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Office of Water Quality Technical Memorandum 2012.01

Subject: Application of the Result-level 'v' Value Qualifier Code and 'E' Remark Code to Selected Organic Results Reported by the National Water Quality Laboratory (NWQL)

This memorandum describes the conditions for which the NWQL will apply the result-level 'v' value-qualifier code (v-code) and 'E' remark code (E-code) to analytical results determined by NWQL organic chemistry methods that are reported to the National Water Information System (NWIS) Water Quality System (QWDATA).

Application of the 'v' result-level value-qualifier code – *Analyte detected in laboratory blank* [see table 11 of Appendix A of the NWIS QWDATA Users manual (U.S. Geological Survey, 2011)].

The estimated (E) result-level remark code has been applied periodically by the NWQL to sample data when the analyte was detected in the associated lab blank(s) and when it was possible that similar levels of contamination might produce positive bias in environmental sample results. The 'v' result-level value-qualifier code also has been applied periodically to sample data when the analyte was detected in the associated laboratory blank(s). Use of the v-code by the NWQL previously was noted in OWQ Technical Memorandum 2002.15 (U.S. Geological Survey, 2002).

For samples collected on or after January 1, 2012, the NWQL will assign the result-level 'v' value-qualifier code along with the 'E' remark code under the conditions shown in table 1 for organic chemistry methods only. The NWQL's inorganic chemistry methods are not included in this change at this time. The analyte's presence in the associated laboratory reagent blank(s) (LRB) is an indicator to data users that the reported concentration of the analyte in the environmental sample might be biased high (positive bias).

Table 1. Data reporting and result-level 'v' value-qualifier and 'E' remark code application conditions for NWQL organic chemistry methods

[C_s, analyte concentration in the sample; C_b, analyte concentration in the associated laboratory blank(s); E, estimated remark code; RL, analyte reporting level value[1]; <, less than remark code]

C_s in relation to C_b and RL	NWIS result level remark code	Sample result reported to NWIS	'v' code applied?
$C_s > 10 \times C_b$	None[2]	C_s	No
ARL $3 \times C_b \leq C_s \leq 10 \times C_b$	E	C_s	Yes
$C_s < 3 \times C_b$ and $C_s \leq RL$	<	RL	No
$C_s < 3 \times C_b$ and $C_s > RL$	<	C_s	Yes

[1]The reporting level value is the "less than" concentration provided when the analyte is not detected or is detected below a minimum concentration, which might be at or below the RL value. The reporting level type in NWIS is either a laboratory reporting level [LRL], interim reporting level [IRL], or minimum reporting level [MRL] (Childress and others, 1999; U.S. Geological Survey, 2010).

[2]Although the E-code is not applied for the specific condition described here, it might be applied for additional performance-based reasons as described in Childress and others (1999).

Associated lab blanks

The number [*N*] of laboratory reagent blanks used to evaluate the potential contribution of blank contamination to the analyte concentration in an "associated" environmental sample differs based on the NWQL's method or schedule. One of the three techniques listed below is applied uniformly for the method to evaluate the LRB(s):

1. Use of the single LRB associated with the sample preparation or instrumental analysis set containing the LRB and environmental sample.
2. Use of the LRB with the highest concentration (that is, the worst case) when bracketing LRBs are utilized during the analysis.
3. Use of the *N*–1 highest-ranked LRB of a set of *N* LRBs or the LRB of the sample preparation or analysis set containing the LRB and environmental sample, whichever has the higher concentration. Typically, *N* is the last 10 LRBs that were analyzed prior to the set containing the environmental samples.

Decisions regarding application of the 'v' result-level value-qualifier code

The v-code is not applied when:

- **$C_s > 10 \times C_b$**
  When C_s is greater than 10 times C_b, the level of blank contamination is unlikely to contribute substantially to the sample concentration. This 10 times (or 10 percent) threshold matches the threshold prescribed for application of the capital 'V' result-level remark code to

environmental sample data relative to the amount of contamination in associated blanks (field and laboratory blanks) as described in OWQ Technical Memorandum 97.08 (U.S. Geological Survey, 1997).

