Data Validation Summary Report
(DVSR ID: TetraTech-M17-2020)
Galleria Drive Bioremediation Treatability Study Closure
Nevada Environmental Response Trust Site
Henderson, Nevada

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TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

LIST OF ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
BW	blank water
CCB	continuing calibration blank
CCV	continuing calibration verification
DL	detection limit
DMC	deuterated monitoring compound
DQO	data quality objectives
DUP	duplicate
DVSR	data validation summary report
EB	equipment blank
EDD	electronic data delivery
FB	field blank
FD	field duplicate
GC-MS	gas chromatography-mass spectroscopy
ICAL	initial calibration
ICB	initial calibration blank
ICS	interference check samples
ICV	initial calibration verification
LCS	laboratory control sample
MDL	method detection limit
MS/MSD	matrix spike/matrix spike duplicate
NORM	normal field sample
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
NFG	National Functional Guidelines
%C	percent completeness
%D	percent difference or drift
%R	percent recovery
%RSD	percent relative standard deviation
PARCCS	precision, accuracy, representativeness, comparability, completeness, sensitivity
PQL	practical quantitation limit
QA	quality assurance
QAPP	quality assurance project plan

Acronyms/Abbreviations	Definition
QC	quality control
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
SDG	sample delivery group
SQL	sample quantitation limit
Tetra Tech	Tetra Tech, Inc.
TKN	total kjeldahl nitrogen
TOC	total organic carbon
Treatability Study	Galleria Drive Bioremediation Treatability Study
USEPA	United States Environmental Protection Agency
µg/L	micrograms per liter
WG	groundwater
WQ	water quality assurance sample

1.0 INTRODUCTION

On behalf of the Nevada Environmental Response Trust (NERT), Tetra Tech, Inc. (Tetra Tech) has prepared this Data Validation Summary Report (DVSR) to assess the validity and usability of laboratory analytical data from the samples associated with the Galleria Drive Bioremediation Treatability Study (Treatability Study) Closure and the addendum for the NERT site, located in Clark County, Nevada. Sampling protocol can be found in the *Galleria Road Bioremediation Treatability Study Work Plan* (Tetra Tech, 2017) and *Galleria Drive Bioremediation Treatability Study Work Plan Addendum* (Tetra Tech, 2019). Tetra Tech performed the Treatability Study, which included the collection and analyses of samples to assess the effectiveness of the Treatability Study. Tetra Tech collected additional quality assurance and quality control (QA/QC) samples to aid in assessing data quality. Tetra Tech collected 48 water samples and 72 soil samples during the investigation. Results from 8 water samples were rejected due to lack of confidence, as discussed in Section 3.3.3, and resampled. Tetra Tech collected and used 40 water samples and 72 soil samples during the investigation.

TestAmerica, Inc. provided laboratory analytical services for all primary samples. Pace National provided laboratory analytical services for split samples during the final sampling event. The analyses were performed by the methods shown in Table 1.

The laboratory assigns job numbers, also called sample delivery groups (SDGs), to all samples. The samples associated with QA/QC are designed to document the data quality of the samples in each sampling round or within an SDG. Table 2 cross-references each sample with its laboratory analysis, SDG, collection date, client sample number, laboratory sample number, QC type, matrix, and stage of validation. Samples in Table 2 are submitted in the DVSR electronic data deliverable (EDD) along with associated, unvalidated field readings, geotechnical data, and microbial data.

The laboratory analytical data were verified and validated in accordance with procedures described in the *Quality Assurance Project Plan, Revision 2* (Ramboll Environ, 2017), *Quality Assurance Project Plan, Revision 3* (Ramboll, 2019), *NDEP Data Verification and Validation Requirements* (NDEP, 2018), and the references contained therein. Aqueous samples were validated to Stage 2A. For soil samples, 90 percent of the data were validated to Stage 2B and 10 percent to Stage 4. The review process uses professional judgment and National Functional Guidelines (NFG) guidance to determine the final qualifiers, which are added to the database and presented in the DVSR tables.

