and protruding obstructions that cause turbulence. Look for reasonably uniform sized substrate. Avoid cross-section with very large boulders upstream of cross-section, since they can cause flow dead zones.
- Streambanks are generally well defined and stable. Don't use heavily brushy streambanks.
- Depth profile across profile is reasonably consistent (don't select cross-section with deep pools).
- Velocity profile across is reasonably consistent (don't select cross-section with single very high velocity flow area).
- Use a stream profile cross-section that can be sampled under different flow conditions (you want a repeatable site). Generally, the upper limit for field measurements safely done by BCWA staff is less than 75 cfs.

The general BCWA procedure is to take velocity and depth measurements in stream cross-section as described below:

1. Select long-term cross section site at sample reach based on above considerations.

2. Place anchor stake at edge of stream within few inches of water, stretch tape (50 foot) perpendicular across stream to establish cross-section. Anchor tape on far bank in such a manner to keep tape out of flow. Record width from bank full to bank full.
3. Set flow meter to real-time mode.

4. BCWA is using a uniform distance method. A depth and velocity measurement is taken at 2-foot intervals. A more accurate method is to take depth and velocity measurements at 1-foot intervals. Periodically, width measurements maybe be taken at other intervals, often dependent on cross-section or low flow areas near banks; just record interval using for calculations.

5. The first measurement is taken at the 2-foot mark on the tape. A depth measurement is taken at the point below the 2-foot mark. Record depth on field form or if established can use meter recording system.

6. Take a velocity measurement at each station. If the depth is less than 1-foot, then the bottom velocity is okay to record. Generally, the flow velocity will be slightly less at the bottom of the stream channel. The BCWA sample rod is calibrated to measure depth 2 inches above the stream bottom. If the depth is greater than 1-foot, then the velocity measurement is taken at the mid-water column depth. Record velocity on field form or if established can use meter recording system. In some cases (e.g., deeper water) several vertical velocity measurements can be taken at interval station and averaged.

7. Calculate flow as follows:

Station Distance (ft)	**Depth (ft)**	**Velocity Ave (Ft/sec)**	**Area (depth X 2-ft interval or as measured)**	**Discharge cubic-ft/sec (velocity X Area)**
2	De1	V1	De1*2=A1	V1*A1= CFS1
4	De2	V2	De2*2=A2	V2*A2= CFS2
Total flow				Sum CFS1:CFS2