6.0 RESULTS OF DATA QUALITY ASSESSMENTS

The data quality level for the laboratory analyses was EPA Level IV. Appropriate uses for data at this level include:

- Site characterization and source identification
- Nature and extent of contamination
- Evaluation of remedial alternatives
- Engineering design
- Human health and ecological risk assessment
- Hydrogeologic modeling

6.1 QUALIFIED DATA

As described in Section 4.5.3.1, data quality was evaluated through the data validation process by QBD, a third party data validator. Data were qualified for any of the following reasons:

1. Because of laboratory deviation from the designated method.
2. Because the data did not meet the criteria listed in the references above.
3. By the professional judgment of the reviewer.

A list of potential data qualifiers used by the laboratory is presented at the beginning of Appendix H. One, none, or a combination of these data qualifiers may appear in the analytical reports to describe the analytical results of individual samples.

The following data validation flags were applied by QBD to qualified sample results to indicate either analytes that are not detectable or limitations in data usability because of deficiencies in field or laboratory QC parameters.

U The analyte was analyzed for but not detected above the numerical quantitation limit.

J The analyte was analyzed for and was positively identified, but the associated numerical value is an estimated quantity.

UJ The analyte was analyzed for but was not detected above the reporting level, but the reporting level is an estimated level.

R The data are unusable for all purposes. The analyte was analyzed for, but the target analyte might not be present.

N The analysis indicates presumptive evidence of the presence of the analyte.

NJ The analysis indicates presumptive evidence of the presence of the analyte, but the numerical value is an estimated quantity.

6.2 DATA USABILITY

Qualified data were evaluated for limitations in data usability. The assessment considered the data quality objectives and the EPA data quality level of generated data. Both the laboratory's flags and the data validation flags were considered. Qualified data may not be of adequate quality for all intended uses. The following general guidelines for data usability were considered:

- All data qualified with a **J** flag can be used for their intended purposes as listed in Section 6.0; however, the value is estimated and should be used with caution.
- Any result that has been qualified **UJ** is considered undetected with an estimated detection limit.
- All data qualified with an **R** flag are invalid and are not considered usable for any purpose.
- All data qualified with an **NJ** flag can be used for site characterization, evaluation of alternatives, and engineering design, but should not be used for human health or ecological risk assessment. Data that have been flagged **NJ** are tentatively identified and the associated numerical value represents an approximate concentration.

The following discusses the implications of data qualifiers on data usability and is summarized according to the qualifier used and reason for the qualifier flag.

- For analytical data flagged **U or UJ** due to blank contamination, the absence of the analyte was not definitely established at the reported level and the potential exists for false negatives. Such qualified results should be used with caution as estimated values for all intended purposes.
- For analytical results flagged **J** or **UJ** due to outlying surrogate or matrix spike/matrix spike duplicate (MS/MSD) recoveries, the reported values are subject to bias attributed to matrix interferences. False positive and false negative results may be reported depending on the direction and degree of bias. Such qualified results are appropriate for all interpretive uses, but should be used with caution.

- For analytical results flagged **J** due to holding time violations, positive results may exhibit low bias due to sample degradation. Such qualified results may be used as estimated values for all intended uses.
- For analytical results flagged **JN** or **NJ,** the qualitative identification of the compound was not definitely established. Therefore, the reported concentration could not be determined accurately. Such qualified results may be used with caution as estimated values for all purposes except risk assessment.
- For analytical results flagged **R,** the data should not be used for interpretation or decision-making for any purpose due to serious QC deficiencies in the collection or analysis of the sample. The data were rejected as unacceptable because the validity of the quantitative and qualitative results could not be determined.

During the VW&R RI, approximately 7 percent of the sample results undergoing data validation were qualified with **R** data qualifier flags. Approximately 90 percent of those sample results were common laboratory contaminants that were flagged **R** due to calibration deficiencies. The remaining results given **R** flags were due to a subsequent sample dilution. These samples were reanalyzed providing a more technically sound result for that analyte. Because the **R** flagged results were either on common laboratory contaminants or replaced with subsequent valid data, the affect on overall data quality for this project is minimal and the completeness of the data set is considered acceptable.

