Appendix D – 2022 Data Validation Reports

Appendix D-1. 1st Quarter Data Validation Reports

Appendix D-2. 2nd Quarter Data Validation Reports

Appendix D-3. 3rd Quarter Data Validation Reports

Appendix D-4. 4th Quarter Data Validation Reports

Appendix D-1. 1st Quarter Data Validation Reports

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/18/2022
Date Validated: 07/05/2022	Sample End Date: 03/18/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Chemical Oxygen Demand by EPA Method 410.4 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Biochemical Oxygen Demand (BOD) by SM Method 5210B ▪ E.Coli by SM Method 9223B	
Laboratory Project ID: 2203A72	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB 3-18-22	2203A72-001
East LDU	2203A72-002
West LDU	2203A72-003
STP-1 to EP-2	2203A72-004
FB 3-18-22	2203A72-005
DUP 3-18-22	2203A72-006
Trip Blank	2203A72-007

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ✓ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J-	The result is an estimated concentration, but may be biased low
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 363 data points. The data completeness calculation does not include any submitted blank sample results. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270: "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

E – Estimated value. *This laboratory flag was applied only to QC sample results in the laboratory report, and qualification of sample data was not required.*

H – Holding times for preparation or analysis exceeded.

J – Analyte detected below quantitation limits

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
245.1	East LDU	Total Mercury	5
200.8	East LDU, West LDU, DUP 3-18-22	Total and Dissolved Metals	5
200.7	East LDU	Total and Dissolved Chromium	10
200.7	East LDU	Total and Dissolved Nickel	10
9223B	STP-1 to EP-2	E.Coli	10
8015	East LDU	GRO, DRO MRO	10
8260B	East LDU	VOCs	10
8270C	East LDU, STP-1 to EP-2, DUP 3-18-22	SVOCs	10

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? Yes

Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C at 2.1°C, 2.3°C, and 2.4°C as noted on the CoC and the *Sample Log-in Check List*.

Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.3°C as noted on the CoC.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L), milligrams per liter (mg/L), and most probable number per 100 mL (MPN/100mL), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
245.1	Total Mercury	66396	0.00014 mg/L
8260B	**Chloromethane**	**R86666**	**0.66 µg/L**
8015D	**GRO**	**G86666**	**0.040 mg/L**

Detections of chloromethane and GRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of GRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66643	Not Prepared
200.7	Dissolved Metals	A86607	EB 3-18-22
200.7	Dissolved Metals	A87332	Not Prepared
200.8	Total Metals	66341	Not Prepared
200.8	Dissolved Metals	A86633	Not Prepared
200.8	Dissolved Metals	B86624	STP-1 to EP-2
245.1	Dissolved and Total Mercury	66396	Not Prepared
410.4	COD	WG1836817	Not Associated
504.1	EDB	66262	Not Prepared
4500CN E	Cyanide	WG1836405	Not Associated
4500CN E	Cyanide	WG1836836	Not Associated
5210B	BOD	66272	Not Prepared
8015D	TPH DRO and MRO	66372	Not Prepared
8015D	TPH GRO	G86666	West LDU
8260B	VOCs	R86666	East LDU
8270C	SVOCs	66282	Not Prepared
8270C	SVOCs	66355	Not Prepared
8270C SIM	SVOCs	R86694	Not Prepared
8270C SIM	SVOCs	R86800	Not Prepared
9223B	E.Coli	66276	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? Yes

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**East LDU**	**10.1%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**East LDU**	**25.0%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**East LDU**	**15.7%**	**18.6-129%**
8015D	**DNOP**	**DUP 3-18-22**	**159%**	**42.2-138%**

The associated target analytes in the sample East LDU with surrogate recoveries that were less than lower laboratory QC limits were qualified as UJ if not detected and J- if detected due to evidence of potential low bias. The associated target analytes in the sample DUP 3-18-22 with a surrogate recovery that was greater than the upper laboratory QC limit were detections and were qualified as J+ due to evidence of potential high bias.

Since Method 8270 surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples West LDU and DUP 3-18-22, and qualification of sample data was not required.

The DRO and MRO results for sample East LDU were not qualified based on the surrogate non-conformance in the Method 8015D analysis since the applied dilution of 10 times resulted in a surrogate concentration below routinely calibrated levels, and that result was deemed unreliable and possibly inaccurate.

The SVOC results for sample STP-1 to EP-2 were not qualified based on the surrogate non-conformances in the Method 8070C analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate. Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-18-22, and one equipment blank sample, EB 3-18-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Chloromethane	0.67 µg/L
Trip Blank	8015	GRO	0.035 mg/L
FB 3-18-22	8015	GRO	0.032 mg/L
EB 3-18-22	**200.7**	**Dissolved Zinc**	**0.0068 mg/L**
EB 3-18-22	8260B	Chloromethane	0.67 µg/L
EB 3-18-22	8015D	GRO	0.034 mg/L
EB 3-18-22	8015D	DRO	0.023 mg/L

The detection of dissolved zinc in the associated sample West LDU that was less than the applicable reporting limit was assigned a U qualifier. Detections of dissolved zinc in the associated samples that were greater than or equal to the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of dissolved zinc in the associated samples and detections of DRO that were above the reporting limit and greater than ten times the blank concentration did not require qualification.
The chloromethane and GRO results were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP 3-18-22 was collected as a field duplicate of sample West LDU.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.
The RPD value could not be calculated for 1,4-dioxane for the field duplicate pair West LDU and DUP 3-18-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, 1,4-dioxane was qualified as J and UJ for the parent and duplicate samples, respectively.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
410.4	COD	WG1836817	Not Associated
4500CN E	Cyanide	WG1836405	Not Associated
4500CN E	Cyanide	WG1836836	DUP 3-18-22, Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.
The RPD for the laboratory duplicate prepared from a project sample was not applicable since the results for one or both measurements were within 5 times the reporting limit.
The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
East LDU	Mercury	ND	0.00010
DUP 3-18-22	Barium	0.068	0.069
DUP 3-18-22	Beryllium	ND	0.00090
East LDU	Cadmium	0.013	0.031
West LDU	Cadmium	0.0047	0.012
DUP 3-18-22	Cadmium	0.0055	0.013
East LDU	Chromium	7.0	7.7
East LDU	Cobalt	0.10	0.12
West LDU	Cobalt	0.0061	0.013
DUP 3-18-22	Cobalt	0.0069	0.014
East LDU	Lead	ND	0.0014
East LDU	Nickel	7.3	8.1
West LDU	Nickel	0.81	0.89
DUP 3-18-22	Nickel	0.83	0.88
STP-1 to EP-2	Silver	ND	0.0014
East LDU	Vanadium	0.14	0.16
West LDU	Vanadium	0.066	0.071
DUP 3-18-22	Vanadium	0.067	0.069
EB 3-18-22	Zinc	ND	0.0068
West LDU	Zinc	ND	0.0080
DUP 3-18-22	Zinc	ND	0.012

FIELD DUPLICATE SUMMARY

Client Sample ID: West LDU Field Duplicate Sample ID: DUP 3-18-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.068 mg/L	0.069 mg/L	1.5%
Barium, Total	E 200.7	0.066 mg/L	0.068 mg/L	3.0%
Beryllium, Dissolved	E 200.7	ND (0.0020 mg/L)	0.00090 mg/L	DL
Cadmium, Dissolved	E 200.7	0.012 mg/L	0.013 mg/L	8.0%
Cadmium, Total	E 200.7	0.0047 mg/L	0.0055 mg/L	15.7%
Chromium, Dissolved	E 200.7	0.14 mg/L	0.14 mg/L	0.0%
Chromium, Total	E 200.7	0.32 mg/L	0.32 mg/L	0.0%
Cobalt, Dissolved	E 200.7	0.013 mg/L	0.014 mg/L	7.4%
Cobalt, Total	E 200.7	0.0061 mg/L	0.0069 mg/L	12.3% +/-RL
Nickel, Dissolved	E 200.7	0.89 mg/L	0.88 mg/L	1.1%
Nickel, Total	E 200.7	0.81 mg/L	0.83 mg/L	2.4%
Vanadium, Dissolved	E 200.7	0.071 mg/L	0.069 mg/L	2.9% +/-RL
Vanadium, Total	E 200.7	0.066 mg/L	0.067 mg/L	1.5% +/-RL
Zinc, Dissolved	E 200.7	0.0080 mg/L	0.012 mg/L	40.0% +/-RL
Arsenic, Total	E200.8	0.00068 mg/L	0.00064 mg/L	6.1% +/-RL
TPH DRO	SW8015	2.0 mg/L	2.4 mg/L	18.2%
TPH GRO	SW8015	0.28 mg/L	0.27 mg/L	3.6%
TPH ORO	SW8015	ND (0.080 mg/L)	0.12 mg/L	DL
1,1-Dichloroethene	SW8260B	0.53 µg/L	ND (1.0 µg/L)	DL
1,2,4-Trimethylbenzene	SW8260B	0.51 µg/L	0.46 µg/L	10.3% +/-RL
1,3,5-Trimethylbenzene	SW8260B	4.8 µg/L	4.7 µg/L	2.1%
Benzene	SW8260B	13 µg/L	12 µg/L	8.0%
Chloromethane	SW8260B	0.83 µg/L	0.85 µg/L	2.4% +/-RL
Ethylbenzene	SW8260B	6.0 µg/L	5.8 µg/L	3.4%
Isopropylbenzene	SW8260B	0.94 µg/L	0.90 µg/L	4.3% +/-RL
MTBE	SW8260B	4.9 µg/L	4.8 µg/L	2.1%
n-Propylbenzene	SW8260B	0.65 µg/L	0.59 µg/L	9.7% +/-RL
p-Isopropyltoluene	SW8260B	0.36 µg/L	0.36 µg/L	0.0% +/-RL
sec-Butylbenzene	SW8260B	0.25 µg/L	0.22 µg/L	12.8% +/-RL
Toluene	SW8260B	0.82 µg/L	0.70 µg/L	15.8% +/-RL
Trichloroethene	SW8260B	0.58 µg/L	ND (1.0 µg/L)	DL
Xylenes, Total	SW8260B	0.52 µg/L	0.51 µg/L	1.9% +/-RL
1,4-Dioxane	**SW8270C**	**8.0 µg/L**	**ND (10 µg/L)**	**DL**
Naphthalene	SW8270C	0.16 µg/L	ND (1.0 µg/L)	DL
Pyrene	SW8270C	0.16 µg/L	ND (2.0 µg/L)	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value could not be calculated for 1,4-dioxane for the field duplicate pair West LDU and DUP 3-18-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, 1,4-dioxane was qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
HT-AN	Sample was analyzed outside of the method holding time.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethene	SW8260B	West LDU	2203a72-003a	0.53	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	West LDU	2203a72-003a	0.51	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP 3-18-22	2203a72-006a	0.46	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	West LDU	2203a72-003c	8.0	1.0	µg/L	J	ERPD-FD
1,4-Dioxane	SW8270C	DUP 3-18-22	2203a72-006c	ND	10	µg/L	UJ	ERPD-FD
2,4,6-Trichlorophenol	SW8270C	East LDU	2203a72-002c	ND	5.0	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	East LDU	2203a72-002c	5.7	5.0	µg/L	J-	LR-SUR
2,4-Dinitrophenol	SW8270C	East LDU	2203a72-002c	ND	5.0	µg/L	UJ	LR-SUR
2-Butanone	SW8260B	East LDU	2203a72-002a	27	100	µg/L	J	MDLRL
2-Methylphenol	SW8270C	East LDU	2203a72-002c	7.7	5.0	µg/L	J-	LR-SUR
3,4-Methylphenol	SW8270C	East LDU	2203a72-002c	7.1	5.0	µg/L	J-	LR-SUR
Acetone	SW8260B	STP-1 to EP-2	2203a72-004a	3.4	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	East LDU	2203A72-002E	0.00087	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	East LDU	2203A72-002D	0.0012	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	West LDU	2203A72-003D	0.00068	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Total	E200.8	DUP 3-18-22	2203A72-006D	0.00064	0.0050	mg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	DUP 3-18-22	2203A72-006E	0.0009	0.0020	mg/L	J	MDLRL
Chloromethane	SW8260B	EB 3-18-22	2203a72-001a	0.67	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	East LDU	2203a72-002a	7.0	30	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	West LDU	2203a72-003a	0.83	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	STP-1 to EP-2	2203a72-004a	0.69	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP 3-18-22	2203a72-006a	0.85	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203a72-007a	0.67	3.0	µg/L	U	MBD, MDLRL
Cobalt, Dissolved	E 200.7	STP-1 to EP-2	2203A72-004E	0.0028	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	STP-1 to EP-2	2203A72-004D	0.0042	0.0060	mg/L	J	MDLRL
Isopropylbenzene	SW8260B	East LDU	2203a72-002a	8.1	10	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	West LDU	2203a72-003a	0.94	1.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	DUP 3-18-22	2203a72-006a	0.90	1.0	µg/L	J	MDLRL
Lead, Dissolved	E200.8	East LDU	2203A72-002E	0.0014	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	STP-1 to EP-2	2203A72-004D	0.00017	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	East LDU	2203A72-002E	0.00010	0.00020	mg/L	J	MDLRL
n-Butylbenzene	SW8260B	East LDU	2203a72-002a	3.0	30	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	West LDU	2203a72-003a	0.65	1.0	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	DUP 3-18-22	2203a72-006a	0.59	1.0	µg/L	J	MDLRL
Phenol	SW8270C	East LDU	2203a72-002c	5.9	5.0	µg/L	J-	LR-SUR
p-Isopropyltoluene	SW8260B	East LDU	2203a72-002a	3.2	10	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	West LDU	2203a72-003a	0.36	1.0	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	DUP 3-18-22	2203a72-006a	0.36	1.0	µg/L	J	MDLRL
Pyrene	SW8270C	West LDU	2203a72-003c	0.16	0.20	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	East LDU	2203a72-002a	3.1	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	West LDU	2203a72-003a	0.25	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	DUP 3-18-22	2203a72-006a	0.22	1.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Dissolved	E200.8	STP-1 to EP-2	2203A72-004E	0.00084	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	STP-1 to EP-2	2203A72-004E	0.0014	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	West LDU	2203a72-003a	0.82	1.0	µg/L	J	MDLRL
Toluene	SW8260B	DUP 3-18-22	2203a72-006a	0.70	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	EB 3-18-22	2203A72-001C	0.023	0.064	mg/L	J	MDLRL
TPH DRO	SW8015	DUP 3-18-22	2203a72-006C	2.40	0.64	mg/L	J+	HR-SUR
TPH ORO	SW8015	DUP 3-18-22	2203a72-006C	0.12	0.08	mg/L	J+	HR-SUR
TPH GRO	SW8015	West LDU	2203a72-003a	0.28	0.050	mg/L	JB	MBD
TPH GRO	SW8015	DUP 3-18-22	2203a72-006a	0.27	0.050	mg/L	JB	MBD
TPH GRO	SW8015	EB 3-18-22	2203a72-001a	0.034	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	STP-1 to EP-2	2203a72-004a	0.044	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	FB 3-18-22	2203a72-005a	0.032	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	Trip Blank	2203a72-007a	0.035	0.050	mg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	West LDU	2203a72-003a	0.58	1.0	ug/L	J	MDLRL
Xylenes, Total	SW8260B	West LDU	2203a72-003a	0.52	1.5	ug/L	J	MDLRL
Xylenes, Total	SW8260B	DUP 3-18-22	2203a72-006a	0.51	1.5	ug/L	J	MDLRL
Zinc, Dissolved	E 200.7	STP-1 to EP-2	2203A72-004E	0.029	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP 3-18-22	2203A72-006E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	West LDU	2203A72-003E	0.0080	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB 3-18-22	2203A72-001E	0.0068	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/22/2022
Date Validated: 07/13/2022	Sample End Date: 03/22/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203B95	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB 3-22-22	2203B95-001
OW-70	2203B95-002
OW-12A	2203B95-003
KA-3	2203B95-004
NAPIS-3	2203B95-005
NAPIS-2	2203B95-006
OAPIS-1	2203B95-007
DUP-3-22-22	2203B95-008
FB-3-22-22	2203B95-009
Trip Blank	2203B95-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C SIM: The chrysene-d_{12} internal standard area count for only the equipment blank was slightly out of range. Insufficient sample extract remained for reanalysis. This sample is non-detect for all PAH compounds.

Method 8270C: "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

1-methylphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample NAPIS-2.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated value. *This laboratory flag was applied only to QC sample and surrogate results in the laboratory report, and qualification of sample data was not required.*

J – Analyte detected below quantitation limits

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-12A, NAPIS-3, NAPIS-2	Total and Dissolved Barium	5
200.8	OAPIS-1	Dissolved Metals	5
200.8	OW-12A, KA-3, OAPIS-1	Total Metals	5
8015D	OAPIS-1	GRO, DRO MRO	5
8260B	OAPIS-1	VOCs	5
200.7	NAPIS-2	Total Barium	10
8015D	NAPIS-2	GRO	10
8260B	OW-12A	Select VOCs	10
8260B	NAPIS-2	VOCs	10

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.1°C and 0.9°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.9°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
245.1	Total Mercury	66396	0.00014 mg/L
8015D	DRO	66385	0.044 mg/L
8260B	**Chloromethane**	**R86734**	**0.66 µg/L**
8015D	**GRO**	**G86734**	**0.041 mg/L**

Detections of chloromethane and GRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of GRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66643	Not Prepared
200.7	Total Metals	66644	Not Prepared
200.7	Dissolved Metals	B86739	Not Prepared
200.8	Total Metals	66440	EB 3-22-22
200.8	Dissolved Metals	B86714	EB 3-22-22, OW-70
245.1	Total Mercury	66396	DUP-3-22-22
245.1	Dissolved Mercury	66455	Not Prepared
504.1	EDB	66393	Not Prepared
4500CN E	Cyanide	WG1838531	Not Associated, OW-12A
4500CN E	Cyanide	WG1839312	Not Associated
8015D	TPH DRO and MRO	66372	Not Prepared
8015D	TPH DRO and MRO	66385	Not Prepared
8015D	TPH GRO	G86734	OW-12A
8260B	VOCs	R86734	OW-70
8260B	VOCs	R86760	Not Prepared
8270C	SVOCs	66355	Not Prepared
8270C SIM	SVOCs	R86800	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exception.

The MSD recovery for GRO in Method 8015D batch G86734 was outside the QC limits of 70-130% at 64.3%. GRO was detected in the associated samples, and these results were qualified as J- due to possible low bias.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	Dissolved Cadmium	B86739	132%	-----	70-130%	-----	-----
200.7	**Total Nickel**	**66643**	**69.0%**	-----	**70-130%**	-----	-----
200.7	**Total Nickel**	**66644**	**67.0%**	-----	**70-130%**	-----	-----
8015D	**DRO**	**66385**	**107%**	**Acceptable**	**31.7%-75.4%**	**56.8%**	**20%**

The associated sample results were non-detections for dissolved cadmium and did not require qualification due to potential high bias.

The DRO results were detections in the associated samples, and these results were qualified as J+ due to potential high bias. These associated DRO results were also qualified as J due to evidence of poor precision.

Associated samples with detections for total nickel were qualified with J- flags to indicate estimated concentrations, and the associated sample EB 3-22-22 with a non-detection for total nickel was qualified with a UJ flag due to possible low bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270 surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample OW-12A, and qualification of sample data was not required.

The 8270C SIM internal standard chrysene-d_{12} was outside the acceptance range in sample EB 3-22-22. The associated analytes (benzo(a)anthracene, chrysene, and pyrene) were not detected in sample EB 3-22-22, and the results were assigned UJ qualifiers.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-3-22-22, and one equipment blank sample, EB 3-22-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Chloromethane	0.70 µg/L
FB-3-22-22	**8260B**	**1,2-Dichloroethane**	**0.42 µg/L**
FB-3-22-22	**8260B**	**2-Butanone**	**4.6 µg/L**
FB-3-22-22	8260B	Chloromethane	0.76 µg/L
Blank Sample ID	Method	Analyte	Concentration
EB 3-22-22	**200.7**	**Dissolved Zinc**	**0.0065 mg/L**
EB 3-22-22	**200.8**	**Total Lead**	**0.00027 mg/L**
EB 3-22-22	8015D	DRO	0.026 mg/L
EB 3-22-22	8015D	GRO	0.034 mg/L
EB 3-22-22	8260B	2-Butanone	6.1 µg/L
EB 3-22-22	8260B	Chloromethane	0.88 µg/L

Detections of 1,2-dichloroethane, 2-butanone, and dissolved zinc in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc and total lead in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloromethane and GRO results were previously qualified due to laboratory blank contamination in batches R86734 and G86734; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-22-22 was collected as a field duplicate of sample OW-70.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

RPD values could not be calculated for acenaphthene and anthracene for the field duplicate pair OW-70 and DUP-3-22-22 since the analytes were detected in the duplicate sample and were undetected in the parent sample. As the detections in the duplicate sample were greater than two times the reporting limits, acenaphthene and anthracene were qualified as J and UJ for the duplicate and parent samples, respectively.

The RPD value for naphthalene exceeded the data validation limit of 30% at 36.4%, which was evidence of poor precision. The naphthalene results were qualified as J for samples OW-70 and DUP-3-22-22.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1838531	Not Associated, EB 3-22-22
4500CN E	Cyanide	WG1839312	Not Associated, DUP-3-22-22

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for the laboratory duplicates prepared from project samples were not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-70	Antimony	ND	0.00049
OW-12A	Antimony	ND	0.00070
KA-3	Arsenic	0.00077	0.00087
OAPIS-1	Cobalt	0.010	0.011
OAPIS-1	Lead	0.0055	0.0059
OW-70	Nickel	0.047	0.048
KA-3	Nickel	0.022	0.027
NAPIS-3	Nickel	0.025	0.028
NAPIS-2	Nickel	0.053	0.056
DUP-3-22-22	Nickel	0.046	0.048
EB 3-22-22	Zinc	ND	0.0065
KA-3	Zinc	0.0075	0.012
OAPIS-1	Zinc	0.019	0.025

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-70 Field Duplicate Sample ID: DUP-3-22-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.54 mg/L	0.55 mg/L	1.8%
Barium, Total	E 200.7	0.92 mg/L	0.83 mg/L	10.3%
Chromium, Total	E 200.7	0.010 mg/L	0.0081 mg/L	21.0% +/-RL
Cobalt, Dissolved	E 200.7	0.0070 mg/L	0.0078 mg/L	10.8% +/-RL
Cobalt, Total	E 200.7	0.011 mg/L	0.010 mg/L	9.5% +/-RL
Nickel, Dissolved	E 200.7	0.048 mg/L	0.048 mg/L	0.0%
Nickel, Total	E 200.7	0.047 mg/L	0.046 mg/L	2.2%
Vanadium, Dissolved	E 200.7	0.0035 mg/L	0.0037 mg/L	5.6% +/-RL
Vanadium, Total	E 200.7	0.018 mg/L	0.015 mg/L	18.2% +/-RL
Zinc, Dissolved	E 200.7	0.0086 mg/L	0.010 mg/L	15.1% +/-RL
Zinc, Total	E 200.7	0.014 mg/L	0.012 mg/L	15.4% +/-RL
Antimony, Dissolved	E200.8	0.00049 mg/L	ND (0.0010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0015 mg/L	0.0013 mg/L	14.3% +/-RL
Arsenic, Total	E200.8	0.0038 mg/L	0.0034 mg/L	11.1%
Lead, Dissolved	E200.8	0.00019 mg/L	0.00014 mg/L	30.3% +/-RL
Lead, Total	E200.8	0.0038 mg/L	0.0029 mg/L	26.9%
Selenium, Total	E200.8	0.00072 mg/L	0.00070 mg/L	2.8% +/-RL
TPH DRO	SW8015	1.1 mg/L	1.1 mg/L	0.0%
TPH GRO	SW8015	0.67 mg/L	0.69 mg/L	2.9%
TPH ORO	SW8015	0.067 mg/L	0.058 mg/L	14.4% +/-RL
1,1-Dichloroethane	SW8260B	0.77 µg/L	0.80 µg/L	3.8% +/-RL
1,2,4-Trimethylbenzene	SW8260B	0.36 µg/L	0.40 µg/L	10.5% +/-RL
1,2-Dichloroethane	SW8260B	16 µg/L	17 µg/L	6.1%
Benzene	SW8260B	4.8 µg/L	5.0 µg/L	4.1%
Isopropylbenzene	SW8260B	20 µg/L	20 µg/L	0.0%
MTBE	SW8260B	50 µg/L	51 µg/L	2.0%
n-Butylbenzene	SW8260B	0.97 µg/L	0.96 µg/L	1.0% +/-RL
n-Propylbenzene	SW8260B	0.97 µg/L	0.92 µg/L	5.3% +/-RL
sec-Butylbenzene	SW8260B	4.3 µg/L	4.2 µg/L	2.4%
Toluene	SW8260B	ND (1.0 µg/L)	0.21 µg/L	DL
Xylenes, Total	SW8260B	1.6 µg/L	1.8 µg/L	11.8% +/-RL
Acenaphthene	**SW8270C**	**ND (0.10 µg/L)**	**0.22 µg/L**	**DL**
Anthracene	**SW8270C**	**ND (0.10 µg/L)**	**0.26 µg/L**	**DL**
Naphthalene	**SW8270C**	**0.18 µg/L**	**0.26 µg/L**	**36.4%**
Phenanthrene	SW8270C	0.80 µg/L	1.0 µg/L	22.2%
Pyrene	SW8270C	ND (0.20 µg/L)	0.26 µg/L	DL
Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.				

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD values could not be calculated for acenaphthene and anthracene for the field duplicate pair OW-70 and DUP-3-22-22 since the analytes were detected in the duplicate sample and were undetected in the parent sample. As the detections in the duplicate sample were greater than two times the reporting limits, acenaphthene and anthracene were qualified as J and UJ for the duplicate and parent samples, respectively.

The RPD value for naphthalene exceeded the data validation limit of 30% at 36.4%, which was evidence of poor precision. The naphthalene results were qualified as J for samples OW-70 and DUP-3-22-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LIS	The internal standard area count is less than 50% of the area of the 12-hour standard.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	OW-70	2203b95-002a	0.77	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OAPIS-1	2203b95-007a	2.8	5.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-3-22-22	2203b95-008a	0.80	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	OW-12A	2203b95-003a	0.62	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-70	2203b95-002a	0.36	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	KA-3	2203b95-004a	0.61	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	NAPIS-3	2203b95-005a	0.22	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	NAPIS-2	2203b95-006a	2.0	10	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP-3-22-22	2203b95-008a	0.40	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-12A	2203b95-003a	0.47	1.0	µg/L	U	FBD, MDLRL
1,2-Dichloroethane	SW8260B	KA-3	2203b95-004a	0.42	1.0	µg/L	U	FBD, MDLRL
1,2-Dichloroethane	SW8260B	NAPIS-3	2203b95-005a	0.42	1.0	µg/L	U	FBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2-Dichloroethane	SW8260B	FB-3-22-22	2203b95-009a	0.42	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	KA-3	2203b95-004a	0.48	1.0	µg/L	J	MDLRL
2,4-Dimethylphenol	SW8270C	NAPIS-2	2203B95-006C	4.1	5.0	µg/L	J	MDLRL
2-Butanone	SW8260B	EB 3-22-22	2203b95-001a	6.1	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	OW-12A	2203b95-003a	2.4	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	FB-3-22-22	2203b95-009a	4.6	10	µg/L	J	MDLRL
Acenaphthene	SW8270C	DUP-3-22-22	2203b95-008c	0.22	0.10	µg/L	J	ERPD-FD
Acenaphthene	SW8270C	OW-70	2203b95-002c	ND	0.10	µg/L	UJ	ERPD-FD
Anthracene	SW8270C	DUP-3-22-22	2203b95-008c	0.26	0.10	µg/L	J	ERPD-FD
Anthracene	SW8270C	OW-70	2203b95-002c	ND	0.10	µg/L	UJ	ERPD-FD
Antimony, Dissolved	E200.8	OW-70	2203B95-002E	0.00049	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	OW-12A	2203B95-003E	0.00070	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	KA-3	2203B95-004E	0.00087	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OAPIS-1	2203B95-007E	0.0050	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	KA-3	2203B95-004D	0.00077	0.0050	mg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	EB 3-22-22	2203b95-001c	ND	0.10	µg/L	UJ	LIS
Chloromethane	SW8260B	EB 3-22-22	2203b95-001a	0.88	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-12A	2203b95-003a	2.7	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	KA-3	2203b95-004a	0.70	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	NAPIS-3	2203b95-005a	0.72	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	NAPIS-2	2203b95-006a	6.7	30	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB-3-22-22	2203b95-009a	0.76	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203b95-010a	0.70	3.0	µg/L	U	MBD, MDLRL
Chrysene	SW8270C	EB 3-22-22	2203b95-001c	ND	0.10	µg/L	UJ	LIS
Cobalt, Dissolved	E 200.7	OW-12A	2203B95-003E	0.0053	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	NAPIS-3	2203B95-005E	0.0027	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	NAPIS-3	2203B95-005D	0.0038	0.0060	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Total	E 200.7	NAPIS-2	2203B95-006D	0.0036	0.0060	mg/L	J	MDLRL
Ethylbenzene	SW8260B	OW-12A	2203b95-003a	0.56	1.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-12A	2203b95-003a	0.84	1.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	NAPIS-2	2203b95-006a	9.4	10	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-70	2203B95-002E	0.00019	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-12A	2203B95-003E	0.00041	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	KA-3	2203B95-004E	0.00027	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	NAPIS-2	2203B95-006E	0.00026	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-3-22-22	2203B95-008E	0.00014	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	NAPIS-3	2203B95-005D	0.0013	0.00050	mg/L	JB	EBD
Lead, Total	E200.8	EB 3-22-22	2203B95-001D	0.00027	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	KA-3	2203B95-004D	0.00052	0.00050	mg/L	JB	EBD
Naphthalene	SW8270C	OW-70	2203b95-002c	0.18	0.10	µg/L	J	ERPD-FD
Naphthalene	SW8270C	DUP-3-22-22	2203b95-008c	0.26	0.10	µg/L	J	ERPD-FD
n-Butylbenzene	SW8260B	OW-70	2203b95-002a	0.97	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	NAPIS-3	2203b95-005a	0.32	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP-3-22-22	2203b95-008a	0.96	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-12A	2203B95-003E	0.0086	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	OW-70	2203B95-002D	0.047	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-12A	2203B95-003D	0.014	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	KA-3	2203B95-004D	0.022	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	NAPIS-3	2203B95-005D	0.025	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	NAPIS-2	2203B95-006D	0.053	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OAPIS-1	2203B95-007D	0.16	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	DUP-3-22-22	2203B95-008D	0.046	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB 3-22-22	2203B95-001D	ND	0.010	mg/L	UJ	LR-LCS
n-Propylbenzene	SW8260B	OW-70	2203b95-002a	0.97	1.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
n-Propylbenzene	SW8260B	KA-3	2203b95-004a	0.69	1.0	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	NAPIS-2	2203b95-006a	8.2	10	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	DUP-3-22-22	2203b95-008a	0.92	1.0	µg/L	J	MDLRL
Phenol	SW8270C	NAPIS-3	2203B95-005C	4.2	5.0	µg/L	J	MDLRL
Pyrene	SW8270C	NAPIS-3	2203b95-005c	0.18	0.20	µg/L	J	MDLRL
Pyrene	SW8270C	EB 3-22-22	2203b95-001c	ND	0.20	µg/L	UJ	LIS
sec-Butylbenzene	SW8260B	OW-12A	2203b95-003a	0.42	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	KA-3	2203b95-004a	0.25	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	NAPIS-3	2203b95-005a	0.73	1.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-12A	2203B95-003E	0.00052	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	NAPIS-2	2203B95-006E	0.00046	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-70	2203B95-002D	0.00072	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-12A	2203B95-003D	0.0022	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	NAPIS-3	2203B95-005D	0.00062	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	NAPIS-2	2203B95-006D	0.00062	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-3-22-22	2203B95-008D	0.00070	0.0010	mg/L	J	MDLRL
Toluene	SW8260B	DUP-3-22-22	2203b95-008a	0.21	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	EB 3-22-22	2203B95-001C	0.026	0.064	mg/L	J	MDLRL
TPH DRO	SW8015	NAPIS-3	2203B95-005C	0.65	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	NAPIS-2	2203B95-006C	2.4	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OAPIS-1	2203B95-007C	7.0	0.32	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	DUP-3-22-22	2203B95-008C	1.1	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH GRO	SW8015	OW-70	2203b95-002a	0.67	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	OW-12A	2203b95-003a	5.2	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	NAPIS-3	2203b95-005a	0.69	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	NAPIS-2	2203b95-006a	3.5	0.50	mg/L	J-	LR-MS
TPH GRO	SW8015	OAPIS-1	2203b95-007a	0.56	0.25	mg/L	J-	LR-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	DUP-3-22-22	2203b95-008a	0.69	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	KA-3	2203b95-004a	0.31	0.050	mg/L	JB	LR-MS, MBD
TPH GRO	SW8015	EB 3-22-22	2203b95-001a	0.034	0.050	mg/L	U	LR-MS, MBD, MDLRL
TPH ORO	SW8015	OW-70	2203B95-002C	0.067	0.080	mg/L	J	MDLRL
TPH ORO	SW8015	OAPIS-1	2203B95-007C	0.96	0.40	mg/L	J+	ERPD-LCS, HR-LCS
TPH ORO	SW8015	NAPIS-3	2203B95-005C	0.091	0.080	mg/L	J+	ERPD-LCS, HR-LCS
TPH ORO	SW8015	NAPIS-2	2203B95-006C	0.16	0.080	mg/L	J+	ERPD-LCS, HR-LCS
TPH ORO	SW8015	DUP-3-22-22	2203B95-008C	0.058	0.080	mg/L	J+	ERPD-LCS, HR-LCS, MDLRL
Trichloroethene	SW8260B	KA-3	2203b95-004a	0.30	1.0	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-70	2203B95-002E	0.0035	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-12A	2203B95-003E	0.0027	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	KA-3	2203B95-004E	0.017	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OAPIS-1	2203B95-007E	0.024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-3-22-22	2203B95-008E	0.0037	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-70	2203B95-002D	0.018	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-12A	2203B95-003D	0.034	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	KA-3	2203B95-004D	0.019	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPIS-3	2203B95-005D	0.0068	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPIS-2	2203B95-006D	0.011	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OAPIS-1	2203B95-007D	0.029	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-3-22-22	2203B95-008D	0.015	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	KA-3	2203b95-004a	0.85	1.50	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	KA-3	2203B95-004E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OAPIS-1	2203B95-007E	0.025	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-3-22-22	2203B95-008E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-70	2203B95-002E	0.0086	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-12A	2203B95-003E	0.0091	0.010	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	NAPIS-3	2203B95-005E	0.0056	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	NAPIS-2	2203B95-006E	0.0080	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB 3-22-22	2203B95-001E	0.0065	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	KA-3	2203B95-004D	0.0075	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	NAPIS-3	2203B95-005D	0.0083	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/23/2022
Date Validated: 07/11/2022	Sample End Date: 03/23/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203C69	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

Tier II Data Validation Report Summary

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-3-23-22	2203C69-001
OW-54	2203C69-002
OW-66	2203C69-003
OW-55	2203C69-004
OW-13	2203C69-005
OW-56	2203C69-006
OW-59	2203C69-007
OW-60	2203C69-008
MKTF-16	2203C69-009
DUP-3-23-22	2203C69-010
FB-3-23-22	2203C69-011
Trip Blank	2203C69-012

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 779 data points. The data completeness calculation does not include any submitted blank sample results. One data point was rejected. The data completeness measure for this data package is calculated to be 99.87% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Naphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample OW-55.

Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for the following sample: OW-66.

"S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

E – Estimated value. *This laboratory flag was applied only to QC sample and surrogate results in the laboratory report, and qualification of sample data was not required.*

J – Analyte detected below quantitation limits

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

D – Sample diluted due to matrix.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-66	Total and Dissolved Barium	5
200.7	OW-60	Total Barium	5
200.8	Multiple Samples	Select Total and Dissolved Metals	5
8015D	OW-54	GRO	5
8260B	OW-54	Select VOCs	5
200.8	OW-66, OW-55, OW-59	Select Total and Dissolved Metals	10
8015D	OW-66	DRO and MRO	10
8260B	MKTF-16	Benzene	10
8260B	DUP-3-23-22	MTBE	10
8270C	OW-66	SVOCs	10
200.8	OW-56	Dissolved Antimony	20
8015D	OW-66, OW-55	GRO	50

VALIDATION CRITERIA CHECKLIST

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	OW-54	MTBE	50
8260B	OW-66, OW-55	Select VOCs	50
8260B	OW-66	Benzene and Toluene	500
8260B	OW-55	Benzene	500

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.3°C and 2.3°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.7°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66385**	**0.044 mg/L**
8015D	DRO	66409	0.040 mg/L
8015D	**MRO**	**66409**	**0.099 mg/L**
8260B	**Chloromethane**	**R86734**	**0.66 µg/L**
8260B	Carbon disulfide	R86760	0.87 µg/L
8260B	**Chloromethane**	**R86760**	**0.69 µg/L**
8260B	Trichloroethene	R86760	0.34 µg/L
8260B	Vinyl Chloride	R86760	0.47 µg/L
8270 SIM	Pyrene	R87058	0.16 µg/L
8015D	**GRO**	**G86734**	**0.041 mg/L**

Detections of DRO, chloromethane, and GRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of DRO, MRO, and GRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66644	OW-54, OW-66
200.7	Dissolved Metals	B86825	Not Prepared
200.8	Total Metals	66472	EB-3-23-22
200.8	Dissolved Metals	B86714	Not Prepared
245.1	Total Mercury	66425	EB-3-23-22
245.1	Dissolved Mercury	66456	Not Prepared
504.1	EDB	66393	Not Prepared
504.1	EDB	66394	Not Prepared
4500CN E	Cyanide	WG1839312	EB-3-23-22, OW-56
8015D	TPH DRO and MRO	66385	Not Prepared
8015D	TPH DRO and MRO	66409	Not Prepared
8015D	TPH GRO	G86734	Not Prepared
8260B	VOCs	R86734	Not Prepared
8260B	VOCs	R86760	Not Prepared
8270C	SVOCs	66392	Not Prepared
8270C SIM	SVOCs	R86913	Not Prepared
8270C SIM	SVOCs	R87058	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	MS Recovery	MSD Recovery	MS/MSD QC Limits	MS/MSD RPD	RPD QC Limits
4500 CN E	**Cyanide**	**WG1839312**	**Acceptable**	**28.4%**	**75-125%**	**110%**	**20%**
4500 CN E	**Cyanide**	**WG1839312**	**Acceptable**	**73.1%**	**75-125%**	**29.5%**	**20%**

Two MS/MSD pairs were analyzed for cyanide in batch WG1839312. The MSD recoveries were below the NFG QC limits for both of the MS/MSD pairs, but the MSD recovery for one of the pairs was less than 30%. The results for all of the associated samples in the batch would typically be qualified based on the MS/MSD results. However, since multiple MS/MSD pairs were analyzed for this batch, the determination of batch sample associations would be arbitrary. Therefore, only the parent sample EB-3-23-22 used for the MS/MSD pair that recovered at 28.4% was qualified as R to indicate rejected (not usable) data based on evidence of extreme low bias. The remaining samples were qualified as J- if detected and UJ if not detected.