The validation checklists are found in Appendix 1. Laboratory data packages may be found in Appendix 2. A database of the analytical results is provided in Appendix 3.

This report summarizes the QA/QC evaluation of the data using precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS) relative to the project data quality objectives (DQOs). This report provides a quantitative and qualitative assessment of the data and identifies potential sources of error, uncertainty, and bias that may affect the overall usability of the data.

2.0 PRECISION AND ACCURACY OF ENVIRONMENTAL DATA

Environmental data quality depends on sample collection procedures, analytical methods and instrumentation, documentation, and sample matrix properties. Both sampling procedures and laboratory analyses contain potential sources of uncertainty, error, and/or bias, which may affect the overall quality of a measurement. Errors for sample data may result from incomplete equipment decontamination, inappropriate sampling techniques, sample heterogeneity, improper filtering, and improper preservation. The accuracy of analytical results is dependent on selecting appropriate analytical methods, maintaining equipment properly, and complying with QC requirements. The sample matrix also is an important factor in the ability to obtain precise and accurate results within a given medium.

Environmental and laboratory QA/QC samples provide information on the effects of sampling procedures and evaluate laboratory contamination, laboratory performance, and matrix effects. Field QA/QC samples include equipment blanks (EBs), field blanks (FBs), field duplicates (FDs), and matrix spike/matrix spike duplicates (MS/MSDs). Laboratory QA/QC samples include method blanks, laboratory control samples (LCSs), laboratory duplicates (DUP), and additional MS/MSDs needed to meet method requirements.

2.1 PRECISION

Precision is a measure of the agreement of analytical results under a given set of conditions. It is a quantity that is not measured directly but is calculated from concentrations. Precision can be expressed as the relative percent difference (RPD) between two measurements:

$$RPD = \frac{(C1 - C2)*100}{(C1 + C2)/2}$$

where:
C1 = reported concentration for the sample
C2 = reported concentration for the duplicate

Precision can be expressed as the percent relative standard deviation (%RSD) between three or more measurements:

$$\%RSD = (s/\bar{a})*100$$

where:
%RSD = percent relative standard deviation
s = standard deviation
$\bar{a}$ = mean of replicate analyses

Precision is assessed by calculating %RSD during an initial calibration (ICAL) and RPD from the percent recoveries of the spiked compounds for each sample in the MS/MSD pair. In the absence of an MS/MSD pair, a laboratory duplicate can be analyzed as an alternative means of assessing precision. An additional measure of sampling precision is obtained by collecting and analyzing FD samples, which are compared using the RPD results as the evaluation criteria.

MS and MSD samples are field samples which have been spiked by the laboratory with target analytes prior to preparation and analysis. These samples measure the appropriateness of the analytical method and effectiveness in recovering target analytes from a specific environmental matrix. The LCS sample is spiked with the same target analytes as the MS/MSD using an interference-free matrix instead of a field sample aliquot. The LCS measures laboratory efficiency in recovering target analytes in the absence of matrix interferences. It is used to verify that the analyses are being performed in control.

The laboratory analyzes laboratory replicates. A field sample is analyzed and an unspiked duplicate of that sample is also analyzed. The data reviewer compares the reported results of the primary analysis and the laboratory duplicate and calculates RPDs to assess laboratory precision.

Calibration precision is determined by calculating %RSD. Laboratory and field sampling precision are evaluated by calculating RPDs for field sample duplicate pairs, if collected. The sampler collects two field samples at the same location and under identical conditions. The laboratory then analyzes the samples under identical conditions.

An RPD outside the allowed limit between MS/MSD samples or DUP samples indicates imprecision. Imprecision is the variance in the consistency with which the laboratory arrives at a reported result. The actual analyte concentration may be higher or lower than the reported result.