6.3 DATA VALIDATION RESULTS

The results of data validation were documented in reports prepared by QBD, and laboratory data summary sheets were amended with the QBD data qualifiers. Appendix H summarizes QC deficiencies and corresponding data qualifiers regarding any of the following issues:

- Holding times or preservation errors
- Gas chromatogram/mass spectrometer (GC/MS) tuning criteria
- Laboratory control standards
- MS/MSD and blank spike/blank spike duplicate (BS/BSD)
- Surrogate recoveries
- Internal standard performance
- Compound quantitation and reported detection limits

Deficiencies not mentioned in the above list are discussed by sampling event below. Assessment of performance evaluation (PE) sample results, blank contamination, and field duplicates are in Sections 6.4, 6.5, and 6.6 respectively.

6.3.1 Vadose Zone Investigation

Sample delivery groups (SDGs) applicable to the vadose zone investigation were summarized in Table 4-2. A total of 108 soil samples, 15 Hydropunch® samples, 12 trip blanks, 10 equipment blanks, 10 field duplicates, and one IDW sample were submitted to STL for analysis under 13 separate SDGs. (Note: Hydropunch® samples are included in this discussion because they were collected during the vadose zone investigation field mobilization.) Although not required, the IDW sample was validated along with the other samples submitted under the same SDG. The following item was noted during data validation:

- SDGs 9908G763, 9909G798, and 9909G957 were received at temperatures lower than the acceptance criteria of 4±2°C. No data qualifier flags were recommended since the laboratory did not note specific damage to the samples, such as evidence of freezing, and because a lower temperature would not adversely affect the analytical results.

6.3.2 Phase III Well Installation

During the Phase III well installation, 21 soil samples, seven Hydropunch®, eight trip blanks, six equipment blanks, and five field duplicates were collected and submitted under eight SDGs. Groundwater from ENT-MW-2 and IDW water samples were also submitted under an additional SDG. The following items were noted during data validation:

- SDGs 9909G086, 9909G138, and 9909G328 were received at temperatures lower than the acceptance criteria of 4±2°C. No data qualifier flags were recommended since the laboratory did not note specific damage to the samples, such as evidence of freezing, and because a lower temperature would not adversely affect the analytical results.
- Benzene was detected in the method blank associated with the samples from SDG 9909G167 and the laboratory flagged all results with a **B**. Because the concentration of benzene was less than the reporting limit, no additional data qualifier flags were recommended.

6.3.3 Round 1 Groundwater Sampling

Round 1 groundwater sampling included three SDGs with 16 groundwater samples, three trip blanks, two equipment blanks, two field duplicates, and one performance evaluation sample. The results of the performance evaluation sample are discussed in Section 6.4. The following items were noted during data validation:

- The COCs for Round 1 were not signed by the laboratory upon receipt of the samples; however, the Federal Express airbills were appended to the data packages. The airbills were signed and dated by the laboratory upon receipt of the samples, indicating that custody had been maintained.
- The laboratory failed to obtain the reporting limit of 1 µg/L listed in the QAPP for carbon disulfide. Undiluted samples with no matrix interference were reported at 2 µg/L. No follow-up was recommended because an Arizona AWQS has not been established for this analyte and carbon disulfide is not considered a contaminant of concern for the WCP East Grand Avenue WQARF Site.

6.3.4 Round 2 Groundwater Sampling

Round 2 groundwater sampling included three SDGs with 22 groundwater samples, two trip blanks, two equipment blanks, one field blank, three field duplicates and one IDW water sample. The following item was noted during data validation:

- The laboratory failed to obtain the reporting limit of 1 µg/L listed in the QAPP for carbon disulfide. Undiluted samples with no matrix interference were reported at 2 µg/L. No follow-up was recommended because there is no Arizona AWQS established for this analyte and carbon disulfide is not considered a contaminant of concern for the WCP East Grand Avenue WQARF Site.

6.3.5 Round 3 Groundwater Sampling

Round 3 included three SDGs with 34 groundwater samples, two trip blanks, five equipment blanks, one field blank, and four field duplicates. An IDW water sample was also submitted for analysis. The following items were noted during data validation:

- The “Sample Date” on the analytical report for Samples MWB-MW-005 and MWB-MW-B05 was incorrectly listed. The date was corrected in both the hard copy and electronic copy of the analytical results.

