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United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Box 25046 M.S. 407

Denver Federal Center

Denver, Colorado 80225

NATIONAL WATER QUALITY LABORATORY TECHNICAL MEMORANDUM 1993.05

March 10, 1993

To: Assistant Chief Hydrologist, PC&TS
Regional Hydrologists
Chief, Office of Water Quality
Assistant Chief, Office of Water Quality
Deputy ACH for PC&TS for NAWQA
Area Assistant Regional Hydrologists
District Chiefs
Regional Water-Quality Specialists
Area Assistant Regional Hydrologists for NAWQA
District Water-Quality Specialists
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Chief, Ocala Project Office
Chief, Yucca Mtn. QA Group
Chief, Branch of Quality Assurance
Employees, National Water Quality Laboratory

From: Chief, National Water Quality Laboratory

Subject: Establishment of one analytical range for silica method

Author: Harold Ardourel (303) 467-8105

Revision: No

SCOPE

This technical memorandum is to inform the Districts of the use of a single analytical range used to determine silica (Lab Code 56, WATSTORE 00955, TWRI I-2700-85) utilizing a new Alpkem autoanalyzer, which has been in operation since October 20, 1992. This single analytical range replaces a single range system utilizing an old Technicon autoanalyzer which was recently found not capable of achieving the stated method detection level of 0.1 mg/L.

Recently, the National Water Quality Laboratory (NWQL) purchased a new Alpkem autoanalyzer system to replace the aging Technicon colorimetric instrumentation (15 years old) previously used to determine dissolved silica (Lab Code 56, WATSTORE 00955, TWRI I-2700-85). This method calls for a dual analytical range: a low range from 0.1 to 6 mg/L and a high range from 6.0 to 60 mg/L. However, the NWQL has always run this method using a single analytical range from 0.1 to 60 mg/L. A recent precision and method detection limit (MDL) study using the protocol set forth in 40 CFR 136, App. B, revealed that the old single-range Technicon system for silica had an MDL of 0.3 mg/L instead of the stated MDL of 0.1 mg/L. Using the same test criteria, the new single-range Alpkem system showed an MDL of 0.1 mg/L. The Alpkem system, utilizing technical advances, is capable of using a single analytical cartridge to achieve the desired analytical range and MDL. Data comparisons for the two systems are presented in Table 1.

Table 1.- Data used to calculate MDL (40 CFR 136, App. B)

Replicate Number	Nominal Concentration(mg/L)	Alpkem Measured Conc.(mg/L)	Technicon Measured Conc.(mg/L)
1	0.30	0.283	0.246
2	0.30	0.296	0.276
3	0.30	0.423	0.527
4	0.30	0.349	0.339
5	0.30	0.317	0.248
6	0.30	0.310	0.296
7	0.30	0.303	0.319
8	0.30	0.305	0.322
	Average (mg/L)	0.32	0.32
	Standard Deviation (mg/L)	0.04	0.09
	Number of Points	8	8
	Degrees of Freedom	7	7
	t value (99% Confidence)	2.998	2.998
	MDL (mg/L)	0.13	0.27

An NWQL team consisting of Harold Ardourel, Pete Rogerson, Mark Sandstrom, Merle Shockey, Charlie Patton, and Chris Klimper determined that, since the same chemistry is being used in all cases, the use of a single analytical range is a Laboratory Standard Operating Procedure (SOP) change and not a method change. The Laboratory SOP will be amended to reflect this change. The effective start date for the Alpkem system for the determination of silica (LC 56) was October 20, 1992.

Data Implications: The use of a single analytical range on the old Technicon instrumentation results in an MDL of 0.3 mg/L rather than the stated 0.1 mg/L for dissolved silica (LC 56). Historically, all data produced by the NWQL since 1976 were run utilizing a single analytical range on the old Technicon system, and all reported values less than 0.3 mg/L have more uncertainty than values greater than 0.3. A survey of silica data produced over the past year shows that less than 2 percent of samples have values less than 0.3 mg/L. There is no reliable way to correct historical data produced prior to October 20, 1992.

Conclusion: The use of the new Alpkem system will correct deficiencies present in the old Technicon system and restore the MDL to the stated level of 0.1 mg/L. The NWQL does not expect a change in data quality, except at the low end of the concentration range (0.3 mg/L).

/signed/

Peter F. Rogerson

Supersedes: None

Key Words: Silica, Alpkem, Technicon, MDL

Distribution: See above plus QWTalk