Possible causes of poor precision include sample heterogeneity, sample matrix interference, improper sample collection or handling, inconsistent sample preparation, instrument column fouling, and poor instrument stability. In duplicate pairs, results may be reported in either the primary or duplicate samples at levels below the practical quantitation limit (PQL) or non-detected. Since these values are estimated, RPD exceedances from these duplicate pairs do not suggest a significant impact to data quality.

2.2 ACCURACY

Accuracy is a measure of the closeness of agreement between a measured value and the true value of an analytical parameter. It may be used to identify bias in each measurement system. Recoveries outside acceptable QC limits may be caused by factors such as instrumentation, analyst error, or matrix interference. Accuracy is assessed through the analysis of continuing calibrations, MS, MSD, LCS, and surrogates. In some cases, samples from multiple SDGs were within one QC batch and therefore are associated with the same laboratory QC samples. Accuracy is determined using the percent recovery (%R) of MS and LCS analyses.

Percent recovery is calculated using the following equation:

$$\%R = (A-B)/C \times 100$$

where:
A = measured concentration in the spiked sample
B = measured native concentration in the unspiked sample
C = concentration of the spike

The percent recovery of each analyte spiked in MS/MSD samples and LCS is evaluated with the acceptance criteria specified by the QAPPs and laboratory limits. Spike recoveries outside the acceptable QC accuracy limits provide an indication of bias, where the reported data may overestimate or underestimate the actual concentration of compounds detected or quantitation limits reported for environmental samples.

2.3 REPRESENTATIVENESS

Representativeness is a qualitative parameter that expresses the degree to which the sample data are characteristic of a population. It is evaluated by reviewing the QC results of blanks, samples, and holding times. Positive detects of compounds in the blank samples identify compounds that may have been introduced into the samples during sample collection, transport, preparation, or analysis. The QA/QC blanks collected and analyzed are method blanks, calibration blanks, EBs, and FBs.

A method blank is a laboratory grade water or solid matrix that contains the method reagents and has undergone the same preparation and analysis as the environmental samples. The method blank provides a measure of the combined contamination derived from the laboratory source water, glassware, instruments, reagents, and sample preparation steps. Method blanks are prepared for each sample of a similar matrix extracted by the same method at a similar concentration level.

Several methods require the use of initial calibration blanks (ICBs) and continuing calibration blanks (CCBs). ICBs and CCBs are laboratory-grade water samples that are analyzed at the beginning, during, and at the end of sample analysis runs. The frequency is dependent on the analytical method. These blanks estimate residual contaminants from the previous sample or standards analysis and measure baseline shifts that commonly occur in emission and absorption spectroscopy.

EBs consist of analyte-free water poured over or through the sample collection equipment. The water is collected in a sample container for laboratory analysis. These blanks are collected after the sampling equipment is decontaminated; they are used to measure effectiveness of the decontamination procedure. Equipment blanks are collected and analyzed for all target analytes.

FBs consist of analyte-free source water stored at the sample collection site. The water is collected from each source water used during each sampling event. Field blanks were collected and analyzed for all target analytes.

Contaminants found in both the environmental sample and the blank sample are assumed to be laboratory artifacts if both values are less than the PQL or if a sample result and blank contaminant value are greater than the PQL and the sample result is less than 10 times the blank contaminant value.

Holding times are evaluated to assure that the sample integrity is intact for accurate sample preparation and analysis. Holding times are specific for each method and matrix analyzed. Holding time exceedance can cause loss of sample constituents due to biodegradation, precipitation, volatilization, and chemical degradation. Sample results for analyses that were performed after the method holding time are qualified according to NDEP requirements using the qualifiers and bias recommendations found in the NFGs.

2.4 COMPARABILITY

Comparability is a qualitative characteristic that defines the extent to which the data for a chemical parameter measurement are consistent with, and may be compared with, data from other sampling events. Comparability is dependent upon the design of the sampling plans and execution of activities consistent with approved plans. Factors affecting comparability include sample collection and handling techniques, matrix type, and analytical method. Comparability is achieved through the use of standard techniques to collect representative samples, consistent application of analytical method protocols, and use of appropriate units in reporting analytical results. Comparability is also dependent upon other PARCCS criteria, because only when precision, accuracy, and representativeness are known can datasets be compared with confidence.