- The laboratory failed to obtain the reporting limit of 1 µg/L listed in the QAPP for carbon disulfide. Undiluted samples with no matrix interference were reported at 2 µg/L. No follow-up was recommended because an Arizona AWQS has not been established for this analyte and carbon disulfide is not considered a contaminant of concern for the WCP East Grand Avenue WQARF Site.
- The laboratory did not sign the COC for the IDW sample; however, the COC lists the same airbill number as the other samples that have a complete signature trail, and the laboratory has an internal COC record of the sample. Based on this, custody was maintained.

6.3.6 Round 4 Groundwater Sampling

Round 4 groundwater samples were submitted under four SDGs and included 18 groundwater samples, four trip blanks, two equipment blanks, one field blank, and two field duplicates. The following items were noted in the data validation report:

- The laboratory did not sign the COC for the IDW sample; however, the COC lists the same airbill number as the other samples that have a complete signature trail, and the laboratory has an internal COC record of the sample. Based on this, custody was maintained.
- Sample WCP-EB-030-060900 was incorrectly identified in the analytical report. The hard copy laboratory report and the electronic data report were corrected.

6.3.7 Deep Well Installation

During the deep well installation of WCP-48, six SDGs were submitted for analysis with seven soil samples, one groundwater sample, six trip blanks, one equipment blank, one field duplicate, one IDW soil sample and one IDW water sample. Additionally, five Hydropunch® samples and two trip blanks were collected and analyzed but these results were not validated. The following items were noted during validation of the applicable samples:

- The laboratory did not provide pH verification for the trip blank in SDG 9A06G792. Since this sample was a trip blank, no data qualifiers were recommended.
- Samples in SDG 9A06G811 were received at a temperature of 18°C, which exceeded the acceptance criteria of 4±2°C. All positive results were flagged with a **J** to indicate an estimated value and all results below the detection limit were flagged with **UJ** to indicate an estimated reporting limit.

- The laboratory internal COC for SDG 9A06G810 did not show a signature trail from the laboratory sample control to the volatile organics group. No data qualifiers were recommended since the laboratory was able to show documentation that the COC was not broken from the field to the laboratory and because the laboratory is a secured facility.

6.3.8 Round 5 Groundwater Sampling

Round 5 groundwater sampling included four SDGs with 19 groundwater samples, four trip blanks, three equipment blanks, one field blank, two field duplicates, and one IDW water sample. The following items were noted during data validation:

- Good laboratory practice violations on the COC occurred for SDG 9A09G614. Two errors that were corrected by obliteration or write-overs were noted. In addition, the pH sample was received and relinquished by the wet chemistry laboratory without signatures. This deviation was noted by sample receiving, and no further action was required.
- The laboratory incorrectly identified sample ENT-MW-002-091900 on the laboratory report. The report was corrected.
- The sample result for TCE at MTP-1 was given a **J** flag by the laboratory. The detected concentration of 0.3 μg/L was below the laboratory reporting limit but above the MDL. This value is considered an approximate value.

6.3.9 Round 6 Groundwater Sampling

Round 6 groundwater samples were submitted under five SDGs. Nineteen groundwater samples, three trip blanks, two equipment blanks, two field duplicates, and one IDW water sample were collected. The following items were noted during data validation:

- The internal laboratory COC for SDG 9A12G073 showed documentation of the date, time, and who placed the samples in the storage location; however, there was no documentation of the date, time, and who removed and replaced the samples for analyses. Since security was maintained within the laboratory, no data qualifier flags were recommended.
- The IDW sample listed in SDG 9A12G073 was not checked out on the internal custody form for the pH analysis. The laboratory noted this error. No flags were recommended.