In addition, both MS/MSD pairs exhibited MS/MSD RPDs that exceeded the laboratory QC limit indicating poor precision.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS / LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**66644**	**67.0%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**DRO**	**66385**	**107%**	**Acceptable**	**31.7-75.4%**	**56.8%**	**20%**
8270C SIM	**Phenanthrene**	**R87058**	**Acceptable**	**Acceptable**	**38.2-93.9%**	**30.4%**	**27.9%**
8270C SIM	**Pyrene**	**R87058**	**Acceptable**	**Acceptable**	**51-113%**	**29.5%**	**20%**
8270C SIM	**Benzo(a)anthracene**	**R87058**	**Acceptable**	**Acceptable**	**51-147%**	**26.2%**	**24.1%**
8270C SIM	**Chrysene**	**R87058**	**Acceptable**	**Acceptable**	**55.3-115%**	**33.0%**	**20%**
8270C SIM	**Benzo(b)fluoranthene**	**R87058**	**Acceptable**	**Acceptable**	**44.4-136%**	**34.5%**	**24.5%**
8270C SIM	**Indeno(1,2,3-cd) pyrene**	**R87058**	**Acceptable**	**Acceptable**	**31.4-165%**	**35.2%**	**21.1%**

Total nickel results were assigned J- qualifiers in associated samples due to evidence of potential low bias, except the non-detect results for associated samples EB-3-23-22 and OW-13 which were assigned UJ qualifiers.

DRO was in the associated samples, and these results were qualified as J+ due to potential high bias. These associated DRO results were also qualified due to evidence of poor precision.

The Method 8270C SIM analytes with LCS/LCSD RPD values that were above the QC limits were not detected in the associated samples. These results were qualified as UJ due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D MOD	**DNOP**	**OW-56**	**147%**	**42.2-138%**
8270C	**2-Fluorophenol**	**OW-59**	**19.4%**	**29.4-87.7%**
8270C	**2,4,6-Tribromophenol**	**OW-59**	**6.62%**	**18.6-129%**

The target analytes DRO and MRO associated with the Method 8015 surrogate DNOP were detected in sample OW-56, and these results were assigned J+ qualifiers due to possible high bias.

The acid fraction target analytes associated with the identified non-compliant Method 8270C surrogate recoveries were not detected in sample OW-59. Normally, if a surrogate recovered below 10%, the associated analytes would be qualified as R, but one of the acid surrogates was acceptable and the recovery for the other acid surrogate was low but not below 10%. The associated acid fraction analytes were not detected in sample OW-59 and the results were assigned UJ qualifiers due to the evidence of low bias.

The SVOC results and the DRO and MRO results for sample OW-66 were not qualified based on the surrogate non-conformances in the Method 8270C and Method 8015D Modified analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Since Method 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples OW-66 and OW-55, and qualification of sample data was not required.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample OW-13, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-3-23-22, and one equipment blank sample, EB-3-23-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Chloromethane	0.69 µg/L
FB-3-23-22	**8260B**	**2-Butanone**	**5.2 µg/L**
FB-3-23-22	8260B	Chloromethane	0.80 µg/L
EB-3-23-22	**200.7**	**Dissolved Nickel**	**0.0035 mg/L**
Blank Sample ID	Method	Analyte	Concentration
EB-3-23-22	**200.7**	**Dissolved Zinc**	**0.0063 mg/L**
EB-3-23-22	8015D	DRO	0.033 mg/L
EB-3-23-22	8015D	GRO	0.034 mg/L
EB-3-23-22	8260B	2-Butanone	5.0 µg/L
EB-3-23-22	8260B	Chloromethane	0.70 µg/L

Detections of 2-butanone, dissolved nickel, and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved nickel and dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The DRO, chloromethane, and GRO results were previously qualified due to laboratory blank contamination in batches 66385, R86734, R86760, and G86734; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-23-22 was collected as a field duplicate of sample OW-54.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1839312	Not Associated
4500CN E	Cyanide	WG1839312	OW-13

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD for the laboratory duplicate prepared from a project sample was not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-54	Antimony	ND	0.00047
DUP-3-23-22	Antimony	ND	0.00051
OW-13	Barium	0.020	0.025
OW-54	Cobalt	0.078	0.086
OW-56	Cobalt	0.0069	0.0074
OW-59	Cobalt	0.0043	0.0050
DUP-3-23-22	Cobalt	0.081	0.085
EB-3-23-22	Nickel	ND	0.0035
OW-54	Nickel	0.24	0.27
OW-66	Nickel	0.33	0.37
OW-55	Nickel	0.24	0.26
OW-13	Nickel	ND	0.0033
OW-56	Nickel	0.072	0.083
OW-59	Nickel	0.037	0.042
DUP-3-23-22	Nickel	0.26	0.27
EB-3-23-22	Zinc	ND	0.0063
OW-13	Zinc	ND	0.0084
OW-56	Zinc	0.010	0.012
OW-59	Zinc	0.0064	0.0091

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-54 Field Duplicate Sample ID: DUP-3-23-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.20 mg/L	0.20 mg/L	0.0%
Barium, Total	E 200.7	0.39 mg/L	0.41 mg/L	5.0%
Chromium, Total	E 200.7	0.0064 mg/L	0.0053 mg/L	18.8% +/-RL
Cobalt, Dissolved	E 200.7	0.086 mg/L	0.085 mg/L	1.2%
Cobalt, Total	E 200.7	0.078 mg/L	0.081 mg/L	3.8%
Nickel, Dissolved	E 200.7	0.27 mg/L	0.27 mg/L	0.0%
Nickel, Total	E 200.7	0.24 mg/L	0.26 mg/L	8.0%
Vanadium, Total	E 200.7	0.015 mg/L	0.015 mg/L	0.0% +/-RL
Zinc, Dissolved	E 200.7	0.017 mg/L	0.018 mg/L	5.7% +/-RL
Zinc, Total	E 200.7	0.031 mg/L	0.026 mg/L	17.5%
Antimony, Dissolved	E200.8	0.00047 mg/L	0.00051 mg/L	8.2% +/-RL
Arsenic, Dissolved	E200.8	0.0081 mg/L	0.0091 mg/L	11.6%
Arsenic, Total	E200.8	0.0098 mg/L	0.0091 mg/L	7.4%
Lead, Dissolved	E200.8	0.0064 mg/L	0.0076 mg/L	17.1%
Lead, Total	E200.8	0.023 mg/L	0.020 mg/L	14.0%
Selenium, Total	E200.8	0.0012 mg/L	0.00086 mg/L	33.0% +/-RL
Mercury, Total	E245.1	0.00014 mg/L	ND (0.00020 mg/L)	DL
Cyanide, Total	E335.4	0.00527 mg/L	ND (0.00500 mg/L)	DL
TPH DRO	SW8015	2.2 mg/L	2.3 mg/L	4.4%
TPH GRO	SW8015	2.0 mg/L	1.9 mg/L	5.1%
TPH ORO	SW8015	0.13 mg/L	0.16 mg/L	20.7% +/-RL
1,1-Dichloroethane	SW8260B	ND (5.0 µg/L)	0.63 µg/L	DL
1,2,4-Trimethylbenzene	SW8260B	4.2 µg/L	4.5 µg/L	6.9%
1,2-Dichloroethane	SW8260B	2.3 µg/L	0.68 µg/L	108.7% +/-RL
Benzene	SW8260B	12 µg/L	12 µg/L	0.0%
Chloroform	SW8260B	1.6 µg/L	ND (1.0 µg/L)	DL
Chloromethane	SW8260B	3.9 µg/L	1.8 µg/L	73.7% +/-RL
Ethylbenzene	SW8260B	13 µg/L	13 µg/L	0.0%
Isopropylbenzene	SW8260B	ND (5.0 µg/L)	0.46 µg/L	DL
MTBE	SW8260B	1,300 µg/L	1,200 µg/L	8.0%
n-Propylbenzene	SW8260B	1.2 µg/L	1.2 µg/L	0.0% +/-RL
sec-Butylbenzene	SW8260B	ND (5.0 µg/L)	0.58 µg/L	DL
Toluene	SW8260B	ND (5.0 µg/L)	0.36 µg/L	DL
Vinyl Chloride	SW8260B	ND (5.0 µg/L)	0.46 µg/L	DL
Xylenes, Total	SW8260B	2.0 µg/L	2.4 µg/L	18.2% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and

therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
ERPD-MS	The MS/MSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1,1-Trichloroethane	SW8260B	MKTF-16	2203c69-009a	0.61	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-66	2203c69-003a	27	50	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-56	2203c69-006a	0.58	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-3-23-22	2203c69-010a	0.63	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-54	2203c69-002a	4.2	5.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-56	2203c69-006a	0.22	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-54	2203c69-002a	2.3	5.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-66	2203c69-003a	21	50	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-13	2203c69-005a	0.76	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-3-23-22	2203c69-010a	0.68	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	MKTF-16	2203c69-009a	0.61	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-60	2203c69-008c	0.24	1.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1-Methylnaphthalene	SW8270C	OW-66	2203C69-003C	25	50	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-66	2203C69-003C	22	50	µg/L	J	MDLRL
2,4-Dinitrophenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
2-Butanone	SW8260B	EB-3-23-22	2203c69-001a	5.0	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	FB-3-23-22	2203c69-011a	5.2	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-66	2203C69-003C	46	50	µg/L	J	MDLRL
2-Methylphenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-66	2203C69-003C	25	50	µg/L	J	MDLRL
3,4-Methylphenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-66	2203C69-003C	40	50	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	OW-54	2203C69-002E	0.00047	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	DUP-3-23-22	2203C69-010E	0.00051	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-13	2203C69-005E	0.00074	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-59	2203C69-007E	0.0047	0.010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-60	2203C69-008E	0.0013	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-13	2203C69-005D	0.00075	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	OW-13	2203c69-005a	0.29	1.0	µg/L	J	MDLRL
Benzene	SW8260B	OW-56	2203c69-006a	0.91	1.0	µg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	MKTF-16	2203c69-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	MKTF-16	2203c69-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.10	µg/L	UJ	ERPD-LCS
Bis(2-ethylhexyl)phthalate	SW8270C	OW-55	2203C69-004C	4.6	10	µg/L	J	MDLRL
Chloroform	SW8260B	OW-54	2203c69-002a	1.6	5.0	µg/L	J	MDLRL
Chloroform	SW8260B	OW-55	2203c69-004a	11	50	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chloromethane	SW8260B	EB-3-23-22	2203c69-001a	0.70	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-54	2203c69-002a	3.9	15	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-66	2203c69-003a	54	150	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-55	2203c69-004a	40	150	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-56	2203c69-006a	1.6	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-59	2203c69-007a	0.66	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-60	2203c69-008a	0.70	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-16	2203c69-009a	0.78	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP-3-23-22	2203c69-010a	1.8	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB-3-23-22	2203c69-011a	0.80	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203c69-012a	0.69	3.0	µg/L	U	MBD, MDLRL
Chromium, Dissolved	E 200.7	OW-60	2203C69-008E	0.0044	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-59	2203C69-007D	0.0028	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-3-23-22	2203C69-010D	0.0053	0.0060	mg/L	J	MDLRL
Chrysene	SW8270C	MKTF-16	2203c69-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.10	µg/L	UJ	ERPD-LCS
Cobalt, Dissolved	E 200.7	OW-66	2203C69-003E	0.0053	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-59	2203C69-007E	0.0050	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-60	2203C69-008E	0.0027	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-59	2203C69-007D	0.0043	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	OW-54	2203C69-002F	0.00527	0.00500	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-66	2203C69-003F	0.00756	0.00500	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-59	2203C69-007F	0.0191	0.00500	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-60	2203C69-008F	0.00928	0.00500	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	EB-3-23-22	2203C69-001F	ND	0.00500	mg/L	R	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-55	2203C69-004F	ND	0.00500	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-13	2203C69-005F	ND	0.00500	mg/L	UJ	ERPD-MS, LR-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cyanide, Total	E335.4	OW-56	2203C69-006F	ND	0.00500	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	DUP-3-23-22	2203C69-010F	ND	0.00500	mg/L	UJ	ERPD-MS, LR-MS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-16	2203c69-009c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.30	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	OW-66	2203c69-003a	17	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-55	2203c69-004a	23	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	DUP-3-23-22	2203c69-010a	0.46	1.0	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-56	2203C69-006E	0.00015	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-59	2203C69-007E	0.00061	0.0050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-13	2203C69-005D	0.000067	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	OW-59	2203C69-007D	0.0020	0.0025	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-54	2203C69-002D	0.00014	0.0002	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-59	2203C69-007D	0.00013	0.0002	mg/L	J	MDLRL
Naphthalene	SW8270C	MKTF-16	2203c69-009c	0.08	0.10	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-66	2203c69-003a	13	150	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-16	2203c69-009a	0.29	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-60	2203C69-008E	0.012	0.010	mg/L	JB	EBD
Nickel, Dissolved	E 200.7	OW-13	2203C69-005E	0.0033	0.010	mg/L	U	EBD, MDLRL
Nickel, Dissolved	E 200.7	EB-3-23-22	2203C69-001E	0.0035	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	OW-54	2203C69-002D	0.24	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-66	2203C69-003D	0.33	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-55	2203C69-004D	0.24	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-56	2203C69-006D	0.072	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-59	2203C69-007D	0.037	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-60	2203C69-008D	0.084	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	DUP-3-23-22	2203C69-010D	0.26	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-3-23-22	2203C69-001D	ND	0.010	mg/L	UJ	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Nickel, Total	E 200.7	OW-13	2203C69-005D	ND	0.010	mg/L	UJ	LR-LCS
n-Propylbenzene	SW8260B	OW-54	2203c69-002a	1.2	5.0	µg/L	J	MDLRL
Phenanthrene	SW8270C	MKTF-16	2203c69-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-59	2203C69-007C	ND	5.0	µg/L	UJ	LR-SUR
Phenol	SW8270C	OW-66	2203C69-003C	46	50	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-16	2203c69-009a	0.21	1.0	µg/L	J	MDLRL
Pyrene	SW8270C	MKTF-16	2203c69-009c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-3-23-22	2203c69-010c	ND	0.20	µg/L	UJ	ERPD-LCS
sec-Butylbenzene	SW8260B	DUP-3-23-22	2203c69-010a	0.58	1.0	µg/L	J	MDLRL
Selenium, Total	E200.8	OW-56	2203C69-006D	0.00082	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-59	2203C69-007D	0.0020	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-3-23-22	2203C69-010D	0.00086	0.001	mg/L	J	MDLRL
Toluene	SW8260B	DUP-3-23-22	2203c69-010a	0.36	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	OW-54	2203C69-002C	2.2	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-66	2203C69-003C	6.6	0.64	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-55	2203C69-004C	3.6	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-56	2203C69-006C	1.1	0.064	mg/L	J+	ERPD-LCS, HR-LCS, HR-SUR
TPH DRO	SW8015	OW-59	2203C69-007C	0.49	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-60	2203C69-008C	0.092	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	EB-3-23-22	2203C69-001C	0.033	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-13	2203C69-005C	0.036	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	OW-13	2203c69-005a	0.15	0.050	mg/L	JB	MBD
TPH GRO	SW8015	OW-60	2203c69-008a	0.066	0.050	mg/L	JB	MBD
TPH GRO	SW8015	EB-3-23-22	2203c69-001a	0.034	0.050	mg/L	U	MBD, MDLRL
TPH ORO	SW8015	DUP-3-23-22	2203C69-010C	0.16	0.080	mg/L	JB	MBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH ORO	SW8015	OW-56	2203C69-006C	0.24	0.080	mg/L	J+	HR-SUR
Vanadium, Dissolved	E 200.7	OW-66	2203C69-003E	0.0029	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-55	2203C69-004E	0.0039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-56	2203C69-006E	0.0033	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-59	2203C69-007E	0.0034	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-60	2203C69-008E	0.011	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-54	2203C69-002D	0.015	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-66	2203C69-003D	0.034	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-55	2203C69-004D	0.023	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-13	2203C69-005D	0.0025	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-56	2203C69-006D	0.0083	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-59	2203C69-007D	0.012	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-3-23-22	2203C69-010D	0.015	0.050	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-16	2203c69-009a	0.65	1.0	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	DUP-3-23-22	2203c69-010a	0.46	1.0	µg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-54	2203c69-002a	2.0	7.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-54	2203C69-002E	0.017	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-55	2203C69-004E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-56	2203C69-006E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-60	2203C69-008E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-3-23-22	2203C69-010E	0.018	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-66	2203C69-003E	0.0081	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-13	2203C69-005E	0.0084	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-59	2203C69-007E	0.0091	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-3-23-22	2203C69-001E	0.0063	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-59	2203C69-007D	0.0064	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/24/2022
Date Validated: 06/282022	Sample End Date: 03/24/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203D54	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks

Tier II Data Validation Report Summary

- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-3-24-22	2203D54-001
OW-30	2203D54-002
OW-64	2203D54-003
OW-14	2203D54-004
STP-1-NW	2203D54-005
MKTF-44	2203D54-006
DUP-3-24-22	2203D54-007
FB-3-24-22	2203D54-008
Trip Blank	2203D54-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

"S" flagged denote that the surrogate recoveries are outside of the standard limits due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

D – Sample diluted due to matrix.

E – Estimated value. *This laboratory flag was applied only to QC sample and surrogate results in the laboratory report, and qualification of sample data was not required.*

J – Analyte detected below quantitation limits.

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-14	Total and Dissolved Barium	5
200.8	STP-1-NW, MKTF-44	Select Total and Dissolved Metals	5
504.1	Multiple Samples	EDB	5
8015D	OW-14	DRO and MRO	10
8015D	OW-14	GRO	20
8260B	OW-14	Ethylbenzene	50
8260B	OW-30, OW-14, DUP-3-24-22	MTBE	50
8260B	OW-14	Benzene	1,000

VALIDATION CRITERIA CHECKLIST

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? — No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? — Yes

Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C at 2.9°C, 3.5°C, and 4.0°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 3.7°C as noted on the CoC.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? — Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. — Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? — No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? — N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? — No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66409**	**0.040 mg/L**
8015D	**MRO**	**66409**	**0.099 mg/L**
8260B	**Chloroform**	**A86942**	**0.21 µg/L**
8270 SIM	**Pyrene**	**R87058**	**0.16 µg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66644	Not Prepared
200.7	Dissolved Metals	A87332	DUP-3-24-22
200.7	Dissolved Metals	C86825	OW-30, EB-3-24-22
200.8	Total Metals	66472	Not Prepared
200.8	Total Metals	66473	MKTF-44
200.8	Dissolved Metals	B86786	Not Prepared
245.1	Total Mercury	66425	Not Prepared
245.1	Dissolved Mercury	66456	Not Prepared
504.1	EDB	66394	Trip Blank
4500CN E	Cyanide	WG1841516	OW-30, Not Associated
8015D	TPH DRO and MRO	66409	Not Prepared
8015D	TPH GRO	A86911	EB-3-24-22
8015D	TPH GRO	B86939	Not Prepared
8260B	VOCs	A86942	Not Prepared
8260B	VOCs	A86972	Not Prepared
8260B	VOCs	A87014	Not Prepared
8270C	SVOCs	66423	Not Prepared
8270C SIM	SVOCs	R87058	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

The MS and MSD recoveries for total antimony in Method 200.8 batch 66473 were outside the QC limits of 75-125% at 58.8% and 54.9%, respectively. Total antimony was not detected in the associated samples, and these results were qualified as UJ due to evidence of potential low bias.

The MS recovery for cyanide in Method 4500 CN E batch WG1841516 was outside the laboratory QC limits of 90-110% at 89.9%. However, the recovery was within data validation limits of 75-125%. Validation action was not required.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**66644**	**67.0%**	**-----**	**70-130%**	**-----**	**-----**
8270C SIM	**Phenanthrene**	**R87058**	**Acceptable**	**Acceptable**	**38.2-93.9%**	**30.4%**	**27.9%**
8270C SIM	**Pyrene**	**R87058**	**Acceptable**	**Acceptable**	**51-113%**	**29.5%**	**20%**
8270C SIM	**Benzo(a)anthracene**	**R87058**	**Acceptable**	**Acceptable**	**51-147%**	**26.2%**	**24.1%**
8270C SIM	**Chrysene**	**R87058**	**Acceptable**	**Acceptable**	**55.3-115%**	**33.0%**	**20%**
8270C SIM	**Benzo(b)fluoranthene**	**R87058**	**Acceptable**	**Acceptable**	**44.4-136%**	**34.5%**	**24.5%**
8270C SIM	**Indeno(1,2,3-cd)pyrene**	**R87058**	**Acceptable**	**Acceptable**	**31.4-165%**	**35.2%**	**21.1%**

Associated samples with detections for total nickel were qualified with J- flags due to possible low bias., and the associated samples with non-detections for total nickel were qualified with a UJ flag due to possible low bias.

The analytes with LCS/LCSD RPD values that were above the QC limit that were not detected in the associated samples were qualified as UJ due to evidence of poor precision. The detected phenanthrene and pyrene results were qualified as J due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

The Method 8015D surrogate BFB was recovered in sample OW-64 above the acceptance limits of 70-130% at 317%. The target analyte, GRO, associated with this surrogate that was detected in sample OW-64 was assigned a J+ qualifier due to evidence of potential high bias.

The DRO and MRO results for sample OW-14 were not qualified based on the surrogate non-conformance in the Method 8015D analysis since the applied dilution of 10 times resulted in a surrogate concentration below routinely calibrated levels, and this result was deemed unreliable and possibly inaccurate.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample OW-14, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-3-24-22, and one equipment blank sample, EB-3-24-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Benzene**	**0.57 µg/L**
Trip Blank	8260B	Chloroform	0.20 µg/L
FB-3-24-22	**8260B**	**2-Butanone**	**6.2 µg/L**
FB-3-24-22	8260B	Benzene	0.75 µg/L
FB-3-24-22	**8260B**	**Ethylbenzene**	**0.25 µg/L**
EB-3-24-22	**200.7**	**Dissolved Zinc**	**0.0071 mg/L**
EB-3-24-22	8015D	DRO	0.027 mg/L
EB-3-24-22	8015D	MRO	0.09 mg/L
EB-3-24-22	8260B	2-Butanone	9.2 µg/L

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloroform, DRO, and MRO results were previously qualified due to laboratory blank contamination in batches A86942, 66409, and 66409, respectively; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-24-22 was collected as a field duplicate of sample OW-30.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1841516	EB-3-24-22
4500CN E	Cyanide	WG1841516	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD for the laboratory duplicate prepared from a project sample was not applicable since the cyanide results for both measurements were non-detections.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

VALIDATION CRITERIA CHECKLIST

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-30	Arsenic	0.00066	0.00084
OW-64	Arsenic	0.0023	0.0024
DUP-3-24-22	Arsenic	0.00071	0.00073
OW-30	Barium	0.14	0.16
OW-64	Barium	0.32	0.33
DUP-3-24-22	Barium	0.14	0.16
OW-30	Cobalt	0.0042	0.0046
OW-14	Cobalt	0.0049	0.0050
OW-30	Nickel	0.082	0.085
OW-14	Nickel	0.086	0.089
DUP-3-24-22	Nickel	0.084	0.085
STP-1-NW	Selenium	0.0057	0.0063
STP-1-NW	Silver	ND	0.0024
EB-3-24-22	Zinc	ND	0.0071
OW-30	Zinc	ND	0.0052
OW-64	Zinc	ND	0.0081
OW-14	Zinc	ND	0.0091
DUP-3-24-22	Zinc	ND	0.0080

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-30 Field Duplicate Sample ID: DUP-3-24-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.16 mg/L	0.16 mg/L	0.0%
Barium, Total	E 200.7	0.14 mg/L	0.14 mg/L	0.0%
Cobalt, Dissolved	E 200.7	0.0046 mg/L	0.0052 mg/L	12.2% +/-RL
Cobalt, Total	E 200.7	0.0042 mg/L	0.0052 mg/L	21.3% +/-RL
Nickel, Dissolved	E 200.7	0.085 mg/L	0.085 mg/L	0.0%
Nickel, Total	E 200.7	0.082 mg/L	0.084 mg/L	2.4%
Zinc, Dissolved	E 200.7	0.0052 mg/L	0.0080 mg/L	42.4% +/-RL
Arsenic, Dissolved	E200.8	0.00084 mg/L	0.00073 mg/L	14.0% +/-RL
Arsenic, Total	E200.8	0.00066 mg/L	0.00071 mg/L	7.3% +/-RL
Lead, Dissolved	E200.8	0.00053 mg/L	0.00055 mg/L	3.7% +/-RL
Lead, Total	E200.8	0.00087 mg/L	0.00088 mg/L	1.1% +/-RL
Cyanide, Total	4500 CN E	0.00562 mg/L	0.00726 mg/L	25.5% +/-RL
TPH DRO	SW8015	0.74 mg/L	0.89 mg/L	18.4%
TPH GRO	SW8015	1.4 mg/L	1.3 mg/L	7.4%
TPH ORO	SW8015	0.11 mg/L	0.095 mg/L	14.6% +/-RL
1,2,4-Trimethylbenzene	SW8260B	0.54 µg/L	0.26 µg/L	70.0% +/-RL
1,2-Dichloroethane	SW8260B	0.42 µg/L	0.42 µg/L	0.0% +/-RL
Acetone	SW8260B	3.1 µg/L	2.9 µg/L	6.7% +/-RL
Ethylbenzene	SW8260B	ND (1.0 µg/L)	0.34 µg/L	DL
MTBE	SW8260B	1,400 µg/L	1,400 µg/L	0.0%
Toluene	SW8260B	0.20 µg/L	ND (1.0 µg/L)	DL
Xylenes, Total	SW8260B	0.85 µg/L	ND (1.5 µg/L)	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	OW-14	2203d54-004a	0.38	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-30	2203d54-002a	0.54	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	STP-1-NW	2203d54-005a	0.18	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP-3-24-22	2203d54-007a	0.26	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-30	2203d54-002a	0.42	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-14	2203d54-004a	0.80	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-3-24-22	2203d54-007a	0.42	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	OW-14	2203d54-004a	0.47	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	STP-1-NW	2203d54-005c	0.14	1.0	µg/L	J	MDLRL
2-Butanone	SW8260B	EB-3-24-22	2203d54-001a	9.2	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	FB-3-24-22	2203d54-008a	6.2	10	µg/L	J	MDLRL
Acetone	SW8260B	OW-30	2203d54-002a	3.1	10	µg/L	J	MDLRL
Acetone	SW8260B	OW-64	2203d54-003a	4.4	10	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Acetone	SW8260B	DUP-3-24-22	2203d54-007a	2.9	10	µg/L	J	MDLRL
Antimony, Total	E200.8	MKTF-44	2203D54-006D	ND	0.0050	mg/L	UJ	LR-MS
Antimony, Total	E200.8	DUP-3-24-22	2203D54-007D	ND	0.0010	mg/L	UJ	LR-MS
Arsenic, Dissolved	E200.8	OW-30	2203D54-002E	0.00084	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	STP-1-NW	2203D54-005E	0.0024	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-3-24-22	2203D54-007E	0.00073	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-30	2203D54-002D	0.00066	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-3-24-22	2203D54-007D	0.00071	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	Trip Blank	2203d54-009a	0.57	1.0	µg/L	J	MDLRL
Benzene	SW8260B	STP-1-NW	2203D54-005A	0.44	1.0	µg/L	U	MDLRL, TBD
Benzene	SW8260B	FB-3-24-22	2203d54-008a	0.75	1.0	µg/L	U	MDLRL, TBD
Benzo(a)anthracene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-30	2203d54-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-64	2203d54-003c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-14	2203d54-004c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	STP-1-NW	2203d54-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	MKTF-44	2203d54-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-30	2203d54-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-64	2203d54-003c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-14	2203d54-004c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	STP-1-NW	2203d54-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	MKTF-44	2203d54-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.10	µg/L	UJ	ERPD-LCS
Chloroform	SW8260B	OW-64	2203d54-003a	0.47	1.0	µg/L	U	MBD, MDLRL
Chloroform	SW8260B	Trip Blank	2203d54-009a	0.20	1.0	µg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chromium, Dissolved	E 200.7	MKTF-44	2203D54-006E	0.0029	0.006	mg/L	J	MDLRL
Chrysene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-30	2203d54-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-64	2203d54-003c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-14	2203d54-004c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	STP-1-NW	2203d54-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-44	2203d54-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.10	µg/L	UJ	ERPD-LCS
Cobalt, Dissolved	E 200.7	OW-30	2203D54-002E	0.0046	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-14	2203D54-004E	0.0050	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	DUP-3-24-22	2203D54-007E	0.0052	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-30	2203D54-002D	0.0042	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-14	2203D54-004D	0.0049	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	STP-1-NW	2203D54-005D	0.0037	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	DUP-3-24-22	2203D54-007D	0.0052	0.0060	mg/L	J	MDLRL
Ethylbenzene	SW8260B	MKTF-44	2203d54-006a	0.61	1.0	µg/L	U	FBD, MDLRL
Ethylbenzene	SW8260B	DUP-3-24-22	2203d54-007a	0.34	1.0	µg/L	U	FBD, MDLRL
Ethylbenzene	SW8260B	FB-3-24-22	2203d54-008a	0.25	1.0	µg/L	J	MDLRL
Indeno(1,2,3-cd)pyrene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-30	2203d54-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-64	2203d54-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-14	2203d54-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	STP-1-NW	2203d54-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-44	2203d54-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	MKTF-44	2203D54-006E	0.000090	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-14	2203D54-004D	0.000097	0.00050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Total	E200.8	STP-1-NW	2203D54-005D	0.0010	0.00250	mg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-64	2203d54-003a	0.98	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-14	2203d54-004a	2.7	3.0	µg/L	J	MDLRL
Nickel, Total	E 200.7	OW-30	2203D54-002D	0.082	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-14	2203D54-004D	0.086	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	DUP-3-24-22	2203D54-007D	0.084	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-3-24-22	2203D54-001D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-64	2203D54-003D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	STP-1-NW	2203D54-005D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-44	2203D54-006D	0.0042	0.010	mg/L	J-	LR-LCS, MDLRL
n-Propylbenzene	SW8260B	STP-1-NW	2203d54-005a	0.28	1.0	µg/L	J	MDLRL
Phenanthrene	SW8270C	OW-64	2203d54-003c	0.94	0.10	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	OW-14	2203d54-004c	0.22	0.10	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	OW-30	2203d54-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	STP-1-NW	2203d54-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	MKTF-44	2203d54-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.10	µg/L	UJ	ERPD-LCS
p-Isopropyltoluene	SW8260B	OW-64	2203d54-003a	0.30	1.0	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	OW-14	2203d54-004a	0.43	1.0	µg/L	J	MDLRL
Pyrene	SW8270C	EB-3-24-22	2203d54-001c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-30	2203d54-002c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-14	2203d54-004c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-44	2203d54-006c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-3-24-22	2203d54-007c	ND	0.20	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-64	2203d54-003c	0.44	0.20	µg/L	JB	ERPD-LCS, MBD
Pyrene	SW8270C	STP-1-NW	2203d54-005c	0.16	0.20	µg/L	U	ERPD-LCS, MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Total	E200.8	OW-64	2203D54-003D	0.00039	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	STP-1-NW	2203D54-005E	0.0024	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	OW-30	2203d54-002a	0.20	1.0	µg/L	J	MDLRL
Toluene	SW8260B	OW-64	2203d54-003a	0.22	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	STP-1-NW	2203D54-005C	0.19	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-3-24-22	2203D54-001C	0.027	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	MKTF-44	2203D54-006C	0.028	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-64	2203D54-003a	0.66	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	OW-30	2203D54-002C	0.11	0.080	mg/L	JB	MBD
TPH ORO	SW8015	EB-3-24-22	2203D54-001C	0.090	0.080	mg/L	U	MBD
TPH ORO	SW8015	DUP-3-24-22	2203D54-007C	0.095	0.080	mg/L	U	MBD
Vanadium, Dissolved	E 200.7	OW-64	2203D54-003E	0.0035	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	STP-1-NW	2203D54-005E	0.034	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-64	2203D54-003D	0.0061	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	STP-1-NW	2203D54-005D	0.034	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-30	2203d54-002a	0.85	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	STP-1-NW	2203D54-005E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-44	2203D54-006E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-3-24-22	2203D54-001E	0.0071	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-30	2203D54-002E	0.0052	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-64	2203D54-003E	0.0081	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-14	2203D54-004E	0.0091	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-3-24-22	2203D54-007E	0.0080	0.010	mg/L	U	EBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/08/2022
Date Validated: 03/31/2022 *revised 11/16/2022*	Sample End Date: 03/08/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203496	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist and Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-3-8-22	2203496-001
BW-5C	2203496-002
BW-5B	2203496-003
OW-50	2203496-004
OW-52	2203496-005
OW-29	2203496-006
MKTF-43	2203496-007
OW-10	2203496-008
DUP-3-8-22	2203496-009
FB 3-8-22	2203496-010
Trip Blank	2203496-011

This data validation report was revised to incorporate data from a re-issued laboratory report with changes in analytes, results, and quality control information.

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)
- ✓ Data Relationships (Item 23)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, February 2021.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
JB	Estimated concentration due to blank contamination
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 728 data points. The data completeness calculation does not include any submitted blank sample results. Sixty-eight data points were rejected. The data completeness measure for this data package is calculated to be 90.66% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270: Samples with "S" flagged surrogates were reextracted and reanalyzed to confirm the original data.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits

J – The identification of the analyte is acceptable; the reported value is an estimate.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – % RPD is outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	MKTF-43	Select Dissolved Metals	5
200.8	Multiple Samples	Select Total and Dissolved Metals	5
8015D	OW-29	GRO	5
200.8	BW-5B	Barium (Total and Dissolved)	10
200.8	MKTF-43	Select Total Metals	10
200.8	MKTF-43	Select Dissolved Metals	20
200.8	BW-5C, DUP-3-8-22	Total Barium	50
8260B	OW-29	MTBE	100

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.0°C and 1.6°C as noted on the CoC and the *Sample Log-in Check List*. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 5.8°C as noted on the CoC.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions. **DRO was detected in the laboratory blank for Method 8015D batch 66084 at a concentration of 0.030 mg/L. DRO results in the associated samples that were less than the laboratory reporting limit were assigned U qualifiers. DRO results greater than the laboratory reporting limit but less than 10 times the blank concentration were qualified assigned JB qualifiers.** Non-detections of DRO in the associated samples and results greater than ten times the blank concentration did not require qualification. **GRO was detected in the laboratory blank for Method 8015D batch R86565 at a concentration of 0.042 mg/L. GRO results in the associated samples that were less than the laboratory reporting limit were assigned U qualifiers. GRO results greater than the laboratory reporting limit but less than 10 times the blank concentration were qualified assigned JB qualifiers.** GRO results greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Dissolved Metals	C86413	EB-3-8-22
200.8	Total Metals	66151	Not Prepared
200.8	Total Metals	66191	EB-3-8-22, OW-50
200.8	Dissolved Antimony	A86624	Not Prepared
200.8	Dissolved Metals	B86418	Not Prepared
200.8	Dissolved Metals	B86537	EB-3-8-22, OW-52
200.8	Dissolved Metals	B86600	OW-10, DUP-3-8-22
200.8	Dissolved Metals	C86418	Not Prepared
245.1	Total Mercury	66216	OW-52
245.1	Dissolved Mercury	66259	Not Prepared
504.1	EDB	66148	Not Prepared
4500CN E	Cyanide	WG1831850	Not Associated, EB-3-8-22
4500CN E	Cyanide	WG1832545	Not Associated, DUP-3-8-22
8015D	TPH DRO and MRO	66084	Not Prepared
8015D	GRO	R86565	EB-3-8-22
8260B	VOC	B86433	BW-5C
8260B	MTBE	B86459	Not Prepared
8270C SIM	SVOC	66057	Not Prepared
8270C	SVOC	66091	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS/LCSD RPD	RPD QC Limits
8270 SIM	Naphthalene	66057	40.0%	25.6%
8270 SIM	1-Methylnaphthalene	66057	38.9%	25.0%
8270 SIM	2-Methylnaphthalene	66057	37.7%	25.0%
8270 SIM	Acenaphthene	66057	31.4%	27.8%

The identified analytes were not detected in the associated samples, and the results were assigned UJ qualifiers due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	2-Fluorophenol	EB-3-8-22	29.0%	29.4-87.7%
8270C	Phenol-d_5	EB-3-8-22	21.9%	28.5-64.7%
8270C	Nitrobenzene-d_5	EB-3-8-22	36.8%	36.9-103%
8270C	2-Fluorobiphenyl	EB-3-8-22	36.7%	38.1-99.9%
8270C	2-Fluorophenol	OW-50	0.0%	29.4-87.7%
8270C	Phenol-d_5	OW-50	1.7%	28.5-64.7%
8270C	Nitrobenzene-d_5	OW-50	0.0%	36.9-103%
8270C	2-Fluorobiphenyl	OW-50	11.5%	38.1-99.9%
8270C	2-Fluorophenol	OW-52	1.4%	29.4-87.7%
8270C	Phenol-d_5	OW-52	2.1%	28.5-64.7%
8270C	Nitrobenzene-d_5	OW-52	2.0%	36.9-103%
8270C	2-Fluorobiphenyl	OW-52	5.4%	38.1-99.9%
8270C	2-Fluorophenol	OW-29	2.1%	29.4-87.7%
8270C	Phenol-d_5	OW-29	6.9%	28.5-64.7%
8270C	Nitrobenzene-d_5	OW-29	3.1%	36.9-103%
8270C	2-Fluorobiphenyl	OW-29	15.5%	38.1-99.9%
8270C	2-Fluorophenol	MKTF-43	0.0%	29.4-87.7%
8270C	Phenol-d_5	MKTF-43	2.1%	28.5-64.7%
8270C	2,4,6-Tribromophenol	MKTF-43	2.3%	18.6-129%
8270C	Nitrobenzene-d_5	MKTF-43	0.0%	36.9-103%
8270C	2-Fluorobiphenyl	MKTF-43	3.0%	38.1-99.9%
8270C	2-Fluorophenol	OW-10	0.0%	29.4-87.7%
8270C	Phenol-d_5	OW-10	1.3%	28.5-64.7%
8270C	Nitrobenzene-d_5	OW-10	0.0%	36.9-103%
8270C	2-Fluorobiphenyl	OW-10	3.4%	38.1-99.9%
8270C	2-Fluorophenol	DUP-3-8-22	0.0%	29.4-87.7%
8270C	Phenol-d_5	DUP-3-8-22	2.0%	28.5-64.7%

VALIDATION CRITERIA CHECKLIST

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**Nitrobenzene-d_5**	**DUP-3-8-22**	**0.0%**	**36.9-103%**
8270C	**2-Fluorobiphenyl**	**DUP-3-8-22**	**8.3%**	**38.1-99.9%**

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

The target analytes associated with surrogate recoveries that were less than the lower laboratory QC limits were not detected in the affected samples, and these results were qualified as UJ due to evidence of potential low bias.