2.5 COMPLETENESS

Completeness is defined as the percentage of acceptable sample results compared to the total number of sample results. Completeness is evaluated to determine if an acceptable amount of usable data were obtained so that a valid scientific site assessment can be completed. Completeness equals the total number of sample results for each fraction minus the total number of rejected sample results divided by the total number of sample results multiplied by 100. As specified in the project DQOs, the goal for completeness for target analytes in each analytical fraction is 90 percent.

Percent completeness is calculated using the following equation:

$$\%C = (T - R)/T \times 100$$

where:
%C = percent completeness
T = total number of sample results
R = total number of rejected sample results

Completeness is also determined by comparing the planned number of samples per method and matrix as specified in the QAPPs, with the number determined above. In cases where multiple results are reported for a

single analyte due to dilutions or re-analysis using a single method, the most technically sound value will be reported, and the other result will be qualified "R". Data rejected in favor of alternate results are not used in the completion calculation.

2.6 SENSITIVITY

Sensitivity is the ability of an analytical method or instrument to discriminate between measurement responses representing different concentrations. It is generally used to describe the instrument detection limits (DLs) or PQLs established to meet project DQOs. The method detection limit (MDL) represents the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. Sample quantitation limits (SQLs) are adjusted MDL values that reflect sample-specific actions, such as dilutions or varying aliquot sizes. The laboratory data reports show MDL in place of the SQL. The MDL was adjusted to reflect the sample analysis conditions. The PQL is the minimum concentration that can be reported based on the analysis of a specific matrix. The PQL is often the lowest acceptable calibration point for the analyte.

For this project, the laboratory data reports show reporting limit (RL) in place of the PQL. The laboratory reported detected analytes down to the adjusted MDL/SQL. All results reported between the SQL and PQL were qualified "J" by the laboratory. Sample results are compared to method and field quality blank results to identify possible effects of laboratory background and field procedures on sensitivity.

3.0 VALIDATION RESULTS AND PARCCS

This section discusses the validation results and the associated PARCCS criteria. Before conducting the PARCCS evaluation, the analytical data were validated.

Samples not meeting the acceptance criteria were denoted with a validation qualifier that indicates a deficiency with the data. Table 3 contains validation qualifiers used in data validation.

When more than one validation qualifier is applicable to a data point, the final validation qualifier applied is based on the following hierarchy:

R > J	R takes precedence over the J qualifier.
J+	The high bias (J+) qualifier is applied to detected results only.
J > J+ or J-	The unbiased (J) qualifier supersedes biased (J+ or J-) qualifiers since it is not possible to assess the direction of the potential bias.
J = J+ plus J-	Adding biased (J+ or J-) qualifiers with opposite signs results in an unbiased qualifier (J).
UJ = U plus J	The UJ qualifier is used when a non-detected (U) flag is added to a (J) flag.

Table 4 identifies the QC elements reviewed for each validation level. The actual elements are method-dependent.

Table 5 lists the reason codes used. Reason codes explain why data were qualified and identify possible limitations of data use. Reason codes are cumulative except when one of the flags is R. In that case, only the reason code associated with the R flag is used.

Table 6 presents the overall qualified results after the validation qualifiers and associated reason codes were applied.

3.1 PRECISION

3.1.1 Instrument Calibration

The objective of the ICAL is to ensure that an instrument can produce acceptable qualitative and quantitative data by determining the ratio of instrument response to analyte concentration. %RSD is used to evaluate ICAL results in RSK-175 and provides a means of evaluating precision within an analytical system. All %RSDs were acceptable. No data were qualified for imprecision in the ICAL.