6.3.10 Phase IV Well Installation

Phase IV well installation samples were submitted for analysis under 16 SDGs. Twenty-four soil samples, 11 Hydropunch® samples, 14 trip blanks, two equipment blanks, one field blank, two

field duplicates, seven IDW samples and one IDW water sample were submitted for analysis. The following items were noted during data validation:

- The spectra for PCE result in sample WCP-HP-086-126 (SDG 201558) were missing from the data package. The laboratory supplied the missing page.
- The sample condition upon receipt was not recorded on the COC (SDG 201658). The laboratory provided additional documentation to show that the temperature was recorded and sample condition was checked. No further action was recommended. The date and time the laboratory received the samples was not recorded on the COC. Since the airbill that accompanied the data package showed a date and time of receipt, no additional action was required. The internal COC did not show the transfer of the trip blank from department to department.
- The internal COC did not show all samples transfer record (SDG 201695). Only the soil samples from this SDG were shown. No data qualifier flags were recommended. The laboratory was advised to show transfer of all samples.
- The laboratory report incorrectly identified WCP-HP-083-121 (SDG 201695). The data validator manually corrected the laboratory report and contacted the laboratory.
- The laboratory showed the sampling date of SDG 201774 incorrectly. A new laboratory report was issued with the correct sampling date listed. No data qualifier flags were issued because the samples were analyzed within the holding times.

6.3.11 Round 7 Groundwater Sampling

Round 7 groundwater sampling included samples submitted under 10 SDGs. Thirty groundwater samples, eight trip blanks, two equipment blanks, one field blank, three field duplicates, and three IDW water samples were submitted for analysis. The following items were noted during data validation:

- The pH for all samples in SDG 202227 was not documented on the run log that was originally provided from the laboratory. A revised run log that indicated the pH for all samples was provided by the laboratory.
- An incorrect sample identification was listed in the laboratory report for SDG 202274. The laboratory issued a corrected report.
- Analytical results for PCE and TCE at MTP-1 indicated concentrations of 0.8 μg/L and 0.6 μg/L, respectively. These results were given a **J** qualifier due to possible contaminant carryover in the laboratory instrumentation. The results should be considered as estimated values.

6.3.12 Round 8 Groundwater Sampling

Nine SDGs were submitted during Round 9 groundwater sampling covering 32 groundwater samples, seven trip blanks, three equipment blanks, one field blank, one PE sample, two field duplicates, and five IDW water samples. Results of the PE sample are discussed in Section 6.4. The following item was noted during data validation:

- The sample result for TCE at MTP-1 was given a **J** flag by the laboratory. The detected concentration of 0.3 µg/L was below the laboratory reporting limit but above the MDL. This value is considered an approximate value.

6.3.13 Aquifer Test

Samples collected during the aquifer test included three groundwater samples, two trip blanks, and three IDW water samples. These samples were submitted under two SDGs. The following items was noted during data validation:

- The data package for SDG 203546 did not contain raw data for the 2 µg/L standard of the initial calibration, and several copies of pages were missing. The laboratory was contacted and provided the missing information.

6.3.14 Round 9 Groundwater Sampling

Round 9 groundwater sampling included 11 SDGs with 31 groundwater samples, nine trip blanks, three equipment blanks, one field blank, three field duplicates, and two IDW water samples were submitted for analysis. The following item was noted during data validation:

- The sample identification for WCP-EB-084-061201 and WCP-MW-084-061201 were switched. Historical data were reviewed to confirm the switch. The correct sample identifications were manually marked in red by QBD and the EDD was corrected.

6.3.15 Round 10 Groundwater Sampling

Round 10 groundwater sampling included 11 SDGs. Thirty groundwater samples, 10 trip blanks, three equipment blanks, one field blank, three field duplicates, and three IDW water samples were submitted for analysis. The following items were noted during data validation:

- The laboratory data package was missing three pages of supporting documentation (pages 248, 249, and 250). The laboratory was contacted and the missing pages were provided.

- The analysis of the dilutions of Samples WCP-MW-030-062701 and WCP-MW-087-062701 (SDG 204166) exceeded the holding time of 14 days by two days. The positive results were flagged **J**.
- The analysis of benzene in Samples MGL-MW-002-062801 and MGL-MW-001-062801 (SDG 204200) exceeded the holding time of 14 days by one day. The positive results have been flagged **J**.

