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July 29, 2010

OFFICE OF SURFACE WATER TECHNICAL MEMORANDUM 2010.07

SUBJECT: Independent Water Temperature Measurement for Hydroacoustic Measurements

The purpose of this memorandum is to state Office of Surface Water (OSW) policy regarding water temperature measurements with hydroacoustic instruments. An independent water temperature measurement must be made and documented prior to every measurement made with hydroacoustic instruments or during each site visit to an index velocity station. This includes measurements of discharge, velocity or water depth. Hydroacoustic instruments include, but are not limited to, acoustic Doppler current profilers (ADCPs) such as the Rio Grande, StreamPro, and RiverSurveyor ADCPs; acoustic Doppler point-velocity meters such as the FlowTracker ADV or Ott ADC; and acoustic index velocity meters. (Any use of trade, product, or firm names in this document is for descriptive purposes only and does not imply endorsement by the U. S. Government.) The water temperature measured by the hydroacoustic instrument should be within 2 degrees Celsius (C) of the independent water temperature measurement or corrective action should be taken. Because these measurements are being made to help insure that there are no gross errors in the temperature readings made by the hydroacoustic instruments, it is not necessary to use a thermometer that meets U. S. Geological Survey Office of Water Quality standards for field measurement of water temperature (National Field Manual for the Collection of Water-Quality Data, Techniques of Water-Resources Investigation, Book 9, Chapter A6, Section 6.1.1, and 6.1.2B - available at http://water.usgs.gov/owq/FieldManual/Chapter6/6.1_contents.html). Any comparison temperature data measured with a thermometer that does not meet USGS Office of Water Quality standards should be used for internal quality assurance purposes only and should not be released to the public.

Hydroacoustic instruments have a built-in temperature sensor to measure water temperature near the transducer(s). The instrument must compute the speed of sound correctly to accurately measure velocities, depths, and compute discharge. An error of 5 degrees C in the water temperature measurement will cause a 2-percent bias error in the measured velocity. Thus, the water temperature measured by the instrument should be compared with an independent water temperature measurement made adjacent to the instrument. This check should be performed prior to every measurement or during each site visit to an index velocity station and the results documented.

It is important to allow adequate time for the hydroacoustic instrument to equilibrate to the water temperature before comparing the temperature measured by the hydroacoustic instrument with the independent temperature measurement. If an instrument's temperature sensor differs consistently from the independent temperature measurement by 2 degrees C or more, or if the instrument temperature sensor has failed, the hydroacoustic instrument should not be used to make measurements until the temperature sensor is repaired and checked. In the event that it is

necessary to make measurements and another instrument for making the measurement is not readily available, some instruments allow for manual entry of measured water temperature for use in the speed-of-sound calculations. This practice is discouraged because it may decrease the accuracy of the discharge measurement.

If you have any questions or comments about the policies and guidance in this memorandum, please contact Kevin Oberg (kaoberg@usgs.gov) or the OSW Hydroacoustics Work Group (hawg@simon.er.usgs.gov).

Steve Blanchard */signed/*
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