

CHAPTER 10

Blanks

10-1. Introduction.

Blanks are assessed to determine the existence and magnitude of contamination problems and measure of the *representativeness* of the analytical process. Blanks reflect the amount of contamination introduced into the environmental samples during sample collection, transfer or analysis. In particular, **method blanks** reflect laboratory contamination from both the determinative and preparatory method. Field blanks (e.g., trip blanks and equipment or rinsate blanks) account for accumulative field and laboratory activities. In general, the samples associated with each blank (e.g., method and field blanks) must not be corrected for blank contamination (e.g., unless QAPP or the method of analysis describes a valid procedure for correcting for blank contamination).

Note: Although blank contamination imparts a high bias to analytical results, blanks are not viewed to be a *measure* of bias or “positive” interference because a one-to-one correspondence between blank contamination and bias does not exist (e.g., high LCS recoveries can be obtained when contamination is not detected in any blanks). Blank contamination is indicative of an effect that is external to the native sample matrix and relates the “representativeness” of the sample.

10-2. Criteria.

10-2.1. Frequency.

- a. At least one method blank must be reported for each preparation batch of samples.

Note: Method blanks associated with a set of environmental samples must be analyzed with the environmental samples using the same instrument in the sample analytical run sequence. For example, if a batch of 20 samples is prepared with a method blank, some of the environmental samples are analyzed with the method blank on “day one,” and the remaining environmental samples are analyzed on “day two,” then the same method blank analyzed on “day one” should be analyzed on the second day of analysis. At a minimum, an instrument blank must be analyzed with the remaining environmental samples on “day two.”

- b. Trip blanks must be reported for each cooler containing VOC samples. Additional field blanks may be required for certain projects. The frequency of collection and types of field blanks must be evaluated against project-specific requirements.

10-2.2. Acceptance Limits.

The concentration of each target analyte in each blank must be less than the greater of the following: (i) the RDL for the target analyte; (ii) the MRL when the MRL is not greater than 5% of

the AL, (iii) 5 to 10% (depending on project DQOs) of the analyte concentration detected in each associated field samples; and (iv) 5 to 10% (depending on project DQOs) of the AL. *Environmental sample detections greater than the MRL but less than 10 times the corresponding blank detections must be qualified.* In instances where more than one blank is associated with a given sample (e.g., a rinsate blank and method blank), evaluate blank contamination using the associated blank containing the *highest* contaminant concentration

Note: Laboratories commonly set the method blank acceptance criteria at the method reporting limit (MRL), which in turn is set equal to the method quantitation limit (MQL). *This is not appropriate when action level is near the MRL/MQL!* When blank acceptance criteria are established based upon the MRLs, blank contamination between the RDLs and MRLs must be reported when the MRL is greater than 5% of the AL.

10-3. Evaluation.

a. Review the Case Narrative and note any problems with method blank contamination. Review the summary forms for method blanks and any field blanks (e.g., trip blanks and rinsate blanks). Significant contamination in a blank may be an isolated occurrence. However, if the reviewer cannot reasonably demonstrate that a contamination problem is an isolated occurrence, a conservative approach must be used. Qualify the environmental sample results using the *highest* analyte concentration detected in the associated blanks (e.g., the method, field, and instrument blanks).

b. Although data qualification strategies for blank contamination are presented in Chapter 10.5, professional judgement is also required. Factors such as the magnitude and frequency of the blank contamination, the nature of the site contamination, the nature of the analysis, and historic data regarding the presence of blank contaminants should also be taken into account. For example, assume that methylene chloride has not been detected during prior sampling efforts (e.g., long-term groundwater monitoring) and methylene chloride has been historically detected in a sporadic manner in associated blanks at low-levels. Furthermore, assume that two batches of groundwater samples are reported for the most current sampling event, "Batch 1" and "Batch 2." Methylene chloride is detected at low levels in the environmental samples in "Batch 1" and "Batch 2," but methylene chloride is detected only in the method blank for "Batch 1." It would be reasonable to qualify the low-level methylene chloride detections for the samples of "Batch 2" on the basis of the method blank associated with "Batch 1," even though all the blanks associated with "Batch 2" are "clean."

10-4. Contractual Considerations.

a. Since laboratories are normally required to reprocess (e.g., reextract and reanalyze) a batch of samples when the method blank is unacceptable, contractual corrective action for unsatisfactorily performance may be warranted when high levels of contamination are systematically observed in the method blanks or when a method blank is not processed. Similarly, contractual corrective action may be appropriate for unacceptable field blanks (e.g., rinsate and field blanks).

b. When high blank contamination is observed, the reviewer should consult with the Project Manager to determine whether the data package must be reviewed or rejected. For example, the laboratory may be required to reanalyze the environmental samples. Alternatively, it may be possible to adopt higher reporting limits (e.g., when the higher reporting limits are still much lower than the project's decision limits).