6.3.16 Phase V Well Installation

Phase V well installation included 23 soil samples, seven Hydropunch® samples, nine trip blanks, two equipment blanks, one field blank, three field duplicates, and four soil IDW samples under 11 SDGs. The following items were noted during data validation:

- Samples WCP-MW-097-016 and WCP-MW-097-086 from SDG 204235 contained target analytes that were reported at concentrations less than the reporting limits. The associated results were flagged **J** to indicate an estimated value.
- The data package for SDG 204328 did not contain the raw data for the determination of percent moisture. The laboratory was contacted and provided this documentation.
- Three soil samples collected from the boring for WCP-96 and listed on the COC associated with the SDG 204521 were not analyzed by the laboratory. The samples were collected using the Encore™ sampling device on a Friday and shipped for overnight delivery to the laboratory by Federal Express. The samples did not arrive at the laboratory until Monday, which exceeded the 48-hour preservation holding time. WESTON was contacted and decided to not analyze those soil samples.
- Percent moisture analysis was requested on the COC for Sample WCP-MW-093-126D in SDG 204565; however, additional sample volume was not provided and the laboratory could not perform the requested analysis.

6.3.17 Round 11 Groundwater Sampling

Round 11 groundwater sampling samples were included under 15 SDGs. Thirty-eight groundwater samples, four field duplicates, two field blanks, four equipment blanks, 13 trip blanks, and four IDW water samples were submitted for analyses. The following items were noted during data validation:

- The laboratory failed to obtain the reporting limit of 1 μg/L listed in the QAPP for carbon disulfide. Undiluted samples with no matrix interference were reported at 2 μg/L. No follow-up was recommended because there is no Arizona AWQS established for this

analyte and carbon disulfide is not considered a contaminant of concern for the WCP East Grand Avenue WQARF Site.

- The identification of sample ENT-MW-002-081501 in SDG 204996 was incorrectly reported as WCP-MW-002-081501. The laboratory report was corrected and the electronic data deliverable was updated.
- The laboratory failed to obtain the reporting limits listed in the QAPP for all compounds in sample ENT-MW-002-081501 due to the dilution required for analysis of benzene. In the reviewer's professional opinion, the laboratory achieved the lowest possible reporting limits; therefore, no follow-up was recommended.

6.3.18 Round 12 Groundwater Sampling

Round 12 groundwater sampling included 14 groundwater samples, 2 field duplicates, one field blank, two equipment blanks, five trip blanks, and two IDW water samples submitted to the laboratory under seven SDGs. An additional 16 groundwater samples and four trip blanks collected with PDB samplers were submitted to Columbia under four additional SDGs. The PDB analytical results were not validated by QBD. No data validation issues were noted regarding the analyses undergoing data validation other than the data qualifiers presented in Appendix H.

6.3.19 Round 13 Groundwater Sampling

Round 13 included 37 groundwater samples, four field duplicates, one field blank, four equipment blanks, 10 trip blanks, and one IDW water sample submitted to the laboratory under 11 SDGs. No data validation issues were noted other than the data qualifiers presented in Appendix H.

6.3.20 Phase VI Well Installation

Phase VI Well Installation included 12 SDGs. Thirty soil samples, three field duplicates, two groundwater, one field blank, three equipment blanks, nine trip blanks, and four IDW soil samples were collected and submitted for analysis. The following item was noted during validation:

- The data package for SDG 206900 did not contain the raw data for the percent solids determinations for samples collected under this SDG. The laboratory was contacted and the data was supplied.

6.3.21 Round 14 Groundwater Sampling

Round 14 groundwater sampling included six groundwater samples, one equipment blank, and three trip blanks under three SDGs. The following item was noted during validation:

- The original laboratory report did not contain the results for methyl tert-butyl ether for SDGs 207292 and 207313. The laboratory was contacted and issued revised reports.

6.3.22 Round 15 Groundwater Sampling

Round 15 groundwater sampling included 39 groundwater samples, four field duplicates, two field blanks, three equipment blanks, nine trip blanks, and two IDW water samples collected under nine SDGs. The following item was noted during validation:

- Several pages were missing in the laboratory report for SDG 207673. The laboratory was contacted and provided the missing pages.

6.4 PERFORMANCE EVALUATION SAMPLE RESULTS

Three PE samples were submitted to the analytical laboratory, STL. The first PE sample was submitted in December 1999 during Round 1 groundwater sampling. Sample results were compared with the true values as certified by Environmental Resource Associates of Arvada, Colorado, as shown in Table 6-1. Of the 23 compounds present in the PE sample, the laboratory detected and reported 20 analytes. The three analytes that were not reported were not part of this project's target compound list. The average percent recovery of the true value for those analytes reported was 88.4 percent. The laboratory reported 17 out of 20, or 85 percent, of the results within the control limits. The recommended percent of reported results falling within the control limits for an acceptable PE sample is 90 to 100 percent. The three analytes not within the control limits were benzene, methylene chloride, and styrene. These compounds are not considered contaminants of concern for this project; therefore the results of this PE sample are considered acceptable.