The target analytes associated with surrogate recoveries that were less than 10% were qualified as R if not detected in the identified samples indicating rejected results, data not usable. For samples OW-50 and OW-29, two of three base/neutral extractable surrogates were recovered above 10%, and these undetected associated results were qualified as UJ.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-8-22, and one equipment blank sample, EB-3-8-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-3-8-22	8260B	Chloromethane	0.47 µg/L
EB-3-8-22	8015D	Gasoline Range Organics (GRO)	0.040 mg/L
EB-3-8-22	**200.8**	**Dissolved Chromium**	**0.00027 mg/L**
EB-3-8-22	**245.1**	**Dissolved Mercury**	**0.00010 mg/L**
EB-3-8-22	**200.7**	**Dissolved Zinc**	**0.0054 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. The detection of dissolved zinc in the associated sample OW-29 that was greater than the reporting limit but less than 10 times the blank result was assigned a JB qualifier. Non-detections of the identified analytes in the associated samples did not require qualification.

The GRO results for the samples in batch R86565 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-3-8-22 was collected as a field duplicate of sample West BW-5C.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

An RPD value could not be calculated for dissolved nickel for the field duplicate pair BW-5C and DUP-3-8-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, dissolved nickel was qualified as J and UJ for the parent and duplicate samples, respectively.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1831850	Not Associated
4500CN E	Cyanide	WG1832545	Not Associated, OW-10

The RPD for the laboratory duplicate prepared from a project sample could not be calculated because both measurements were reported as not detected.

The RPD values for laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic and acceptable?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270), and the results were in agreement? Yes

Comments: Target analytes were not reported by more than one method in this data set, with the following exception.

The target analyte 1,2-dibromoethane (EDB) was reported from analyses by both Method 8260B and Method 504.1. This analyte was reported as not detected by both methods. Qualification of data was not required.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The total metals concentrations were greater than or equal to the dissolved fractions, with the following exceptions.

Sample ID	Analyte	Total Result	Dissolved Result	Reporting Limit	Units	RPD
EB-3-8-22	Mercury	ND	0.00010	0.00020	mg/L	----- ♦
BW-5B	Mercury	ND	0.00010	0.00020	mg/L	----- ♦
OW-52	Arsenic	0.00075	0.00079	0.0010	mg/L	♦
OW-52	Barium	0.035	0.043	0.0010	mg/L	20.5%
OW-10	Barium	0.049	0.051	0.0010 / 0.0050	mg/L	4.0%
MKTF-43	Cadmium	ND	0.0030	0.0050 / 0.010	mg/L	----- ♦
EB-3-8-22	Chromium	ND	0.00027	0.0010	mg/L	----- ♦
OW-50	Chromium	ND	0.00025	0.0010	mg/L	----- ♦
MKTF-43	Cobalt	0.0021	0.023	0.010 / 0.030	mg/L	♦
OW-10	Cobalt	ND	0.0032	0.0010 / 0.0060	mg/L	----- ♦
BW-5B	Nickel	0.0029	0.011	0.0010	mg/L	♦
BW-5B	Selenium	0.00076	0.0011	0.0010	mg/L	♦
OW-52	Vanadium	0.0067	0.011	0.0010 / 0.050	mg/L	♦
EB-3-8-22	Zinc	ND	0.0054	0.010	mg/L	----- ♦
BW-5B	Zinc	ND	0.0074	0.010	mg/L	----- ♦
OW-50	Zinc	ND	0.0086	0.010	mg/L	----- ♦
OW-52	Zinc	ND	0.0049	0.010	mg/L	----- ♦
OW-29	Zinc	ND	0.010	0.010	mg/L	----- ♦
MKTF-43	Zinc	ND	0.020	0.10 / 0.050	mg/L	----- ♦
OW-10	Zinc	ND	0.0094	0.010	mg/L	----- ♦

----- *RPD could not be calculated.*

♦ *= One or both of the detections were less than 5 times the applicable reporting limits, and qualification of data was not required.*

The differences for the corresponding analytical results were within five times the applicable reporting limits, and validation action was not required, or the RPDs between the results were less than 30% indicating that the data were within the measurement uncertainty for the methods, and qualification of results was not required based on the analytical inconsistencies.

FIELD DUPLICATE SUMMARY

Client Sample ID: BW-5C Field Duplicate Sample ID: DUP-3-8-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
1,1-Dichloroethane	SW8260B	0.82 µg/L	0.81 µg/L	1.2% +/-RL
1,2-Dichloroethane	SW8260B	0.68 µg/L	0.67 µg/L	1.5% +/-RL
MTBE	SW8260B	24 µg/L	25 µg/L	4.1%
1,4-Dioxane	SW8270C	2.2 µg/L	2.4 µg/L	8.7%
TPH GRO	SW8015	0.062 mg/L	0.060 mg/L	3.3% +/-RL
TPH DRO	SW8015	0.069 mg/L	0.071 mg/L	2.9% +/-RL
Mercury, Dissolved	E245.1	0.00014 mg/L	0.00012 mg/L	15.4% +/-RL
Mercury, Total	E245.1	0.00042 mg/L	0.00042 mg/L	0.0%
Arsenic, Dissolved	E200.8	0.00043 mg/L	ND (0.0050 mg/L)	DL
Arsenic, Total	E200.8	0.0026 mg/L	0.0025 mg/L	3.9%
Barium, Dissolved	E200.8	0.11 mg/L	0.12 mg/L	8.7%
Barium, Total	E200.8	1.6 mg/L	1.6 mg/L	0.0%
Beryllium, Total	E200.8	0.0016 mg/L	0.0022 mg/L	31.6% +/-RL
Chromium, Dissolved	E200.8	0.00048 mg/L	0.0015 mg/L	103.0% +/-RL
Chromium, Total	E200.8	0.045 mg/L	0.049 mg/L	8.5%
Cobalt, Total	E200.8	0.011 mg/L	0.012 mg/L	8.7%
Lead, Total	E200.8	0.014 mg/L	0.014 mg/L	0.0%
Nickel, Dissolved	**E200.8**	**0.0025 mg/L**	**ND (0.0050 mg/L)**	**DL**
Nickel, Total	E200.8	0.033 mg/L	0.035 mg/L	5.9%
Selenium, Dissolved	E200.8	0.00045 mg/L	ND (0.0050 mg/L)	DL
Selenium, Total	E200.8	0.003 mg/L	0.0027 mg/L	10.5%
Silver, Total	E200.8	0.0003 mg/L	0.00033 mg/L	9.5% +/-RL
Vanadium, Total	E200.8	0.041 mg/L	0.049 mg/L	17.8%
Zinc, Total	E200.8	0.041 mg/L	0.046 mg/L	11.5%
Cobalt, Dissolved	E 200.7	ND (0.0060 mg/L)	0.0035 mg/L	DL
Zinc, Dissolved	E 200.7	0.0073 mg/L	0.0069 mg/L	5.6% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

An RPD value could not be calculated for dissolved nickel for the field duplicate pair BW-5C and DUP-3-8-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, dissolved nickel was qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	BW-5C	2203496-002a	0.82	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	BW-5B	2203496-003a	0.54	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-10	2203496-008a	0.73	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-3-8-22	2203496-009a	0.81	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	OW-10	2203496-008a	0.47	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	BW-5C	2203496-002a	0.68	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	BW-5B	2203496-003a	0.49	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-50	2203496-004a	0.52	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-52	2203496-005a	0.51	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-29	2203496-006a	0.53	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-10	2203496-008a	0.51	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-3-8-22	2203496-009a	0.67	1.0	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
1,4-Dichlorobenzene	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
1,4-Dichlorobenzene	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
1,4-Dichlorobenzene	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dichlorobenzene	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dichlorobenzene	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dichlorobenzene	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dioxane	SW8270C	BW-5B	2203496-003c	0.42	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-29	2203496-006c	0.64	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	EB-3-8-22	2203496-001c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-5C	2203496-002c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-5B	2203496-003c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-50	2203496-004c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-52	2203496-005c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-29	2203496-006c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-43	2203496-007c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-10	2203496-008c	ND	0.10	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-3-8-22	2203496-009c	ND	0.10	µg/L	UJ	ERPD-LCS
2,4,6-Trichlorophenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dimethylphenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
2-Methylnaphthalene	SW8270C	EB-3-8-22	2203496-001c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-5C	2203496-002c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-5B	2203496-003c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-50	2203496-004c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-52	2203496-005c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-29	2203496-006c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-43	2203496-007c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-10	2203496-008c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-3-8-22	2203496-009c	ND	0.10	µg/L	UJ	ERPD-LCS
2-Methylphenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
3,4-Methylphenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
Acenaphthene	SW8270C	EB-3-8-22	2203496-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-5C	2203496-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-5B	2203496-003c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-50	2203496-004c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-52	2203496-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-29	2203496-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-43	2203496-007c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-10	2203496-008c	ND	0.10	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-3-8-22	2203496-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Acetone	SW8260B	OW-29	2203496-006a	3.0	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5C	2203496-002E	0.00043	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5B	2203496-003E	0.00079	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-52	2203496-005E	0.00079	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-29	2203496-006E	0.00059	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-5B	2203496-003D	0.00096	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-52	2203496-005D	0.00075	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-29	2203496-006D	0.00076	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-43	2203496-007D	0.0028	0.010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-10	2203496-008D	0.00065	0.0010	mg/L	J	MDLRL
Benzoic Acid	SW8270C	OW-52	2203496-005C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	MKTF-43	2203496-007C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-10	2203496-008C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	DUP-3-8-22	2203496-009C	ND	20	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Benzoic Acid	SW8270C	EB-3-8-22	2203496-001C	ND	20	µg/L	UJ	LR-SUR
Benzoic Acid	SW8270C	OW-50	2203496-004C	ND	20	µg/L	UJ	LR-SUR
Benzoic Acid	SW8270C	OW-29	2203496-006C	ND	20	µg/L	UJ	LR-SUR
Beryllium, Total	E200.8	DUP-3-8-22	2203496-009D	0.0022	0.0050	mg/L	J	MDLRL
Bis(2-ethylhexyl)phthalate	SW8270C	OW-52	2203496-005C	ND	10	µg/L	R	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	MKTF-43	2203496-007C	ND	10	µg/L	R	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	OW-10	2203496-008C	ND	10	µg/L	R	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	DUP-3-8-22	2203496-009C	ND	10	µg/L	R	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	EB-3-8-22	2203496-001C	ND	10	µg/L	UJ	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	OW-50	2203496-004C	ND	10	µg/L	UJ	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	OW-29	2203496-006C	ND	10	µg/L	UJ	LR-SUR
Cadmium, Dissolved	E200.8	MKTF-43	2203496-007E	0.0030	0.010	mg/L	J	MDLRL
Chloromethane	SW8260B	EB-3-8-22	2203496-001a	0.47	3.0	µg/L	J	MDLRL
Chromium, Dissolved	E200.8	BW-5C	2203496-002E	0.00048	0.0010	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	BW-5B	2203496-003E	0.00069	0.0010	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	OW-50	2203496-004E	0.00025	0.0010	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	OW-52	2203496-005E	0.00041	0.0010	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	OW-29	2203496-006E	0.00048	0.0010	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	DUP-3-8-22	2203496-009E	0.0015	0.0050	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	EB-3-8-22	2203496-001E	0.00027	0.0010	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-43	2203496-007E	0.023	0.030	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-10	2203496-008E	0.0032	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	DUP-3-8-22	2203496-009E	0.0035	0.0060	mg/L	J	MDLRL
Cobalt, Total	E200.8	BW-5B	2203496-003D	0.00021	0.0010	mg/L	J	MDLRL
Cobalt, Total	E200.8	OW-52	2203496-005D	0.00048	0.0010	mg/L	J	MDLRL
Cobalt, Total	E200.8	OW-29	2203496-006D	0.00089	0.0010	mg/L	J	MDLRL
Cobalt, Total	E200.8	MKTF-43	2203496-007D	0.0021	0.010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cyanide, Total	E335.4	OW-50	2203496-004F	3.29	5.00	µg/L	J	MDLRL
Diethylphthalate	SW8270C	OW-52	2203496-005C	ND	10	µg/L	R	LR-SUR
Diethylphthalate	SW8270C	MKTF-43	2203496-007C	ND	10	µg/L	R	LR-SUR
Diethylphthalate	SW8270C	OW-10	2203496-008C	ND	10	µg/L	R	LR-SUR
Diethylphthalate	SW8270C	DUP-3-8-22	2203496-009C	ND	10	µg/L	R	LR-SUR
Diethylphthalate	SW8270C	EB-3-8-22	2203496-001C	ND	10	µg/L	UJ	LR-SUR
Diethylphthalate	SW8270C	OW-50	2203496-004C	ND	10	µg/L	UJ	LR-SUR
Diethylphthalate	SW8270C	OW-29	2203496-006C	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	OW-52	2203496-005C	ND	10	µg/L	R	LR-SUR
Dimethylphthalate	SW8270C	MKTF-43	2203496-007C	ND	10	µg/L	R	LR-SUR
Dimethylphthalate	SW8270C	OW-10	2203496-008C	ND	10	µg/L	R	LR-SUR
Dimethylphthalate	SW8270C	DUP-3-8-22	2203496-009C	ND	10	µg/L	R	LR-SUR
Dimethylphthalate	SW8270C	EB-3-8-22	2203496-001C	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	OW-50	2203496-004C	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	OW-29	2203496-006C	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	OW-52	2203496-005C	ND	10	µg/L	R	LR-SUR
Di-n-butylphthalate	SW8270C	MKTF-43	2203496-007C	ND	10	µg/L	R	LR-SUR
Di-n-butylphthalate	SW8270C	OW-10	2203496-008C	ND	10	µg/L	R	LR-SUR
Di-n-butylphthalate	SW8270C	DUP-3-8-22	2203496-009C	ND	10	µg/L	R	LR-SUR
Di-n-butylphthalate	SW8270C	EB-3-8-22	2203496-001C	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	OW-50	2203496-004C	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	OW-29	2203496-006C	ND	10	µg/L	UJ	LR-SUR
Di-n-octylphthalate	SW8270C	OW-52	2203496-005C	ND	20	µg/L	R	LR-SUR
Di-n-octylphthalate	SW8270C	MKTF-43	2203496-007C	ND	20	µg/L	R	LR-SUR
Di-n-octylphthalate	SW8270C	OW-10	2203496-008C	ND	20	µg/L	R	LR-SUR
Di-n-octylphthalate	SW8270C	DUP-3-8-22	2203496-009C	ND	20	µg/L	R	LR-SUR
Di-n-octylphthalate	SW8270C	EB-3-8-22	2203496-001C	ND	20	µg/L	UJ	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Di-n-octylphthalate	SW8270C	OW-50	2203496-004C	ND	20	µg/L	UJ	LR-SUR
Di-n-octylphthalate	SW8270C	OW-29	2203496-006C	ND	20	µg/L	UJ	LR-SUR
Lead, Dissolved	E200.8	BW-5B	2203496-003E	0.00010	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	BW-5B	2203496-003D	0.00015	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-52	2203496-005D	0.00023	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-29	2203496-006D	0.00028	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-43	2203496-007D	0.0015	0.0050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-10	2203496-008D	0.00011	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	BW-5C	2203496-002E	0.00014	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	BW-5B	2203496-003E	0.00010	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	DUP-3-8-22	2203496-009E	0.00012	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EB-3-8-22	2203496-001E	0.00010	0.00020	mg/L	J	MDLRL
MTBE	SW8260B	MKTF-43	2203496-007a	0.51	1.0	µg/L	J	MDLRL
Naphthalene	SW8270C	EB-3-8-22	2203496-001c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-5C	2203496-002c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-5B	2203496-003c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-50	2203496-004c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-52	2203496-005c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-29	2203496-006c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-43	2203496-007c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-10	2203496-008c	ND	0.10	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-3-8-22	2203496-009c	ND	0.10	µg/L	UJ	ERPD-LCS
Nickel, Dissolved	E200.8	BW-5C	2203496-002E	0.0025	0.0010	mg/L	J	ERPD-FD
Nickel, Dissolved	E200.8	DUP-3-8-22	2203496-009E	ND	0.0050	mg/L	UJ	ERPD-FD
Nickel, Dissolved	E200.8	OW-52	2203496-005E	0.00057	0.0010	mg/L	J	MDLRL
Nickel, Total	E200.8	OW-52	2203496-005D	0.00092	0.0010	mg/L	J	MDLRL
Nickel, Total	E200.8	MKTF-43	2203496-007D	0.0082	0.010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	OW-50	2203496-004C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	OW-52	2203496-005C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	OW-29	2203496-006C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	MKTF-43	2203496-007C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	OW-10	2203496-008C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	DUP-3-8-22	2203496-009C	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	EB-3-8-22	2203496-001C	ND	5.0	µg/L	UJ	LR-SUR
Pyridine	SW8270C	OW-52	2203496-005C	ND	10	µg/L	R	LR-SUR
Pyridine	SW8270C	MKTF-43	2203496-007C	ND	10	µg/L	R	LR-SUR
Pyridine	SW8270C	OW-10	2203496-008C	ND	10	µg/L	R	LR-SUR
Pyridine	SW8270C	DUP-3-8-22	2203496-009C	ND	10	µg/L	R	LR-SUR
Pyridine	SW8270C	EB-3-8-22	2203496-001C	ND	10	µg/L	UJ	LR-SUR
Pyridine	SW8270C	OW-50	2203496-004C	ND	10	µg/L	UJ	LR-SUR
Pyridine	SW8270C	OW-29	2203496-006C	ND	10	µg/L	UJ	LR-SUR
Selenium, Dissolved	E200.8	BW-5C	2203496-002E	0.00045	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	BW-5B	2203496-003D	0.00076	0.0010	mg/L	J	MDLRL
Silver, Total	E200.8	BW-5C	2203496-002D	0.00030	0.00050	mg/L	J	MDLRL
Silver, Total	E200.8	DUP-3-8-22	2203496-009D	0.00033	0.00050	mg/L	J	MDLRL
TPH DRO	SW8015	BW-5C	2203496-002C	0.069	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-43	2203496-007C	0.13	0.064	mg/L	JB	MBD
TPH DRO	SW8015	OW-10	2203496-008C	0.080	0.064	mg/L	JB	MBD
TPH DRO	SW8015	DUP-3-8-22	2203496-009C	0.071	0.064	mg/L	JB	MBD
TPH DRO	SW8015	BW-5B	2203496-003C	0.031	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-50	2203496-004C	0.030	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-52	2203496-005C	0.026	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	BW-5C	2203496-002a	0.062	0.050	mg/L	JB	MBD
TPH GRO	SW8015	BW-5B	2203496-003a	0.054	0.050	mg/L	JB	MBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	OW-50	2203496-004a	0.085	0.050	mg/L	JB	MBD
TPH GRO	SW8015	DUP-3-8-22	2203496-009a	0.060	0.050	mg/L	JB	MBD
TPH GRO	SW8015	EB-3-8-22	2203496-001a	0.040	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-52	2203496-005a	0.049	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-43	2203496-007a	0.039	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-10	2203496-008a	0.042	0.050	mg/L	U	MBD, MDLRL
Vanadium, Dissolved	E 200.7	BW-5B	2203496-003E	0.0084	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-52	2203496-005E	0.011	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-10	2203496-008E	0.0051	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-29	2203496-006E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	BW-5C	2203496-002E	0.0073	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	BW-5B	2203496-003E	0.0074	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-50	2203496-004E	0.0086	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-52	2203496-005E	0.0049	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-43	2203496-007E	0.020	0.050	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-10	2203496-008E	0.0094	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-3-8-22	2203496-009E	0.0069	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-3-8-22	2203496-001E	0.0054	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, GW Sampling 2022	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/09/2022
Date Validated: 03/30/2022	Sample End Date: 03/09/2022
Parameters Included: ▪ Total Suspended Solids (TSS) by Standard Methods for the Examination of Water and Wastewater (SM) Method 2540D	
Laboratory Project ID: 2203571	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- Laboratory control samples (LCS)

Method compliance was established by reviewing sample integrity, holding times, detection limits, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
MKTF-41	2203571-001
MKTF-32	2203571-002
MKTF-34	2203571-003

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ⊗ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ✓ Laboratory Blanks (Items 11 and 12)
- ○ Matrix Spikes (MS) and Matrix Spike Duplicates (MSD) ((Items 13 and 14)
- ✓ LCS (Items 15 and 16)
- ○ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ○ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ○ Field Duplicates (Items 20 and 21)
- ○ Laboratory Duplicates (Item 22)
- ○ Data Relationships (Item 23)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Trihydro Data Validation Variance Documentation, February 2021.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
UJ	Estimated reporting limit

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 3 data points. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	Yes
Comments: The laboratory did not identify non-conformances regarding the analytical data.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	Yes
Comments: The laboratory did not apply qualification flags or other notes to the data in the laboratory report.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The reporting limits for the analyses were reviewed and appeared to be acceptable. Dilutions were not applied for the analyses of the submitted samples.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	Yes
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.9°C and 3.5°C as noted on the CoC and the *Sample Log-in Check List*. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	No
Comments: The samples were not analyzed within method-specific holding times. Method 2540D: **The submitted samples were analyzed outside the defined holding time of 7 days by approximately 1 day. Detected results for samples MKTF-32 and MKTF-34 by Method 2540D were assigned J qualifiers based on the holding time exceedances. The non-detect result for sample MKTF-41 was assigned a UJ qualifier based on the holding time exceedance.**	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	

VALIDATION CRITERIA CHECKLIST	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	Yes
Comments: Target analytes were reported as not detected in the laboratory blanks.	
13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	No
Comments: The total number of matrix spike samples prepared was not equal to at least 5% of the total number of samples. Matrix spikes were not prepared for the analyses in this data set.	
14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits?	N/A
Comments: MS/MSD samples were not prepared using project samples as the sample source.	
15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.	
16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits?	Yes
Comments: The LCS percent recoveries were within laboratory QC limits. LCSDs were not analyzed as part of this sample set.	
17. Were surrogate recoveries within laboratory QC limits?	N/A
Comments: Surrogates were not required for the analyses included in this data set.	
18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples?	N/A
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Field duplicates were not collected as part of this sample set.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	N/A
Comments: Field duplicates were not collected as part of this sample set.	
22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits?	N/A
Comments: Laboratory duplicate samples were not prepared for this sample set.	

VALIDATION CRITERIA CHECKLIST	
23. Were the following data relationships realistic and acceptable?	
• Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270), and the results were in agreement?	N/A
Comments: Target analytes were not reported by more than one method.	
• Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results?	N/A
Comments: Total and dissolved metals analyses were not performed for this data set.	

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HT-AN	Sample was analyzed outside of the method holding time.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Solids, Total Suspended	SM 2540 D	MKTF-32	2203571-002A	91	4.0	mg/L	J	HT-AN
Solids, Total Suspended	SM 2540 D	MKTF-34	2203571-003A	27	4.0	mg/L	J	HT-AN
Solids, Total Suspended	SM 2540 D	MKTF-41	2203571-001A	ND	4.0	mg/L	UJ	HT-AN

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/09/2022
Date Validated: 04/04/2022 *revised 11/16/2022*	Sample End Date: 03/09/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203574	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist and Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
MKTF-42	2203574-001
MKTF-41	2203574-002
MKTF-32	2203574-003
MKTF-34	2203574-004
PW-3	2203574-005
PW-4	2203574-006
DUP-3-9-22	2203574-007
EB-3-9-22	2203574-008
FB 3-9-22	2203574-009
Trip Blank	2203574-010

This data validation report was revised to incorporate data from a re-issued laboratory report with changes in analytes, results, and quality control information.

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)
- ✓ Data Relationships (Item 23)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, February 2021.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
JB	Estimated concentration due to blank contamination
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 637 data points. The data completeness calculation does not include any submitted blank sample results. Six data points were rejected. The data completeness measure for this data package is calculated to be 99.06% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270: "S" flagged surrogates are due to sample dilution and/or matrix interferences.

Method 8015D: "S" flagged surrogates are due to sample dilution and/or matrix interferences.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits

J – The identification of the analyte is acceptable; the reported value is an estimate.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – % RPD is outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8015	MKTF-32, DUP-3-9-22	GRO	2
8260B	MKTF-32, DUP-3-9-22	VOCs	2
200.8	Multiple Samples	Select Total and Dissolved Metals	5
504.1	Multiple Samples	EDB	10
8270C	MKTF-42, DUP-3-9-22	SVOCs	10
8270 SIM	MKTF-42	1,4-Dioxane	20
8015D	MKTF-42, DUP-3-9-22	DRO and MRO	20
8260B	MKTF-32	MTBE	20
8270 SIM	MKTF-42, MKTF-41, DUP-3-9-22	SVOCs	20

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.9°C and 3.5°C as noted on the CoC and the *Sample Log-in Check List*. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

Samples transferred to Pace National were assumed to be received within the recommended temperature range, since results to the contrary were not reported.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8260B	**Chloromethane**	**R86565**	**0.65 µg/L**
8260B	**Trichloroethene**	**R86565**	**0.24 µg/L**
8015D	**GRO**	**R86565**	**0.042 mg/L**
8015D	**DRO**	**66129**	**0.026 mg/L**
245.1	**Dissolved and Total Mercury**	**66260**	**0.00012 mg/L**

Detections of the identified analytes in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Dissolved Metals	C86413	EB-3-9-22
200.8	Total Metals	66151	Not Prepared
200.8	Total Metals	66191	Not Prepared
200.8	Dissolved Metals	A86537	Not Prepared
200.8	Dissolved Metals	A86624	Not Prepared
200.8	Dissolved Metals	B86600	Not Prepared
245.1	Dissolved and Total Mercury	66259	MKTF-41
245.1	Dissolved and Total Mercury	66260	EB-3-9-22
504.1	EDB	66232	Not Prepared
4500CN E	Cyanide	WG1832548	Not Associated, PW-4
8015D	TPH DRO and MRO	66129	Not Prepared
8015D	GRO	R86565	Not Prepared
8260B	VOCs	R86565	MKTF-42
8270C	SVOCs	66111	Not Prepared
8270C SIM	SVOCs	66214	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
8270C	**1,4-Dichlorobenzene**	**66111**	**Acceptable**	**Acceptable**	**15.0-87.6%**	**32.0%**	**30.4%**
8270C	**Phenol**	**66111**	**Acceptable**	**Acceptable**	**16.8-70.5%**	**38.9%**	**37.2%**
200.8	**Dissolved Selenium**	**A86537**	**69.2%**	**-----**	**70-130%**	**-----**	**-----**
245.1	**Mercury**	**66259**	**143%**	**-----**	**70-130%**	**-----**	**-----**
245.1	**Mercury**	**66260**	**140%**	**-----**	**70-130%**	**-----**	**-----**

1,4-Dichlorobenzene and phenol were not detected in the associated samples in Method 8270C batch 66111, and these results were assigned UJ qualifiers due to evidence of poor precision.

Dissolved selenium was not detected in the associated sample EB-3-9-22, and this result was qualified as UJ due to potential low bias.

Detections of mercury in the associated samples in Method 245.1 batches 66259 and 66260 were assigned J+ qualifiers due to evidence of potential high bias. The non-detect results for mercury in these batches did not require qualification based on these non-conformances.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-34**	**0.0%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-34**	**5.8%**	**28.5-64.7%**

Since Method 8270 surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples MKTF-41, MKTF-32, PW-3, and PW-4, and qualification of sample data was not required.

The acid fraction target analytes associated with the identified surrogate recoveries were not detected in sample MKTF-34. Since the surrogate recoveries were less than 10%, the results for the acid extractables were qualified as R indicating rejected results, data not usable, due to evidence of extreme low bias.

The DRO and MRO results for samples MKTF-42 and DUP-3-9-22 were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilutions of 20 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

The SVOC results for samples MKTF-42 and DUP-3-9-22 were not qualified based on the surrogate non-conformances in the Method 8270C analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

The SVOC results for samples MKTF-42, MKTF-41, and DUP-3-9-22 were not qualified based on the surrogate non-conformances in the Method 8270 SIM analyses since the applied dilutions of 20 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-9-22, and one equipment blank sample, EB-3-9-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Chloromethane	0.70 µg/L
Trip Blank	**8260B**	**Methylene Chloride**	**0.51 µg/L**
FB-3-9-22	**8260B**	**Acetone**	**3.1 µg/L**
FB-3-9-22	8260B	Chloromethane	0.68 µg/L
FB-3-9-22	8260B	Methylene Chloride	4.0 µg/L
EB-3-9-22	**8260B**	**1,2-Dichloroethane**	**0.41 µg/L**
EB-3-9-22	8260B	Chloromethane	0.66 µg/L
EB-3-9-22	8015D	GRO	0.039 mg/L
EB-3-9-22	8015D	DRO	0.022 mg/L
EB-3-9-22	**200.7**	**Dissolved Zinc**	**0.0045 mg/L**
EB-3-9-22	**200.8**	**Dissolved Chromium**	**0.00020 mg/L**
EB-3-9-22	245.1	Dissolved Mercury	0.000095 mg/L

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than or equal to the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloromethane, dissolved mercury, DRO, and GRO results for the samples in batches R86565, 66260, 66129, and R86565, respectively, were previously qualified due to laboratory method blank detections; therefore, additional qualification due to the trip, field, and equipment blank detections was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-3-9-22 was collected as a field duplicate of sample MKTF-42.

VALIDATION CRITERIA CHECKLIST	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	No
Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions. **The RPD values for multiple analytes exceeded the data validation limit of 30%, which was evidence of poor precision. These analyte results were qualified as J for samples MKTF-42 and DUP-3-9-22.** **An RPD value could not be calculated for total chromium for the field duplicate pair MKTF-42 and DUP-3-9-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, total chromium was qualified as J and UJ for the parent and duplicate samples, respectively.**	
22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits?	Yes
Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1832548 from sample MKTF-32 and from a sample not associated with this data set. The RPD for the laboratory duplicate prepared from a project sample was within laboratory acceptance limits. The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.	

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic and acceptable?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270), and the results were in agreement? Yes

Comments: Target analytes were not reported by more than one method in this data set, with the following exception.

The target analyte 1,2-dibromoethane (EDB) was reported from analyses by both Method 8260B and Method 504.1. This analyte was reported as not detected by both methods, or the results were less than the applicable RLs for the comparable analyses, or one or both results were within 5 times the applicable reporting limit. Validation action was not required.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The total metals concentrations were greater than or equal to the dissolved fractions, with the following exceptions.

Sample ID	Analyte	Total Result	Dissolved Result	Reporting Limit	Units	RPD
MKTF-41	Mercury	0.00011	0.00016	0.00020	mg/L	♦
PW-3	Mercury	ND	0.000093	0.00020	mg/L	----- ♦
EB-3-9-22	Mercury	ND	0.000095	0.00020	mg/L	----- ♦
MKTF-41	Arsenic	0.0021	0.0023	0.0010	mg/L	♦
MKTF-41	Barium	0.063	0.066	0.0050	mg/L	4.7%
MKTF-34	Barium	0.17	0.18	0.0050	mg/L	5.7%
PW-3	Barium	0.011	0.013	0.0010 / 0.0050	mg/L	♦
EB-3-9-22	Chromium	ND	0.00020	0.0010	mg/L	----- ♦
MKTF-34	Cobalt	0.0077	0.0080	0.0010 / 0.0060	mg/L	♦
PW-3	Cobalt	ND	0.0032	0.0010 / 0.0060	mg/L	----- ♦
PW-4	Cobalt	ND	0.0025	0.0010 / 0.0060	mg/L	----- ♦
MKTF-42	Zinc	ND	0.011	0.010	mg/L	----- ♦
MKTF-41	Zinc	ND	0.0097	0.010	mg/L	----- ♦
MKTF-34	Zinc	0.0086	0.013	0.010	mg/L	♦
PW-3	Zinc	0.0080	0.012	0.010	mg/L	♦
PW-4	Zinc	0.014	0.022	0.010	mg/L	♦
DUP-3-9-22	Zinc	ND	0.013	0.010	mg/L	----- ♦
EB-3-9-22	Zinc	ND	0.0045	0.010	mg/L	----- ♦

----- *RPD could not be calculated.*

♦ = *One or both of the detections were less than 5 times the applicable reporting limits, and qualification of data was not required.*

The differences for the corresponding analytical results were within five times the applicable reporting limits, and validation action was not required, or the RPDs between the results were less than 30% indicating that the data were within the measurement uncertainty for the methods, and qualification of results was not required based on the analytical inconsistencies.

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-42 Field Duplicate Sample ID: DUP-3-9-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Vanadium, Dissolved	E 200.7	0.058 mg/L	0.056 mg/L	3.5% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	0.013 mg/L	16.7% +/-RL
Arsenic, Dissolved	E200.8	0.0023 mg/L	0.0021 mg/L	9.1%
Arsenic, Total	E200.8	0.0024 mg/L	0.0026 mg/L	8.0%
Barium, Dissolved	E200.8	0.054 mg/L	0.053 mg/L	1.9%
Barium, Total	E200.8	0.059 mg/L	0.059 mg/L	0.0%
Chromium, Dissolved	E200.8	0.00030 mg/L	ND (0.0050 mg/L)	DL
Chromium, Total	**E200.8**	**0.0096 mg/L**	**ND (0.0010 mg/L)**	**DL**
Cobalt, Total	E200.8	0.00028 mg/L	0.00021 mg/L	28.6% +/-RL
Lead, Total	E200.8	0.00025 mg/L	0.00019 mg/L	27.3% +/-RL
Nickel, Total	E200.8	0.00063 mg/L	ND (0.0010 mg/L)	DL
Selenium, Dissolved	E200.8	0.00083 mg/L	ND (0.0050 mg/L)	DL
Selenium, Total	E200.8	0.00099 mg/L	0.00097 mg/L	2.0% +/-RL
Vanadium, Total	E200.8	0.060 mg/L	0.062 mg/L	3.3%
Mercury, Dissolved	E245.1	0.000092 mg/L	ND (0.00020 mg/L)	DL
Mercury, Total	E245.1	0.000092 mg/L	0.000095 mg/L	3.2% +/-RL
Cyanide, Total	E335.4	6.93 µg/L	3.89 µg/L	56.2% +/-RL
1,2-Dibromoethane	E504.1	0.12 µg/L	0.074 µg/L	47.4% +/-RL
TPH DRO	SW8015	23 mg/L	21 mg/L	9.1%
TPH GRO	**SW8015**	**0.21 mg/L**	**0.47 µg/L**	**76.5%**
1,1-Dichloroethane	SW8260B	0.68 µg/L	1.4 µg/L	69.2% +/-RL
1,1-Dichloroethene	SW8260B	1.1 µg/L	2.6 µg/L	81.1% +/-RL
1,2,4-Trimethylbenzene	**SW8260B**	**6.3 µg/L**	**13 µg/L**	**69.4%**
1,2-Dichloroethane	SW8260B	1.3 µg/L	2.6 µg/L	66.7% +/-RL
1,3,5-Trimethylbenzene	**SW8260B**	**2.1 µg/L**	**4.6 µg/L**	**74.6%**
Benzene	**SW8260B**	**9.5 µg/L**	**21 µg/L**	**75.4%**
Chloromethane	SW8260B	0.68 µg/L	1.3 µg/L	62.6% +/-RL
Ethylbenzene	SW8260B	1.2 µg/L	2.7 µg/L	76.9% +/-RL
Isopropylbenzene	SW8260B	1.5 µg/L	3.3 µg/L	75.0% +/-RL
MTBE	SW8260B	1.2 µg/L	2.5 µg/L	70.3% +/-RL
n-Butylbenzene	SW8260B	0.46 µg/L	1.2 µg/L	89.2% +/-RL
n-Propylbenzene	SW8260B	1.6 µg/L	3.5 µg/L	74.5% +/-RL
p-Isopropyltoluene	SW8260B	0.37 µg/L	0.84 µg/L	77.7% +/-RL
sec-Butylbenzene	SW8260B	0.38 µg/L	0.85 µg/L	76.4% +/-RL
Toluene	SW8260B	0.43 µg/L	1.2 µg/L	94.5% +/-RL
Vinyl Chloride	SW8260B	ND (1.0 µg/L)	0.87 µg/L	DL
Xylenes, Total	**SW8260B**	**26 µg/L**	**56 µg/L**	**73.2%**
Naphthalene	SW8270C	ND (2.0 µg/L)	2.0 µg/L	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD values for multiple analytes exceeded the data validation limit of 30%, which was evidence of poor precision. These analyte results were qualified as J for samples MKTF-42 and DUP-3-9-22.

