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## NATIONAL WATER QUALITY LABORATORY TECHNICAL MEMORANDUM 2007.01

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### PURPOSE

Turbidity is a measurement that is useful in scientific and resource monitoring programs. It is an operationally defined parameter that depends on the type of instrumentation used for measurement. In 2002-2004, the Office of Water Quality (OWQ) did an interagency study comparing various turbidity instruments. The results of the workshop demonstrated that turbidity data from different sources and instrumentation can be highly variable, and are often in disagreement with each other. In order to reduce and track the variability, the USGS National Field Manual and OWQ Technical Memorandum 2004.03 established a series of new parameter codes and 10 different sets of reporting units that relate to the major optical configuration of turbidity instruments. Per Attachment 3 in the OWQ TM 2004.03, Water Science Centers were permitted to re-label previous data in NWIS (National Water Information System) with the new units and parameter codes if sufficient information was available to make an unambiguous decision. This memo documents the turbidity instruments and methods used historically at the National Water Quality Laboratory (NWQL), so that Water Science Centers will be able to correctly migrate data in NWIS if they choose to do so.

### INSTRUMENTATION HISTORY

Records are not available to confidently identify the instruments used before 1985, although the published method (I-3860-78; Skougstad and others, 1979) specifies either a Hach 2100 or 2100A turbidimeter. Turbidity results are correctly described in NWIS 4.4 and 4.5 as 00076, with no method code. In NWIS 4.6, the data are correctly described as 00076 TBD01.

NWQL used a Hach 2100A turbidimeter from 1985 through June 2001. Based on the technical information provided by Hach Company, the Hach 2100A turbidimeter has a single detector at 90° to incident beam, and uses a white or broadband light with a peak spectral output of 400-680 nanometers. Results were released from NWQL using parameter-method code 00076A. Based on OWQ TM 2003.04, those results are correctly described in NWIS 4.4 and 4.5 as parameter code 63675, method code U, units NTU. NWQL did not use parameter/method code 63675U to report any results. The data are correctly described as parameter-method 63675 TS093 in NWIS 4.6.

The Hach 2100AN instrument was brought on-line beginning October 1, 2000. Because of instrumental differences, Water Science Centers were encouraged to have their samples analyzed by both the Hach 2100A and the Hach 2100AN instruments between October 1, 2000 and June 2001. Since June 2001, the Hach 2100AN instrument has been used exclusively. The Hach 2100 AN turbidimeter uses multiple detectors at 90° to incident beam and other angles, and uses a white or broadband light with a peak spectral output of 400-680 nanometers. The instrument is run in the 'ratio' mode which allows for analysis of concentrations up to 400 NTRU without dilution. At the NWQL, parameter code/method code 63676A applies in NWIS 4.4 and 4.5 to all turbidity data analyzed on the Hach 2100 AN instrument. The units are NTRU. In NWIS 4.6, these data are correctly described as parameter-method 63676 TS098.

**Table 1**  
**History of NWQL Turbidity Measurement Including Parameter and Method Coding**  
 NTU—Nephelometric Turbidity Units, NTRU—Nephelometric Turbidity Ratio Units

Sample Collection Date	Labcode	Instrument	Parameter Code (NWIS 4.4-4.5, 8/2004 – 8/2006)	Parameter Code (NWIS 4.6, after 9/2006)	Reporting Units
Pre 1985	50	Unknown	00076	00076 TBD01	NTU
1985-6/1/2001	50	Hach 2100A	00076A 63675U	00076 TBD01 63675 TS093	NTU
10/1/2000 – 9/30/2004	2187	Hach 2100AN	99872A	99872 TBD01	NTU
10/1/2004 – 10/30/2006	2187	Hach 2100AN	63676A	63676 TS098	NTRU
11/1/2006 - present	2187	Hach 2100AN	---	63676 TS098	NTRU

## REFERENCES

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Brown, Glenda E., 2000, NWQL Technical Memorandum 00-04, Hach Turbidimeter 2100AN to replace Hach Turbidimeter 2100A for determination of turbidity in raw unfiltered water, [[http://nwql.usgs.gov/Public/tech\\_memos/nwql.2000-04.pdf](http://nwql.usgs.gov/Public/tech_memos/nwql.2000-04.pdf)]

Brown, Glenda E., 2000, NWQL Technical Memorandum Supplement 00-04S Hach Turbidimeter 2100AN to replace Hach Turbidimeter 2100A for determination of turbidity in raw unfiltered water; this technical memorandum contains supplementary information for NWQL Technical Memorandum 2000.04, [[http://nwql.usgs.gov/Public/tech\\_memos/sup\\_nwql.2000-04S.pdf](http://nwql.usgs.gov/Public/tech_memos/sup_nwql.2000-04S.pdf)]

National Water Quality Laboratory Rapi-Note 01-016 Reminder of Turbidity Method Change [<http://wwwnwql.cr.usgs.gov/USGS/rapi-note/01-016.html>]

Office of Water Quality Technical Memorandum 2004.03 Revision of NFM Chapter 6, Section 6.7—Turbidity [<http://water.usgs.gov/admin/memo/QW/qw04.03.html>]

Skougstad, M.W., Fishman, M.J., Friedman, L.C., Erdmann, D.E., and Duncan, S.S., eds., 1979, Methods for determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A1, p. 549-550.

Supersedes: None

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