The second PE sample was submitted to STL on May 2, 2001. Out of 23 possible acceptable results, the laboratory reported 20 results (Table 6-2). As in the previous PE sample, the analytes not reported were not part of the target compound list. Of the 20 results reported by the laboratory, six results were determined to be unacceptable, which resulted in a score of 70 percent acceptable. The unacceptable results were carbon tetrachloride, chlorobenzene, PCE, 1,1,1-TCA, m/p-xylenes, and total xylenes. The average percent recovery was 84.7 percent.

Due to the low overall score, the poor average percent recovery, and the unacceptable result for PCE, which is a primary compound of concern for this project, the laboratory was asked to perform a corrective action. The laboratory reviewed the analytical data and supporting QC data including initial and continuing calibrations, surrogate recoveries, internal standards, second source laboratory control standards and duplicates, and method blank results. All laboratory QC results were within acceptance criteria. The laboratory also checked for transcription errors and reviewed integration and ion ratios, which were confirmed correct. There were no QC deficiencies detected in relationship to the questioned sample results.

A third PE sample was submitted to STL one week later on May 7, 2001. The results of this PE sample were acceptable (Table 6-3). As in the previous two PE samples submitted, 20 out of 23 possible analytes were reported. The three non-reported analytes were not on the target analyte list. The average percent recovery was 98.6 percent and all 20 of the reported analyte results were within acceptable control limits. Based on the results of this PE sample and the 1999 PE sample, the overall performance of the laboratory is considered acceptable.

6.5 ASSESSMENT OF FIELD BLANK CONTAMINATION

A summary of field QC validation results of trip blank, equipment blank, and field blanks is presented in Table 6-4. The majority of detectable contaminants that were found in field blanks were common laboratory contaminants (acetone, methylene chloride, and 2-butanone). Appropriate data qualifier flags were applied as shown in Table 6-4. Detected contaminants that are not common laboratory contaminants included chloromethane, toluene, m,p-xylenes, benzene, and MTBE. Additionally, TCE, PCE, and 1,1-DCE were detected in some blank

samples; however, the associated samples did not have detectable concentrations of these analytes and therefore data qualifier flags were not applied to the associated sample results.

As described above, data qualified due to blank contamination is useable, however the possibility of false negative results exists. Analytical results for TCE were affected by contamination in the field blank samples in only two samples: ENT-MW-2 in Round 6 and WCP-46 in Round 10. The reporting limits of TCE for those samples were raised to 4 µg/L and 1 µg/L, respectively. No other analytical results for any of the primary contaminants of concern, PCE, TCE, or 1,1-DCE, were affected by contamination in field blanks.

6.6 ASSESSMENT OF FIELD DUPLICATE SAMPLES

There are no standard procedures for evaluating field duplicates. Typically, assessment criteria of field duplicates defaults to the criteria listed in EPA's *Functional Guidelines for Inorganic and Organic Data Review*, which is a relative percent difference (RPD) of ≤20 percent for water and ≤50 percent for soil. These values were listed as the acceptance criteria in the project QAPP.

Some field duplicate results were not within the above acceptance criteria. Results near the MDL often result in a high RPD and the absolute criteria listed in the project QAPP should not be applied. When the results were near the MDL, a five times rule, as described in the EPA guidelines, was used. In the five times rule, results that were greater than five times the MDL were evaluated against the criteria stated above. RPDs for analyte concentrations that are less than five times the MDL were evaluated on a case-by-case basis. Field duplicate results not within acceptance criteria are presented in Table 6-4.