3.1.2 MS/MSD and Laboratory Duplicate Samples

Most MS/MSD and lab duplicate RPDs were within the acceptance criteria as stated in the QAPP. Four results were qualified for lab duplicate outliers. One result in GRTS-MW02B-SO-109 was qualified “J” for high RPD of a lab duplicate. Three results in GRTS-MW03B-SO-95 were qualified “J” for high MS/MSD RPDs. The results are denoted with reason code “ld” in Table 6. Table 7 shows the lab duplicate outliers.

3.1.3 Field Duplicate Samples

For results > 5X the PQL, the FDs were evaluated for acceptable precision with RPDs. RPD limits are 30% for water or 50% for soils. For results < 5X the PQL in either sample, samples were evaluated by the difference between the two measurements. The difference between the values must be less than the absolute value of the PQL. Two results were qualified for FD imprecision. Results qualified for FD imprecision are found in Table 6 with reason code “fd”. Table 8 shows the field duplicate outliers.

3.2 ACCURACY

3.2.1 Calibration and Continuing Calibration

As stated previously, the objective of initial calibration is to ensure that an instrument is capable of producing acceptable qualitative and quantitative data by determining the ratio of instrument response to analyte concentrations. Typically, inorganic methods use regression models for initial calibration. Regression may also be used in organic analyses. The correlation coefficient indicates the linearity of the calibration curve. The coefficient of determination is an overall measure of the accuracy of the regression calibration curve. The objective of continuing calibration is to ensure that the instrument continues to meet the sensitivity and linearity criteria throughout each analytical sequence. Initial and continuing calibration verification (CCV) results provide a means of evaluating accuracy. Percent difference or drift (%D), percent recovery (%R), correlation coefficient, and coefficient of determination are the parameters used to measure the effectiveness of instrument calibration. %R and %D are used to verify the ongoing calibration acceptability of the analytical system.

No data were qualified for calibration outliers.

3.2.2 MS/MSD Samples

Several MS/MSD %Rs were outside of acceptance criteria shown in the QAPP. MS/MSD %R exceedances can be found in Table 9. Analytes that were present in the parent sample in concentrations greater than 4 times the amount spiked were not qualified and are not shown in the table. In cases where the recoveries were high and the parent sample was non-detect, no qualification was applied. Qualifiers were applied to parent samples only, unless FD samples or samples of known similarity were analyzed in the same SDG. Table 8 contains the spiked parent sample only. Per the inorganic NFG, MS/MSD recoveries < 30 percent resulted in rejection of the non-detected data point. In cases where dilutions caused the low recoveries, the data were not rejected or qualified. The effect of dilution on matrix spike recoveries is determined on a case-by-case-basis using professional judgment, knowledge of the lab's procedures, and input from the lab. For some analyses, the lab may dilute the sample prior to preparation for analyses and prior to addition of the matrix spike compounds. The lab also approaches this on a case-by-case basis. Eleven results were qualified and one non-detected result was rejected for MS/MSD %Rs. Associated results qualified or rejected for MS/MSD recoveries can be found in Table 6 with reason code "m."

3.2.3 LCS Samples

No data were qualified for LCS %R outliers.

3.2.4 Serial Dilutions

The serial dilution is used to determine whether physical or chemical interferences exist due to matrix. Serial dilution %Ds were less than 10 percent as required in the inorganic NFG. No results were qualified for high %Ds in the serial dilutions.

3.2.5 Interference Check Samples

Interference check samples (ICS) are analyzed in the following methods: EPA 314.0, SW-6010B, and SW-6020A. All interference check %Rs met acceptance criteria of 80 to 120 percent.

3.2.6 Surrogates

Surrogates are added to all samples analyzed by EPA 300.1B to measure the efficiency of the analytical method. The acceptance limits are 90 to 115 percent. No data were qualified for surrogate outliers.

3.2.7 Analyte Quantitation and Target Identification

Raw data were evaluated in Stage 4 validation. All analyte quantitation and target identifications reviewed matched the reported values.