- **$C_s < 3 \times C_b$ and $C_s \leq RL$**
  When C_s is less than 3 times C_b, and C_s is less than (or equal to) the reporting level, the determined analyte concentration in the environmental sample is not considered sufficiently greater than the blank and, thus, is not reported. The "less than" the reporting level [<RL] value is reported for the analyte in the environmental sample. The v-code is not provided with the <RL value under this scenario because the added amount of effort required on each environmental sample to evaluate whether the v-code should be applied would be excessive and impractical and does not contribute information useful for interpretation of the result. Omission of the v-code when <RL is reported does not necessarily imply that the analyte was not detected in the laboratory blank.

***The v-code is applied when*:**

- **$3 \times C_b \leq C_s \leq 10 \times C_b$**
  When C_s is greater than or equal to 3 times C_b, but less than or equal to 10 times C_b, the level of contamination observed in the blank might also be present in the sample and contribute to the determined sample concentration as noted by inclusion of the 'v' result-level value-qualifier code (along with the E-code).

- **$C_s < 3 \times C_b$ and $C_s > RL$**
  When C_s is less than 3 times C_b, and C_s is greater than the reporting level, the determined analyte concentration is not considered sufficiently different from the blank. For this scenario, C_s is not reported. Instead a "less than" raised reporting level concentration [$<C_s$] is provided specifically for the analyte in this sample. The v-code is provided to denote that a substantial amount of analyte detected in the laboratory blank is the basis for providing the raised reporting level. **Note**: although this $<C_s$ sample result is referred to as a "raised reporting level" condition by NWQL, the reporting level (RL) value and reporting level type displayed in NWIS QWDATA that is associated with the reported $<C_s$ sample result remains unchanged.

Important Notes:

- No changes will be made to the remark or result-level value-qualifier codes in NWIS QWDATA or in the NWQL's Laboratory Information Management System database for samples collected before January 1, 2012.
- Currently, a maximum of 3 result-level value-qualifier codes can be associated with each result in NWIS [see table 11 of Appendix A of the NWIS QWDATA Users manual (U.S. Geological Survey, 2011)]. These value-qualifier codes have been available for use since 2001 and have been used to varying degree by the NWQL. If more than 3 value-qualifier codes are applied to a reported value, any excluded (displaced) codes are

appended as a comment within NWIS. The v-code would take precedence over most other result-level value-qualifier codes used by the NWQL.

- Application of certain result-level value-qualifier codes simply provides a notation of a possible performance limitation for an individual sample result. Both laboratory and field quality-assurance and quality-control data need to be used to fully evaluate the quality of environmental sample data.

References

Childress, C.J., Foreman, W.T., Connor, B.F., and Maloney, T.J., 1999, New reporting procedures based on long-term method detection levels and some considerations for interpretations of water-quality data provided by the U.S. Geological Survey National Water Quality Laboratory: U.S. Geological Survey Open-file report 99-193, 19 p. Accessed December 2011 at http://water.usgs.gov/owq/OFR_99-193/index.html.

U.S. Geological Survey, 2011, User's manual for the National Water Information System of the U.S. Geological Survey, Water-Quality System, version 4.11; Appendix A last modified Mar. 1, 2011. Accessed December 2011 at http://nwis.usgs.gov/currentdocs/qw/QW.user.book.html;

U.S. Geological Survey, 2002, Use of the new data-quality-indicator (DQI) field in NWIS 4_1: USGS Office of Water Quality Technical Memorandum 2002.15. Accessed December 2011 at http://phoenix.cr.usgs.gov/policy/OWQ_02.15_dqi.html.

U.S. Geological Survey, 1997, NWIS: New Remark Code (V) for Water-Quality Data: USGS Office of Water Quality Technical Memorandum 97.08. Accessed December 2011 at http://water.usgs.gov/admin/memo/QW/qw97.08.html.

U.S. Geological Survey, 2010, Changes to the reporting convention and to data qualification approaches for selected analyte results reported by the National Water Quality Laboratory (NWQL): USGS Office of Water Quality Technical Memorandum 2010.07. Accessed December 2011 at http://water.usgs.gov/admin/memo/QW/qw10.07.html.

Contact Information

For questions about these changes, please contact the NWQL via labhelp@usgs.gov.

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This memorandum does not supersede any other OWQ Technical Memorandum. This memorandum does further define application of the 'v' result-level value-qualifier code described in OWQ Technical Memorandum 2002.15.

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