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# United States Department of the Interior

U.S. GEOLOGICAL SURVEY

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## NATIONAL WATER QUALITY LABORATORY TECHNICAL MEMORANDUM 2000.04

July 25, 2000

To: distribution.e  
From: Gregory B. Mohrman, Chief  
National Water Quality Laboratory  
Subject: Hach Turbidimeter 2100AN to replace Hach Turbidimeter 2100A for  
determination of turbidity in raw unfiltered water  
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Revision: None  
Effective Date  
of Change: October 1, 2000

### Supplemental information:

Further information regarding the comparison studies of the two instruments is available as a supplement to the web page version of this technical memorandum, which is accessible under "Technical Memoranda" on the National Water Quality Laboratory's home page at <http://wwwnwql.cr.usgs.gov/USGS>.

### PURPOSE

On October 1, 2000, the NWQL will begin analyzing samples for turbidity using a Hach 2100AN Nephelometer. The new nephelometer will replace the current Hach instrument on June 1, 2001. The Hach 2100AN uses improved technology to determine turbidity. It is more efficient and produces more accurate results in the presence of color than the present instrument. Color from dissolved substances in water that absorb light, causes measured turbidities to be biased low.

Data produced by the new instrument may be different from previous data produced on the Hach 2100A. These differences are site and matrix specific. Both lab codes may be requested at no additional charge until June 1, 2001, because of the possible effect to the data base.

### SCOPE

The NWQL will replace the current procedure for static turbidity measurement (the Hach 2100A instrument) with a dynamic flow-through procedure using the Hach 2100AN turbidimeter. The new procedure is based on the Twentieth Edition of Standard Methods for the Examination of Water and Wastewater (American Public Health Association, 1998). The method number remains I-3860-85 and the laboratory reporting limit remains 0.1 NTU (nephelometric turbidity unit). The new lab code for turbidity will be 2187, and the test ID (Parameter code and method identifier) is 99872A. Lab code 2187

turbidity analysis will require the raw chilled (RC) sample type, and will have a holding time limited to 14 days. The use of a chilled sample with a reduced holding time will keep any changes in the water to a minimum before it is analyzed. The laboratory will require 500 mL (milliliters) of sample (LC 2187) rather than 250 mL, because of the flow-through system.

The Hach 2100AN uses an advanced optical and electronic design. The optical system consists of a tungsten-filament lamp, lenses and apertures to focus the light, a 90-degree detector to monitor scattered light, a forward-scatter light detector, a transmitted-light detector, and a back-scatter light detector. The instrument can accurately measure samples with turbidity up to 400 NTU without dilutions. Samples with turbidity greater than 400 NTU will be diluted to the calibration range.

Data collected to validate the Hach 2100AN turbidimeter demonstrate excellent linearity that ranges from 0 to 400 NTU and excellent accuracy and precision for third-party check standards. In addition to improved accuracy and precision of turbidity data, we also expect improved turnaround time and laboratory efficiency.

### **EFFECT ON THE DATA BASE**

Minimal changes in data are expected for samples with turbidity measurements less than 20 NTU. Data may change for more turbid and colored samples, usually with increased values on the 2100AN. Occasional increases of 50 percent were noted when checking samples. These differences are matrix specific, so a universal adjustment factor is not appropriate. Data produced during instrument validation is provided in the supplement to this tech memo and is available from the NWQL home page.

The NWQL encourages district users to request both lab code 2187 (Parameter code 99872A) and Lab code 50 (Parameter code 00076A) until June 1, 2001. This request will allow customers to observe data changes in their individual sample matrix. When both lab codes are requested, lab code 50 will be provided at no cost. After June 1, lab code 50 will no longer be available.

The NWQL plans to summarize all the comparative data after the dual-testing phase. The data will be added to the web site as a second supplement to this tech memo.

### **References**

American Public Health Association, 1998, Standard methods for the examination of water and wastewater (20th ed.): Washington, D.C., p. 2-9 to 2-11.

Fishman, M.J., and Friedman, L.C., eds., 1989, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chapter A1, p. 497 and 498.

**Supersedes:** None

**Key Words:** turbidity, Hach, color, nephelometer

**Distribution:** E and <http://www.nwql.cr.usgs.gov/USGS>