An RPD value could not be calculated for total chromium for the field duplicate pair MKTF-42 and DUP-3-9-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, total chromium was qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
TBD	Trip blank detection
FBD	Field blank detection
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-42	2203574-001a	0.68	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-34	2203574-004a	0.55	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-3-9-22	2203574-007a	1.4	2	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	MKTF-34	2203574-004a	0.57	1	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	MKTF-42	2203574-001a	6.3	1	µg/L	J	ERPD-FD
1,2,4-Trimethylbenzene	SW8260B	MKTF-34	2203574-004a	0.4	1	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP-3-9-22	2203574-007a	13	2	µg/L	J	ERPD-FD
1,2-Dibromoethane	E504.1	DUP-3-9-22	2203574-007B	0.074	0.093	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-42	2203574-001a	1.3	1	µg/L	JB	EBD
1,2-Dichloroethane	SW8260B	MKTF-41	2203574-002a	2.1	1	µg/L	JB	EBD
1,2-Dichloroethane	SW8260B	MKTF-34	2203574-004a	0.54	1	µg/L	U	EBD, MDLRL
1,2-Dichloroethane	SW8260B	PW-4	2203574-006a	0.42	1	µg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2-Dichloroethane	SW8260B	DUP-3-9-22	2203574-007a	2.6	2	µg/L	JB	EBD
1,2-Dichloroethane	SW8260B	EB-3-9-22	2203574-008a	0.41	1	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	MKTF-42	2203574-001a	2.1	1	µg/L	J	ERPD-FD
1,3,5-Trimethylbenzene	SW8260B	MKTF-41	2203574-002a	0.91	1	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	DUP-3-9-22	2203574-007a	4.6	2	µg/L	J	ERPD-FD
1,4-Dichlorobenzene	SW8270C	MKTF-42	2203574-001C	ND	50	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-41	2203574-002C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-32	2203574-003C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	PW-3	2203574-005C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	PW-4	2203574-006C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	DUP-3-9-22	2203574-007C	ND	50	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	EB-3-9-22	2203574-008C	ND	5	µg/L	UJ	ERPD-LCS
2,4,6-Trichlorophenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	LR-SUR
2-Butanone	SW8260B	MKTF-34	2203574-004a	6.8	10	µg/L	J	MDLRL
2-Methylphenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	LR-SUR
Acetone	SW8260B	MKTF-34	2203574-004a	16	10	µg/L	JB	FBD
Acetone	SW8260B	FB 3-9-22	2203574-009a	3.1	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-34	2203574-004E	0.002	0.005	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	PW-3	2203574-005E	0.0037	0.005	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	PW-4	2203574-006E	0.00094	0.005	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-3-9-22	2203574-007E	0.0021	0.005	mg/L	J	MDLRL
Benzene	SW8260B	MKTF-42	2203574-001a	9.5	1	µg/L	J	ERPD-FD
Benzene	SW8260B	MKTF-41	2203574-002a	0.35	1	µg/L	J	MDLRL
Benzene	SW8260B	DUP-3-9-22	2203574-007a	21	2	µg/L	J	ERPD-FD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Bis(2-ethylhexyl)phthalate	SW8270C	MKTF-34	2203574-004C	6.2	10	µg/L	J	MDLRL
Carbon Disulfide	SW8260B	PW-4	2203574-006a	0.68	10	µg/L	J	MDLRL
Chloromethane	SW8260B	MKTF-42	2203574-001a	0.68	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-41	2203574-002a	0.67	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-32	2203574-003a	1.3	6	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	PW-3	2203574-005a	0.8	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	PW-4	2203574-006a	0.71	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP-3-9-22	2203574-007a	1.3	6	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	EB-3-9-22	2203574-008a	0.66	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB 3-9-22	2203574-009a	0.68	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203574-010a	0.7	3	µg/L	U	MBD, MDLRL
Chromium, Dissolved	E200.8	MKTF-42	2203574-001E	0.0003	0.001	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	MKTF-41	2203574-002E	0.0013	0.001	mg/L	JB	EBD
Chromium, Dissolved	E200.8	MKTF-32	2203574-003E	0.00023	0.001	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E200.8	EB-3-9-22	2203574-008E	0.0002	0.001	mg/L	J	MDLRL
Chromium, Total	E200.8	MKTF-42	2203574-001D	0.0096	0.001	mg/L	J	ERPD-FD
Chromium, Total	E200.8	MKTF-34	2203574-004D	0.00074	0.001	mg/L	J	MDLRL
Chromium, Total	E200.8	DUP-3-9-22	2203574-007D	ND	0.001	mg/L	UJ	ERPD-FD
Cobalt, Dissolved	E 200.7	PW-3	2203574-005E	0.0032	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	PW-4	2203574-006E	0.0025	0.006	mg/L	J	MDLRL
Cobalt, Total	E200.8	MKTF-42	2203574-001D	0.00028	0.001	mg/L	J	MDLRL
Cobalt, Total	E200.8	MKTF-32	2203574-003D	0.00072	0.001	mg/L	J	MDLRL
Cobalt, Total	E200.8	DUP-3-9-22	2203574-007D	0.00021	0.001	mg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-41	2203574-002F	4.04	5	µg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-32	2203574-003F	2.03	5	µg/L	J	MDLRL
Cyanide, Total	E335.4	DUP-3-9-22	2203574-007F	3.89	5	µg/L	J	MDLRL
Ethylbenzene	SW8260B	MKTF-41	2203574-002a	0.8	1	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-41	2203574-002a	0.18	1	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Dissolved	E200.8	MKTF-32	2203574-003E	0.000095	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-34	2203574-004E	0.0014	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-42	2203574-001D	0.00025	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-41	2203574-002D	0.000066	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-3-9-22	2203574-007D	0.00019	0.0005	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	MKTF-42	2203574-001E	0.000092	0.0002	mg/L	J+	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	MKTF-41	2203574-002E	0.00016	0.0002	mg/L	J+	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	MKTF-34	2203574-004E	0.00023	0.0002	mg/L	JB	HR-LCS, MBD
Mercury, Dissolved	E245.1	PW-3	2203574-005E	0.000093	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	PW-4	2203574-006E	0.000093	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	EB-3-9-22	2203574-008E	0.000095	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	MKTF-42	2203574-001D	0.000092	0.0002	mg/L	J+	HR-LCS, MDLRL
Mercury, Total	E245.1	MKTF-41	2203574-002D	0.00011	0.0002	mg/L	J+	HR-LCS, MDLRL
Mercury, Total	E245.1	MKTF-32	2203574-003D	0.000098	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	MKTF-34	2203574-004D	0.00046	0.0002	mg/L	JB	HR-LCS, MBD
Mercury, Total	E245.1	PW-4	2203574-006D	0.0001	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	DUP-3-9-22	2203574-007D	0.000095	0.0002	mg/L	U	HR-LCS, MBD, MDLRL
Methylene Chloride	SW8260B	MKTF-34	2203574-004a	1.1	3	µg/L	U	MDLRL, TBD
Methylene Chloride	SW8260B	PW-4	2203574-006a	0.53	3	µg/L	U	MDLRL, TBD
Methylene Chloride	SW8260B	FB 3-9-22	2203574-009a	4	3	µg/L	JB	TBD
Methylene Chloride	SW8260B	Trip Blank	2203574-010a	0.51	3	µg/L	J	MDLRL
MTBE	SW8260B	MKTF-41	2203574-002a	0.56	1	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-42	2203574-001a	0.46	3	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP-3-9-22	2203574-007a	1.2	6	µg/L	J	MDLRL
Nickel, Total	E200.8	MKTF-42	2203574-001D	0.00063	0.001	mg/L	J	MDLRL
Nickel, Total	E200.8	PW-3	2203574-005D	0.00097	0.001	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-41	2203574-002a	0.34	1	µg/L	J	MDLRL
Phenol	SW8270C	MKTF-42	2203574-001C	ND	50	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	MKTF-41	2203574-002C	ND	5	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-32	2203574-003C	ND	5	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-34	2203574-004C	ND	5	µg/L	R	ERPD-LCS, LR-SUR
Phenol	SW8270C	PW-3	2203574-005C	ND	5	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	PW-4	2203574-006C	ND	5	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	DUP-3-9-22	2203574-007C	ND	50	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	EB-3-9-22	2203574-008C	ND	5	µg/L	UJ	ERPD-LCS
p-Isopropyltoluene	SW8260B	MKTF-42	2203574-001a	0.37	1	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	DUP-3-9-22	2203574-007a	0.84	2	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-42	2203574-001a	0.38	1	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-32	2203574-003a	0.33	2	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	DUP-3-9-22	2203574-007a	0.85	2	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-42	2203574-001E	0.00083	0.001	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	EB-3-9-22	2203574-008E	ND	0.001	mg/L	UJ	LR-LCS
Selenium, Total	E200.8	MKTF-42	2203574-001D	0.00099	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-32	2203574-003D	0.00041	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-34	2203574-004D	0.00072	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-3-9-22	2203574-007D	0.00097	0.001	mg/L	J	MDLRL
Silver, Total	E200.8	MKTF-34	2203574-004D	0.00041	0.0005	mg/L	J	MDLRL
Toluene	SW8260B	MKTF-42	2203574-001a	0.43	1	µg/L	J	MDLRL
Toluene	SW8260B	DUP-3-9-22	2203574-007a	1.2	2	µg/L	J	MDLRL
TPH DRO	SW8015	MKTF-32	2203574-003C	0.23	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-34	2203574-004C	0.19	0.064	mg/L	JB	MBD
TPH DRO	SW8015	PW-3	2203574-005C	0.03	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	PW-4	2203574-006C	0.022	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	EB-3-9-22	2203574-008C	0.022	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-42	2203574-001a	0.21	0.05	mg/L	JB	ERPD-FD, MBD
TPH GRO	SW8015	MKTF-41	2203574-002a	0.085	0.05	mg/L	JB	MBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	PW-3	2203574-005a	0.041	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	PW-4	2203574-006a	0.042	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	DUP-3-9-22	2203574-007a	0.47	0.1	mg/L	J	ERPD-FD
TPH GRO	SW8015	EB-3-9-22	2203574-008a	0.039	0.05	mg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	MKTF-41	2203574-002a	0.35	1	µg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	MKTF-32	2203574-003a	0.52	2	µg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	MKTF-34	2203574-004a	0.69	1	µg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	PW-4	2203574-006a	0.22	1	µg/L	U	MBD, MDLRL
Vanadium, Dissolved	E 200.7	MKTF-41	2203574-002E	0.03	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-32	2203574-003E	0.0063	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	PW-3	2203574-005E	0.0026	0.05	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	PW-4	2203574-006a	0.46	1	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	DUP-3-9-22	2203574-007a	0.87	2	µg/L	J	MDLRL
Xylenes, Total	SW8260B	MKTF-42	2203574-001a	26	1.5	µg/L	J	ERPD-FD
Xylenes, Total	SW8260B	DUP-3-9-22	2203574-007a	56	3	µg/L	J	ERPD-FD
Zinc, Dissolved	E 200.7	MKTF-42	2203574-001E	0.011	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-41	2203574-002E	0.0097	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-32	2203574-003E	0.0046	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-34	2203574-004E	0.013	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	PW-3	2203574-005E	0.012	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	PW-4	2203574-006E	0.022	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-3-9-22	2203574-007E	0.013	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-3-9-22	2203574-008E	0.0045	0.01	mg/L	J	MDLRL
Zinc, Total	E200.8	MKTF-32	2203574-003D	0.0047	0.01	mg/L	J	MDLRL
Zinc, Total	E200.8	MKTF-34	2203574-004D	0.0086	0.01	mg/L	J	MDLRL
Zinc, Total	E200.8	PW-3	2203574-005D	0.008	0.01	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/10/2022
Date Validated: 09/19/2022	Sample End Date: 03/10/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Per- and Polyfluorinated Alkyl Substances (PFAS) by Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS) and Isotope Dilution (ID)	
Laboratory Project ID: 2203667	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, and from Vista Analytical Laboratory of El Dorado Hills, California, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample ID Hall Environmental	Laboratory Sample ID Pace	Laboratory Sample ID Vista
EB 3-10-22	2203667-001	L1471288-01	-----
MKTF-46	2203667-002	L1471288-02	-----
MKTF-35	2203667-003	L1471288-03	-----
OW-57	2203667-004	L1471288-04	-----
OW-58	2203667-005	L1471288-05	-----
OW-58A	2203667-006	L1471288-06	-----
OW-63	2203667-007	L1471288-07	2203119-01
DUP 3-10-22	2203667-008	L1471288-08	-----
FB 3-10-22	2203667-009	-----	-----
PFAS-FB	2203667-010	-----	2203119-02
Trip Blank	2203667-011	-----	-----

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Identified Issues (Item 1)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Data review and evaluation was performed following criteria set forth in Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFASs) Analyzed Using EPA Method 537, document number EPA 910-R-18-001, November 2018.
- Data were reviewed and evaluated according to criteria set forth in the Department of Defense (DoD) / Department of Energy (DOE) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3, 2019.

Tier II Data Validation Report Summary

- Data were reviewed and evaluated according to criteria set forth in Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15, United States Department of Defense, Environmental Data Quality Workgroup, May 2020.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
JB	Estimated concentration due to blank contamination
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 654 data points. The data completeness calculation does not include any submitted blank sample results. One data points was rejected. The data completeness measure for this data package is calculated to be 99.85% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C SIM: A laboratory error on the spiking of the LCS/LCSD occurred. The LCS/LCSD for only the 8270 SIM compound was spiked with the inappropriate spike and the laboratory could not determine the LCS/LCSD concentrations for the samples in this batch (R86533). The surrogate recoveries were all acceptable for the 8270 SIM samples and all other method criteria were met. We have flagged all compounds with an "E" flag to represent the fact that the data for the 8270SIM test should be considered estimated. **The samples in Method 8270C SIM batch R86533 were assigned J qualifiers for detections and UJ for non-detections due to incomplete required quality control analyses.**

Method 8270C: "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

E – Estimated value.

H – Recovery was outside laboratory acceptance criteria.

J – Analyte detected below quantitation limits.

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-57, OW-63, MKTF-35	Total and Dissolved Barium	5
200.8	MKTF-35	Select Total Metals	5
245.1	DUP 3-10-22, MKTF-35	Total Mercury	5
200.7	OW-58, MKTF-35	Total and Dissolved Barium	10
504.1	Multiple Samples	EDB	10
8015 D	OW-58, OW-57, OW-58A	DRO and MRO	10
8015D	MKTF-35	GRO	10
8260B	MKTF-35	Select VOCs	10
8015D	OW-58A	GRO	20
8260B	OW-58A	Select VOCs	20
8015D	OW-58, OW-57, OW-63	GRO	50

VALIDATION CRITERIA CHECKLIST

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	OW-58, OW-57, OW-63	Select VOCs	50
8260B	MKTF-35	Select VOCs	100
8260B	OW-58A	Benzene	200
8260B	OW-58, OW-57, OW-63	Benzene	500

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? — No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? — No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between -0.5°C to 5.3°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.7°C as noted on the CoC. Samples transferred to Vista were received in good condition with the cooler temperature outside the recommended range at 0.7°C as noted on the Sample Log-in Checklist. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? — Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. — Yes

Comments: The results were reported in concentration units of nanograms per liter (ng/L), micrograms per liter (µg/L), and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? — No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? — N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66129**	**0.026 mg/L**
8015D	**DRO**	**66219**	**0.018 mg/L**
8260B	**Chloromethane**	**R86601**	**0.66 µg/L**
8260B	**Chloromethane**	**R86626**	**0.68 µg/L**
8015D	**GRO**	**R86601**	**0.044 mg/L**
8015D	**GRO**	**G86626**	**0.034 mg/L**

Detections of DRO, GRO, and chloromethane in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of GRO in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were greater than the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66641	Not Prepared
200.7	Total Metals	66642	OW-57, OW-58
200.7	Dissolved Metals	A86443	Not Prepared
200.7	Dissolved Barium	A87332	Not Prepared
200.8	Total Metals	66191	Not Prepared
200.8	Dissolved Metals	A86482	EB 3-10-22
200.8	Dissolved Lead	A86537	MKTF-46
245.1	Total and Dissolved Mercury	66283	DUP 3-10-22
504.1	EDB	66149	Not Prepared
504.1	EDB	66232	Not Prepared
4500CN E	Cyanide	WG1834196	EB 3-10-22, OW-63
8015D	TPH DRO and MRO	66129	Not Prepared
8015D	TPH DRO and MRO	66219	Not Prepared
8015D	TPH GRO	G86626	Not Prepared
8015D	TPH GRO	R86601	Not Prepared
8260B	VOCs	R86601	MKTF-46
8260B	VOCs	R86626	Not Prepared
8270C	SVOCs	66142	Not Prepared
8270C SIM	1,4-Dioxane	R86533	Not Prepared
PFAS Method	PFAs	B22C148	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits or were not applicable because the unspiked amount was more than four times the spike added, with the following exceptions, with the following exceptions.

The MS recovery for cyanide in Method 4500 CN E batch WG1834196 was outside the QC limits of 75-125% at 74.2%. Cyanide results were qualified as J- if detected and UJ if not detected in the associated samples due to evidence of potential low bias.

Also, the MS/MSD RPD for cyanide Method 4500 CN E batch WG1834196 exceeded the QC limit of 20% at 28.4%. The associated sample results were qualified as J if detected or UJ if not detected due to evidence of poor precision.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**66642**	**67.7%**	-----	**70-130%**	-----	-----
200.8	**Dissolved Antimony**	**A86482**	**67.8%**	-----	**70-130%**	-----	-----
8015D	**TPH DRO**	**66219**	**77.8%**	**Acceptable**	**31.7-75.4%**	**Acceptable**	**20%**
8270 SIM	**Acenaphthene**	**R86533**	**Acceptable**	**Acceptable**	**29.8-82.7%**	**40.5%**	**27.8%**

The total nickel and dissolved antimony results were qualified as J- if detected and UJ if not detected in the associated samples due to evidence of potential low bias.

Detections of TPH DRO in the associated samples in batch 66219 were qualified as J+ due to evidence of potential high bias.

The acenaphthene results were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample MKTF-35, and qualification of sample data was not required.

The DRO and MRO results for samples OW-57, OW-58, and OW-58A were not qualified based on the surrogate non-conformances in the Method 8015D analysis since the applied dilutions of 10 times resulted in a surrogate concentrations below routinely calibrated levels, and this result was deemed unreliable and possibly inaccurate.

The PFAS Method extracted internal standard (EIS) $^{13}C_3$-PFBA for sample OW-63 was recovered outside the data validation limits of 50-150% at 19.5%. The associated target analyte PFBA was not detected in sample OW-63, and this result was qualified as R due to evidence of extreme low bias (recovery less than 20%).

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, two field blank samples, FB 3-10-22 and PFAS-FB, and one equipment blank sample, EB 3-10-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Benzene**	**0.29 µg/L**
Trip Blank	8260B	Chloromethane	0.69 µg/L
Trip Blank	8015D	TPH GRO	0.034 mg/L
FB 3-10-22	8260B	Acetone	4.5 µg/L
FB 3-10-22	8260B	Benzene	0.37 µg/L
FB 3-10-22	8015D	TPH GRO	0.040 mg/L
EB 3-10-22	8260B	2-Butanone	5.7 µg/L
EB 3-10-22	8260B	Chloromethane	0.78 µg/L
EB 3-10-22	8015D	TPH GRO	0.039 mg/L
EB 3-10-22	8015D	TPH DRO	0.025 mg/L
EB 3-10-22	**8270C SIM**	**Pyrene**	**0.24 µg/L**
EB 3-10-22	**200.7**	**Dissolved Zinc**	**0.0070 mg/L**

Detections of benzene, pyrene, and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of pyrene and dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloromethane (batches R86601 and R86626), TPH GRO (batches R86601 and R86626), and TPH DRO (batches 66129 and 66219) results were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the trip and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-10-22 was collected as a field duplicate of sample MKTF-46.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for naphthalene exceeded the data validation limit of 30% at 61.5%. The naphthalene results were qualified as J for samples MKTF-46 and DUP-3-10-22 due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1834196	Not Associated
4500CN E	Cyanide	WG1834196	MKTF-35

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for laboratory duplicates prepared from project samples were not applicable since the result for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-46	Antimony	ND	0.0015
MKTF-35	Antimony	ND	0.00071
OW-58A	Barium	0.90	0.94
OW-63	Barium	4.3	4.6
OW-57	Nickel	0.055	0.057
OW-58A	Nickel	0.034	0.037
OW-63	Nickel	0.025	0.027
OW-63	Vanadium	0.0026	0.0027
OW-58	Zinc	ND	0.0091
OW-57	Zinc	ND	0.0080
OW-58A	Zinc	ND	0.015
OW-63	Zinc	ND	0.015
DUP 3-10-22	Zinc	ND	0.0081
EB 3-10-22	Zinc	ND	0.0070
MKTF-46	Zinc	ND	0.0099

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-46 Field Duplicate Sample ID: DUP-3-10-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
1,2,4-Trimethylbenzene	SW8260B	0.37 µg/L	1.1 µg/L	99.3% +/-RL
1,3,5-Trimethylbenzene	SW8260B	ND (1.0 µg/L)	0.21 µg/L	DL
Benzene	SW8260B	ND (1.0 µg/L)	0.39 µg/L	DL
Chlorobenzene	SW8260B	0.19 µg/L	0.38 µg/L	66.7% +/-RL
Chloromethane	SW8260B	0.67 µg/L	0.67 µg/L	0.0% +/-RL
sec-Butylbenzene	SW8260B	0.21 µg/L	0.37 µg/L	55.2% +/-RL
Xylenes, Total	SW8260B	0.77 µg/L	1.8 µg/L	80.2% +/-RL
1,4-Dioxane	SW8270C	1.7 µg/L	1.5 µg/L	12.5% +/-RL
Naphthalene	**SW8270C**	**0.18 µg/L**	**0.34 µg/L**	**61.5%**
TPH GRO	SW8015	0.061 mg/L	0.066 mg/L	7.9% +/-RL
TPH DRO	SW8015	0.042 mg/L	0.046 mg/L	9.1% +/-RL
Barium, Dissolved	E 200.7	0.030 mg/L	0.032 mg/L	6.5%
Barium, Total	E 200.7	0.079 mg/L	0.069 mg/L	13.5%
Cobalt, Dissolved	E 200.7	0.0029 mg/L	ND (0.0060 mg/L)	DL
Cobalt, Total	E 200.7	0.0041 mg/L	0.0032 mg/L	24.7% +/-RL
Vanadium, Dissolved	E 200.7	0.0021 mg/L	ND (0.050 mg/L)	DL
Vanadium, Total	E 200.7	0.0047 mg/L	0.0049 mg/L	4.2% +/-RL
Zinc, Dissolved	E 200.7	0.0099 mg/L	0.0081 mg/L	20.0% +/-RL
Antimony, Dissolved	E200.8	0.0015 mg/L	ND (0.0010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00093 mg/L	0.00096 mg/L	3.2% +/-RL
Arsenic, Total	E200.8	0.0012 mg/L	0.0012 mg/L	0.0% +/-RL
Lead, Total	E200.8	0.0011 mg/L	0.0010 mg/L	9.5%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for naphthalene exceeded the data validation limit of 30% at 61.5%, which was evidence of poor precision. The naphthalene results were qualified as J for samples MKTF-46 and DUP-3-10-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HZ-QAQC	Analysis of QA/QC samples was not performed at the required frequency.
MBD	Method blank detection
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
ERPD-MS	The MS/MSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-EIS	The extracted internal standard (EIS) recovery was less than the lower acceptance limit.
EBD	Equipment blank detection
TBD	Trip blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-35	2203667-003a	7.2	10	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-58A	2203667-006a	11	20	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-63	2203667-007a	31	50	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	MKTF-46	2203667-002a	0.37	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-57	2203667-004a	6.5	50	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-58	2203667-005a	12	50	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-57	2203667-004a	21	50	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-58	2203667-005a	21	50	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-58A	2203667-006a	8.9	20	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-63	2203667-007a	21	50	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,3,5-Trimethylbenzene	SW8260B	DUP 3-10-22	2203667-008a	0.21	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-46	2203667-002c	1.7	1.0	µg/L	J	HZ-QAQC
1,4-Dioxane	SW8270C	MKTF-35	2203667-003C	1.7	1.0	µg/L	J	HZ-QAQC
1,4-Dioxane	SW8270C	OW-58	2203667-005C	1.3	1.0	µg/L	J	HZ-QAQC
1,4-Dioxane	SW8270C	OW-58A	2203667-006C	1.9	1.0	µg/L	J	HZ-QAQC
1,4-Dioxane	SW8270C	DUP 3-10-22	2203667-008c	1.5	1.0	µg/L	J	HZ-QAQC
1,4-Dioxane	SW8270C	EB 3-10-22	2203667-001c	ND	1.0	µg/L	UJ	HZ-QAQC
1,4-Dioxane	SW8270C	OW-57	2203667-004C	ND	1.0	µg/L	UJ	HZ-QAQC
1,4-Dioxane	SW8270C	OW-63	2203667-007C	ND	1.0	µg/L	UJ	HZ-QAQC
1-Methylnaphthalene	SW8270C	MKTF-35	2203667-003C	9.1	0.10	µg/L	J	HZ-QAQC
1-Methylnaphthalene	SW8270C	OW-57	2203667-004C	82	0.10	µg/L	J	HZ-QAQC
1-Methylnaphthalene	SW8270C	OW-58	2203667-005C	74	0.10	µg/L	J	HZ-QAQC
1-Methylnaphthalene	SW8270C	OW-58A	2203667-006C	91	0.10	µg/L	J	HZ-QAQC
1-Methylnaphthalene	SW8270C	OW-63	2203667-007C	65	0.10	µg/L	J	HZ-QAQC
1-Methylnaphthalene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
1-Methylnaphthalene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
1-Methylnaphthalene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
2-Butanone	SW8260B	EB 3-10-22	2203667-001a	5.7	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	MKTF-35	2203667-003C	13	0.10	µg/L	J	HZ-QAQC
2-Methylnaphthalene	SW8270C	OW-57	2203667-004C	59	0.10	µg/L	J	HZ-QAQC
2-Methylnaphthalene	SW8270C	OW-58	2203667-005C	83	0.10	µg/L	J	HZ-QAQC
2-Methylnaphthalene	SW8270C	OW-58A	2203667-006C	89	0.10	µg/L	J	HZ-QAQC
2-Methylnaphthalene	SW8270C	OW-63	2203667-007C	94	0.10	µg/L	J	HZ-QAQC
2-Methylnaphthalene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
2-Methylnaphthalene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
2-Methylnaphthalene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
3,4-Methylphenol	SW8270C	OW-58A	2203667-006C	4.6	5.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Acenaphthene	SW8270C	MKTF-35	2203667-003C	1.6	0.10	µg/L	J	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	OW-57	2203667-004C	2.4	0.10	µg/L	J	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	OW-58	2203667-005C	2.2	0.10	µg/L	J	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	OW-63	2203667-007C	0.76	0.10	µg/L	J	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	OW-58A	2203667-006C	ND	0.10	µg/L	UJ	ERPD-LCS, HZ-QAQC
Acenaphthene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	ERPD-LCS, HZ-QAQC
Acetone	SW8260B	FB 3-10-22	2203667-009a	4.5	10	µg/L	J	MDLRL
Anthracene	SW8270C	MKTF-35	2203667-003C	0.30	0.10	µg/L	J	HZ-QAQC
Anthracene	SW8270C	OW-57	2203667-004C	0.20	0.10	µg/L	J	HZ-QAQC
Anthracene	SW8270C	OW-58	2203667-005C	0.30	0.10	µg/L	J	HZ-QAQC
Anthracene	SW8270C	OW-58A	2203667-006C	0.42	0.10	µg/L	J	HZ-QAQC
Anthracene	SW8270C	OW-63	2203667-007C	0.20	0.10	µg/L	J	HZ-QAQC
Anthracene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Anthracene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Anthracene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
Antimony, Dissolved	E200.8	MKTF-46	2203667-002E	0.0015	0.0010	mg/L	J-	LR-LCS
Antimony, Dissolved	E200.8	EB 3-10-22	2203667-001E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	OW-57	2203667-004E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	OW-58	2203667-005E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	OW-58A	2203667-006E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	OW-63	2203667-007E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	DUP 3-10-22	2203667-008E	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Dissolved	E200.8	MKTF-35	2203667-003E	0.00071	0.0010	mg/L	J-	LR-LCS, MDLRL
Arsenic, Dissolved	E200.8	MKTF-46	2203667-002E	0.00093	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-35	2203667-003E	0.00058	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	DUP 3-10-22	2203667-008E	0.00096	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	Trip Blank	2203667-011a	0.29	1.0	µg/L	J	MDLRL
Benzene	SW8260B	DUP 3-10-22	2203667-008a	0.39	1.0	µg/L	U	MDLRL, TBD
Benzene	SW8260B	FB 3-10-22	2203667-009a	0.37	1.0	µg/L	U	MDLRL, TBD
Benzo(a)anthracene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	MKTF-35	2203667-003C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	OW-57	2203667-004C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	OW-58	2203667-005C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	OW-58A	2203667-006C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	OW-63	2203667-007C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(a)anthracene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	MKTF-35	2203667-003C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	OW-57	2203667-004C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	OW-58	2203667-005C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	OW-58A	2203667-006C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	OW-63	2203667-007C	ND	0.10	µg/L	UJ	HZ-QAQC
Benzo(b)fluoranthene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
Chlorobenzene	SW8260B	MKTF-46	2203667-002a	0.19	1.0	µg/L	J	MDLRL
Chlorobenzene	SW8260B	DUP 3-10-22	2203667-008a	0.38	1.0	µg/L	J	MDLRL
Chloroform	SW8260B	MKTF-35	2203667-003a	5.0	10	µg/L	J	MDLRL
Chloroform	SW8260B	OW-57	2203667-004a	9.5	50	µg/L	J	MDLRL
Chloroform	SW8260B	OW-58	2203667-005a	9.2	50	µg/L	J	MDLRL
Chloroform	SW8260B	OW-63	2203667-007a	17	50	µg/L	J	MDLRL
Chloromethane	SW8260B	EB 3-10-22	2203667-001a	0.78	3.0	µg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chloromethane	SW8260B	MKTF-46	2203667-002a	0.67	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-57	2203667-004a	47	150	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-58	2203667-005a	47	150	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-58A	2203667-006a	24	60	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-63	2203667-007a	60	150	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP 3-10-22	2203667-008a	0.67	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203667-011a	0.69	3.0	µg/L	U	MBD, MDLRL
Chrysene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	MKTF-35	2203667-003C	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	OW-57	2203667-004C	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	OW-58	2203667-005C	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	OW-58A	2203667-006C	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	OW-63	2203667-007C	ND	0.10	µg/L	UJ	HZ-QAQC
Chrysene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
Cobalt, Dissolved	E 200.7	MKTF-46	2203667-002E	0.0029	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-46	2203667-002D	0.0041	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-58A	2203667-006D	0.0027	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	DUP 3-10-22	2203667-008D	0.0032	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	OW-58	2203667-005F	0.00515	0.0050	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-58A	2203667-006F	0.00527	0.0050	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-63	2203667-007F	0.00773	0.0050	mg/L	J-	ERPD-MS, LR-MS
Cyanide, Total	E335.4	EB 3-10-22	2203667-001F	ND	0.0050	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	MKTF-46	2203667-002F	ND	0.0050	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	MKTF-35	2203667-003F	ND	0.0050	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	OW-57	2203667-004F	ND	0.0050	mg/L	UJ	ERPD-MS, LR-MS
Cyanide, Total	E335.4	DUP 3-10-22	2203667-008F	ND	0.0050	mg/L	UJ	ERPD-MS, LR-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluoranthene	SW8270C	OW-58A	2203667-006C	0.26	0.20	µg/L	J	HZ-QAQC
Fluoranthene	SW8270C	EB 3-10-22	2203667-001c	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	MKTF-46	2203667-002c	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	MKTF-35	2203667-003C	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	OW-57	2203667-004C	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	OW-63	2203667-007C	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.20	µg/L	UJ	HZ-QAQC
Fluoranthene	SW8270C	OW-58	2203667-005C	0.18	0.20	µg/L	J	HZ-QAQC, MDLRL
Fluorene	SW8270C	MKTF-35	2203667-003C	0.54	0.10	µg/L	J	HZ-QAQC
Fluorene	SW8270C	OW-57	2203667-004C	4.1	0.10	µg/L	J	HZ-QAQC
Fluorene	SW8270C	OW-58	2203667-005C	3.0	0.10	µg/L	J	HZ-QAQC
Fluorene	SW8270C	OW-58A	2203667-006C	4.7	0.10	µg/L	J	HZ-QAQC
Fluorene	SW8270C	OW-63	2203667-007C	1.4	0.10	µg/L	J	HZ-QAQC
Fluorene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Fluorene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Fluorene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	EB 3-10-22	2203667-001c	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-46	2203667-002c	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-35	2203667-003C	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	OW-57	2203667-004C	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	OW-58	2203667-005C	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	OW-63	2203667-007C	ND	0.30	µg/L	UJ	HZ-QAQC
Indeno(1,2,3-cd)pyrene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.30	µg/L	UJ	HZ-QAQC
Isopropylbenzene	SW8260B	OW-57	2203667-004a	11	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-58	2203667-005a	35	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-35	2203667-003E	0.00021	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-57	2203667-004D	0.00049	0.00050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Total	E200.8	OW-58	2203667-005D	0.00049	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-63	2203667-007D	0.000081	0.00050	mg/L	J	MDLRL
MTBE	SW8260B	OW-57	2203667-004a	34	50	µg/L	J	MDLRL
MTBE	SW8260B	OW-63	2203667-007a	21	50	µg/L	J	MDLRL
Naphthalene	SW8270C	MKTF-35	2203667-003C	96	0.10	µg/L	J	HZ-QAQC
Naphthalene	SW8270C	OW-57	2203667-004C	170	0.10	µg/L	J	HZ-QAQC
Naphthalene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Naphthalene	SW8270C	OW-58	2203667-005C	ND	0.10	µg/L	UJ	HZ-QAQC
Naphthalene	SW8270C	OW-58A	2203667-006C	ND	0.10	µg/L	UJ	HZ-QAQC
Naphthalene	SW8270C	OW-63	2203667-007C	ND	0.10	µg/L	UJ	HZ-QAQC
Naphthalene	SW8270C	MKTF-46	2203667-002c	0.18	0.10	µg/L	J	ERPD-FD, HZ-QAQC
Naphthalene	SW8270C	DUP 3-10-22	2203667-008c	0.34	0.10	µg/L	J	ERPD-FD, HZ-QAQC
n-Butylbenzene	SW8260B	MKTF-35	2203667-003a	5.3	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-58A	2203667-006a	11	60	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-63	2203667-007a	20	150	µg/L	J	MDLRL
Nickel, Total	E 200.7	OW-57	2203667-004D	0.055	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-58	2203667-005D	0.051	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-58A	2203667-006D	0.034	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-63	2203667-007D	0.025	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	DUP 3-10-22	2203667-008D	ND	0.010	mg/L	UJ	LR-LCS
n-Propylbenzene	SW8260B	OW-57	2203667-004a	31	50	µg/L	J	MDLRL
Perfluorobutanoic acid (PFBA)	EPA 537.1	OW-63	2203667-007G	ND	2.09	ng/L	R	LR-EIS
Phenanthrene	SW8270C	MKTF-35	2203667-003C	0.16	0.10	µg/L	J	HZ-QAQC
Phenanthrene	SW8270C	OW-57	2203667-004C	5.5	0.10	µg/L	J	HZ-QAQC
Phenanthrene	SW8270C	OW-58	2203667-005C	2.6	0.10	µg/L	J	HZ-QAQC
Phenanthrene	SW8270C	OW-58A	2203667-006C	4.6	0.10	µg/L	J	HZ-QAQC
Phenanthrene	SW8270C	OW-63	2203667-007C	1.0	0.10	µg/L	J	HZ-QAQC

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenanthrene	SW8270C	EB 3-10-22	2203667-001c	ND	0.10	µg/L	UJ	HZ-QAQC
Phenanthrene	SW8270C	MKTF-46	2203667-002c	ND	0.10	µg/L	UJ	HZ-QAQC
Phenanthrene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.10	µg/L	UJ	HZ-QAQC
p-Isopropyltoluene	SW8260B	OW-58A	2203667-006a	4.7	20	µg/L	J	MDLRL
Pyrene	SW8270C	EB 3-10-22	2203667-001c	0.24	0.20	µg/L	J	HZ-QAQC
Pyrene	SW8270C	MKTF-46	2203667-002c	ND	0.20	µg/L	UJ	HZ-QAQC
Pyrene	SW8270C	DUP 3-10-22	2203667-008c	ND	0.20	µg/L	UJ	HZ-QAQC
Pyrene	SW8270C	OW-58A	2203667-006C	0.28	0.20	µg/L	JB	EBD, HZ-QAQC
Pyrene	SW8270C	OW-63	2203667-007C	0.24	0.20	µg/L	U	EBD, HZ-QAQC
Pyrene	SW8270C	MKTF-35	2203667-003C	0.16	0.20	µg/L	U	EBD, HZ-QAQC, MDLRL
Pyrene	SW8270C	OW-57	2203667-004C	0.16	0.20	µg/L	U	EBD, HZ-QAQC, MDLRL
Pyrene	SW8270C	OW-58	2203667-005C	0.18	0.20	µg/L	U	EBD, HZ-QAQC, MDLRL
sec-Butylbenzene	SW8260B	MKTF-46	2203667-002a	0.21	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-35	2203667-003a	1.6	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-58A	2203667-006a	3.3	20	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-63	2203667-007a	9.4	50	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	DUP 3-10-22	2203667-008a	0.37	1.0	µg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-35	2203667-003D	0.0045	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-57	2203667-004D	0.00059	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-58	2203667-005D	0.00045	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-58A	2203667-006D	0.00044	0.0010	mg/L	J	MDLRL
Styrene	SW8260B	MKTF-35	2203667-003a	2.3	10	µg/L	J	MDLRL
TPH DRO	SW8015	OW-58	2203667-005C	6.5	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-58A	2203667-006C	4.2	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-63	2203667-007C	3.3	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	DUP 3-10-22	2203667-008C	0.046	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	EB 3-10-22	2203667-001C	0.025	0.064	mg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	MKTF-46	2203667-002C	0.042	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-46	2203667-002a	0.061	0.050	mg/L	JB	MBD
TPH GRO	SW8015	DUP 3-10-22	2203667-008a	0.066	0.050	mg/L	JB	MBD
TPH GRO	SW8015	Trip Blank	2203667-011a	0.034	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	EB 3-10-22	2203667-001a	0.039	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	FB 3-10-22	2203667-009a	0.040	0.050	mg/L	U	MBD, MDLRL
Trichloroethene	SW8260B	MKTF-35	2203667-003a	3.0	10	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-46	2203667-002E	0.0021	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-57	2203667-004E	0.0023	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-58	2203667-005E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-63	2203667-007E	0.0027	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-46	2203667-002D	0.0047	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-57	2203667-004D	0.0036	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58	2203667-005D	0.0049	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-63	2203667-007D	0.0026	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP 3-10-22	2203667-008D	0.0049	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	MKTF-46	2203667-002a	0.77	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-58A	2203667-006E	0.015	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-63	2203667-007E	0.015	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-46	2203667-002E	0.0099	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-35	2203667-003E	0.0057	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-57	2203667-004E	0.0080	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-58	2203667-005E	0.0091	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP 3-10-22	2203667-008E	0.0081	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB 3-10-22	2203667-001E	0.007	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, GW Sampling 2022	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/10/2022
Date Validated: 03/31/2022	Sample End Date: 03/10/2022
Parameters Included: ▪ Total Suspended Solids (TSS) by Standard Methods for the Examination of Water and Wastewater (SM) Method 2540D	
Laboratory Project ID: 2203670	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report package generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- Laboratory control samples (LCS)

Method compliance was established by reviewing sample integrity, holding times, detection limits, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
OW-57	2203670-001
OW-58A	2203670-002

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ✓ Laboratory Blanks (Items 11 and 12)
- ○ Matrix Spikes (MS) and Matrix Spike Duplicates (MSD) ((Items 13 and 14)
- ✓ LCS (Items 15 and 16)
- ○ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ○ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ○ Field Duplicates (Items 20 and 21)
- ○ Laboratory Duplicates (Item 22)
- ○ Data Relationships (Item 23)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Trihydro Data Validation Variance Documentation, February 2021.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers were not applied as a result of this validation.