Seven sulfate results and 5 chloride results exceeded the calibration range of the instrument and were re-analyzed by the lab. Three non-detected results were rejected because alternate results were chosen from lower dilution analyses. Nitrate in one sample and nitrate and nitrite in another were analyzed twice at different dilutions. Analyses with lower PQLs were reported. The 15 original results were assigned a validation qualifier "R" and are shown with reason code "brr" in Table 6. The most technically sound results were used.

Fifteen rejected results are shown in Table 10 with a comment describing the logic for using the alternate result. Data rejected in favor of alternate results such as dilution runs are not used in the completion calculation.

3.3 REPRESENTATIVENESS

3.3.1 Sample Condition, Preservation, and Holding Times

Sample condition, preservation, and holding times were evaluated to verify compliance with the analytical methods.

Six volatile fatty acid results and one methane result were qualified "UJ" because they were received at the lab with headspace. They are designated with reason code "vh" for volatile headspace in Table 6. The samples with descriptions of outliers are shown in Table 11.

One perchlorate sterile sample bottle arrived empty at the laboratory. The lab analyzed the sample from a non-sterile aliquot. The perchlorate result was qualified "J" and is designated with reason code "o" in Table 6. Bias was not applied because it is not known. The sample is also shown in Table 11.

Twenty-four results were qualified and two non-detected results were rejected for analysis outside of holding times. Parameters qualified include chlorate, pH, total kjeldahl nitrogen (TKN), and total organic carbon (TOC). Most of the qualified results were soils. The chlorate and TKN methods for soils required a water leaching before analysis. The holding times for soils are based on analysis after leaching. Although the analyses were run soon after leaching, the validator qualified the results based on the long lapse from sampling time, using professional judgment. The qualified and rejected results are designated with reason code "h" in Table 6. The holding time exceedances are shown in Table 12.

3.3.2 Blanks

Method blanks, ICBs, CCBs, EBs, and FBs were analyzed to evaluate representativeness. The concentration of an analyte in any blank was used for data qualification. If contaminants were detected in a blank, the blank concentration was compared to the sample results. If the analyte was not detected in the sample, no qualification was applied to the sample. If the sample concentration was greater than 10 times the amount in the blank, after dilutions were considered, no qualification was applied.

For concentrations detected in the sample below the PQL, the sample result was qualified "J". Based on hierarchy of validation qualification, the "J" qualifier, in this case applied to detected results below the PQL, supersedes the positive bias associated with blank contamination. For concentrations detected in the sample above the PQL and less than 10 times the amount in the blank, the sample result was qualified "J+".

3.3.2.1 Method Blanks

Several inorganic analytes were detected in method blanks. Seven sample results were qualified because of analytes found in both the samples and the lab blanks. Qualified results are shown in Table 6 with reason code "bl." Laboratory blank detections that resulted in qualification are shown in Table 13.

3.3.2.2 Equipment Blanks and Field Blanks

No results were qualified because of EB or FB detections.

3.3.3 Sample Data Confidence

Based on anomalous perchlorate sample results, perchlorate contamination in equipment and lab blanks, and the inability of the lab to determine a source of perchlorate contamination, TetraTech has no confidence in data in lab SDGs 440-250707-1, 440-250859-1, and 440-250859-2 and believes they do not reflect site conditions. Since it was unclear which perchlorate results were valid and which may have been the result of contamination, the sample locations were resampled. Analytes other than perchlorate are used to aid in assessing the progress of the remediation process. As such, they were also resampled. The original 43 results from the field samples, EB, and FB were assigned a validation qualifier "R" and are shown with reason code "o" in Table 6. The unused results rejected for resampling are shown in Table 14.

Data rejected because the locations were resampled are not used in the completion calculation. It is recommended that they be excluded from the NDEP database.

3.4 COMPARABILITY

The laboratories used standard analytical methods for all analyses. In split samples sent to Pace National, chlorate was analyzed using Method EPA 300.0. Eurofins TestAmerica, the primary lab for all other samples, used Method EPA 300.1B to analyze for chlorate. In all cases, the SQLs attained were at or below the PQLs. Target compounds detected below the PQLs were flagged "J" by the laboratory and should be considered estimated. All 48 results detected between the SQL and PQL, and used as reported, are shown with reason code "sp" in Table 6. The comparability of the data is acceptable.