Although some field duplicate sample results were out of acceptance criteria as written in the project QAPP, the effect on overall data usability is minimal. The implications to data usability for each duplicate result listed in Table 6-4 are as follows:

- The calculated RPD of 28.6 percent for *cis*-1,2-dichloroethene (*cis*-1,2-DCE) in WCP-15 during Round 1 is only slightly above the acceptance criteria. The analytical results of both the sample and field duplicate of 3 µg/L and 4 µg/L, respectively, are below the AWQS/MCL of 70 µg/L. Presence of this compound is generally used as an indicator

species of the degradation of PCE and TCE. Due to the low concentrations of *cis*-1,2-DCE detected throughout this project, it is not a contaminant of concern and the field duplicate results do not affect project decision making.

- Due to serial dilution, the detection limit for 1,1-DCE in WCP-30 during Round 2 was 12 µg/L. Sample and field duplicate results were 69 µg/L and 54 µg/L, respectively. Because of the increased detection limit, the five times rule would be applicable in this instance and the RPD of 24.4 percent is considered acceptable.
- The analytical result of PCE in WCP-15 during Round 6 sampling and the associated field duplicate, 47 µg/L and 61 µg/L, respectively, are both above the AWQS/MCL of 5 µg/L. Both the duplicate and sample results are within the concentration range of PCE in previous samples collected from WCP-15.
- Analytical results for both the sample and duplicates for WCP-87 for 1,1-DCE, TCE, and PCE during Round 9 sampling are significantly greater than their corresponding AWQS/MCL (7 µg/L, 5 µg/L, and 5 µg/L, respectively). Round 9 analytical results indicate an increase in 1,1-DCE, TCE, and PCE results over previous samples collected from WCP-87; however, the duplicate sample results for Round 9 more closely reflect previous sample results of these contaminants. Due to the high RPD for these sample results, the concentrations should be considered estimated values.
- The calculated RPD for chloroform in WCP-90 during Round 15 was 28.6 percent, based on the sample result of 3 µg/L and the field duplicate of 4 µg/L. Because chloroform is a common laboratory contaminant, the differences in sample and duplicate results likely are a result of laboratory contamination and do not affect overall data quality.
- The analytical result of TCE in WCP-202 of 2 µg/L and the associated field duplicate result of 3 µg/L during Round 15 are both below the AWQS/MCL for TCE. Because of the low concentrations, the effects to data usability are minimal.

6.7 ANALYTICAL PROBLEMS/CORRECTIVE ACTION

The following discussion presents the problems encountered and the corrective actions taken during the laboratory analysis of samples for this investigation.

- During the early portion of the RI (vadose zone investigation and Phase III well installation), STL did not report *trans*-1,2-dichloroethene. This compound was listed as a target compound in Table 2-3C of the project QAPP; however, the original analysis request was for EPA Methods 601/602, which did not include this analyte. The target list was not updated when the change order was made to analyze by EPA Method 8260B. It was decided not to reissue the affected reports and a corrective action was implemented so that analyses beginning with Round 1 groundwater sampling would include this analyte.

- Analysis of equipment blanks collected during the vadose zone investigation and Phase III well installation showed consistent positive results for several contaminants. In order to identify the source of the contamination, samples of the ultra pure water, deionized water, and the hexane rinse used for equipment decontamination were submitted to the analytical laboratory. Results of the analysis indicated positive results for acetone and 4-methyl-2-pentanone in the ultra pure water, 4-methyl-2-pentanone in the deionized water, and 4-methyl-2-pentanone, benzene, toluene, and total xylenes in the hexane rinse.

  Contamination detected in equipment blanks was attributed to a combination of laboratory contamination and field practices. The hexane rinse sample contained the greatest number of contaminants and also contained contaminants that are not common laboratory contaminants. Hexane, for use as an equipment decontamination rinse, had been kept on hand in a locked storage area. The hexane was potentially used over the course of several projects and kept on hand for varying amounts of time, creating the possibility for contamination. Corrective actions included purchasing new hexane for each drilling project and not storing excess hexane in the storage area for extended periods of time. Corrective actions for laboratory contamination included changing to factory sealed ultra pure water rather than laboratory supplied ultra pure water.

- As discussed in Section 6.3, the performance by the laboratory in the analysis of the May 2, 2001 PE sample was not within the recommended acceptance criteria. Because the laboratory did not find any deficiencies in their QC results a corrective action was not developed. A subsequent PE sample submitted to STL resulted in 100 percent of sample results falling within the acceptable criteria. No further corrective action was requested.