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 2 data points. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	Yes
Comments: The laboratory did not identify non-conformances regarding the analytical data.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	Yes
Comments: The laboratory did not apply qualification flags or other notes to the data in the laboratory report.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The reporting limits for the analyses were reviewed and appeared to be acceptable. Dilutions were not applied for the analyses of the submitted samples.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	Yes
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between -0.8°C and 5.3°C as noted on the CoC and the *Sample Log-in Check List*. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	Yes
Comments: Target analytes were reported as not detected in the laboratory blanks.	

VALIDATION CRITERIA CHECKLIST	
13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	No
Comments: The total number of matrix spike samples prepared was not equal to at least 5% of the total number of samples. Matrix spikes were not prepared for the analyses in this data set.	
14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits?	N/A
Comments: MS/MSD samples were not prepared using project samples as the sample source.	
15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.	
16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits?	Yes
Comments: The LCS percent recoveries were within laboratory QC limits. LCSDs were not analyzed as part of this sample set.	
17. Were surrogate recoveries within laboratory QC limits?	N/A
Comments: Surrogates were not required for the analyses included in this data set.	
18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples?	N/A
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Field duplicates were not collected as part of this sample set.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	N/A
Comments: Field duplicates were not collected as part of this sample set.	
22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits?	N/A
Comments: Laboratory duplicate samples were not prepared for this sample set.	

VALIDATION CRITERIA CHECKLIST	
23. Were the following data relationships realistic and acceptable?	
• Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270), and the results were in agreement?	N/A
Comments: Target analytes were not reported by more than one method.	
• Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results?	N/A
Comments: Total and dissolved metals analyses were not performed for this data set.	

DATA QUALIFICATION SUMMARY

Data qualifiers were not applied as a result of this validation.

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/15/2022
Date Validated: 04/04/2022	Sample End Date: 03/15/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203825	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB 3-15-22	2203825-001
OW-1	2203825-002
MKTF-17R	2203825-003
MKTF-18R	2203825-004
MKTF-38	2203825-005
MKTF-04R	2203825-006
MKTF-11	2203825-007
MKTF-10	2203825-008
FB 3-15-22	2203825-009
DUP-3-15-22	2203825-010
Trip Blank	2203825-011

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)
- ✓ Data Relationships (Item 23)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, February 2021.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 720 data points. The data completeness calculation does not include submitted blank sample results. Three data points were rejected. The data completeness measure for this data package is calculated to be 99.58% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270: "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.8	MKTF-38	Dissolved Barium	5
200.8	MKTF-11, MKTF-10, OW-1	Select Total Metals	5
8015D	MKTF-04R	GRO	5
8260B	MKTF-04R	VOCs	5
200.8	MKTF-17R	Dissolved Barium	10
8015D	Multiple Samples	DRO, MRO, GRO	10
8260B	Multiple Samples	VOCs	10
8270 SIM	MKTF-04R	1,4-Dioxane	10
200.8	MKTF-38, MKTF-17R	Total Barium	20
200.8	MKTF-04R	Dissolved Barium	20
200.8	MKTF-18R, MKTF-04R	Total Barium	50
200.8	MKTF-18R	Dissolved Barium	50
8260B	MKTF-04R	Benzene	50
8260B	Multiple Samples	Select VOCs	100
200.8	MKTF-11	Dissolved and Total Barium	200
200.8	MKTF-10	Dissolved and Total Barium	500
8260B	MKTF-17R	Toluene	1,000

VALIDATION CRITERIA CHECKLIST

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? — No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? — No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between -0.1°C and 1.0°C as noted on the CoC and the *Sample Log-in Check List*. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 3.0°C as noted on the CoC.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? — Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. — Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? — No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? — N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? — No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66219**	**0.018 mg/L**
8015D	**DRO**	**66236**	**0.030 mg/L**
8260B	**Chloromethane**	**R86601**	**0.66 µg/L**
8260B	**Chloromethane**	**R86626**	**0.68 µg/L**
8270 SIM	**Pyrene**	**R86628**	**0.22 µg/L**

VALIDATION CRITERIA CHECKLIST

Method	Analyte	Batch	Concentration
8015D	**GRO**	**R86601**	**0.044 mg/L**
8015D	**GRO**	**G86626**	**0.034 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Dissolved Metals	A86535	EB 3-15-22
200.8	Total Metals	66254	EB 3-15-22, OW-1
200.8	Dissolved Metals	A86624	MKTF-11, MKTF-10
200.8	Dissolved Metals	B86600	Not Prepared
245.1	Dissolved and Total Mercury	66284	DUP-3-15-22
504.1	EDB	66256	Not Prepared
4500CN E	Cyanide	WG1835677	Not Associated, MKTF-04R
8015D	TPH DRO and MRO	66219	Not Prepared
8015D	TPH DRO and MRO	66236	Not Prepared
8015D	TPH GRO	G86626	Not Prepared
8015D	TPH GRO	R86601	Not Prepared
8260B	VOCs	R86601	Not Prepared
8260B	VOCs	R86626	Not Prepared
8270C	SVOCs	66226	Not Prepared
8270C SIM	SVOCs	R86628	Not Prepared
8270C SIM	1,4-Dioxane	R86665	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exception.

The MSD recovery for cyanide in Method 4500CN E batch WG1835677 (R86794) was outside the data validation QC limits of 75-125% at 74.8%. Cyanide results were qualified as J- if detected and UJ if not detected in the associated samples due to evidence of potential low bias.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exception.

The LCS recovery for DRO in Method 8015D batch 66219 was outside the acceptance limits of 31.7-75.4% at 77.8%. DRO was detected in the associated samples, and these results were qualified as J+ due to potential high bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-17R**	**0.0%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-17R**	**27.3%**	**28.5-64.7%**
8270C	**Phenol-d_5**	**MKTF-11**	**26.9%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**MKTF-11**	**12.6%**	**18.6-129%**
8270C	**2-Fluorophenol**	**MKTF-10**	**0.0%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-10**	**24.7%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**MKTF-10**	**1.8%**	**18.6-129%**

Since Method 8270 surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample DUP-3-15-22, and qualification of sample data was not required.

For samples MKTF-17R and MKTF-11, two or three of the three acid extractable surrogates reported recoveries above 10%. Therefore, the associated target analytes in these samples with surrogate recoveries that were less than the lower laboratory QC limits were qualified as J- if detected and UJ if not detected due to potential low bias.

For sample MKTF-10, two of the three acid extractable surrogates were recovered below 10%. The target analytes associated with surrogate recoveries that were less than 10% were qualified as R if not detected in the identified samples indicating rejected results, data not usable due to evidence of extreme low bias. The detected results were qualified as J- for sample MKTF-10 due to potential low bias.

The DRO and MRO results for samples MKTF-17R and MKTF-18R were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-15-22, and one equipment blank sample, EB 3-15-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	GRO	0.035 mg/L
Trip Blank	8260B	Chloromethane	0.66 µg/L
FB 3-15-22	**8260B**	**1,1-Dichloroethene**	**0.57 µg/L**
FB 3-15-22	**8260B**	**2-Butanone**	**7.9 µg/L**
FB 3-15-22	8260B	Chloromethane	0.89 µg/L
EB 3-15-22	**200.7**	**Dissolved Zinc**	**0.0063 mg/L**
EB 3-15-22	200.8	Dissolved Barium	0.00082 mg/L
EB 3-15-22	8015D	DRO	0.026 mg/L
EB 3-15-22	8015D	GRO	0.037 mg/L
EB 3-15-22	8260B	2-Butanone	7.30 µg/L
EB 3-15-22	**8260B**	**Benzene**	**0.23 µg/L**
EB 3-15-22	8260B	Chloromethane	0.91 µg/L

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than or equal to the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloromethane, DRO, and GRO results were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-15-22 was collected as a field duplicate of sample OW-1.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

RPD values could not be calculated for 1-methylnaphthalene and 2-methylnaphthalene for the field duplicate pair OW-1 and DUP-3-15-22 since the analytes were detected in the parent sample and were undetected in the duplicate sample. As the detections in the parent sample were greater than two times the reporting limits, 1-methylnaphthalene and 2-methylnaphthalene were qualified as J and UJ for the parent and duplicate samples, respectively.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1835677 from sample EB 3-15-22 and from a sample not associated with this data set.

The RPD for the laboratory duplicate prepared from a project sample was not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic and acceptable?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270), and the results were in agreement? Yes

Comments: Target analytes were not reported by more than one method in this data set, with the following exception.

The target analyte 1,2-dibromoethane (EDB) was reported from analyses by both Method 8260B and Method 504.1. This analyte was reported as not detected by both methods.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The total metals concentrations were greater than or equal to the dissolved fractions, with the following exceptions.

Sample ID	Analyte	Total Result	Dissolved Result	Reporting Limit	Units	RPD
OW-1	Mercury	ND	0.00036	0.00020	mg/L	----- ♦
MKTF-10	Barium	7.9	8.7	0.50	mg/L	9.6%
DUP-3-15-22	Barium	0.041	0.044	0.0010	mg/L	7.1%
EB 3-15-22	Barium	ND	0.00082	0.0010	mg/L	----- ♦
OW-1	Barium	0.044	0.046	0.0050 / 0.0010	mg/L	4.4%
MKTF-11	Cobalt	0.0039	0.0058	0.0050 / 0.0060	mg/L	♦
MKTF-17R	Cobalt	0.0023	0.0033	0.0010 / 0.0060	mg/L	♦
MKTF-11	Selenium	ND	0.00046	0.0050 / 0.0010	mg/L	----- ♦
DUP-3-15-22	Selenium	0.0022	0.0028	0.0010	mg/L	♦
MKTF-18R	Zinc	0.0093	0.010	0.010	mg/L	♦
DUP-3-15-22	Zinc	ND	0.0077	0.010	mg/L	----- ♦
EB 3-15-22	Zinc	ND	0.0063	0.010	mg/L	----- ♦
OW-1	Zinc	ND	0.0094	0.010	mg/L	----- ♦

----- *RPD could not be calculated.*

♦ *= One or both of the detections were less than 5 times the applicable reporting limits, and qualification of data was not required.*

The differences for the corresponding analytical results were within five times the applicable reporting limits and validation action was not required, or the RPDs between the results were less than 30% indicating that the data were within the measurement uncertainty for the methods, and qualification of results was not required based on the analytical inconsistencies.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-1 Field Duplicate Sample ID: DUP-3-15-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Vanadium, Dissolved	E 200.7	0.041 mg/L	0.044 mg/L	7.1% +/-RL
Zinc, Dissolved	E 200.7	0.0094 mg/L	0.0077 mg/L	19.9% +/-RL
Arsenic, Dissolved	E200.8	0.00052 mg/L	0.00068 mg/L	26.7% +/-RL
Arsenic, Total	E200.8	0.00069 mg/L	0.00080 mg/L	14.8% +/-RL
Barium, Dissolved	E200.8	0.046 mg/L	0.044 mg/L	4.4%
Barium, Total	E200.8	0.044 mg/L	0.041 mg/L	7.1%
Chromium, Dissolved	E200.8	0.00052 mg/L	0.00051 mg/L	1.9% +/-RL
Chromium, Total	E200.8	0.0031 mg/L	0.0031 mg/L	0.0%
Lead, Dissolved	E200.8	0.000077 mg/L	ND (0.00050 mg/L)	DL
Lead, Total	E200.8	0.00019 mg/L	0.00018 mg/L	5.4% +/-RL
Nickel, Dissolved	E200.8	0.00052 mg/L	0.00062 mg/L	17.5% +/-RL
Nickel, Total	E200.8	0.0021 mg/L	0.0022 mg/L	4.7%
Selenium, Dissolved	E200.8	0.0027 mg/L	0.0028 mg/L	3.6%
Selenium, Total	E200.8	0.0027 mg/L	0.0022 mg/L	20.4%
Vanadium, Total	E200.8	0.044 mg/L	0.045 mg/L	2.2%
Mercury, Dissolved	E245.1	0.00036 mg/L	ND (0.00020 mg/L)	DL
TPH DRO	SW8015	0.022 mg/L	0.026 mg/L	16.7% +/-RL
TPH GRO	SW8015	0.041 mg/L	0.036 mg/L	13.0% +/-RL
1,2-Dichloroethane	SW8260B	0.42 µg/L	0.41 µg/L	2.4% +/-RL
Chloromethane	SW8260B	0.77 µg/L	0.75 µg/L	2.6% +/-RL
MTBE	SW8260B	2.3 µg/L	2.3 µg/L	0.0%
1,4-Dioxane	SW8270C	0.20 µg/L	ND (1.0 µg/L)	DL
1-Methylnaphthalene	**SW8270C**	**0.28 µg/L**	**ND (0.10 µg/L)**	**DL**
2-Methylnaphthalene	**SW8270C**	**0.40 µg/L**	**ND (0.10 µg/L)**	**DL**
Naphthalene	SW8270C	0.14 µg/L	ND (0.10 µg/L)	DL
Phenanthrene	SW8270C	0.080 µg/L	ND (0.10 µg/L)	DL
Pyrene	SW8270C	0.24 µg/L	ND (0.40 µg/L)	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD values could not be calculated for 1-methylnaphthalene and 2-methylnaphthalene since the analytes were detected in the parent sample and were undetected in the duplicate sample. As the detections in the parent sample were greater than two times the reporting limits, 1-methylnaphthalene and 2-methylnaphthalene were qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
EBD	Equipment blank detection
FBD	Field blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-17R	2203825-003a	7.5	10	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	MKTF-38	2203825-005a	0.61	1	µg/L	U	FBD, MDLRL
1,1-Dichloroethene	SW8260B	FB 3-15-22	2203825-009a	0.57	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-1	2203825-002a	0.42	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-17R	2203825-003a	4.2	10	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-38	2203825-005a	0.41	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-04R	2203825-006a	2.8	5	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-11	2203825-007a	4.3	10	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-10	2203825-008a	4.1	10	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-3-15-22	2203825-010a	0.41	1	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-1	2203825-002c	0.2	1	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-1	2203825-002c	0.28	0.1	µg/L	J	ERPD-FD
1-Methylnaphthalene	SW8270C	DUP-3-15-22	2203825-010c	ND	0.1	µg/L	UJ	ERPD-FD
2,4,6-Trichlorophenol	SW8270C	MKTF-17R	2203825-003c	ND	5	µg/L	UJ	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-11	2203825-007c	ND	5	µg/L	UJ	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-10	2203825-008c	ND	5	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dimethylphenol	SW8270C	MKTF-17R	2203825-003c	ND	5	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-18R	2203825-004c	2.7	5	µg/L	J	MDLRL
2,4-Dimethylphenol	SW8270C	MKTF-11	2203825-007c	4.3	5	µg/L	J-	LR-SUR, MDLRL
2,4-Dimethylphenol	SW8270C	MKTF-10	2203825-008c	16	5	µg/L	J-	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-17R	2203825-003c	ND	5	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-11	2203825-007c	ND	5	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-10	2203825-008c	ND	5	µg/L	R	LR-SUR
2-Butanone	SW8260B	EB 3-15-22	2203825-001a	7.3	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	MKTF-10	2203825-008a	21	100	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	FB 3-15-22	2203825-009a	7.9	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-1	2203825-002c	0.4	0.1	µg/L	J	ERPD-FD
2-Methylnaphthalene	SW8270C	DUP-3-15-22	2203825-010c	ND	0.1	µg/L	UJ	ERPD-FD
2-Methylphenol	SW8270C	MKTF-17R	2203825-003c	20	5	µg/L	J-	LR-SUR
2-Methylphenol	SW8270C	MKTF-18R	2203825-004c	4.4	5	µg/L	J	MDLRL
2-Methylphenol	SW8270C	MKTF-11	2203825-007c	6.4	5	µg/L	J-	LR-SUR
2-Methylphenol	SW8270C	MKTF-10	2203825-008c	6.1	5	µg/L	J-	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-17R	2203825-003c	11	5	µg/L	J-	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-18R	2203825-004c	3.5	5	µg/L	J	MDLRL
3,4-Methylphenol	SW8270C	MKTF-11	2203825-007c	3.8	5	µg/L	J-	LR-SUR, MDLRL
3,4-Methylphenol	SW8270C	MKTF-10	2203825-008c	ND	5	µg/L	R	LR-SUR
Arsenic, Dissolved	E200.8	OW-1	2203825-002E	0.00052	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-3-15-22	2203825-010E	0.00068	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-1	2203825-002D	0.00069	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-3-15-22	2203825-010D	0.0008	0.001	mg/L	J	MDLRL
Benzene	SW8260B	EB 3-15-22	2203825-001a	0.23	1	µg/L	J	MDLRL
Benzene	SW8260B	MKTF-38	2203825-005a	0.49	1	µg/L	U	EBD, MDLRL
Chloroform	SW8260B	MKTF-17R	2203825-003a	7.2	10	µg/L	J	MDLRL
Chloroform	SW8260B	MKTF-18R	2203825-004a	1.9	10	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chloroform	SW8260B	MKTF-04R	2203825-006a	2.1	5	µg/L	J	MDLRL
Chloroform	SW8260B	MKTF-11	2203825-007a	3.5	10	µg/L	J	MDLRL
Chloroform	SW8260B	MKTF-10	2203825-008a	4	10	µg/L	J	MDLRL
Chloromethane	SW8260B	EB 3-15-22	2203825-001a	0.91	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	OW-1	2203825-002a	0.77	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-38	2203825-005a	0.78	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-04R	2203825-006a	3.9	15	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-10	2203825-008a	27	30	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB 3-15-22	2203825-009a	0.89	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP-3-15-22	2203825-010a	0.75	3	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203825-011a	0.66	3	µg/L	U	MBD, MDLRL
Chromium, Total	E 200.7	OW-1	2203825-002D	0.0033	0.006	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-17R	2203825-003D	0.0041	0.006	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-18R	2203825-004D	0.0042	0.006	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-10	2203825-008D	0.0059	0.006	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-3-15-22	2203825-010D	0.0029	0.006	mg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-18R	2203825-004a	4.6	10	µg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-10	2203825-008a	6.2	10	µg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-17R	2203825-003E	0.0033	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-18R	2203825-004E	0.0032	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-38	2203825-005E	0.0038	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-04R	2203825-006E	0.0056	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-11	2203825-007E	0.0058	0.006	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-17R	2203825-003D	0.0037	0.006	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-10	2203825-008D	0.0058	0.006	mg/L	J	MDLRL
Cyanide, Total	E335.4	EB 3-15-22	2203825-001F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	OW-1	2203825-002F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	MKTF-17R	2203825-003F	ND	0.005	mg/L	UJ	LR-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cyanide, Total	E335.4	MKTF-18R	2203825-004F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	MKTF-38	2203825-005F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	MKTF-04R	2203825-006F	0.00801	0.005	mg/L	J-	LR-MS
Cyanide, Total	E335.4	MKTF-11	2203825-007F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	MKTF-10	2203825-008F	ND	0.005	mg/L	UJ	LR-MS
Cyanide, Total	E335.4	DUP-3-15-22	2203825-010F	ND	0.005	mg/L	UJ	LR-MS
Isopropylbenzene	SW8260B	MKTF-18R	2203825-004a	4.4	10	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-04R	2203825-006a	2.3	5	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-1	2203825-002E	0.000077	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-17R	2203825-003E	0.00024	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-38	2203825-005E	0.000068	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	OW-1	2203825-002D	0.00019	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-11	2203825-007D	0.002	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-3-15-22	2203825-010D	0.00018	0.0005	mg/L	J	MDLRL
Methylene Chloride	SW8260B	MKTF-10	2203825-008a	5.6	30	µg/L	J	MDLRL
MTBE	SW8260B	MKTF-10	2203825-008a	9.6	10	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-17R	2203825-003a	16	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-18R	2203825-004a	3.5	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-11	2203825-007a	5.3	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-10	2203825-008a	11	30	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-17R	2203825-003E	0.0058	0.01	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-18R	2203825-004E	0.0057	0.01	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-38	2203825-005E	0.0055	0.01	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-04R	2203825-006E	0.0083	0.01	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-17R	2203825-003D	0.0061	0.01	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-18R	2203825-004D	0.0098	0.01	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-18R	2203825-004a	6.6	10	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-04R	2203825-006a	3.1	5	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenanthrene	SW8270C	OW-1	2203825-002c	0.08	0.1	µg/L	J	MDLRL
Phenol	SW8270C	MKTF-17R	2203825-003c	7.5	5	µg/L	J-	LR-SUR
Phenol	SW8270C	MKTF-11	2203825-007c	30	5	µg/L	J-	LR-SUR
Phenol	SW8270C	MKTF-10	2203825-008c	22	5	µg/L	J-	LR-SUR
p-Isopropyltoluene	SW8260B	MKTF-17R	2203825-003a	5	10	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-18R	2203825-004a	2.2	10	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-04R	2203825-006a	1.3	5	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-10	2203825-008a	7.7	10	µg/L	J	MDLRL
Pyrene	SW8270C	OW-1	2203825-002c	0.24	0.4	µg/L	U	MBD, MDLRL
Pyrene	SW8270C	MKTF-17R	2203825-003c	0.42	0.4	µg/L	JB	MBD
Pyrene	SW8270C	MKTF-38	2203825-005c	0.16	0.4	µg/L	U	MBD, MDLRL
Pyrene	SW8270C	MKTF-04R	2203825-006c	0.22	0.4	µg/L	U	MBD, MDLRL
Pyrene	SW8270C	MKTF-11	2203825-007c	0.2	0.4	µg/L	U	MBD, MDLRL
Pyrene	SW8270C	MKTF-10	2203825-008c	0.18	0.4	µg/L	U	MBD, MDLRL
sec-Butylbenzene	SW8260B	MKTF-17R	2203825-003a	5.5	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-18R	2203825-004a	1.7	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-11	2203825-007a	4.4	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-10	2203825-008a	5.7	10	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-11	2203825-007E	0.00046	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-18R	2203825-004D	0.00087	0.001	mg/L	J	MDLRL
Styrene	SW8260B	MKTF-17R	2203825-003a	2.6	10	µg/L	J	MDLRL
Toluene	SW8260B	MKTF-38	2203825-005a	0.8	1	µg/L	J	MDLRL
TPH DRO	SW8015	EB 3-15-22	2203825-001C	0.026	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-1	2203825-002C	0.022	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-17R	2203825-003C	7	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-18R	2203825-004C	4	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-38	2203825-005C	0.11	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	MKTF-04R	2203825-006C	1.5	0.064	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	MKTF-11	2203825-007C	0.92	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-10	2203825-008C	1.9	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	DUP-3-15-22	2203825-010C	0.026	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	EB 3-15-22	2203825-001a	0.037	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-1	2203825-002a	0.041	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-38	2203825-005a	0.047	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	DUP-3-15-22	2203825-010a	0.036	0.05	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	Trip Blank	2203825-011a	0.035	0.05	mg/L	U	MBD, MDLRL
TPH ORO	SW8015	MKTF-38	2203825-005C	0.066	0.08	mg/L	J	MDLRL
Trichloroethene	SW8260B	MKTF-38	2203825-005a	0.57	1	µg/L	J	MDLRL
Trichloroethene	SW8260B	MKTF-04R	2203825-006a	2.5	5	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-1	2203825-002E	0.041	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-38	2203825-005E	0.0041	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-3-15-22	2203825-010E	0.044	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-1	2203825-002D	0.043	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-17R	2203825-003D	0.0056	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-18R	2203825-004D	0.011	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-38	2203825-005D	0.027	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-04R	2203825-006D	0.024	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-11	2203825-007D	0.0049	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-10	2203825-008D	0.018	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-3-15-22	2203825-010D	0.042	0.05	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-17R	2203825-003a	4.4	10	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-10	2203825-008a	8	10	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	EB 3-15-22	2203825-001E	0.0063	0.01	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-1	2203825-002E	0.0094	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-17R	2203825-003E	0.033	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-18R	2203825-004E	0.01	0.01	mg/L	JB	EBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	MKTF-38	2203825-005E	0.0055	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-04R	2203825-006E	0.012	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-11	2203825-007E	0.01	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-10	2203825-008E	0.008	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-3-15-22	2203825-010E	0.0077	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	MKTF-18R	2203825-004D	0.0078	0.01	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/16/2022
Date Validated: 07/26/2022	Sample End Date: 03/16/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203920	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB 3-16-22	2203920-001
MKTF-40	2203920-002
MKTF-31	2203920-003
MKTF-25	2203920-004
MKTF-24	2203920-005
MKTF-02R	2203920-006
FB 3-16-22	2203920-007
DUP-3-16-22	2203920-008
Trip Blank	2203920-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ⊗ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Seven data points were rejected. The data completeness measure for this data package is calculated to be 98.70% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C: "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.8	Multiple Samples	Select Total and Dissolved Metals	5
245.1	MKTF-24	Total Mercury	5
8015D	MKTF-31, DUP-3-16-22	GRO	5
8260B	MKTF-31, DUP-3-16-22	VOCs	5
8015D	MKTF-25, MKTF-24	GRO	10
8260B	MKTF-02R, MKTF-25, MKTF-24	VOCs	10
8270C SIM	Multiple Samples	1,4-Dioxane	10
504.1	MKTF-02R	EDB	20
8260B	MKTF-24	Benzene	100

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 0.2°C, 0.9°C, 1.3°C, and 3.9°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.6°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? No

Comments: The samples were extracted/digested and analyzed within method-specific holding times, with the following exceptions.

Method 4500 CN E: **Samples EB 3-16-22, MKTF-40, MKTF-31, and MKTF-25 were analyzed for cyanide outside the defined holding time of 14 days by approximately 1 day. Cyanide was detected in samples MKTF-40, MKTF-31, and MKTF-25 by Method 4500 CN E and the results were assigned J qualifiers based on the holding time exceedances. The non-detect result for sample EB 3-16-22 was assigned an R qualifier to indicate that the result was rejected based on the holding time exceedance.**

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66236**	**0.030 mg/L**
8260B	**Chloromethane**	**R86626**	**0.68 µg/L**
8260B	**Chloromethane**	**R86666**	**0.66 µg/L**
8015D	**GRO**	**G86626**	**0.034 µg/L**

Detections of DRO, chloromethane, and GRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66642	Not Prepared
200.7	Total Metals	66643	Not Prepared
200.7	Dissolved Metals	A86535	Not Prepared
200.8	Total Metals	66254	Not Prepared
200.8	Dissolved Metals	B86624	Not Prepared
245.1	Total and Dissolved Mercury	66370	MKTF-24
504.1	EDB	66256	Not Prepared
4500CN E	Cyanide	WG1838528	Not Associated
4500CN E	Cyanide	WG1837590	Not Associated
4500CN E	Cyanide	WG1836404	Not Associated, MKTF-02R
8015D	TPH DRO and MRO	66236	Not Prepared
8015D	TPH GRO	G86626	MKTF-31
8260B	VOCs	R86626	MKTF-40
8260B	VOCs	R86666	Not Prepared
8270C	SVOCs	66244	Not Prepared
8270C SIM	SVOCs	R86665	Not Prepared
8270C SIM	1,4-Dioxane	R86694	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	MS/MSD RPD	RPD QC Limits
4500 CN E	**Cyanide**	**WG1836404**	**23%**	**20%**
8015D	**TPH GRO**	**G86626**	**26.9%**	**20%**

The identified analytes with MS/MSD RPD values that were above the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCS/LCSD QC Limits
200.7	**Total Nickel**	**66642**	**67.7%**	**70-130%**
200.7	**Total Nickel**	**66643**	**69.0%**	**70-130%**

Detections of total nickel in the associated samples were assigned J- qualifiers due to potential low bias. Total nickel was not detected in the associated sample EB 3-16-22 and the result was assigned a UJ qualifier.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-02R**	**6.13%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-02R**	**19.0%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**MKTF-02R**	**2.36%**	**18.6-129%**

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. **Since 2 of the 3 acid fraction surrogates were recovered below 10% in sample MKTF-02R, acid fraction analytes were assigned R qualifiers indicating rejected results.**

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-16-22, and one equipment blank sample, EB 3-16-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**1,1-Dichloroethene**	**0.68 µg/L**
Trip Blank	8260B	Chloromethane	0.69 µg/L
FB-3-16-22	8260B	1,1-Dichloroethene	0.57 µg/L
FB-3-16-22	**8260B**	**2-Butanone**	**5.7 µg/L**
FB-3-16-22	8260B	Chloromethane	0.84 µg/L
EB 3-16-22	**200.7**	**Dissolved Zinc**	**0.0067 mg/L**
EB 3-16-22	8015D	GRO	0.036 mg/L
EB 3-16-22	8260B	2-Butanone	8.5 µg/L
EB 3-16-22	8260B	Chloromethane	1.1 µg/L

Detections of 1,1-dichloroethene, 2-butanone, and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The chloromethane (batches R86626 and R86666) and GRO (batch G86626) results were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-16-22 was collected as a field duplicate of sample MKTF-31.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1836404	Not Associated, MKTF-24
4500CN E	Cyanide	WG1837590	MKTF-25. Not Associated
4500CN E	Cyanide	WG1838528	MKTF-31, Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for laboratory duplicates prepared from project samples were within laboratory acceptance limits or were not applicable since the result for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-24	Arsenic	0.0030	0.0031
MKTF-24	Barium	0.76	0.81
MKTF-40	Cobalt	0.0039	0.0051
MKTF-40	Nickel	0.0094	0.010
MKTF-24	Nickel	0.031	0.033
MKTF-02R	Nickel	0.013	0.014
MKTF-40	Silver	ND	0.0016
MKTF-02R	Silver	ND	0.0016
EB 3-16-22	Zinc	ND	0.0067
MKTF-40	Zinc	0.0079	0.010
MKTF-24	Zinc	0.0076	0.0088
MKTF-02R	Zinc	0.011	0.013

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-31 Field Duplicate Sample ID: DUP-3-16-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.12 mg/L	0.12 mg/L	0.0%
Barium, Total	E 200.7	0.30 mg/L	0.34 mg/L	12.5%
Chromium, Total	E 200.7	0.010 mg/L	0.0091 mg/L	9.4% +/-RL
Cobalt, Total	E 200.7	0.0085 mg/L	0.0075 mg/L	12.5% +/-RL
Nickel, Dissolved	E 200.7	0.0066 mg/L	0.0051 mg/L	25.6% +/-RL
Nickel, Total	E 200.7	0.012 mg/L	0.012 mg/L	0.0% +/-RL
Vanadium, Dissolved	E 200.7	0.0024 mg/L	0.0022 mg/L	8.7% +/-RL
Vanadium, Total	E 200.7	0.025 mg/L	0.026 mg/L	3.9% +/-RL
Zinc, Dissolved	E 200.7	0.0082 mg/L	0.0096 mg/L	15.7% +/-RL
Zinc, Total	E 200.7	0.020 mg/L	0.022 mg/L	9.5%
Arsenic, Dissolved	E200.8	0.00059 mg/L	0.00049 mg/L	18.5% +/-RL
Arsenic, Total	E200.8	0.0021 mg/L	0.0023 mg/L	9.1%
Lead, Dissolved	E200.8	0.00012 mg/L	0.00015 mg/L	22.2% +/-RL
Lead, Total	E200.8	0.0084 mg/L	0.0095 mg/L	12.3%
Selenium, Total	E200.8	0.0018 mg/L	0.0019 mg/L	5.4% +/-RL
Mercury, Total	E245.1	0.00013 mg/L	ND (0.00020 mg/L)	DL
Cyanide, Total	E335.4	0.00964 mg/L	ND (0.00500 mg/L)	DL
TPH DRO	SW8015	0.29 mg/L	0.27 mg/L	7.1%
TPH GRO	SW8015	0.55 mg/L	0.55 mg/L	0.0%
1,1,1-Trichloroethane	SW8260B	2.3 µg/L	2.3 µg/L	0.0% +/-RL
1,1-Dichloroethane	SW8260B	27 µg/L	30 µg/L	10.5%
1,1-Dichloroethene	SW8260B	34 µg/L	41 µg/L	18.7%
1,2-Dichloroethane	SW8260B	12 µg/L	12 µg/L	0.0%
Benzene	SW8260B	ND (5.0 µg/L)	1.2 µg/L	DL
Chloromethane	SW8260B	3.5 µg/L	3.4 µg/L	2.9% +/-RL
cis-1,2-Dichloroethene	SW8260B	3.2 µg/L	3.1 µg/L	3.2% +/-RL
MTBE	SW8260B	350 µg/L	340 µg/L	2.9%
Trichloroethene	SW8260B	5.2 µg/L	5.1 µg/L	1.9% +/-RL
1,4-Dioxane	SW8270C	81 µg/L	63 µg/L	25.0%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HT-AN	Sample was analyzed outside of the method holding time.
ERPD-MS	The MS/MSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
EBD	Equipment blank detection
FBD	Field blank detection
TBD	Trip blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1,1-Trichloroethane	SW8260B	MKTF-31	2203920-003a	2.3	5.0	µg/L	J	MDLRL
1,1,1-Trichloroethane	SW8260B	DUP-3-16-22	2203920-008a	2.3	5.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-40	2203920-002a	0.85	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	Trip Blank	2203920-009a	0.68	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	MKTF-25	2203920-004a	9.2	10	µg/L	U	MDLRL, TBD
1,1-Dichloroethene	SW8260B	MKTF-24	2203920-005a	6.1	10	µg/L	U	MDLRL, TBD
1,1-Dichloroethene	SW8260B	FB 3-16-22	2203920-007a	0.57	1.0	µg/L	U	MDLRL, TBD
1,2-Dichloroethane	SW8260B	MKTF-40	2203920-002a	0.45	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-24	2203920-005a	5.9	10	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	MKTF-02R	2203920-006c	ND	50	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-02R	2203920-006c	ND	50	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-02R	2203920-006c	ND	5.0	µg/L	R	LR-SUR
2-Butanone	SW8260B	EB 3-16-22	2203920-001a	8.5	10	µg/L	U	FBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Butanone	SW8260B	FB 3-16-22	2203920-007a	5.7	10	µg/L	J	MDLRL
2-Methylphenol	SW8270C	MKTF-02R	2203920-006c	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-02R	2203920-006c	ND	5.0	µg/L	R	LR-SUR
Arsenic, Dissolved	E200.8	MKTF-31	2203920-003E	0.00059	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-25	2203920-004E	0.00079	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-02R	2203920-006E	0.0018	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-3-16-22	2203920-008E	0.00049	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-40	2203920-002D	0.0013	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-25	2203920-004D	0.0031	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-24	2203920-005D	0.0030	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-02R	2203920-006D	0.0021	0.0050	mg/L	J	MDLRL
Benzene	SW8260B	DUP-3-16-22	2203920-008a	1.2	5.0	µg/L	J	MDLRL
Chloromethane	SW8260B	EB 3-16-22	2203920-001a	1.1	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-40	2203920-002a	0.75	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-31	2203920-003a	3.5	15	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-25	2203920-004a	9.9	30	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-02R	2203920-006a	1.9	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB 3-16-22	2203920-007a	0.84	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP-3-16-22	2203920-008a	3.4	15	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203920-009a	0.69	3.0	µg/L	U	MBD, MDLRL
Chromium, Total	E 200.7	MKTF-25	2203920-004D	0.0037	0.0060	mg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-31	2203920-003a	3.2	5.0	µg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-25	2203920-004a	8.0	10	µg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	DUP-3-16-22	2203920-008a	3.1	5.0	µg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-40	2203920-002E	0.0051	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-25	2203920-004E	0.0058	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-02R	2203920-006E	0.0041	0.0060	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Total	E 200.7	MKTF-40	2203920-002D	0.0039	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-02R	2203920-006D	0.0060	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-40	2203920-002F	0.00839	0.0050	mg/L	J	HT-AN
Cyanide, Total	E335.4	MKTF-31	2203920-003F	0.00964	0.0050	mg/L	J	HT-AN
Cyanide, Total	E335.4	MKTF-25	2203920-004F	0.00896	0.0050	mg/L	J	HT-AN
Cyanide, Total	E335.4	EB 3-16-22	2203920-001F	ND	0.0050	mg/L	R	HT-AN
Cyanide, Total	E335.4	MKTF-02R	2203920-006F	0.0129	0.0050	mg/L	J	ERPD-MS
Cyanide, Total	E335.4	MKTF-24	2203920-005F	ND	0.0050	mg/L	UJ	ERPD-MS
Cyanide, Total	E335.4	DUP-3-16-22	2203920-008F	ND	0.0050	mg/L	UJ	ERPD-MS
Lead, Dissolved	E200.8	MKTF-31	2203920-003E	0.00012	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-25	2203920-004E	0.00023	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-3-16-22	2203920-008E	0.00015	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-40	2203920-002D	0.0024	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-02R	2203920-006D	0.0012	0.0025	mg/L	J	MDLRL
Mercury, Total	E245.1	MKTF-40	2203920-002D	0.000099	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	MKTF-31	2203920-003D	0.00013	0.00020	mg/L	J	MDLRL
Methylene Chloride	SW8260B	MKTF-02R	2203920-006a	1.1	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-24	2203920-005a	7.7	30	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-31	2203920-003E	0.0066	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	DUP-3-16-22	2203920-008E	0.0051	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-31	2203920-003D	0.012	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-25	2203920-004D	0.029	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-24	2203920-005D	0.031	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-02R	2203920-006D	0.013	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	DUP-3-16-22	2203920-008D	0.012	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB 3-16-22	2203920-001D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-40	2203920-002D	0.0094	0.010	mg/L	J-	LR-LCS, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	MKTF-02R	2203920-006c	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	MKTF-25	2203920-004c	4.1	5.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-24	2203920-005a	4.6	10	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-25	2203920-004E	0.00041	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-24	2203920-005E	0.00039	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-25	2203920-004D	0.0023	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-24	2203920-005D	0.0019	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-40	2203920-002E	0.0016	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-02R	2203920-006E	0.0016	0.0050	mg/L	J	MDLRL
Tetrachloroethene	SW8260B	MKTF-02R	2203920-006a	0.36	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	MKTF-31	2203920-003C	0.29	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-02R	2203920-006C	0.24	0.064	mg/L	JB	MBD
TPH DRO	SW8015	DUP-3-16-22	2203920-008C	0.27	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-40	2203920-002C	0.058	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-31	2203920-003a	0.55	0.25	mg/L	J	ERPD-MS
TPH GRO	SW8015	MKTF-25	2203920-004a	0.97	0.50	mg/L	J	ERPD-MS
TPH GRO	SW8015	MKTF-24	2203920-005a	12	0.50	mg/L	J	ERPD-MS
TPH GRO	SW8015	MKTF-02R	2203920-006a	0.63	0.050	mg/L	J	ERPD-MS
TPH GRO	SW8015	DUP-3-16-22	2203920-008a	0.55	0.25	mg/L	J	ERPD-MS
TPH GRO	SW8015	EB 3-16-22	2203920-001a	0.036	0.050	mg/L	U	ERPD-MS, MBD, MDLRL
TPH GRO	SW8015	MKTF-40	2203920-002a	0.038	0.050	mg/L	U	ERPD-MS, MBD, MDLRL
Trichloroethene	SW8260B	MKTF-25	2203920-004a	5.7	10	µg/L	J	MDLRL
Trichloroethene	SW8260B	MKTF-24	2203920-005a	3.2	10	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-40	2203920-002E	0.0084	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-31	2203920-003E	0.0024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-02R	2203920-006E	0.0032	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Dissolved	E 200.7	DUP-3-16-22	2203920-008E	0.0022	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-40	2203920-002D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-31	2203920-003D	0.025	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-25	2203920-004D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-24	2203920-005D	0.0067	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-02R	2203920-006D	0.0075	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-3-16-22	2203920-008D	0.026	0.050	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-25	2203920-004a	7.1	10	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-02R	2203920-006a	0.75	1.0	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-40	2203920-002E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-02R	2203920-006E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-31	2203920-003E	0.0082	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-25	2203920-004E	0.0054	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-24	2203920-005E	0.0088	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-3-16-22	2203920-008E	0.0096	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB 3-16-22	2203920-001E	0.0067	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-40	2203920-002D	0.0079	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-24	2203920-005D	0.0076	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q1 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 03/17/2022
Date Validated: 06/28/2022	Sample End Date: 03/17/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2203989	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB 3-17-22	2203989-001
MKTF-01R	2203989-002
MKTF-27	2203989-003
MKTF-28	2203989-004
MKTF-29	2203989-005
MKTF-30	2203989-006
FB 3-17-22	2203989-007
DUP-3-17-22	2203989-008
Trip Blank	2203989-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates and Internal Standards) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Eighteen data points were rejected. The data completeness measure for this data package is calculated to be 96.67% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

"S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.

Naphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample MKTF-01R.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated value. *This laboratory flag was applied only to QC sample and surrogate results in the laboratory report, and qualification of sample data was not required.*

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	MKTF-27, DUP-3-17-22	Total and Dissolved Metals	5
200.8	MKTF-27, MKTF-29, DUP-3-17-22	Total and Dissolved Metals	5
245.1	MKTF-29	Total Mercury	5
200.7	MKTF-01R	Total and Dissolved Barium	10
8015	MKTF-01R	GRO	10
8260B	MKTF-01R	Select VOCs	10
8260B	MKTF-01R	Benzene	100

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.3°C and 1.7°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.3°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**DRO**	**66267**	**0.027 mg/L**
8260B	**Chloromethane**	**R86626**	**0.68 µg/L**
8015D	**GRO**	**G86626**	**0.034 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of DRO and GRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	66643	MKTF-01R, MKTF-27
200.7	Dissolved Metals	A86575	EB 3-17-22
200.7	Dissolved Barium	A87332	Not Prepared
200.8	Total Metals	66341	EB 3-17-22, MKTF-01R
200.8	Dissolved Metals	A86633	MKTF-27
200.8	Dissolved Metals	B86624	Not Prepared
245.1	Total and Dissolved Mercury	66371	Not Prepared
504.1	EDB	66256	Not Prepared
504.1	EDB	66262	Not Prepared
4500CN E	Cyanide	WG1836836	MKTF-01R, MKTF-30
8015D	TPH DRO and MRO	66267	Not Prepared
8015D	TPH GRO	G86626	Not Prepared
8260B	VOCs	R86626	Not Prepared
8270C	SVOCs	66282	Not Prepared
8270C SIM	SVOCs	R86694	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

The MS and MSD recoveries for cyanide in Method 4500 CN E batch WG1836836 were outside the laboratory QC limits of 90-110% at 86.2% and 79.2%, respectively. However, the recoveries were within data validation limits of 75-125%. Validation action was not required.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exception.

The LCS recovery for total nickel in Method 200.7 batch 66643 were outside the data validation acceptance limits of 70-130% at 69%, indicating a potential low bias. Associated samples with detections for total nickel were qualified with J- flags due to possible low bias, and the associated samples with non-detections for total nickel were qualified with a UJ flag due to possible low bias.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-27**	**5.18%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-27**	**10.6%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**MKTF-27**	**2.12%**	**18.6-129%**
8270C	**2-Fluorophenol**	**MKTF-29**	**5.56%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**MKTF-29**	**18.0%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**MKTF-29**	**1.77%**	**18.6-129%**
8270C	**2-Fluorophenol**	**DUP-3-17-22**	**3.92%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**DUP-3-17-22**	**9.97%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**DUP-3-17-22**	**1.87%**	**18.6-129%**

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

The associated analytes were not detected in the listed samples. Since the recoveries for 2 of 3 surrogates in each of the identified samples were below 10%, these non-detected results were qualified as R indicating rejected results, data not usable.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 3-17-22, and one equipment blank sample, EB 3-17-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Chloromethane	0.69 µg/L
FB-3-17-22	**8260B**	**2-Butanone**	**5.1 µg/L**
FB-3-17-22	8260B	Chloromethane	0.71 µg/L
EB-3-17-22	**200.7**	**Dissolved Zinc**	**0.0044 mg/L**
EB-3-17-22	8015D	TPH DRO	0.021 mg/L
EB-3-17-22	8015D	TPH GRO	0.037 mg/L
EB-3-17-22	**8260B**	**1,1-Dichloroethene**	**0.54 µg/L**
EB-3-17-22	8260B	2-Butanone	5.3 µg/L

Detections of 2-butanone and dissolved zinc in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. The detection of 1,1-dichloroethene in the associated sample MKTF-30 that was greater than the reporting limit but less than 10 times the blank result was assigned a JB qualifier. Non-detections of the identified analytes in the associated samples did not require qualification.

The chloromethane, DRO, and GRO results were previously qualified due to laboratory blank contamination in batches R86626, 66267, and G86626, respectively; therefore, additional qualification due to the trip, field, and equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-3-17-22 was collected as a field duplicate of sample MKTF-27.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for total cyanide exceeded the data validation limit of 30% at 90.0%, which was evidence of poor precision. The total cyanide results were qualified as J for samples MKTF-27 and DUP-3-17-22.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1836836	Not Associated
4500CN E	Cyanide	WG1836836	MKTF-28

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD for the laboratory duplicate prepared from a project sample was not applicable since the cyanide results for both measurements were non-detections.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-01R	Barium	5.1	5.6
MKTF-29	Barium	0.21	0.22
MKTF-01R	Nickel	0.024	0.027
MKTF-27	Nickel	0.021	0.033
MKTF-28	Nickel	0.0067	0.0079
MKTF-29	Nickel	0.018	0.020
DUP-3-17-22	Nickel	0.021	0.030
DUP-3-17-22	Selenium	0.0034	0.0043
EB 3-17-22	Zinc	ND	0.0044
MKTF-29	Zinc	ND	0.0061

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-27 Field Duplicate Sample ID: DUP-3-17-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.068 mg/L	0.068 mg/L	0.0%
Barium, Total	E 200.7	0.073 mg/L	0.076 mg/L	4.0%
Cobalt, Total	E 200.7	0.015 mg/L	0.017 mg/L	12.5% +/-RL
Nickel, Dissolved	E 200.7	0.033 mg/L	0.030 mg/L	9.5% +/-RL
Nickel, Total	E 200.7	0.021 mg/L	0.021 mg/L	0.0% +/-RL
Arsenic, Dissolved	E200.8	0.0011 mg/L	0.0012 mg/L	8.7% +/-RL
Arsenic, Total	E200.8	0.0015 mg/L	0.0015 mg/L	0.0% +/-RL
Lead, Total	E200.8	0.00093 mg/L	0.0017 mg/L	58.6% +/-RL
Selenium, Dissolved	E200.8	0.0047 mg/L	0.0043 mg/L	8.9% +/-RL
Selenium, Total	E200.8	0.0062 mg/L	0.0034 mg/L	58.3% +/-RL
Cyanide, Total	**E335.4**	**0.0118 mg/L**	**0.0311 mg/L**	**90.0%**
TPH DRO	SW8015	0.36 mg/L	0.38 mg/L	5.4%
TPH GRO	SW8015	0.054 mg/L	0.055 mg/L	1.8% +/-RL
TPH ORO	SW8015	0.16 mg/L	0.18 mg/L	11.8%
1,1-Dichloroethane	SW8260B	0.86 µg/L	0.89 µg/L	3.4% +/-RL
1,2-Dichloroethane	SW8260B	0.54 µg/L	0.54 µg/L	0.0% +/-RL
Benzene	SW8260B	1.3 µg/L	0.49 µg/L	90.5% +/-RL
Chloromethane	SW8260B	0.72 µg/L	0.66 µg/L	8.7% +/-RL
MTBE	SW8260B	17 µg/L	17 µg/L	0.0%
Vinyl Chloride	SW8260B	0.46 µg/L	ND (1.0 µg/L)	DL
1,4-Dioxane	SW8270C	3.3 µg/L	3.6 µg/L	8.7%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for total cyanide exceeded the data validation limit of 30% at 90.0%, which was evidence of poor precision. The total cyanide results were qualified as J for samples MKTF-27 and DUP-3-17-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
FBD	Field blank detection
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-01R	2203989-002a	5.5	10	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-27	2203989-003a	0.86	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-29	2203989-005a	0.63	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-3-17-22	2203989-008a	0.89	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	MKTF-30	2203989-006a	1.3	1.0	µg/L	JB	EBD
1,1-Dichloroethene	SW8260B	EB 3-17-22	2203989-001a	0.54	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-01R	2203989-002a	5.1	10	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-27	2203989-003a	0.54	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-28	2203989-004a	0.42	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-3-17-22	2203989-008a	0.54	1.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dimethylphenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-01R	2203989-002c	4.0	5.0	µg/L	J	MDLRL
2,4-Dinitrophenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
2-Butanone	SW8260B	EB 3-17-22	2203989-001a	5.3	10	µg/L	U	FBD, MDLRL
2-Butanone	SW8260B	FB 3-17-22	2203989-007a	5.1	10	µg/L	J	MDLRL
2-Methylphenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-01R	2203989-002c	3.7	5.0	µg/L	J	MDLRL
3,4-Methylphenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
Arsenic, Dissolved	E200.8	MKTF-27	2203989-003E	0.0011	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-28	2203989-004E	0.00090	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-29	2203989-005E	0.00073	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-30	2203989-006E	0.00059	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-3-17-22	2203989-008E	0.0012	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-27	2203989-003D	0.0015	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-3-17-22	2203989-008D	0.0015	0.0050	mg/L	J	MDLRL
Benzene	SW8260B	MKTF-28	2203989-004a	0.30	1.0	µg/L	J	MDLRL
Benzene	SW8260B	DUP-3-17-22	2203989-008a	0.49	1.0	µg/L	J	MDLRL
Chloroform	SW8260B	MKTF-01R	2203989-002a	5.7	10	µg/L	J	MDLRL
Chloromethane	SW8260B	MKTF-27	2203989-003a	0.72	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-28	2203989-004a	0.70	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	MKTF-29	2203989-005a	0.91	3.0	µg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chloromethane	SW8260B	MKTF-30	2203989-006a	0.65	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	FB 3-17-22	2203989-007a	0.71	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	DUP-3-17-22	2203989-008a	0.66	3.0	µg/L	U	MBD, MDLRL
Chloromethane	SW8260B	Trip Blank	2203989-009a	0.69	3.0	µg/L	U	MBD, MDLRL
Chromium, Total	E 200.7	MKTF-30	2203989-006D	0.0027	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-01R	2203989-002E	0.003	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	MKTF-29	2203989-005E	0.0053	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-01R	2203989-002D	0.0053	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-27	2203989-003D	0.015	0.030	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-28	2203989-004D	0.0057	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-29	2203989-005D	0.0059	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-30	2203989-006D	0.0041	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	DUP-3-17-22	2203989-008D	0.017	0.030	mg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-27	2203989-003F	0.0118	0.0050	mg/L	J	ERPD-FD
Cyanide, Total	E335.4	DUP-3-17-22	2203989-008F	0.0311	0.0050	mg/L	J	ERPD-FD
Lead, Dissolved	E200.8	MKTF-30	2203989-006E	0.000072	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-27	2203989-003D	0.00093	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-3-17-22	2203989-008D	0.0017	0.0025	mg/L	J	MDLRL
MTBE	SW8260B	MKTF-28	2203989-004a	0.53	1.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-01R	2203989-002a	11	30	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-27	2203989-003E	0.033	0.050	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-28	2203989-004E	0.0079	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	DUP-3-17-22	2203989-008E	0.030	0.050	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-01R	2203989-002D	0.024	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-29	2203989-005D	0.018	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-30	2203989-006D	0.017	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB 3-17-22	2203989-001D	ND	0.010	mg/L	UJ	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Nickel, Total	E 200.7	MKTF-27	2203989-003D	0.021	0.050	mg/L	J-	LR-LCS, MDLRL
Nickel, Total	E 200.7	MKTF-28	2203989-004D	0.0067	0.010	mg/L	J-	LR-LCS, MDLRL
Nickel, Total	E 200.7	DUP-3-17-22	2203989-008D	0.021	0.050	mg/L	J-	LR-LCS, MDLRL
Phenol	SW8270C	MKTF-27	2203989-003c	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	MKTF-29	2203989-005c	ND	5.0	µg/L	R	LR-SUR
Phenol	SW8270C	DUP-3-17-22	2203989-008c	ND	5.0	µg/L	R	LR-SUR
p-Isopropyltoluene	SW8260B	MKTF-01R	2203989-002a	2.7	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-01R	2203989-002a	4.2	10	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-01R	2203989-002E	0.00038	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-27	2203989-003E	0.0047	0.0050	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-28	2203989-004E	0.00068	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP-3-17-22	2203989-008E	0.0043	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-01R	2203989-002D	0.00075	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-29	2203989-005D	0.00069	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-3-17-22	2203989-008D	0.0034	0.00500	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-29	2203989-005E	0.0017	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	MKTF-29	2203989-005D	0.0019	0.005	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-28	2203989-004C	0.17	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-30	2203989-006C	0.13	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB 3-17-22	2203989-001C	0.021	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-27	2203989-003a	0.054	0.050	mg/L	JB	MBD
TPH GRO	SW8015	MKTF-29	2203989-005a	0.058	0.050	mg/L	JB	MBD
TPH GRO	SW8015	MKTF-30	2203989-006a	0.066	0.050	mg/L	JB	MBD
TPH GRO	SW8015	DUP-3-17-22	2203989-008a	0.055	0.050	mg/L	JB	MBD
TPH GRO	SW8015	EB 3-17-22	2203989-001a	0.037	0.050	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-28	2203989-004a	0.039	0.050	mg/L	U	MBD, MDLRL
TPH ORO	SW8015	MKTF-28	2203989-004C	0.056	0.080	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Trichloroethene	SW8260B	MKTF-01R	2203989-002a	3.0	10	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-28	2203989-004E	0.0027	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-29	2203989-005E	0.0034	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-30	2203989-006E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-01R	2203989-002D	0.0054	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-28	2203989-004D	0.012	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-29	2203989-005D	0.0044	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-30	2203989-006D	0.014	0.050	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-27	2203989-003a	0.46	1.0	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-29	2203989-005a	0.44	1.0	µg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-30	2203989-006a	0.46	1.0	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-01R	2203989-002E	0.0077	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-28	2203989-004E	0.0059	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-29	2203989-005E	0.0061	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-30	2203989-006E	0.0082	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB 3-17-22	2203989-001E	0.0044	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-30	2203989-006D	0.0082	0.010	mg/L	J	MDLRL

Appendix D-2. 2nd Quarter Data Validation Reports

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Aqueous
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/21/2022
Date Validated: 09/19/2022	Sample End Date: 06/21/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206B30	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-21-22	2206B30-001
MKTF-46	2206B30-002
MKTF-18R	2206B30-003
MKTF-35	2206B30-004
MKTF-38	2206B30-005
MKTF-11	2206B30-006
MKTF-16	2206B30-007
FB-6-21-22	2206B30-008
DUP-6-21-22	2206B30-009
Trip Blank	2206B30-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 628 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C: Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene may be reported by either EPA Method 8270 or EPA Method 8270 SIM, depending which method needs the least dilution. In this report naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM for sample MKTF-18R. Naphthalene and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM for sample MKTF-35.

Method 4500CN E: For samples MKTF-18R, MKTF-38, and MKTF-16, analyses were performed from improper containers.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

P – Sample pH not in range.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	Multiple Samples	Total and/or Dissolved Barium	2
200.8	MKTF-35, MKTF-11, MKTF-16	Select Total and Dissolved Metals	5
8015D	MKTF-18R, MKTF-35, MKTF-11	TPH GRO	10
8260B	MKTF-18R, MKTF-11	Select VOCs	10
8260B	MKTF-35	VOCs	20
8260B	MKTF-18R, MKTF-11	Benzene	100
200.7	MKTF-35	Total Barium	100
8260B	MKTF-35	Benzene and Toluene	200

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.4°C and 5.3°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.1°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen. A preserved vial was submitted for the Method 8015D GRO analysis for sample MKTF-18R but the pH at the time of analysis was greater than two. Following EPA defined actions, the holding time for this sample was reduced from 14 days to 7 days from sampling to analysis.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific and reduced holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 68348 at a concentration of 0.021 mg/L. TPH DRO was detected in sample EB-6-21-22 at a concentration less than the laboratory reporting limit and the result was qualified with a U flag. The TPH DRO results for sample DUP-6-21-22 and sample MKTF-46 that were greater than the blank detection and the laboratory reporting limit but less than 10 times the blank concentration were qualified with JB flags.** Detections of this analyte in the associated samples greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68353	Not Prepared
200.7	Dissolved Metals	A88979	Not Prepared
200.7	Dissolved Metals	B88979	DUP-6-21-22
200.8	Total Metals	68353	Not Prepared
200.8	Dissolved Metals	A88981	Not Prepared
245.1	Total and Dissolved Mercury	68333	Not Prepared
504.1	EDB	68319	Not Prepared
4500CN E	Cyanide	WG1886404	MKTF-35
8015D	TPH DRO and MRO	68348	Not Prepared
8015D	TPH GRO	A89029	Not Prepared
8260B	Benzene	A89138	Not Prepared
8260B	VOCs	R89107	Not Prepared
8260B	VOCs	W89041	MKTF-46
8270C and 8270C SIM	SVOCs	68332	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**68353**	**53.6%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Selenium**	**68353**	**131%**	**-----**	**70-130%**	**-----**	**-----**
504.1	**EDB**	**68319**	**Acceptable**	**Acceptable**	**70-130%**	**21.9%**	**20%**
8015D	**TPH DRO**	**68348**	**81.2%**	**89.2%**	**31.7-75.4%**	**Acceptable**	**20%**
8270C SIM	**1,4-Dioxane**	**68332**	**53.0%**	**55.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
8270C SIM	**Acenaphthene**	**68332**	**Acceptable**	**83.0%**	**29.8-82.7%**	**Acceptable**	**27.8%**
8270C SIM	**Phenanthrene**	**68332**	**Acceptable**	**94.0%**	**38.2-93.9%**	**Acceptable**	**27.9%**

Total nickel results were was qualified as J- if detected and UJ if not detected in the associated samples due to evidence of potential low bias.

Analytes with LCS and/or LCSD recoveries greater than the laboratory or data validation QC limits were detected in associated samples and the results were qualified as J+ to indicate estimated concentrations that may be biased high. Non-detections of these analytes in the associated samples did not require qualification.

EDB was not detected in the associated samples and the results were qualified UJ due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270C and Method 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples MKTF-46 and MKTF-35 Method 8270C analyses.

The Method 8015D surrogate BFB was recovered in sample MKTF-35 outside the acceptance limits of 70-130% at 151%. The target analyte, TPH GRO, associated with this surrogate was detected in sample MKTF-35, and the result was assigned a J+ qualifier due to evidence of potential high bias.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-21-22, and one equipment blank sample, EB 6-21-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB-6-21-22	**8260B**	**Acetone**	**3.6 µg/L**
EB-6-21-22	8260B	Acetone	3.2 µg/L
EB-6-21-22	8260B	Methylene Chloride	0.80 µg/L
EB-6-21-22	8015D	TPH DRO	0.041 mg/L
EB-6-21-22	**200.7**	**Dissolved Zinc**	**0.0075 mg/L**

Detections of acetone and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank result were assigned JB qualifiers. Non-detections of these analytes in the associated samples did not require qualification.

The TPH DRO results in batch 68348 were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-21-22 was collected as a field duplicate of sample MKTF-46.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for TPH DRO exceeded the data validation limit of 30% at 96.3%, which was evidence of poor precision. The TPH DRO results were qualified as J for samples MKTF-46 and DUP-6-21-22.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1886404 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-35	Antimony	ND	0.00076
MKTF-16	Antimony	ND	0.00070
MKTF-18R	Arsenic	0.0065	0.0085
MKTF-11	Nickel	0.022	0.025
MKTF-46	Silver	ND	0.0032
MKTF-18R	Silver	ND	0.0016
MKTF-35	Silver	ND	0.0028
MKTF-38	Silver	ND	0.0027
MKTF-11	Silver	ND	0.0029
Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP-6-21-22	Silver	ND	0.0034
MKTF-11	Vanadium	ND	0.0030
EB-6-21-22	Zinc	ND	0.0075
MKTF-46	Zinc	0.0048	0.0084
MKTF-18R	Zinc	0.0044	0.0099
DUP-6-21-22	Zinc	0.0040	0.0071

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-46 Field Duplicate Sample ID: DUP-6-21-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
1,4-Dioxane	SW8270C	1.5 µg/L	1.7 µg/L	12.5% +/-RL
Phenanthrene	SW8270C	0.22 µg/L	ND (0.30 µg/L)	DL
TPH GRO	SW8015	0.016 mg/L	ND (0.050 mg/L)	DL
TPH DRO	**SW8015**	**0.070 mg/L**	**0.20 mg/L**	**96.3%**
Barium, Dissolved	E 200.7	0.037 mg/L	0.037 mg/L	0.0%
Barium, Total	E 200.7	0.080 mg/L	0.080 mg/L	0.0%
Chromium, Total	E 200.7	0.0021 mg/L	0.0023 mg/L	9.1% +/-RL
Silver, Dissolved	E 200.7	0.0032 mg/L	0.0034 mg/L	6.1% +/-RL
Vanadium, Dissolved	E 200.7	0.0040 mg/L	0.0042 mg/L	4.9% +/-RL
Vanadium, Total	E 200.7	0.0040 mg/L	0.0044 mg/L	9.5% +/-RL
Zinc, Dissolved	E 200.7	0.0084 mg/L	0.0071 mg/L	16.8% +/-RL
Zinc, Total	E 200.7	0.0048 mg/L	0.0040 mg/L	18.2% +/-RL
Arsenic, Dissolved	E200.8	0.00066 mg/L	0.00062 mg/L	6.3% +/-RL
Arsenic, Total	E200.8	0.00086 mg/L	0.00078 mg/L	9.8% +/-RL
Lead, Total	E200.8	0.0014 mg/L	0.0014 mg/L	0.0%
Selenium, Total	E200.8	0.00045 mg/L	0.00051 mg/L	12.5% +/-RL
Mercury, Total	E245.1	0.00013 mg/L	0.00013 mg/L	0.0% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for TPH DRO exceeded the data validation limit of 30% at 96.3%, which was evidence of poor precision. The TPH DRO results were qualified as J for samples MKTF-46 and DUP-6-21-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
EBD	Equipment blank detection
FBD	Field blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1,1-Trichloroethane	SW8260B	MKTF-16	2206b30-007a	0.95	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	MKTF-38	2206b30-005a	0.31	1.0	µg/L	J	MDLRL
1,2-Dibromoethane	E504.1	EB-6-21-22	2206B30-001B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-46	2206B30-002B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-18R	2206B30-003B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-35	2206B30-004B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-38	2206B30-005B	ND	0.0095	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-11	2206B30-006B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-16	2206B30-007B	ND	0.0095	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	DUP-6-21-22	2206B30-009B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-46	2206b30-002c	1.5	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-18R	2206B30-003C	13	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-35	2206B30-004C	2.0	1.0	µg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	MKTF-38	2206b30-005c	3.6	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-11	2206b30-006c	6.6	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-16	2206b30-007c	1.4	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	DUP-6-21-22	2206b30-009c	1.7	1.0	µg/L	J+	HR-LCS
1-Methylnaphthalene	SW8270C	MKTF-16	2206b30-007c	0.16	0.3	µg/L	J	MDLRL
2-Methylphenol	SW8270C	MKTF-18R	2206b30-003c	7.3	10	µg/L	J	MDLRL
Acenaphthene	SW8270C	MKTF-18R	2206B30-003C	6.3	0.30	µg/L	J+	HR-LCS
Acenaphthene	SW8270C	MKTF-35	2206B30-004C	1.6	0.30	µg/L	J+	HR-LCS
Acenaphthene	SW8270C	MKTF-11	2206b30-006c	0.44	0.30	µg/L	J+	HR-LCS
Acetone	SW8260B	EB-6-21-22	2206b30-001a	3.2	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	MKTF-38	2206b30-005a	5.4	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	MKTF-16	2206b30-007a	4.0	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	FB-6-21-22	2206b30-008a	3.6	10	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-35	2206B30-004E	0.00076	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-16	2206B30-007E	0.00070	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-46	2206B30-002E	0.00066	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-21-22	2206B30-009E	0.00062	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-46	2206B30-002D	0.00086	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-21-22	2206B30-009D	0.00078	0.0010	mg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	MKTF-18R	2206B30-003C	0.16	0.30	µg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-46	2206B30-002D	0.0021	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-18R	2206B30-003D	0.0028	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-6-21-22	2206B30-009D	0.0023	0.0060	mg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-18R	2206b30-003a	5.7	10	ug/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-18R	2206B30-003D	0.0051	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-11	2206B30-006D	0.0049	0.0060	mg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-18R	2206b30-003a	5.0	10	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Isopropylbenzene	SW8260B	MKTF-16	2206b30-007a	0.48	1.0	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-35	2206B30-004E	0.00021	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-38	2206B30-005E	0.0001	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-16	2206B30-007E	0.00017	0.00050	mg/L	J	MDLRL
Mercury, Total	E245.1	MKTF-46	2206B30-002D	0.00013	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	DUP-6-21-22	2206B30-009D	0.00013	0.00020	mg/L	J	MDLRL
Methylene Chloride	SW8260B	EB-6-21-22	2206b30-001a	0.80	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-18R	2206b30-003a	3.7	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-35	2206b30-004a	8.0	60	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-18R	2206B30-003E	0.0062	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-38	2206B30-005E	0.0059	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-16	2206B30-007E	0.0054	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-35	2206B30-004D	0.066	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-38	2206B30-005D	0.011	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-11	2206B30-006D	0.022	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	MKTF-16	2206B30-007D	0.032	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-6-21-22	2206B30-001D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-46	2206B30-002D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	DUP-6-21-22	2206B30-009D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-18R	2206B30-003D	0.0079	0.010	mg/L	J-	LR-LCS, MDLRL
n-Propylbenzene	SW8260B	MKTF-18R	2206b30-003a	5.6	10	µg/L	J	MDLRL
Phenanthrene	SW8270C	MKTF-18R	2206B30-003C	6.7	0.30	µg/L	J+	HR-LCS
Phenanthrene	SW8270C	MKTF-35	2206B30-004C	0.38	0.30	µg/L	J+	HR-LCS
Phenanthrene	SW8270C	MKTF-11	2206b30-006c	0.38	0.30	µg/L	J+	HR-LCS
Phenanthrene	SW8270C	MKTF-46	2206b30-002c	0.22	0.30	µg/L	J+	HR-LCS, MDLRL
p-Isopropyltoluene	SW8260B	MKTF-18R	2206b30-003a	2.7	10	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-35	2206b30-004a	6.1	20	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
sec-Butylbenzene	SW8260B	MKTF-18R	2206b30-003a	2.6	10	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-35	2206b30-004a	5.4	20	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-11	2206b30-006a	5.7	10	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-16	2206B30-007E	0.00049	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-35	2206B30-004D	0.018	0.0050	mg/L	J+	HR-LCS
Selenium, Total	E200.8	MKTF-38	2206B30-005D	0.0035	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	MKTF-16	2206B30-007D	0.0058	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	MKTF-46	2206B30-002D	0.00045	0.0010	mg/L	J+	HR-LCS, MDLRL
Selenium, Total	E200.8	MKTF-18R	2206B30-003D	0.00075	0.0010	mg/L	J+	HR-LCS, MDLRL
Selenium, Total	E200.8	MKTF-11	2206B30-006D	0.00047	0.0010	mg/L	J+	HR-LCS, MDLRL
Selenium, Total	E200.8	DUP-6-21-22	2206B30-009D	0.00051	0.0010	mg/L	J+	HR-LCS, MDLRL
Silver, Dissolved	E 200.7	MKTF-46	2206B30-002E	0.0032	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-18R	2206B30-003E	0.0016	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-35	2206B30-004E	0.0028	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-38	2206B30-005E	0.0027	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-11	2206B30-006E	0.0029	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP-6-21-22	2206B30-009E	0.0034	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-18R	2206B30-003C	3.5	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-35	2206B30-004C	3.2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-38	2206B30-005C	0.22	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-11	2206B30-006C	1.3	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	EB-6-21-22	2206B30-001C	0.041	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-46	2206B30-002C	0.07	0.064	mg/L	JB	ERPD-FD, HR-LCS, MBD
TPH DRO	SW8015	DUP-6-21-22	2206B30-009C	0.20	0.064	mg/L	JB	ERPD-FD, HR-LCS, MBD
TPH GRO	SW8015	MKTF-35	2206b30-004a	64	0.50	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-46	2206b30-002a	0.016	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	MKTF-38	2206b30-005a	0.034	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Trichloroethene	SW8260B	MKTF-38	2206b30-005a	0.47	1.0	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-46	2206B30-002E	0.0040	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-18R	2206B30-003E	0.0024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-35	2206B30-004E	0.0029	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-38	2206B30-005E	0.0039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-11	2206B30-006E	0.0030	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-16	2206B30-007E	0.0038	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-21-22	2206B30-009E	0.0042	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-46	2206B30-002D	0.004	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-18R	2206B30-003D	0.011	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-38	2206B30-005D	0.026	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-21-22	2206B30-009D	0.0044	0.050	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	MKTF-16	2206b30-007a	0.93	1.0	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-35	2206B30-004E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-38	2206B30-005E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-11	2206B30-006E	0.018	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-16	2206B30-007E	0.034	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-46	2206B30-002E	0.0084	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-18R	2206B30-003E	0.0099	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-21-22	2206B30-009E	0.0071	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-21-22	2206B30-001E	0.0075	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-46	2206B30-002D	0.0048	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-18R	2206B30-003D	0.0044	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-21-22	2206B30-009D	0.0040	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/22/2022
Date Validated: 12/22/2022	Sample End Date: 06/22/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206C26	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-22-22	2206C26-001
MKTF-40	2206C26-002
MKTF-31	2206C26-003
FB-6-22-22	2206C26-004
DUP-6-22-22	2206c26-005
Trip Blank	2206c26-006

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 270 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? Yes

Comments: The laboratory did not report non-conformances related to the analytical data for this sample set.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated value. **The target analyte 1,4-dioxane was flagged by the laboratory with the E flag for sample MKTF-31. This result was assigned a J qualifier to indicate an estimated concentration.**

J – Analyte detected below quantitation limits

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD is outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	MKTF-31	VOCs	2
200.8	MKTF-40, DUP-6-22-22	Dissolved and Total Metals	5
8260B	MKTF-31	MTBE	10

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C at 0.9°C and 1.1°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.5°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception.

TPH DRO was detected in the laboratory blank for Method 8015D batch 68348 at a concentration of 0.021 mg/L. TPH DRO results in the associated samples (EB-6-22-22 and MKTF-40) that were less than the laboratory reporting limit were assigned U qualifiers. The TPH DRO result for sample MKTF-31 that was greater than the laboratory reporting limit but less than or equal to 10 times the blank concentration was assigned a JB qualifier. The TPH DRO result in the associated sample DUP-6-22-22 was greater than ten times the blank concentration and did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68353	DUP-6-22-22
200.7	Dissolved Metals	B88979	Not Prepared
200.8	Total Metals	68353	Not Prepared
200.8	Dissolved Metals	B89062	Not Prepared
200.8	Dissolved Metals	C89140	Not Prepared

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
245.1	Total and Dissolved Mercury	68334	EB-6-22-22
504.1	EDB	68319	DUP-6-22-22
4500CN E	Cyanide	WG1888356	Not Associated
4500CN E	Cyanide	WG1888360	Not Associated
8015D	TPH DRO and MRO	68348	Not Prepared
8015D	GRO	A89029	Not Prepared
8260B	VOC	A89211	Not Prepared
8260B	VOC	R89156	MKTF-40
8270C SIM	SVOC	68332	Not Prepared
8270C	SVOC	68332	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**68353**	**53.6%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Selenium**	**68353**	**131%**	**-----**	**70-130%**	**-----**	**-----**
8011	**EDB**	**68319**	**Acceptable**	**Acceptable**	**70-130%**	**21.9%**	**20%**
8015D	**TPH DRO**	**68348**	**81.2%**	**89.2%**	**31.7-75.4%**	**Acceptable**	**20%**
8270C SIM	**1,4-Dioxane**	**68332**	**53.0%**	**55.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
8270C SIM	Acenaphthene	68332	Acceptable	83.0%	29.8-82.7%	Acceptable	27.8%
8270C SIM	Phenanthrene	68332	Acceptable	94.0%	38.2-93.9%	Acceptable	27.9%

Detections of total nickel in the associated samples were qualified as J- and non-detected total nickel results were qualified as UJ due to evidence of low bias.

Detections of the identified analytes in the associated samples with LCS and/or LCSD percent recoveries that were greater than the upper laboratory QC limits were qualified as J+ due to evidence of potential high bias. Non-detection of these analytes in the associated samples did not require qualification.

EDB was not detected in the associated samples, and the results were assigned UJ qualifiers due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample EB-6-22-22, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-22-22, and one equipment blank sample, EB-6-22-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB-6-22-22	**8260B**	**Acetone**	**5.7 µg/L**
EB-6-22-22	**200.7**	**Dissolved Vanadium**	**0.0021 mg/L**
EB-6-22-22	**200.7**	**Dissolved Zinc**	**0.0066 mg/L**
EB-6-22-22	8015	TPH DRO	0.023 mg/L
EB-6-22-22	8260B	Acetone	5.30 µg/L

Detections of acetone, dissolved vanadium, and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. The detections of dissolved zinc in the associated samples DUP-6-22-22 and MKTF-40 that were greater than the reporting limit but less than 10 times the blank result were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 68348 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-6-22-22 was collected as a field duplicate of sample MKTF-40.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for TPH DRO greatly exceeded the data validation limit of 30% at 163.6%. The reported results for TPH DRO were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for TPH DRO in the associated samples due to evidence of extremely poor precision (RPD > 100%).

An RPD value could not be calculated for TPH ORO for the field duplicate pair MKTF-40 and DUP-6-22-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, TPH ORO was qualified as J and UJ for the duplicate and parent samples, respectively.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1888356	Not Associated
4500CN E	Cyanide	WG1888360	Not Associated

Not Associated – The duplicate sample source was not associated with this project.

The RPD values for laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-40	Nickel	0.0093	0.013
DUP-6-22-22	Nickel	0.010	0.011
MKTF-40	Silver	ND	0.0056
MKTF-31	Silver	ND	0.0016
DUP-6-22-22	Silver	ND	0.0060
EB-6-22-22	Vanadium	ND	0.0021
EB-6-22-22	Zinc	ND	0.0066

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-40 Field Duplicate Sample ID: DUP-6-22-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.047 mg/L	0.050 mg/L	6.2%
Barium, Total	E 200.7	0.29 mg/L	0.26 mg/L	10.9%
Chromium, Total	E 200.7	0.0048 mg/L	0.0032 mg/L	40.0% +/-RL
Cobalt, Total	E 200.7	0.0057 mg/L	0.0076 mg/L	28.6% +/-RL
Nickel, Dissolved	E 200.7	0.013 mg/L	0.011 mg/L	16.7% +/-RL
Nickel, Total	E 200.7	0.0093 mg/L	0.010 mg/L	7.3% +/-RL
Silver, Dissolved	E 200.7	0.0056 mg/L	0.0060 mg/L	6.9% +/-RL
Vanadium, Dissolved	E 200.7	0.013 mg/L	0.013 mg/L	0.0% +/-RL
Vanadium, Total	E 200.7	0.027 mg/L	0.025 mg/L	7.7% +/-RL
Zinc, Dissolved	E 200.7	0.018 mg/L	0.013 mg/L	32.3% +/-RL
Zinc, Total	E 200.7	0.024 mg/L	0.019 mg/L	23.3%
Arsenic, Dissolved	E200.8	0.00092 mg/L	0.00080 mg/L	14.0% +/-RL
Arsenic, Total	E200.8	0.0024 mg/L	0.0017 mg/L	34.1% +/-RL
Lead, Total	E200.8	0.012 mg/L	0.0099 mg/L	19.2%
Cyanide, Total	E335.4	0.0128 mg/L	0.0129 mg/L	0.8%
TPH DRO	**SW8015**	**0.053 mg/L**	**0.53 mg/L**	**163.6%**
TPH ORO	**SW8015**	**ND (0.080 mg/L)**	**1.1 mg/L**	**DL**
1,1-Dichloroethane	SW8260B	0.80 µg/L	0.97 µg/L	19.2% +/-RL
MTBE	SW8260B	1.3 µg/L	1.4 µg/L	7.4% +/-RL
1,4-Dioxane	SW8270C	11 µg/L	11 µg/L	0.0%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for TPH DRO greatly exceeded the data validation limit of 30% at 163.6%. The reported results for TPH DRO were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for TPH DRO in the associated samples due to evidence of extremely poor precision (RPD > 100%).