3.5 COMPLETENESS

The overall completeness level attained for the field samples, EBs, and FBs is 99.75 percent and meets the project goal of 90 percent. The completeness percentage was calculated as the total number of accepted (non-rejected) sample results divided by the total number of sample results multiplied by 100. TKN in GRTS-MW05A-BL01 was rejected for low MS/MSD recoveries. TOC results in GRTS-MW02B-SO-65 and GRTS-MW03B-SO-95 were rejected for missed holding times. Completeness for TOC by SW-9060 was 66.7%, which is below the completeness goal. All other analytical parameters met the completeness goal. TOC is used during the treatability study as an indicator of nutrient presence. The rejected results do not affect the overall outcome of the treatability study. Completeness by method is presented in Table 15. Data rejected in favor of alternate results such as dilution runs are not used in the completion calculation. Data rejected because the locations were resampled are not used in the completion calculation.

3.6 SENSITIVITY

The calibrations were evaluated for instrument sensitivity and were determined to be technically acceptable. Due to high analyte concentrations, many analytical runs were analyzed at dilutions. For diluted analyses, SQLs and PQLs were elevated. Several analyses were run at multiple dilutions because of high concentrations of other

target analytes. The most technically sound result was used. Typically, where multiple non-detected results were reported, and quality control criteria were comparable, the result with the lowest PQL was used. Typically, where multiple detected results were reported, and quality control criteria were comparable, the result with the highest concentration was used, unless the lab indicated it should not be used. Unused results were assigned a validation qualifier “R” and are shown with reason code “brr” in Table 6. The unused results are shown in Table 11 with a comment describing the logic for using the alternate result. Data rejected in favor of alternate results such as dilution runs are not used in the completion calculation. It is recommended that these data be excluded from the NDEP database.

3.6.1 Internal Standards

Internal standards were added to samples analyzed by methods SW-6010B and SW-6020A. The internal standards in methods SW-6010B and SW-6020A were used to determine the existence and magnitude of instrument drift and physical interferences. No analytes were qualified for internal standard anomalies.

4.0 CONCLUSIONS AND RECOMMENDATIONS

Data were qualified for issues affecting precision, accuracy, representativeness, and comparability. Three results out of 1221 analyzed, validated, and reported were rejected: one for low MS/MSD recoveries and two for missed holding times. Multiple runs were analyzed for samples with high chloride and sulfate concentrations that exceeded the calibration range of the instrument. They were assigned a validation qualifier “R” because more technically sound results were used. Three non-detected results were rejected because alternate results were chosen from lower dilution analyses. The results were non-detect and not qualified by the lab. The result with the lower PQL was reported. Data rejected in favor of alternate results such as dilution runs were not used in the completion calculation. It is recommended that they be excluded from the NDEP database.

Groundwater samples reported in lab SDGs 440-250707-1, 440-250859-1, and 440-250859-2 were rejected because of lack of confidence in the data. The locations were re-sampled because they may not be representative of site conditions. Data rejected because the locations were resampled were not used in the completion calculation. It is recommended that they be excluded from the NDEP database.

The analytical data quality assessment for the analytical results generated during the Galleria Drive Bioremediation Treatability Study at the NERT site in Henderson, Nevada, established that the overall project requirements and completeness levels were met.

5.0 REFERENCES

Nevada Division of Environmental Protection (NDEP). (2018). *NDEP Data Verification and Validation Requirements*.

Ramboll Environ. (2017). *Quality Assurance Project Plan, Revision 2, Nevada Environmental Response Trust Site, Henderson, Nevada.*

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Tables

Appendix 1 Validation Checklists

Appendix 2 Laboratory Data Packages

Appendix 3 DVSR Electronic Data Deliverable