Note: Meeting the method blank acceptance criteria on a routine basis may not be practical for common laboratory contaminants (e.g., methylene chloride, phthalates, and acetone); sporadic detections of contamination may occur and are difficult to control. Exercise professional judgment when evaluating contractual compliance for common laboratory contaminants.

10-5. Qualification for Blank Contamination.

a. When a target analyte is detected above the RDL in any blank, qualification for the associated environmental samples for blank contamination is *not* required when any of the following occur:

- (1) The target analyte is not detected in the environmental samples.
- (2) The target analyte is detected in the blank at a concentration less than 5% to 10% of the corresponding environmental sample concentration.
- (3) The target analyte is detected in the blank at a concentration greater than the RDL and less than the MRL, where the MRL is less than 5% of the AL.

b. In general, qualification is required when a target analyte is detected in a blank at a concentration *greater than 5 or 10%* of the corresponding environmental sample concentration (e.g., even when the analyte is detected at *less than 5% of the AL*). Qualification for blank contamination is illustrated in Table 10-Samples are qualified for blank contamination using the following strategies:

(1) *J+ flag*. If the analyte concentration for an environmental sample is greater than five but less than ten to twenty times higher than the analyte concentration in the corresponding blank, qualify the reported sample result with a J+ flag. Under these circumstances, the J+ flag indicates that the analyte is present in the sample but the reported concentration of the analyte believed to be biased high because of blank contamination. When the analyte concentration for an environmental sample is *less than five times the analyte concentration in an associated blank*, data qualification will be highly dependent upon project-specific DQOs. In particular, qualification will be dependent upon whether or not action levels are available. Sample results are qualified with the U, UN, X, or N flag as discussed below.

(2) *UN flag*. If the analyte concentration for the environmental sample is less than five times the analyte concentration in the corresponding blank, then qualify the sample result with the *UN flag* if (i) an AL is *not* available or (ii) the sample result is *less* than the AL. The UN flag indicates that the analyte was not reliably detected because of blank contamination and the re-

ported result is viewed as a tentative nondetection at the reported concentration. Alternatively, multiply the blank by a factor of five and report (in place of the sample result) the resulting product with a U flag when (i) the product is significantly less than the AL (e.g., 5% or 10% of the AL) or (ii) an AL is not available.

(3) *X flag*. If the analyte concentration for the environmental sample is less than five times the analyte concentration in the corresponding blank but is *greater* than the AL, then qualify the sample result with the *X flag*. Under these circumstances, the X flag indicates that the analyte was not reliably detected (above the AL) because of blank contamination and should be rejected. In effect, blank contamination has increased the reporting limit for the analyte to a concentration that is greater than the AL. A nondetection reported at the elevated limit does not demonstrate the target analyte is present in the environmental sample above or below the AL. *The sample result must not be qualified with the UN (or U flag) unless a defensible technical rationale for the use of the flag UN is presented.*

(4) *N flag*. If the analyte concentration for the environmental sample is less than five times the analyte concentration in the corresponding blank and the analyte concentration is greater than the AL, then qualify the sample result with an *N flag* only when it can be demonstrated that the UN flag or X flag is *not* appropriate. For example, the N flag may be appropriate when it is desirable to establish an upper limit for site-related contamination. When used in this manner, the N flag indicates that a target analyte result is being reported as a detection but the detection may not be reliable because of contamination problems.

Table 10-1
Data Qualification for Blank Contamination ¹

Blank (BLK) (ppb)	Reported Result (y) (ppb)	Qualified Result (ppb)	Remarks AL = 100 ppb MRL = 1 ppb MQL = 5 ppb	Blank acceptance criteria in Chapter 10.2.2 met?
1 U	6	6	No significant contamination detected.	Yes BLK < RL < 5% of AL
23	< 1	1 U	Contamination detected, but no action required.	No ³ BLK > 5% of AL
2 J	4	4 UN or 10 U	$y < 5 \text{ BLK}$ and $y < \text{AL}$ ²	Yes BLK < 5% of AL
2 J	11	11 J+	$5 \text{ BLK} < y < 20 \text{ BLK}$	Yes BLK < 5% of AL
2 J	60	60	$y > 20 \text{ BLK}$	Yes BLK < 5% of AL
80	150	150 X	$y < 5 \text{ BLK}$ and $y > \text{AL}$	No ⁴ BLK > 5% of y

Notes: 1. The concentration of analyte detected in the field sample and blank are denoted by y and BLK, respectively. For the purposes of illustration, it is assumed that MRL = 1 ppb, MQL = 5 ppb, and AL = 100 ppb, where $\text{RDL} \leq \text{MRL}$. Note that the MRL is less than 5% of the AL. 2. The same flags would be applied to the sample result if an AL were not available. 3. Although acceptance criteria for blank contamination in Chapter 10.2.2 were not met, the result is still usable. The laboratory would not typically be required to reprocess the sample for method blank contamination but should be expected to investigate the source of the contamination. 4. The laboratory would typically be required to reprocess the sample for method blank contamination