An RPD value could not be calculated for TPH ORO for the field duplicate pair MKTF-40 and DUP-6-22-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, TPH ORO was qualified as J and UJ for the duplicate and parent samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ECAL	The result exceeds the calibration range.
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1,1-Trichloroethane	SW8260B	MKTF-31	2206C26-003a	2.0	2.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-40	2206C26-002a	0.80	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-6-22-22	2206c26-005a	0.97	1.0	µg/L	J	MDLRL
1,2-Dibromoethane	E504.1	EB-6-22-22	2206C26-001B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-40	2206C26-002B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-31	2206C26-003B	ND	0.0095	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	DUP-6-22-22	2206C26-005B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-40	2206c26-002c	11	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	DUP-6-22-22	2206c26-005c	11	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-31	2206c26-003c	79	1.0	µg/L	J+	ECAL, HR-LCS
Acetone	SW8260B	EB-6-22-22	2206C26-001a	5.3	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	FB-6-22-22	2206C26-004a	5.7	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-40	2206C26-002E	0.00092	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	MKTF-31	2206C26-003E	0.00064	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-22-22	2206C26-005E	0.0008	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-40	2206C26-002D	0.0024	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-22-22	2206C26-005D	0.0017	0.0050	mg/L	J	MDLRL
Benzene	SW8260B	MKTF-31	2206C26-003a	0.51	2.0	µg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-40	2206C26-002D	0.0048	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-6-22-22	2206C26-005D	0.0032	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-40	2206C26-002D	0.0057	0.0060	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-31	2206C26-003E	0.000088	0.00050	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-31	2206C26-003E	0.0058	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-31	2206C26-003D	0.016	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-6-22-22	2206C26-001D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-40	2206C26-002D	0.0093	0.010	mg/L	J-	LR-LCS, MDLRL
Nickel, Total	E 200.7	DUP-6-22-22	2206C26-005D	0.010	0.010	mg/L	J-	LR-LCS, MDLRL
Selenium, Total	E200.8	MKTF-31	2206C26-003D	0.0022	0.0010	mg/L	J+	HR-LCS
Silver, Dissolved	E 200.7	MKTF-31	2206C26-003E	0.0016	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	DUP-6-22-22	2206C26-005C	0.53	0.0640	mg/L	J+	ERPD-FD, HR-LCS
TPH DRO	SW8015	MKTF-31	2206C26-003C	0.21	0.064	mg/L	JB	MBD, ERPD-FD, HR-LCS
TPH DRO	SW8015	EB-6-22-22	2206C26-001C	0.023	0.064	mg/L	J+	ERPD-FD, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-40	2206C26-002C	0.053	0.064	mg/L	U	MBD, ERPD-FD, HR-LCS, MDLRL
TPH ORO	SW8015	DUP-6-22-22	2206C26-005C	1.1	0.080	mg/L	J	ERPD-FD
TPH ORO	SW8015	MKTF-40	2206C26-002C	ND	0.080	mg/L	UJ	ERPD-FD
Vanadium, Dissolved	E 200.7	MKTF-40	2206C26-002E	0.013	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	MKTF-31	2206C26-003E	0.0067	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-22-22	2206C26-005E	0.013	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EB-6-22-22	2206C26-001E	0.0021	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	MKTF-40	2206C26-002D	0.027	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-31	2206C26-003D	0.036	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-22-22	2206C26-005D	0.025	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-40	2206C26-002E	0.018	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-6-22-22	2206C26-005E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-31	2206C26-003E	0.0079	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-22-22	2206C26-001E	0.0066	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task 0006	Sample Start Date: 06/24/2022
Date Validated: 10/03/2022	Sample End Date: 06/24/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270 with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Chemical Oxygen Demand (COD) by EPA Method 410.4 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Biochemical Oxygen Demand (BOD) by SM Method 5210B ▪ E. Coli by SM Method 9223B	
Laboratory Project ID: 2026E09	
Data Validator: Kyle Power, Environmental Chemist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blank
- Field blank
- Equipment blank

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-24-22	2206E09-001
MKTF-27	2206E09-002
MKTF-28	2206E09-003
NAPIS-2	2206E09-004
NAPIS-3	2206E09-005
KA-3	2206E09-006
STP-1 to EP-2	2206E09-007
EP-2	2206E09-008
EP-6	2206E09-009
FB-6-24-22	2206E09-010
DUP-6-24-22	2206E09-011
Trip Blank	2206E09-012

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicate (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 819 data points. The data completeness calculation does not include any submitted blank sample results. One data point was rejected. The data completeness measure for this data package is calculated to be 99.88% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	Yes
Comments: The laboratory did not identify non-conformances regarding the analytical data.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	No
Comments: The laboratory used the following data qualification flags with this data set. D – Sample diluted due to matrix J – Analyte detected below quantitation limits J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low. P1 – RPD value not applicable for sample concentrations less than 5 times the RL. R – RPD outside of range S – % Recovery outside of range due to dilution or matrix interference. * – Value exceeds maximum contaminant level.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The detection limits appeared to be acceptable. The following dilutions were applied. Method 8260B: Dilutions of 2 to 20 times were applied for the VOC analyses of select samples. Methods 8270C/8270 SIM: Dilutions of 10 times were applied for the SVOC analyses of samples STP-1 to EP-2, EP-2, and EP-6. Method 200.7: Dilutions of 5 and 10 times were applied for the total and dissolved metals analysis of samples NAPIS-2, NAPIS-3, and EP-6. Method 200.8: Dilutions of 5 to 100 times were applied for the metals analyses of select samples. Method 245.1: A dilution of 5 times was applied for the mercury analysis of sample KA-3. Method 410.4: A dilution of 5 times was applied for the COD analysis of sample EP-6. SM 9223B: Dilutions of 10 times were applied for the E. coil analysis of samples NAPIS-2, NAPIS-3, and EP-6.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	Yes
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.8°C and 5.3°C as noted on the *Sample Log-In Check List* and CoC. The cooler temperatures below 2°C were judged as acceptable since the samples were not reported to be frozen upon receipt at the laboratory, and the sample containers were reported to be intact.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	

VALIDATION CRITERIA CHECKLIST

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. — Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L), milligrams per liter (mg/L), and most probable number per 100 milliliters (MPN/100 mL), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? — No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? — N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? — No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method 8015D Modified: **The analyte TPH DRO was detected in the method blank from batch 68464 at 0.037 mg/L. TPH DRO was detected in samples EB-6-24-22, EP-2, and STP-1 to EP-2 at concentrations less than the blank detection and the results were qualified as U. TPH DRO was detected in samples DUP-6-24-22, MKTF-27, and MKTF-28 at concentrations greater than the blank detection but less than or equal to 10 times the blank concentration and the results were qualified as JB.** TPH DRO results in the associated samples that were greater than 10 times the blank detection did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68406	Not Prepared
200.7	Dissolved Metals	B89068	Not Prepared
200.7	Dissolved Metals	A89154	Not Prepared
200.8	Total Metals	68406	DUP-6-24-22
200.8	Dissolved Metals	B89062	EB-6-24-22
200.8	Dissolved Metals	C89140	MKTF-27
245.1	Total Mercury	68497	KA-3
504.1	EDB	68526	EB-6-24-22
8015D	TPH DRO and MRO	68495	Not Prepared
8015D	TPH DRO	68464	Not Prepared
8015D	TPH GRO	A89090	MKTF-27
8260B	VOC	R89248	Not Prepared
8270C	SVOC	68408	Not Prepared
8270C	SVOC	68468	Not Prepared

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8270 SIM	SVOC	68408	Not Prepared
8270 SIM	SVOC	68468	Not Prepared
5210B	BOD	68337	Not Prepared
9223B	E. Coli	68346	Not Prepared
4500 CN E	Cyanide	WG1888930	Not Associated
4500 CN E	Cyanide	WG1889365	Not Associated and MKTF-28

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

Recoveries and RPDs for MS/MSDs prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the exceptions listed in the following table.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Nickel, Total**	**68406**	**136%**	-----	**70-130%**	-----	-----
8015D	**TPH DRO**	**68464**	**83.6%**	Acceptable	**31.7-75.4%**	Acceptable	20%
8270C	Pyrene	68408	Acceptable	Acceptable	61-123%	12.3%	11.8%
8270C	Acenaphthene	68468	Acceptable	Acceptable	21.3-104%	58.7%	45.3%
8270C	**1,4-Dichlorobenzene**	**68468**	Acceptable	Acceptable	15-89.8%	**55.4%**	**39.6%**
8270C	**Phenol**	**68468**	Acceptable	Acceptable	17-61.1%	**59.2%**	**42.5%**
8270C	Pyrene	68468	Acceptable	Acceptable	61-123%	19.2%	11.8%
8270 SIM	**1,4-Dioxane**	**68408**	**53.0%**	Acceptable	**20.2-48.4%**	Acceptable	30.1%
8270 SIM	Naphthalene	68408	80.0%	Acceptable	21.3-79.9%	Acceptable	25.6%
8270 SIM	Acenaphthene	68408	84.0%	Acceptable	29.8-82.7%	Acceptable	27.8%

Analytes with LCS recoveries greater than laboratory QC limits were detected in the associated samples and the results were qualified as J+ to indicate estimated concentrations that may be biased high. Non-detections did not require qualification based on the evidence of potential high bias.

Results for 1,4-dichlorobenzene and phenol were qualified as J if detected in the associated samples and UJ if not detected due to evidence of poor precision.

Qualification was not required for acenaphthene and pyrene by Method 8270C as the associated samples' results were reported from Method 8270 SIM and the non-compliant LCS results did not apply to those analyses.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the exceptions listed in the following table.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	**Bromofluorobenzene**	**NAPIS-2**	**354%**	**70-130%**
8015D	**Bromofluorobenzene**	**NAPIS-3**	**198%**	**70-130%**
8015D	**Bromofluorobenzene**	**KA-3**	**161%**	**70-130%**
8015D	**Di-n-octylphthalate**	**STP-1 to EP-2**	**25.5%**	**42.2-138%**
8270C	2-Fluorophenol	STP-1 to EP-2	0%	29.4-87.7%
8270C	Phenol-d_5	STP-1 to EP-2	0%	28.5-64.7%
8270C	2,4,6-Tribromophenol	STP-1 to EP-2	0%	18.6-129%
8270C	Nitrobenzene-d_5	STP-1 to EP-2	0%	36.9-103%
8270C	2-Fluorobiphenyl	STP-1 to EP-2	0%	38.1-99.9%
8270C	4-Terphenyl-d_{14}	STP-1 to EP-2	0%	48-155%
8270 SIM	Nitrobenzene-d_5	STP-1 to EP-2	0%	31.6-100%
8270 SIM	2-Fluorobiphenyl	STP-1 to EP-2	0%	26.7-90.1%
8270 SIM	4-Terphenyl-d_{14}	STP-1 to EP-2	0%	72.3-147%
8015D	**Di-n-octylphthalate**	**EP-2**	**6.11%**	**42.2-138%**
8270C	2-Fluorophenol	EP-2	0%	29.4-87.7%
8270C	Phenol-d_5	EP-2	0%	28.5-64.7%
8270C	2,4,6-Tribromophenol	EP-2	0%	18.6-129%
8270C	Nitrobenzene-d_5	EP-2	0%	36.9-103%
8270C	2-Fluorobiphenyl	EP-2	0%	38.1-99.9%
8270C	4-Terphenyl-d_{14}	EP-2	0%	48-155%
8270 SIM	Nitrobenzene-d_5	EP-2	0%	31.6-100%
8270 SIM	2-Fluorobiphenyl	EP-2	0%	26.7-90.1%
8270 SIM	4-Terphenyl-d_{14}	EP-2	0%	72.3-147%
8270C	2-Fluorophenol	EP-6	0%	29.4-87.7%
8270C	Phenol-d_5	EP-6	0%	28.5-64.7%
8270C	2,4,6-Tribromophenol	EP-6	0%	18.6-129%
8270C	Nitrobenzene-d_5	EP-6	0%	36.9-103%
8270C	2-Fluorobiphenyl	EP-6	0%	38.1-99.9%
8270C	4-Terphenyl-d_{14}	EP-6	0%	48-155%
8270 SIM	Nitrobenzene-d_5	EP-6	0%	31.6-100%
8270 SIM	2-Fluorobiphenyl	EP-6	0%	26.7-90.1%

The analyte associated with bromofluorobenzene (TPH GRO) was detected in the affected samples and was qualified as J+ to indicate estimated concentrations that may be biased high.

The analytes associated with Method 8015 D surrogate di-n-octylphthalate were qualified as J- if detected and UJ if not detected in the affected samples. As the surrogate recovery in sample EP-2 was less than 10%, the non-detect result for TPH ORO was qualified as R to indicate a rejected datum.

Qualification was not required for samples STP-1 to EP-2, EP-2, and EP-6 as the listed surrogates were diluted out.

Qualification was not required based on surrogate nonconformance in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-24-22, and one equipment blank sample, EB-6-24-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples, with the exceptions listed in the following table.

Blank Sample ID	Method	Analyte	Concentration
FB-6-24-22	**8260B**	**Acetone**	**7.4 µg/L**
FB-6-24-22	**8260B**	**Toluene**	**0.22 µg/L**
FB-6-24-22	**8260B**	**Xylenes, Total**	**0.64 µg/L**
EB-6-24-22	8260B	Acetone	4.9 µg/L
EB-6-24-22	**8260B**	**Chloromethane**	**0.6 µg/L**
EB-6-24-22	8260B	Toluene	0.23 µg/L
EB-6-24-22	8260B	Xylenes, Total	0.64 µg/L
EB-6-24-22	**8015D**	**TPH GRO**	**0.019 mg/L**
EB-6-24-22	8015D	TPH DRO	0.031 mg/L
EB-6-24-22	**200.7**	**Total Zinc**	**0.0046 mg/L**
EB-6-24-22	**200.7**	**Dissolved Zinc**	**0.0053 mg/L**

Detections in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results were previously qualified due to laboratory blank contamination in batch 68464; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-24-22 was collected as a field duplicate of sample MKTF-27.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for total barium exceeded the data validation QC limit of 30% at 33.3%, which was evidence of poor precision. The total barium results were qualified as J for samples MKTF-27 and DUP-6-24-22.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? Yes

Comments: Laboratory duplicates prepared for these analyses and laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
410.4	COD	WG1891521	STP-1 to EP-2 and Not Associated
4500 CN E	Cyanide	WG1888930	Not Associated and EB-6-24-22
4500CN E	Cyanide	WG1889365	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

Laboratory duplicate RPDs were within data validation and laboratory QC limits.

The RPD values for laboratory duplicate samples prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
STP-1 to EP-2	Antimony	0.00056	0.0012
NAPIS-2	Barium	4.4	4.9
EP-6	Barium	0.31	0.32
EP-6	Chromium	ND	0.021
KA-3	Nickel	0.023	0.025
EP-2	Nickel	0.05	0.052
MKTF-27	Selenium	ND	0.0018
STP-1 to EP-2	Selenium	0.00043	0.00045
MKTF-27	Silver	ND	0.0062
MKTF-28	Silver	ND	0.0022
NAPIS-2	Silver	0.002	0.0028
NAPIS-3	Silver	0.0024	0.0029
STP-1 to EP-2	Silver	0.0044	0.0048
EP-2	Silver	ND	0.01
EP-6	Silver	ND	0.026
DUP-6-24-22	Silver	ND	0.0058
NAPIS-2	Vanadium	ND	0.0025

VALIDATION CRITERIA CHECKLIST					
	Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)	
	KA-3	Vanadium	0.014	0.016	
	STP-1 to EP-2	Vanadium	ND	0.0022	
	EP-2	Vanadium	ND	0.005	
	EP-6	Vanadium	ND	0.016	
	EB-6-24-22	Zinc	0.0046	0.0053	
	MKTF-27	Zinc	0.0068	0.0084	
	NAPIS-2	Zinc	0.0048	0.014	
	NAPIS-3	Zinc	0.0041	0.0084	
	KA-3	Zinc	0.0066	0.013	
	EP-2	Zinc	0.0044	0.011	

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-27 Field Duplicate Sample ID: DUP-6-24-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
1,1-Dichloroethane	8260B	1.6 µg/L	1.7 µg/L	6.1% +/-RL
1,1-Dichloroethene	8260B	0.87 µg/L	0.85 µg/L	2.3% +/-RL
1,2-Dichloroethane	8260B	0.78 µg/L	0.78 µg/L	0.0% +/-RL
Acetone	8260B	ND (10 µg/L)	2.9 µg/L	DL
Benzene	8260B	0.55 µg/L	0.63 µg/L	13.6% +/-RL
MTBE	8260B	39 µg/L	41 µg/L	5.0%
1,4-Dioxane	8270 SIM	8.4 µg/L	7.1 µg/L	16.8%
TPH GRO	8015D	0.046 mg/L	0.028 mg/L	48.6% +/-RL
TPH DRO	8015D	0.19 mg/L	0.20 mg/L	5.1%
Barium, Dissolved	200.7	0.055 mg/L	0.054 mg/L	1.8%
Barium, Total	**200.7**	**0.14 mg/L**	**0.10 mg/L**	**33.3%**
Nickel, Dissolved	200.7	0.031 mg/L	0.030 mg/L	3.3%
Nickel, Total	200.7	0.035 mg/L	0.032 mg/L	9.0%
Silver, Dissolved	200.7	0.0062 mg/L	0.0058 mg/L	6.7% +/-RL
Vanadium, Dissolved	200.7	0.0025 mg/L	0.0023 mg/L	8.3% +/-RL
Vanadium, Total	200.7	0.0087 mg/L	0.0063 mg/L	32.0% +/-RL
Zinc, Dissolved	200.7	0.0084 mg/L	0.0072 mg/L	15.4% +/-RL
Zinc, Total	200.7	0.0068 mg/L	0.0090 mg/L	27.8% +/-RL
Arsenic, Dissolved	200.8	ND (0.005 mg/L)	0.00092 mg/L	DL
Arsenic, Total	200.8	0.0010 mg/L	0.0013 mg/L	26.1% +/-RL
Lead, Total	200.8	0.0025 mg/L	0.0019 mg/L	27.3% +/-RL
Selenium, Dissolved	200.8	0.0018 mg/L	ND (0.005 mg/L)	DL
Selenium, Total	200.8	ND (0.005 mg/L)	0.0020 mg/L	DL
Cyanide, Total	4500 CN E	16.3 µg/L	14.7 µg/L	10.3%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for total barium exceeded the data validation QC limit and was qualified as J for samples MKTF-27 and DUP-6-24-22 due to evidence of poor precision.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
FBD	Field blank detection
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethene	SW8260B	MKTF-27	2206e09-002a	0.87	1	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	DUP-6-24-22	2206e09-011a	0.85	1	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	NAPIS-2	2206e09-004a	1.7	2	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	NAPIS-3	2206e09-005a	0.19	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	MKTF-27	2206e09-002a	0.78	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	DUP-6-24-22	2206e09-011a	0.78	1	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	NAPIS-2	2206e09-004a	1.4	2	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	NAPIS-2	2206E09-004C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	NAPIS-3	2206E09-005C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	KA-3	2206E09-006C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	STP-1 to EP-2	2206E09-007C	ND	50	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	EP-2	2206E09-008C	ND	500	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	EP-6	2206E09-009C	ND	200	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dichlorobenzene	SW8270C	DUP-6-24-22	2206E09-011C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-27	2206e09-002c	8.4	1	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	MKTF-28	2206e09-003c	0.78	1	µg/L	J+	HR-LCS, MDLRL
1,4-Dioxane	SW8270C	NAPIS-3	2206e09-005c	0.68	1	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	KA-3	2206e09-006c	0.58	1	µg/L	J	MDLRL
Acetone	SW8260B	EP-2	2206e09-008a	10	10	µg/L	JB	FBD
Acetone	SW8260B	EP-6	2206e09-009a	23	10	µg/L	JB	FBD
Acetone	SW8260B	EB-6-24-22	2206e09-001a	4.9	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	MKTF-28	2206e09-003a	2.7	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	NAPIS-2	2206e09-004a	15	20	µg/L	U	FBD, MDLRL
Acetone	SW8260B	NAPIS-3	2206e09-005a	6.5	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	KA-3	2206e09-006a	2.7	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	STP-1 to EP-2	2206e09-007a	4.2	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	FB-6-24-22	2206e09-010a	7.4	10	µg/L	J	MDLRL
Acetone	SW8260B	DUP-6-24-22	2206e09-011a	2.9	10	µg/L	J	MDLRL
Anthracene	SW8270C	NAPIS-2	2206e09-004c	0.22	0.3	µg/L	J	MDLRL
Antimony, Total	E200.8	STP-1 to EP-2	2206E09-007D	0.00056	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-28	2206E09-003E	0.00084	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	KA-3	2206E09-006E	0.00071	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-24-22	2206E09-011E	0.00092	0.005	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-27	2206E09-002D	0.001	0.005	mg/L	J	MDLRL
Arsenic, Total	E200.8	KA-3	2206E09-006D	0.00081	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-24-22	2206E09-011D	0.0013	0.005	mg/L	J	MDLRL
Barium, Total	E 200.7	MKTF-27	2206E09-002D	0.14	0.003	mg/L	J	ERPD-FD
Barium, Total	E 200.7	DUP-6-24-22	2206E09-011D	0.1	0.003	mg/L	J	ERPD-FD
Benzene	SW8260B	MKTF-27	2206e09-002a	0.55	1	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Benzene	SW8260B	DUP-6-24-22	2206e09-011a	0.63	1	µg/L	J	MDLRL
Carbon Disulfide	SW8260B	EP-2	2206e09-008a	1.3	10	µg/L	J	MDLRL
Chloroform	SW8260B	NAPIS-2	2206e09-004a	0.76	2	µg/L	J	MDLRL
Chloroform	SW8260B	NAPIS-3	2206e09-005a	0.22	1	µg/L	J	MDLRL
Chloroform	SW8260B	KA-3	2206e09-006a	0.25	1	µg/L	J	MDLRL
Chloromethane	SW8260B	NAPIS-2	2206e09-004a	1.3	6	µg/L	U	EBD, MDLRL
Chloromethane	SW8260B	NAPIS-3	2206e09-005a	0.64	3	µg/L	U	EBD, MDLRL
Chloromethane	SW8260B	STP-1 to EP-2	2206e09-007a	0.61	3	µg/L	U	EBD, MDLRL
Chloromethane	SW8260B	EP-2	2206e09-008a	0.76	3	µg/L	U	EBD, MDLRL
Chloromethane	SW8260B	EP-6	2206e09-009a	1.4	3	µg/L	U	EBD, MDLRL
Chloromethane	SW8260B	EB-6-24-22	2206e09-001a	0.6	3	µg/L	J	MDLRL
Chromium, Dissolved	E 200.7	EP-6	2206E09-009E	0.021	0.03	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-28	2206E09-003D	0.0021	0.006	mg/L	J	MDLRL
Cyanide, Total	E335.4	EP-6	2206E09-009F	4.4	5	µg/L	J	MDLRL
Lead, Dissolved	E200.8	NAPIS-2	2206E09-004E	0.00025	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	KA-3	2206E09-006E	0.00024	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	KA-3	2206E09-006D	0.0004	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	STP-1 to EP-2	2206E09-007D	0.00021	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-6-24-22	2206E09-011D	0.0019	0.0025	mg/L	J	MDLRL
MTBE	SW8260B	MKTF-28	2206e09-003a	0.7	1	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	NAPIS-2	2206e09-004a	1.5	6	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	NAPIS-3	2206e09-005a	0.39	3	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-28	2206E09-003E	0.0059	0.01	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-27	2206E09-002D	0.035	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	NAPIS-2	2206E09-004D	0.064	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	NAPIS-3	2206E09-005D	0.025	0.01	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Nickel, Total	E 200.7	KA-3	2206E09-006D	0.023	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	EP-2	2206E09-008D	0.05	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	EP-6	2206E09-009D	0.24	0.1	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	DUP-6-24-22	2206E09-011D	0.032	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	MKTF-28	2206E09-003D	0.009	0.01	mg/L	J+	HR-LCS, MDLRL
n-Propylbenzene	SW8260B	KA-3	2206e09-006a	0.59	1	µg/L	J	MDLRL
Phenanthrene	SW8270C	NAPIS-2	2206e09-004c	0.18	0.3	µg/L	J	MDLRL
Phenanthrene	SW8270C	NAPIS-3	2206e09-005c	0.16	0.3	µg/L	J	MDLRL
Phenol	SW8270C	NAPIS-2	2206E09-004C	52	20	µg/L	J	ERPD-LCS
Phenol	SW8270C	NAPIS-3	2206E09-005C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	KA-3	2206E09-006C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	STP-1 to EP-2	2206E09-007C	ND	200	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	EP-2	2206E09-008C	ND	2000	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	EP-6	2206E09-009C	ND	800	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	DUP-6-24-22	2206E09-011C	ND	20	µg/L	UJ	ERPD-LCS
sec-Butylbenzene	SW8260B	NAPIS-3	2206e09-005a	0.77	1	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	KA-3	2206e09-006a	0.26	1	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-27	2206E09-002E	0.0018	0.005	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	STP-1 to EP-2	2206E09-007E	0.00045	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	NAPIS-3	2206E09-005D	0.00037	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	STP-1 to EP-2	2206E09-007D	0.00043	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	EP-6	2206E09-009D	0.011	0.02	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-6-24-22	2206E09-011D	0.002	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-28	2206E09-003E	0.0022	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	NAPIS-2	2206E09-004E	0.0028	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	NAPIS-3	2206E09-005E	0.0029	0.005	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Silver, Dissolved	E 200.7	STP-1 to EP-2	2206E09-007E	0.0048	0.005	mg/L	J	MDLRL
Silver, Total	E 200.7	NAPIS-2	2206E09-004D	0.002	0.005	mg/L	J	MDLRL
Silver, Total	E 200.7	NAPIS-3	2206E09-005D	0.0024	0.005	mg/L	J	MDLRL
Silver, Total	E 200.7	STP-1 to EP-2	2206E09-007D	0.0044	0.005	mg/L	J	MDLRL
Toluene	SW8260B	EB-6-24-22	2206e09-001a	0.23	1	µg/L	U	FBD, MDLRL
Toluene	SW8260B	NAPIS-2	2206e09-004a	0.7	2	µg/L	U	FBD, MDLRL
Toluene	SW8260B	NAPIS-3	2206e09-005a	0.23	1	µg/L	U	FBD, MDLRL
Toluene	SW8260B	FB-6-24-22	2206e09-010a	0.22	1	µg/L	J	MDLRL
TPH DRO	SW8015	NAPIS-2	2206E09-004C	1.7	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	NAPIS-3	2206E09-005C	0.54	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	KA-3	2206E09-006C	1.2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	EP-6	2206E09-009C	0.9	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	STP-1 to EP-2	2206E09-007C	0.04	0.064	mg/L	U	HR-LCS, LR-SUR, MBD, MDLRL
TPH DRO	SW8015	EP-2	2206E09-008C	0.045	0.064	mg/L	U	HR-LCS, LR-SUR, MBD, MDLRL
TPH DRO	SW8015	MKTF-27	2206E09-002C	0.19	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	MKTF-28	2206E09-003C	0.19	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	DUP-6-24-22	2206E09-011C	0.2	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	EB-6-24-22	2206E09-001C	0.031	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH GRO	SW8015	NAPIS-2	2206e09-004a	4.2	0.05	mg/L	J+	HR-SUR
TPH GRO	SW8015	NAPIS-3	2206e09-005a	0.9	0.05	mg/L	J+	HR-SUR
TPH GRO	SW8015	KA-3	2206e09-006a	0.15	0.05	mg/L	JB	EBD, HR-SUR
TPH GRO	SW8015	MKTF-27	2206e09-002a	0.046	0.05	mg/L	U	EBD, MDLRL
TPH GRO	SW8015	EP-2	2206e09-008a	0.0096	0.05	mg/L	U	EBD, MDLRL
TPH GRO	SW8015	DUP-6-24-22	2206e09-011a	0.028	0.05	mg/L	U	EBD, MDLRL
TPH GRO	SW8015	EB-6-24-22	2206e09-001a	0.019	0.05	mg/L	J	MDLRL
TPH ORO	SW8015	EP-2	2206E09-008C	ND	0.08	mg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH ORO	SW8015	STP-1 to EP-2	2206E09-007C	ND	0.08	mg/L	UJ	LR-SUR
TPH ORO	SW8015	EP-6	2206E09-009C	0.058	0.08	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-27	2206E09-002E	0.0025	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-28	2206E09-003E	0.0042	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	NAPIS-2	2206E09-004E	0.0025	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	KA-3	2206E09-006E	0.016	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	STP-1 to EP-2	2206E09-007E	0.0022	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	EP-2	2206E09-008E	0.005	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	EP-6	2206E09-009E	0.016	0.25	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-24-22	2206E09-011E	0.0023	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-27	2206E09-002D	0.0087	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-28	2206E09-003D	0.012	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	KA-3	2206E09-006D	0.014	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-24-22	2206E09-011D	0.0063	0.05	mg/L	J	MDLRL
Xylenes, Total	SW8260B	NAPIS-3	2206e09-005a	3.3	1.5	µg/L	JB	FBD
Xylenes, Total	SW8260B	EB-6-24-22	2206e09-001a	0.64	1.5	µg/L	U	FBD, MDLRL
Xylenes, Total	SW8260B	KA-3	2206e09-006a	0.72	1.5	µg/L	U	FBD, MDLRL
Xylenes, Total	SW8260B	EP-2	2206e09-008a	0.66	1.5	µg/L	U	FBD, MDLRL
Xylenes, Total	SW8260B	EP-6	2206e09-009a	0.65	1.5	µg/L	U	FBD, MDLRL
Xylenes, Total	SW8260B	FB-6-24-22	2206e09-010a	0.64	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	NAPIS-2	2206E09-004E	0.014	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	KA-3	2206E09-006E	0.013	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	STP-1 to EP-2	2206E09-007E	0.025	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EP-2	2206E09-008E	0.011	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-6-24-22	2206E09-001E	0.0053	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-27	2206E09-002E	0.0084	0.01	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	MKTF-28	2206E09-003E	0.009	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	NAPIS-3	2206E09-005E	0.0084	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-24-22	2206E09-011E	0.0072	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	MKTF-28	2206E09-003D	0.018	0.01	mg/L	JB	EBD
Zinc, Total	E 200.7	STP-1 to EP-2	2206E09-007D	0.046	0.01	mg/L	JB	EBD
Zinc, Total	E 200.7	MKTF-27	2206E09-002D	0.0068	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	NAPIS-2	2206E09-004D	0.0048	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	NAPIS-3	2206E09-005D	0.0041	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	KA-3	2206E09-006D	0.0066	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	EP-2	2206E09-008D	0.0044	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	DUP-6-24-22	2206E09-011D	0.009	0.01	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	EB-6-24-22	2206E09-001D	0.0046	0.01	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task 0006	Sample Start Date: 06/28/2022
Date Validated: 10/03/2022	Sample End Date: 06/28/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270 with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206F41	
Data Validator: Kyle Power, Environmental Chemist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blank
- Field blank
- Equipment blank

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-28-22	2206F41-001
MKTF-30	2206F41-002
MKTF-29	2206F41-003
OPIS-1	2206F41-004
STP-1-NM	2206F41-005
OW-12A	2206F41-006
OW-70	2206F41-007
DUP-6-28-22	2206F41-008
FB-6-28-22	2206F41-009
Trip Blank	2206F41-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicate (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	No
Comments: The laboratory noted the following non-conformances regarding the analytical data. Method 8270C: The recovery for pyrene in the LCSD was slightly low. "S" flagged surrogates denote low surrogate recoveries due to matrix interferences/sample dilution.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	No
Comments: The laboratory used the following data qualification flags with this data set. D – Sample diluted due to matrix J – Analyte detected below quantitation limits J3 – The associated batch QC was outside the established quality control range for precision. J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low. P1 – RPD value not applicable for sample concentrations less than 5 times the RL. R – RPD outside of range S – % Recovery outside of range due to dilution or matrix interference. * – Value exceeds maximum contaminant level.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The detection limits appeared to be acceptable. The following dilutions were applied. Method 8260B: Dilutions of 2 to 20 times were applied for the VOC analyses of select samples. Methods 8270C/8270 SIM: A dilution of 10 times was applied for the SVOC analysis of sample OPIS-1. Method 8015D: A dilution of 2 times was applied for the TPH GRO analysis of sample OPIS-1. Method 8015D Modified: A dilution of 2 times was applied for the TPH DRO and TPH MRO analyses of sample OPIS-1. Method 200.7: Dilutions of 5 times were applied for the total barium analyses of samples OPIS-1 and OW-12A. Method 200.8: A dilution of 5 times was applied for the dissolved metals analysis of sample OPIS-1.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	

VALIDATION CRITERIA CHECKLIST	
6. Were samples received in good condition within method-specified requirements?	Yes
Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C between 2.1°C and 5.2°C as noted on the *Sample Log-In Check List* and CoC.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.	
Method 8015D Modified: **The analyte TPH DRO was detected in the method blanks from batches 68495 and 68464 at 0.023 mg/L and 0.037 mg/L, respectively. TPH DRO was detected in sample EB-6-28-22 at a concentration less than the blank detection, and the result was qualified as U. TPH DRO was detected in samples MKTF-30 and STP-1-NM at concentrations greater than the blank detection but less than or equal to 10 times the blank concentration, and the results were qualified as JB.**	
TPH DRO non-detections in the associated samples and results greater than 10 times the blank detections did not require qualification.	
13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.	

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68545	Not Prepared
200.7	Dissolved Metals	B89154	Not Prepared
200.8	Total Metals	68545	Not Prepared
200.8	Dissolved Metals	A89215	EB-6-28-22
245.1	Total Mercury	68621	OW-12A
504.1	EDB	68566	Not Prepared

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8015D	TPH DRO and MRO	68495	Not Prepared
8015D	TPH DRO	68464	Not Prepared
8015D	TPH GRO	R89210	Not Prepared
8260B	VOC	B89226	Not Prepared
8260B	VOC	R89293	Not Prepared
8270C	SVOC	68493	Not Prepared
8270C	SVOC	68468	Not Prepared
8270 SIM	SVOC	68493	Not Prepared
8270 SIM	SVOC	68468	Not Prepared
4500 CN E	Cyanide	WG1889907	Not Prepared
4500 CN E	Cyanide	WG1891839	Not Associated and OW-70

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

Recoveries and RPDs for MS/MSDs prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the exceptions listed in the following table.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Nickel, Total**	**68545**	**132%**	-----	**70-130%**	-----	-----
8015D	**TPH DRO**	**68464**	**83.6%**	Acceptable	**31.7-75.4%**	Acceptable	20%
8015D	**TPH DRO**	**68495**	**75.5%**	**78.6%**	**31.7-75.4%**	Acceptable	20%
8270C	Acenaphthene	68493	Acceptable	Acceptable	21.3-104%	53.0%	45.3%
8270C	**1,4-Dichlorobenzene**	**68493**	Acceptable	Acceptable	15-89.8%	**49.3%**	**39.6%**
8270C	**Phenol**	**68493**	Acceptable	Acceptable	17-61.1%	**55.7%**	**42.5%**
8270C	Pyrene	68493	Acceptable	55.4%	61-123%	30.2%	11.8%
8270C	Acenaphthene	68468	Acceptable	Acceptable	21.3-104%	58.7%	45.3%
8270C	**1,4-Dichlorobenzene**	**68468**	Acceptable	Acceptable	15-89.8%	**55.4%**	**39.6%**
8270C	**Phenol**	**68468**	Acceptable	Acceptable	17-61.1%	**59.2%**	**42.5%**
8270C	Pyrene	68468	Acceptable	Acceptable	61-123%	19.2%	11.8%
8270 SIM	**1,4-Dioxane**	**68493**	**49.0%**	Acceptable	**20.2-48.4%**	**86.5%**	**30.1%**
8270 SIM	**Naphthalene**	**68493**	Acceptable	Acceptable	21.3-79.9%	**87.9%**	**25.6%**

VALIDATION CRITERIA CHECKLIST

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
8270 SIM	**1-Methylnaphthalene**	**68493**	Acceptable	Acceptable	22.2-80.3%	**80.4%**	**25%**
8270 SIM	**2-Methylnaphthalene**	**68493**	Acceptable	Acceptable	20.6-80.1%	**76.6%**	**25%**
8270 SIM	**Acenaphthene**	**68493**	Acceptable	Acceptable	29.8-82.7%	**80.3%**	**27.8%**
8270 SIM	**Fluorene**	**68493**	Acceptable	Acceptable	33.3-86%	**56.5%**	**26.4%**
8270 SIM	**Phenanthrene**	**68493**	Acceptable	Acceptable	38.2-93.9%	**33.3%**	**27.9%**
8270 SIM	**Chrysene**	**68493**	Acceptable	Acceptable	55.3-115%	**34.7%**	**20%**

Analytes with LCS and/or LCSD recoveries greater than laboratory QC limits were detected in the associated samples, and the results were qualified as J+ to indicate estimated concentrations that may be biased high. Analytes with LCS/LCSD RPD values exceeding laboratory QC limits were qualified as J if detected and UJ if not detected due to poor precision.

Qualification was not required for acenaphthene and pyrene by Method 8270C as the associated samples' results were reported from Method 8270 SIM.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the exceptions listed in the following table.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	**Bromofluorobenzene**	**OPIS-1**	**145%**	**70-130%**
8270C	2-Fluorophenol	OPIS-1	0%	29.4-87.7%
8270C	Phenol-d_5	OPIS-1	0%	28.5-64.7%
8270C	2,4,6-Tribromophenol	OPIS-1	0%	18.6-129%
8270C	Nitrobenzene-d_5	OPIS-1	0%	36.9-103%
8270C	2-Fluorobiphenyl	OPIS-1	0%	38.1-99.9%
8270C	4-Terphenyl-d_{14}	OPIS-1	0%	48-155%
8270 SIM	Nitrobenzene-d_5	OPIS-1	0%	31.6-100%
8270 SIM	2-Fluorobiphenyl	OPIS-1	0%	26.7-90.1%
8270 SIM	4-Terphenyl-d_{14}	OPIS-1	0%	72.3-147%
8015D	**Bromofluorobenzene**	**OW-12A**	**261%**	**70-130%**
8270C	Phenol-d_5	OW-12A	0%	28.5-64.7%
8270 SIM	4-Terphenyl-d_{14}	OW-12A	66.1%	72.3-147%
8015D	**Bromofluorobenzene**	**OW-70**	**441%**	**70-130%**
8270C	2,4,6-Tribromophenol	DUP-6-28-22	15.6%	18.6-129%
8270 SIM	4-Terphenyl-d_{14}	DUP-6-28-22	71.2%	72.3-147%

The analyte associated with bromofluorobenzene (TPH GRO) was detected in the affected samples and was qualified as J+ to indicate estimated concentrations that may be biased high.

The semivolatile organic compound results for sample OPIS-1 were not qualified based on the surrogate non-conformances in the Method 8270C and Method 8270 SIM analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and these results were deemed unreliable and possibly inaccurate.

Since Methods 8270C and 8270 SIM surrogate associations were not available from the laboratory, qualification was assigned to all the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples OW-12A and DUP-6-28-22, and qualification of sample data was not required.

