

ASL AQFlow's [Acoustic Scintillation Flow Meter](#) (ASFM) has been installed at the [BC Hydro's Wahleach project](#) near Hope, BC, as a replacement to an existing Over-Velocity Detection System (OVDS). Hydroelectric operations use these detection systems in order to detect if the tunnel or penstock downstream of the intake has a leak or rupture. In such cases, intake gates are closed to prevent uncontrolled release of water that can be potentially dangerous for the public and may cause damage to properties and infrastructure.

The ASFM uses [ultrasonic pulses](#) across an intake to analyze variations in turbulence to measure flow. These data are used to produce real-time current velocities and discharge volumes. At the Wahleach site, two independent 4-path ASFM instruments—acoustic beams consisting of transmitter (Tx) and receiver (Rx) pairs—were mounted to a removable frame that was lowered into an intake slot (Figure 1). This installation did not require dewatering of the tunnel and provides a non-intrusive method to measure water flow passing through the intake. Maintenance and trouble-shooting of the ASFM system can be conveniently performed from the intake floor. The previous OVDS was based on measurements of differential pressure using Pitot tubes that had become unreliable. It caused false gate trips in the past resulting in rapid dewatering of the tunnel which is very harmful for the stability of the tunnel. ASFM data were analyzed for repeated measurements at ten steady flow conditions (Figure 2). The average standard deviation for these tests was less than 1% for each of the 4-path ASFM's. A bias adjustment value has been used to reduce the discharge by approximately 5.5% to match with turbine test data collected in 2002. These test results comply with BC Hydro's requirements for an accurate monitoring of over-velocity.

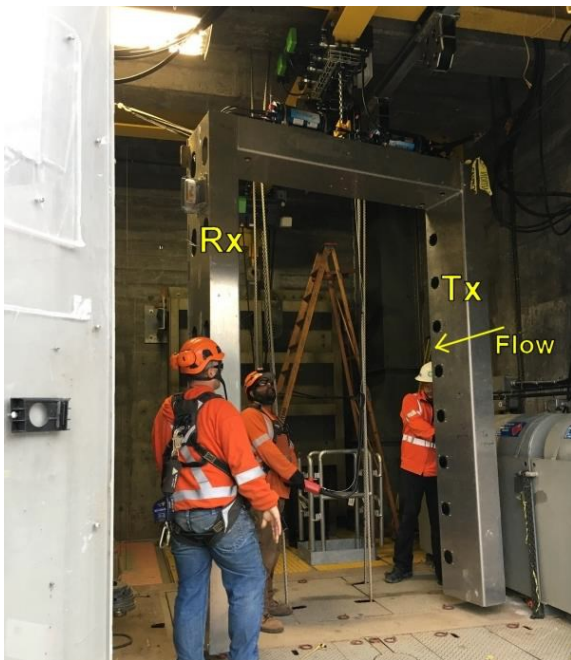


Figure 1. Removable ASFM support frame being installed at the intake maintenance gate slot. The direction of flow and the location of the transmitter (Tx) and the receiver (Rx) transducers are indicated.

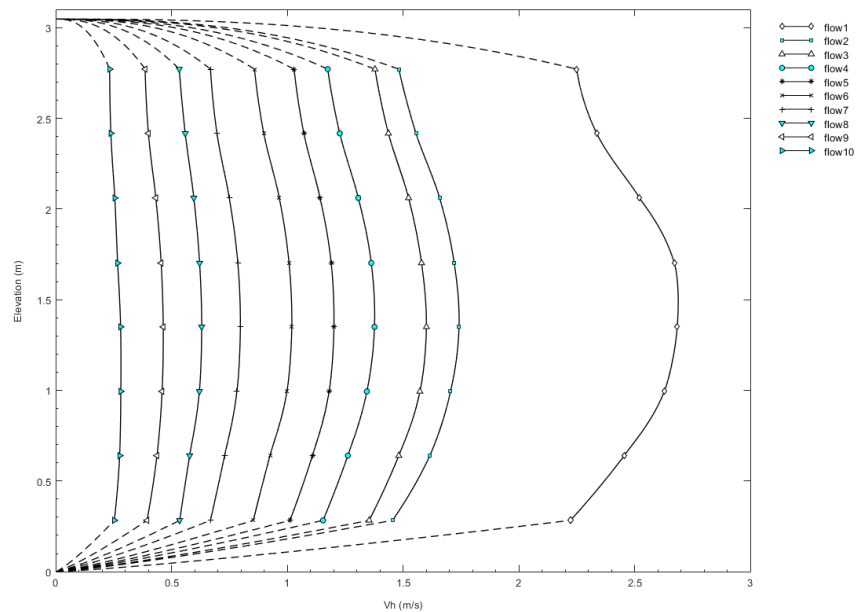


Figure 2. Curves display the horizontal component of velocity from all eight ASFM transducer paths for ten flow conditions.