Qualification was not required based on surrogate nonconformance in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-28-22, and one equipment blank sample, EB-6-28-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples, with the exceptions listed in the following table.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**3.2 µg/L**
FB-6-28-22	8260B	Acetone	6.4 µg/L
FB-6-28-22	**8260B**	**Chloromethane**	**0.50 µg/L**
EB-6-28-22	8260B	Acetone	5.9 µg/L
EB-6-28-22	8260B	Chloromethane	0.41 µg/L
EB-6-28-22	**200.7**	**Dissolved Zinc**	**0.0038 mg/L**
EB-6-28-22	**8015D**	**TPH GRO**	**0.010 mg/L**
EB-6-28-22	8015D	TPH DRO	0.022 mg/L

Detections in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results were previously qualified due to laboratory blank contamination in batches 68495 and 68464; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-28-22 was collected as a field duplicate of sample MKTF-29.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for TPH DRO exceeded the data validation QC limit of 30% at 56.2%, which was evidence of poor precision. The TPH DRO results were qualified as J for samples MKTF-29 and DUP-6-28-22.

An RPD value could not be calculated for TPH MRO for the field duplicate pairs MKTF-29 and DUP-6-28-22 because the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent was greater than two times the reporting limits, TPH MRO was qualified as J and UJ for the parent and duplicate samples, respectively.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates prepared for these analyses and laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500 CN E	Cyanide	WG1889907	Not Associated
4500CN E	Cyanide	WG1891839	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD values for laboratory duplicate samples prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OPIS-1	Cadmium	ND	0.0011
DUP-6-28-22	Selenium	0.00041	0.0009
OPIS-1	Selenium	0.0014	0.0018
STP-1-NM	Selenium	0.0046	0.0078
DUP-6-28-22	Silver	ND	0.0066
MKTF-29	Silver	ND	0.0072
MKTF-30	Silver	ND	0.0025
OPIS-1	Silver	ND	0.0029
OW-12A	Silver	ND	0.0021
STP-1-NM	Silver	ND	0.0016
STP-1-NM	Vanadium	0.038	0.039
DUP-6-28-22	Zinc	0.0082	0.0086
EB-6-28-22	Zinc	ND	0.0038
OPIS-1	Zinc	0.029	0.032

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-29 Field Duplicate Sample ID: DUP-6-28-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
1,1-Dichloroethane	8260B	0.94 µg/L	0.91 µg/L	3.2% +/-RL
Chloromethane	8260B	0.52 µg/L	0.47 µg/L	10.1% +/-RL
MTBE	8260B	22 µg/L	22 µg/L	0.0%
1,4-Dioxane	8270 SIM	4.5 µg/L	4.0 µg/L	11.8%
TPH GRO	8015D	0.025 mg/L	0.025 mg/L	0.0% +/-RL
TPH DRO	**8015D**	**0.57 mg/L**	**0.32 mg/L**	**56.2%**
TPH MRO	**8015D**	**0.57 mg/L**	**ND (0.08 mg/L)**	**DL**
Barium, Dissolved	200.7	0.16 mg/L	0.15 mg/L	6.5%
Barium, Total	200.7	0.26 mg/L	0.25 mg/L	3.9%
Cobalt, Total	200.7	0.0070 mg/L	0.0086 mg/L	20.5% +/-RL
Nickel, Dissolved	200.7	0.015 mg/L	0.015 mg/L	0.0% +/-RL
Nickel, Total	200.7	0.024 mg/L	0.024 mg/L	0.0%
Silver, Dissolved	200.7	0.0072 mg/L	0.0066 mg/L	8.7% +/-RL
Vanadium, Dissolved	200.7	0.0064 mg/L	0.0064 mg/L	0.0% +/-RL
Vanadium, Total	200.7	0.0073 mg/L	0.0072 mg/L	1.4% +/-RL
Zinc, Dissolved	200.7	0.0087 mg/L	0.0086 mg/L	1.2% +/-RL
Zinc, Total	200.7	0.013 mg/L	0.0082 mg/L	45.3% +/-RL
Arsenic, Dissolved	200.8	0.00083 mg/L	0.00080 mg/L	3.7% +/-RL
Arsenic, Total	200.8	0.00096 mg/L	0.00095 mg/L	1.0% +/-RL
Lead, Dissolved	200.8	0.000064 mg/L	0.000061 mg/L	4.8% +/-RL
Lead, Total	200.8	0.00053 mg/L	0.00040 mg/L	28.0% +/-RL
Selenium, Dissolved	200.8	ND (0.0010 mg/L)	0.00090 mg/L	DL
Selenium, Total	200.8	0.00075 mg/L	0.00041 mg/L	58.6% +/-RL
Cyanide, Total	4500 CN E	6.31 µg/L	6.92 µg/L	9.2% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL). **TPH MRO was detected in the parent sample, but not in the duplicate sample. As the detected result was greater than two times the reporting limit, TPH MRO was qualified as J and UJ for the parent and duplicate samples, respectively.**

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for TPH DRO exceeded the data validation QC limit and was qualified as J for samples MKTF-29 and DUP-6-28-22 due to evidence of poor precision.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
ERPD-FD	High field duplicate RPD.
MBD	Method blank detection
FBD	Field blank detection
EBD	Equipment blank detection
TBD	Trip blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-29	2206f41-003a	0.94	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OPIS-1	2206f41-004a	3	5	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-12A	2206f41-006a	1.1	2	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-70	2206f41-007a	0.74	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP-6-28-22	2206f41-008a	0.91	1	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OPIS-1	2206f41-004a	1.2	5	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-70	2206f41-007a	0.25	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-12A	2206f41-006a	0.92	2	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	EB-6-28-22	2206F41-001C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-30	2206F41-002C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-29	2206F41-003C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OPIS-1	2206F41-004C	ND	50	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	STP-1-NM	2206F41-005C	ND	5	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dichlorobenzene	SW8270C	OW-12A	2206F41-006C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-70	2206F41-007C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	DUP-6-28-22	2206F41-008C	ND	5	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	STP-1-NM	2206f41-005c	0.22	1	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-12A	2206f41-006c	16	1	µg/L	J+	ERPD-LCS, HR-LCS
1,4-Dioxane	SW8270C	DUP-6-28-22	2206f41-008c	4	1	µg/L	J+	ERPD-LCS, HR-LCS
1,4-Dioxane	SW8270C	OW-70	2206f41-007c	0.7	1	µg/L	J+	ERPD-LCS, HR-LCS, MDLRL
1-Methylnaphthalene	SW8270C	OW-12A	2206f41-006c	0.96	0.3	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-70	2206f41-007c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Butanone	SW8260B	OW-12A	2206f41-006a	4.7	20	µg/L	J	MDLRL
2-Butanone	SW8260B	OW-70	2206f41-007a	2.6	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-12A	2206f41-006c	0.42	0.3	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-70	2206f41-007c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-12A	2206f41-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-70	2206f41-007c	0.24	0.3	µg/L	J	ERPD-LCS, MDLRL
Acetone	SW8260B	Trip Blank	2206f41-010a	3.2	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-6-28-22	2206f41-001a	5.9	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-12A	2206f41-006a	11	20	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-70	2206f41-007a	7.5	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	FB-6-28-22	2206f41-009a	6.4	10	µg/L	U	MDLRL, TBD
Arsenic, Dissolved	E200.8	MKTF-30	2206F41-002E	0.00063	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-29	2206F41-003E	0.00083	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-28-22	2206F41-008E	0.0008	0.001	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Total	E200.8	MKTF-29	2206F41-003D	0.00096	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-28-22	2206F41-008D	0.00095	0.001	mg/L	J	MDLRL
Beryllium, Total	E 200.7	MKTF-30	2206F41-002D	0.0009	0.002	mg/L	J	MDLRL
Cadmium, Dissolved	E 200.7	OPIS-1	2206F41-004E	0.0011	0.002	mg/L	J	MDLRL
Chloromethane	SW8260B	EB-6-28-22	2206f41-001a	0.41	3	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	MKTF-29	2206f41-003a	0.52	3	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	STP-1-NM	2206f41-005a	0.44	3	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	OW-12A	2206f41-006a	2.2	6	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	OW-70	2206f41-007a	1.4	3	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	DUP-6-28-22	2206f41-008a	0.47	3	µg/L	U	FBD, MDLRL
Chloromethane	SW8260B	FB-6-28-22	2206f41-009a	0.5	3	µg/L	J	MDLRL
Chromium, Total	E 200.7	OPIS-1	2206F41-004D	0.0022	0.006	mg/L	J	MDLRL
Chrysene	SW8270C	OW-12A	2206f41-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-70	2206f41-007c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
cis-1,2-Dichloroethene	SW8260B	OW-12A	2206f41-006a	0.94	2	µg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OPIS-1	2206F41-004E	0.0051	0.006	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-70	2206F41-007E	0.0053	0.006	mg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-30	2206F41-002F	2.91	5	µg/L	J	MDLRL
Cyanide, Total	E335.4	OW-12A	2206F41-006F	2.42	5	µg/L	J	MDLRL
Cyanide, Total	E335.4	OW-70	2206F41-007F	4.04	5	µg/L	J	MDLRL
Fluorene	SW8270C	OW-70	2206f41-007c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-12A	2206f41-006c	0.16	0.3	µg/L	J	ERPD-LCS, MDLRL
Lead, Dissolved	E200.8	MKTF-29	2206F41-003E	0.000064	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-70	2206F41-007E	0.00013	0.0005	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Dissolved	E200.8	DUP-6-28-22	2206F41-008E	0.000061	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-6-28-22	2206F41-008D	0.0004	0.0005	mg/L	J	MDLRL
MTBE	SW8260B	STP-1-NM	2206f41-005a	0.41	1	µg/L	J	MDLRL
Naphthalene	SW8270C	OW-12A	2206f41-006c	2.8	0.3	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-70	2206f41-007c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
n-Butylbenzene	SW8260B	OW-70	2206f41-007a	1.2	3	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-12A	2206F41-006E	0.0068	0.01	mg/L	J	MDLRL
Nickel, Total	E 200.7	OW-12A	2206F41-006E	0.0068	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	MKTF-30	2206F41-002D	0.03	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	MKTF-29	2206F41-003D	0.024	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OPIS-1	2206F41-004D	0.18	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-12A	2206F41-006D	0.02	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-70	2206F41-007D	0.05	0.01	mg/L	J+	HR-LCS
n-Propylbenzene	SW8260B	OPIS-1	2206f41-004a	1	5	µg/L	J	MDLRL
Phenanthrene	SW8270C	OW-70	2206f41-007c	0.62	0.3	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	OW-12A	2206f41-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	DUP-6-28-22	2206f41-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	EB-6-28-22	2206F41-001C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-30	2206F41-002C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-29	2206F41-003C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OPIS-1	2206F41-004C	ND	200	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	STP-1-NM	2206F41-005C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-12A	2206F41-006C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-70	2206F41-007C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	DUP-6-28-22	2206F41-008C	ND	20	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
sec-Butylbenzene	SW8260B	OW-12A	2206f41-006a	0.95	2	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-30	2206F41-002E	0.00037	0.001	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	OPIS-1	2206F41-004E	0.0018	0.005	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-12A	2206F41-006E	0.00058	0.001	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP-6-28-22	2206F41-008E	0.0009	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-29	2206F41-003D	0.00075	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-70	2206F41-007D	0.00051	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-6-28-22	2206F41-008D	0.00041	0.001	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-30	2206F41-002E	0.0025	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OPIS-1	2206F41-004E	0.0029	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	STP-1-NM	2206F41-005E	0.0016	0.005	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-12A	2206F41-006E	0.0021	0.005	mg/L	J	MDLRL
Toluene	SW8260B	OW-12A	2206f41-006a	1.5	2	µg/L	J	MDLRL
TPH DRO	SW8015	OPIS-1	2206F41-004C	6	0.13	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-12A	2206F41-006C	2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-70	2206F41-007C	0.97	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-30	2206F41-002C	0.11	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	STP-1-NM	2206F41-005C	0.17	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	EB-6-28-22	2206F41-001C	0.022	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-29	2206F41-003C	0.57	0.064	mg/L	J+	ERPD-FD, HR-LCS
TPH DRO	SW8015	DUP-6-28-22	2206F41-008C	0.32	0.064	mg/L	J+	ERPD-FD, HR-LCS
TPH GRO	SW8015	OPIS-1	2206F41-004a	0.48	0.1	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-12A	2206F41-006a	2.8	0.05	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-70	2206F41-007a	0.38	0.05	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-30	2206F41-002a	0.022	0.05	mg/L	U	EBD, MDLRL
TPH GRO	SW8015	MKTF-29	2206F41-003a	0.025	0.05	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	DUP-6-28-22	2206F41-008a	0.025	0.05	mg/L	U	EBD, MDLRL
TPH GRO	SW8015	EB-6-28-22	2206F41-001a	0.01	0.05	mg/L	J	MDLRL
TPH MRO	SW8015	MKTF-29	2206F41-003C	0.57	0.08	mg/L	J	ERPD-FD
TPH MRO	SW8015	DUP-6-28-22	2206F41-008C	ND	0.08	mg/L	UJ	ERPD-FD
Trichloroethene	SW8260B	MKTF-30	2206f41-002a	0.93	1	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-30	2206F41-002E	0.0041	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-29	2206F41-003E	0.0064	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OPIS-1	2206F41-004E	0.023	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	STP-1-NM	2206F41-005E	0.039	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-12A	2206F41-006E	0.004	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-70	2206F41-007E	0.0018	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-28-22	2206F41-008E	0.0064	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-30	2206F41-002D	0.044	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-29	2206F41-003D	0.0073	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OPIS-1	2206F41-004D	0.037	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	STP-1-NM	2206F41-005D	0.038	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-12A	2206F41-006D	0.032	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-70	2206F41-007D	0.013	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-28-22	2206F41-008D	0.0072	0.05	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OPIS-1	2206F41-004E	0.032	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-12A	2206F41-006E	0.014	0.01	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-30	2206F41-002E	0.0063	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-29	2206F41-003E	0.0087	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	STP-1-NM	2206F41-005E	0.0089	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-70	2206F41-007E	0.0097	0.01	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-28-22	2206F41-008E	0.0086	0.01	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	EB-6-28-22	2206F41-001E	0.0038	0.01	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-28-22	2206F41-008D	0.0082	0.01	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/29/2022
Date Validated: 01/24/2023	Sample End Date: 06/29/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206G22	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-29-22	2206G22-001
MKTF-44	2206G22-002
OW-57	2206G22-003
OW-58	2206G22-004
OW-58A	2206G22-005
DUP-6-29-22	2206G22-006
FB-6-29-22	2206G22-007
Trip Blank	2206G22-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 450 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C: The laboratory control spike duplicate (LCSD) for Method 8270 had a low recovery for pyrene. The laboratory control spike (LCS) had acceptable recovery.

Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene may be reported by either EPA Method 8270 or EPA Method 8270 SIM, depending which method needs the least dilution.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present nor required on the coolers because the samples were transferred to a courier for delivery to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-57	Dissolved Barium	5
200.7	OW-58A	Dissolved and Total Barium	5
200.8	OW-57	Select Total Metals	5
245.1	OW-58A	Total Mercury	5
200.7	OW-58, DUP-6-29-22	Dissolved and Total Barium	10
8015D	OW-57, OW-58, DUP-6-29-22	DRO and MRO	10
200.7	OW-57	Total Metals	20
200.8	OW-57	Total Lead	20
8015D	OW-58A	GRO	20
8015D	OW-57, OW-58, DUP-6-29-22	GRO	50
8260B	Multiple Samples	Select VOCs	50
200.7	OW-57	Total Barium	100
8260B	Multiple Samples	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 1.3°C, 2.3°C, and 3.6°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.4°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen. The laboratory noted that additional nitric acid preservative was added to samples OW-57 and OW-58A to adjust the pH to meet the method requirement. Validation action was not required.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 68495 at a concentration of 0.023 mg/L. TPH DRO was detected in samples EB-6-29-22 and MKTF-44 at concentrations less than the laboratory reporting limit and the results were assigned U qualifiers.** The TPH DRO results in the remaining associated samples were greater than ten times the blank concentration and did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batch. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68545	EB-6-29-22, MKTF-44
200.7	Dissolved Metals	A89290	Not Prepared
200.7	Dissolved Barium	A89335	Not Prepared
200.7	Dissolved Barium	B89506	Not Prepared
200.7	Dissolved Barium	C89417	OW-58A
200.8	Total Metals	68545	Not Prepared
200.8	Dissolved Metals	A89215	Not Prepared
245.1	Total and Dissolved Mercury	68622	OW-58A
504.1	EDB	68565	Not Prepared
504.1	EDB	68566	Not Prepared
4500CN E	Cyanide	WG1889913	Not Associated
4500CN E	Cyanide	WG1893803	OW-57, Not Associated
8015D	TPH DRO and MRO	68495	Not Prepared
8015D	GRO	G89271	MKTF-44
8260B	VOC	R89230	MKTF-44
8260B	VOC	R89347	Not Prepared
8270C SIM	SVOC	68493	Not Prepared
8270C	SVOC	68493	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exception.

The MSD recovery for cyanide in Method 4500CN E batch WG1893803 was outside the laboratory QC limits of 90.0-110% at 87.5%. However, the recoveries were within data validation limits of 75-125%. Validation action was not required.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	Total Nickel	68545	132%	-----	70-130%	-----	-----
200.7	Dissolved Barium	C89417	60.7%	-----	70-130%	-----	-----
200.7	Dissolved Nickel	A89290	61.8%	-----	70-130%	-----	-----
8015D	DRO	68495	75.5%	78.6%	31.7-75.4%	Acceptable	20%
8270C	Acenaphthene	68493	Acceptable	Acceptable	21.3-104%	53.0%	45.3%
8270C	1,4-Dichlorobenzene	68493	Acceptable	Acceptable	15-89.8%	49.3%	39.6%
8270C	Phenol	68493	Acceptable	Acceptable	17-61.1%	55.7%	42.5%
8270C	Pyrene	68493	Acceptable	55.4%	61-123%	30.2%	11.8%
8270C SIM	1,4-Dioxane	68493	49.0%	Acceptable	20.2-48.4%	86.5%	30.1%
8270C SIM	Naphthalene	68493	Acceptable	Acceptable	21.3-79.9%	87.9%	25.6%
8270C SIM	1-Methylnaphthalene	68493	Acceptable	Acceptable	22.2-80.3%	80.4%	25%
8270C SIM	2-Methylnaphthalene	68493	Acceptable	Acceptable	20.6-80.1%	76.6%	25%
8270C SIM	Acenaphthene	68493	Acceptable	Acceptable	29.8-82.7%	80.3%	27.8%
8270C SIM	Fluorene	68493	Acceptable	Acceptable	33.3-86%	56.5%	26.4%
8270C SIM	Phenanthrene	68493	Acceptable	Acceptable	38.2-93.9%	33.3%	27.9%
8270C SIM	Chrysene	68493	Acceptable	Acceptable	55.3-115%	34.7%	20%

The target analytes total nickel and DRO were detected in the associated samples, and the results were qualified as J+ based on the evidence of potential high bias. Non-detections of total nickel and 1,4-dioxane in the associated samples did not require qualification based on the evidence of potential high bias.

Detections of the analytes with LCS and/or LCSD recoveries less than the lower QC limits in the associated samples were qualified as J- due to evidence of potential low bias. Non-detections of these analytes in the associated samples were qualified as UJ.

The analytes with LCS/LCSD RPD values that exceeded the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**DUP-6-29-22**	**10.4%**	**29.4-87.7%**
8270C	**2,4,6-Tribromophenol**	**DUP-6-29-22**	**4.47%**	**18.6-129%**
8270C-SIM	4-Terphenyl-d_{14}	OW-58	71.8%	72.3-147%
8270C-SIM	4-Terphenyl-d_{14}	DUP-6-29-22	67.6%	72.3-147%

Since Method 8270C and 8270C-SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C-SIM analysis of samples OW-58 and DUP-6-9-22, and qualification of sample data was not required.

Phenol was detected in sample DUP-6-29-22 and this result was qualified as J-. The remaining SVOC target analytes were not detected in sample DUP-6-29-22, and these results were qualified as UJ, due to the evidence of potential low bias.

The DRO and MRO results for samples OW-57, OW-58, and DUP-6-9-22 were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-29-22, and one equipment blank sample, EB-6-29-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**13 µg/L**
EB-6-29-22	**200.7**	**Dissolved Zinc**	**0.0098 mg/L**
EB-6-29-22	8015D	DRO	0.025 mg/L
EB-6-29-22	8260B	Acetone	8.6 µg/L

Detections of acetone and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. The detections of dissolved zinc in the associated samples that were greater than or equal to the reporting limit but less than 10 times the blank result was assigned JB qualifiers. Non-detections of acetone in the associated samples did not require qualification.

The DRO results for the samples in batch 68495 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

VALIDATION CRITERIA CHECKLIST

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-6-29-22 was collected as a field duplicate of sample OW-58.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

RPD value for phenol exceeded the data validation limit of 30% at 45.6%. The phenol results for samples OW-58 and DUP-6-29-22 were assigned J qualifiers due to evidence of poor precision.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for these analyses and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1889913	Not Associated
4500CN E	Cyanide	WG1893803	OW-57, Not Associated

The RPD for the laboratory duplicate prepared from sample OW-57 was not applicable since the results for both measurements were not detected.

The RPD values for laboratory duplicate samples prepared from non-project samples were evaluated and considered but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
EB-6-29-22	Zinc	ND	0.0098
DUP-6-29-22	Zinc	0.0060	0.011

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-58 Field Duplicate Sample ID: DUP-6-29-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	5.1 mg/L	5.0 mg/L	2.0%
Barium, Total	E 200.7	5.5 mg/L	5.6 mg/L	1.8%
Cobalt, Total	E 200.7	ND (0.0060 mg/L)	0.0039 mg/L	DL
Nickel, Dissolved	E 200.7	0.050 mg/L	0.051 mg/L	2.0%
Nickel, Total	E 200.7	0.058 mg/L	0.055 mg/L	5.3%
Vanadium, Dissolved	E 200.7	0.0031 mg/L	0.0033 mg/L	6.3% +/-RL
Vanadium, Total	E 200.7	0.0049 mg/L	0.004 mg/L	20.2% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	0.011 mg/L	0.0% +/-RL
Zinc, Total	E 200.7	0.014 mg/L	0.006 mg/L	80.0% +/-RL
Arsenic, Dissolved	E200.8	0.0035 mg/L	0.0034 mg/L	2.9%
Arsenic, Total	E200.8	0.0039 mg/L	0.0039 mg/L	0.0%
Lead, Total	E200.8	0.00039 mg/L	0.00024 mg/L	47.6% +/-RL
TPH DRO	SW8015	5.9 mg/L	5.2 mg/L	12.6%
TPH GRO	SW8015	74 mg/L	77 mg/L	4.0%
1,2,4-Trimethylbenzene	SW8260B	9.6 µg/L	9.6 µg/L	0.0% +/-RL
Benzene	SW8260B	28,000 µg/L	27,000 µg/L	3.6%
Ethylbenzene	SW8260B	1,200 µg/L	1,200 µg/L	0.0%
Isopropylbenzene	SW8260B	31 µg/L	30 µg/L	3.3% +/-RL
MTBE	SW8260B	1000 µg/L	1000 µg/L	0.0%
n-Butylbenzene	SW8260B	15 µg/L	14 µg/L	6.9% +/-RL
n-Propylbenzene	SW8260B	95 µg/L	93 µg/L	2.1% +/-RL
sec-Butylbenzene	SW8260B	7.3 µg/L	ND (50 µg/L)	DL
Toluene	SW8260B	39 µg/L	40 µg/L	2.5% +/-RL
Xylenes, Total	SW8260B	130 µg/L	140 µg/L	7.4% +/-RL
1-Methylnaphthalene	SW8270C	68 µg/L	65 µg/L	4.5%
2-Methylnaphthalene	SW8270C	77 µg/L	73 µg/L	5.3%
Acenaphthene	SW8270C	2.7 µg/L	2.2 µg/L	20.4%
Anthracene	SW8270C	0.40 µg/L	0.30 µg/L	28.6% +/-RL
Fluoranthene	SW8270C	0.24 µg/L	0.22 µg/L	8.7% +/-RL
Fluorene	SW8270C	3.7 µg/L	2.9 µg/L	24.2%
Naphthalene	SW8270C	140 µg/L	130 µg/L	7.4%
Phenanthrene	SW8270C	3.3 µg/L	2.5 µg/L	27.6%
Phenol	**SW8270C**	**70 µg/L**	**44 µg/L**	**45.6%**

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD value for phenol exceeded the data validation limit of 30% at 45.6%, which was evidence of poor precision. The phenol results were qualified as J for samples OW-58 and DUP-6-29-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	OW-58	2206G22-004A	9.6	50	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP-6-29-22	2206G22-006A	9.6	50	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	OW-58A	2206G22-005A	45	50	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	EB-6-29-22	2206G22-001C	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	MKTF-44	2206G22-002C	ND	50	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-57	2206G22-003C	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-58	2206G22-004C	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-58A	2206G22-005C	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	DUP-6-29-22	2206G22-006C	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	EB-6-29-22	2206g22-001c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-44	2206g22-002c	ND	10	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	OW-57	2206G22-003C	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	OW-58	2206G22-004C	ND	1.0	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	OW-58A	2206G22-005C	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	DUP-6-29-22	2206G22-006C	ND	1.0	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-57	2206G22-003C	96	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-58	2206G22-004C	68	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-58A	2206G22-005C	100	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-6-29-22	2206G22-006C	65	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
2,4,6-Trichlorophenol	SW8270C	DUP-6-29-22	2206G22-006C	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	DUP-6-29-22	2206G22-006C	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	DUP-6-29-22	2206G22-006C	ND	20	µg/L	UJ	LR-SUR
2-Methylnaphthalene	SW8270C	OW-57	2206G22-003C	71	5.0	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-58	2206G22-004C	77	5.0	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-58A	2206G22-005C	97	5.0	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-6-29-22	2206G22-006C	73	5.0	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
2-Methylphenol	SW8270C	DUP-6-29-22	2206G22-006C	ND	10	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-58A	2206G22-005C	9.5	10	µg/L	J	MDLRL
3,4-Methylphenol	SW8270C	DUP-6-29-22	2206G22-006C	ND	10	µg/L	UJ	LR-SUR
Acenaphthene	SW8270C	OW-57	2206G22-003C	3.0	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	OW-58	2206G22-004C	2.7	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	OW-58A	2206G22-005C	4.2	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	DUP-6-29-22	2206G22-006C	2.2	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
Acetone	SW8260B	EB-6-29-22	2206G22-001A	8.6	10	µg/L	U	MDLRL, TBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Anthracene	SW8270C	OW-57	2206G22-003C	0.20	0.30	µg/L	J	MDLRL
Barium, Dissolved	E 200.7	MKTF-44	2206G22-002E	0.035	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	OW-58A	2206G22-005E	1.0	0.010	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	EB-6-29-22	2206G22-001E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Total	E 200.7	OW-57	2206G22-003D	0.029	0.040	mg/L	J	MDLRL
Chromium, Dissolved	E 200.7	MKTF-44	2206G22-002E	0.0024	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-58A	2206G22-005D	0.0035	0.0060	mg/L	J	MDLRL
Chrysene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-57	2206G22-003C	ND	0.30	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-58	2206G22-004C	ND	0.30	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-58A	2206G22-005C	ND	0.30	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	DUP-6-29-22	2206G22-006C	ND	0.30	µg/L	UJ	ERPD-LCS
Cobalt, Dissolved	E 200.7	OW-57	2206G22-003E	0.0026	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	DUP-6-29-22	2206G22-006D	0.0039	0.0060	mg/L	J	MDLRL
Fluoranthene	SW8270C	OW-58	2206G22-004C	0.24	0.30	µg/L	J	MDLRL
Fluoranthene	SW8270C	OW-58A	2206G22-005C	0.26	0.30	µg/L	J	MDLRL
Fluoranthene	SW8270C	DUP-6-29-22	2206G22-006C	0.22	0.30	µg/L	J	MDLRL
Fluorene	SW8270C	OW-57	2206G22-003C	5.3	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	OW-58	2206G22-004C	3.7	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	OW-58A	2206G22-005C	5.9	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	DUP-6-29-22	2206G22-006C	2.9	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	OW-57	2206G22-003A	14	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-58	2206G22-004A	31	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-58A	2206G22-005A	32	50	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Isopropylbenzene	SW8260B	DUP-6-29-22	2206G22-006A	30	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-44	2206G22-002E	0.00032	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-58	2206G22-004D	0.00039	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-6-29-22	2206G22-006D	0.00024	0.00050	mg/L	J	MDLRL
MTBE	SW8260B	OW-57	2206G22-003A	31	50	µg/L	J	MDLRL
Naphthalene	SW8270C	OW-57	2206G22-003C	130	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-58	2206G22-004C	140	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-58A	2206G22-005C	190	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	DUP-6-29-22	2206G22-006C	130	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
n-Butylbenzene	SW8260B	OW-58	2206G22-004A	15	150	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-58A	2206G22-005A	15	150	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP-6-29-22	2206G22-006A	14	150	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-57	2206G22-003E	0.057	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	OW-58	2206G22-004E	0.050	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	OW-58A	2206G22-005E	0.036	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	DUP-6-29-22	2206G22-006E	0.051	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	EB-6-29-22	2206G22-001E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	MKTF-44	2206G22-002E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-57	2206G22-003D	0.31	0.20	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-58	2206G22-004D	0.058	0.01	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-58A	2206G22-005D	0.040	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	DUP-6-29-22	2206G22-006D	0.055	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	MKTF-44	2206G22-002D	0.0081	0.010	mg/L	J+	HR-LCS, MDLRL
n-Propylbenzene	SW8260B	OW-57	2206G22-003A	34	50	µg/L	J	MDLRL
Phenanthrene	SW8270C	OW-57	2206G22-003C	7.3	0.30	µg/L	J	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenanthrene	SW8270C	OW-58	2206G22-004C	3.3	0.30	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	OW-58A	2206G22-005C	5.0	0.30	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	DUP-6-29-22	2206G22-006C	2.5	0.30	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	EB-6-29-22	2206g22-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	MKTF-44	2206g22-002c	ND	3.0	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-58	2206G22-004C	70	20	µg/L	J	ERPD-FD, ERPD-LCS
Phenol	SW8270C	DUP-6-29-22	2206G22-006C	44	20	µg/L	J-	ERPD-FD, ERPD-LCS, LR-SUR
Phenol	SW8270C	OW-57	2206G22-003C	110	20	µg/L	J	ERPD-LCS
Phenol	SW8270C	OW-58A	2206G22-005C	21	20	µg/L	J	ERPD-LCS
Phenol	SW8270C	EB-6-29-22	2206G22-001C	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-44	2206G22-002C	ND	200	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	EB-6-29-22	2206g22-001c	ND	1.0	µg/L	UJ	ERPD-LCS, LR-LCS
Pyrene	SW8270C	MKTF-44	2206g22-002c	ND	10	µg/L	UJ	ERPD-LCS, LR-LCS
Pyrene	SW8270C	OW-57	2206G22-003C	ND	1.0	µg/L	UJ	ERPD-LCS, LR-LCS
Pyrene	SW8270C	OW-58	2206G22-004C	ND	1.0	µg/L	UJ	ERPD-LCS, LR-LCS
Pyrene	SW8270C	OW-58A	2206G22-005C	ND	1.0	µg/L	UJ	ERPD-LCS, LR-LCS
Pyrene	SW8270C	DUP-6-29-22	2206G22-006C	ND	1.0	µg/L	UJ	ERPD-LCS, LR-LCS
sec-Butylbenzene	SW8260B	OW-58	2206G22-004A	7.3	50	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-58A	2206G22-005A	7.9	50	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-58A	2206G22-005E	0.00041	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-58A	2206G22-005D	0.00053	0.0010	mg/L	J	MDLRL
Toluene	SW8260B	OW-57	2206G22-003A	28	50	µg/L	J	MDLRL
Toluene	SW8260B	OW-58	2206G22-004A	39	50	µg/L	J	MDLRL
Toluene	SW8260B	DUP-6-29-22	2206G22-006A	40	50	µg/L	J	MDLRL
TPH DRO	SW8015	OW-57	2206G22-003C	4.7	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-58	2206G22-004C	5.9	0.64	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	OW-58A	2206G22-005C	3.2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	DUP-6-29-22	2206G22-006C	5.2	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	EB-6-29-22	2206G22-001C	0.025	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-44	2206G22-002C	0.042	0.064	mg/L	U	HR-LCS, MBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-57	2206G22-003E	0.0029	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-58	2206G22-004E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-29-22	2206G22-006E	0.0033	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-57	2206G22-003D	0.43	1.0	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58	2206G22-004D	0.0049	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58A	2206G22-005D	0.015	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-29-22	2206G22-006D	0.004	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-44	2206G22-002E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-58	2206G22-004E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-58A	2206G22-005E	0.015	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-6-29-22	2206G22-006E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-57	2206G22-003E	0.0078	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-29-22	2206G22-001E	0.0098	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-29-22	2206G22-006D	0.0060	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/08/2022
Date Validated: 09/20/2022	Sample End Date: 06/08/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Per- and Polyfluorinated Alkyl Substances (PFAS) by Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS) and Isotope Dilution (ID)	
Laboratory Project ID: 2206528	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, and from Vista Analytical Laboratory of El Dorado Hills, California, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-8-22	2206528-001
OW-63	2206528-002
OW-64	2206528-003
OW-10	2206528-004
FB-6-8-22	2206528-005
DUP-6-8-22	2206528-006
Trip Blank	2206528-007
Equipment Blank	2206528-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 384 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8015D DRO/MRO: The Laboratory control spike had elevated recovery that was due to laboratory error. The Laboratory control spike duplicate had acceptable recoveries.

Method 8270C: Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene may be reported by either EPA Method 8270 or EPA Method 8270 SIM, depending which method needs the least dilution. In this report naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM for sample OW-63.

PFAS Isotope Dilution Method: Sample "OW-63" contained particulate and was centrifuged prior to extraction.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-63	Dissolved Barium	5
200.8	OW-64	Total Arsenic and Selenium	5
200.7	OW-63	Total Barium	10
8260B	OW-10	Methylene Chloride	10
8015D	OW-63	TPH GRO	50
8260B	OW-63	Select VOCs	50
8260B	OW-63	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C at 3.5°C, 3.8°C, and 3.9°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.7°C as noted on the CoC. Samples transferred to Vista were received in good condition with the cooler temperature outside the recommended range at 1.1°C as noted on the *Sample Log-in Checklist*. The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of nanograms per liter (ng/L), micrograms per liter (µg/L), and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 68038 at a concentration of 0.029 mg/L. The sample EB-6-8-22 TPH DRO result detected below the laboratory reporting limit was qualified with a U flag. Samples DUP-6-8-22 and OW-10 TPH DRO results greater than the blank detection and/or the laboratory reporting limit but less than 10 times the blank concentration were qualified with a JB flag.** Detections of this analyte greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68127	EB-6-8-22
200.7	Dissolved Metals	B88662	Not Prepared
200.8	Total Metals	68127	OW-64
200.8	Dissolved Metals	A88688	Not Prepared
245.1	Total and Dissolved Mercury	68088	Not Prepared
504.1	EDB	68078	Not Prepared
4500CN E	Cyanide	WG1882735	Not Associated
8015D	TPH DRO and MRO	68038	Not Prepared
8015D	TPH GRO	A88732	EB-6-8-22
8260B	Methylene Chloride	A88912	Not Prepared
8260B	VOCs	R88822	OW-64
8270C and 8270C SIM	SVOCs	68135	Not Prepared
PFAS Method	PFAs	B22F113	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	Total Cobalt	68127	133%	-----	70-130%	-----	-----
200.7	**Dissolved Zinc**	**B88662**	**144%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**68038**	**642%**	**77.6%**	**31.7-75.4%**	**157%**	**20%**

Dissolved zinc and TPH DRO were detected in the associated samples, and these results were qualified as J+ due to evidence of potential high bias. Non-detections of total cobalt in the associated samples did not require qualification.

TPH DRO was detected in the associated samples, and these results were qualified as J due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exception.

The Method 8015D surrogate BFB was recovered in sample OW-64 outside the acceptance limits of 70-130% at 288%. The associated target analyte (TPH GRO) was detected in sample OW-64 and was assigned a J+ qualifier due to evidence of potential high bias.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample FB-6-8-22, and two equipment blank samples, EB-6-8-22 and Equipment Blank, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-6-8-22	8015D	TPH DRO	0.044 mg/L
EB-6-8-22	8270 SIM	1,4-Dioxane	0.30 µg/L
EB-6-8-22	**200.7**	**Dissolved Zinc**	**0.0068 mg/L**

Detections of dissolved zinc in the associated samples that were less than the blank result and less than the applicable reporting limits were assigned U qualifiers. The detection of dissolved zinc in the associated sample OW-63 that was greater than the reporting limit but less than 10 times the blank result was assigned a JB qualifier. Non-detections of 1,4-dioxane in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results in batch 68038 were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the equipment blank contamination was not required.

VALIDATION CRITERIA CHECKLIST	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	Yes
Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-8-22 was collected as a field duplicate of sample OW-10.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	Yes
Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.	

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1882735	Not Associated
4500CN E	Cyanide	WG1882735	EB-6-8-22

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for laboratory duplicates prepared from project samples were not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-63	Antimony	ND	0.00061
OW-10	Cobalt	ND	0.0039
DUP-6-8-22	Cobalt	ND	0.0028
OW-63	Vanadium	ND	0.0027
EB-6-8-22	Zinc	ND	0.0068
OW-63	Zinc	ND	0.014

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-10 Field Duplicate Sample ID: DUP-6-8-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.046 mg/L	0.045 mg/L	2.2%
Barium, Total	E 200.7	0.057 mg/L	0.055 mg/L	3.6%
Cobalt, Dissolved	E 200.7	0.0039 mg/L	0.0028 mg/L	32.8% +/-RL
Vanadium, Dissolved	E 200.7	0.0055 mg/L	0.0063 mg/L	13.6% +/-RL
Vanadium, Total	E 200.7	0.0061 mg/L	0.0067 mg/L	9.4% +/-RL
Zinc, Dissolved	E 200.7	0.0056 mg/L	0.0066 mg/L	16.4% +/-RL
Zinc, Total	E 200.7	0.0081 mg/L	0.0071 mg/L	13.2% +/-RL
Arsenic, Dissolved	E200.8	0.00065 mg/L	0.00067 mg/L	3.0% +/-RL
Arsenic, Total	E200.8	0.0011 mg/L	0.0011 mg/L	0.0% +/-RL
Lead, Dissolved	E200.8	0.00008 mg/L	0.000074 mg/L	7.8% +/-RL
Lead, Total	E200.8	0.00021 mg/L	0.00021 mg/L	0.0% +/-RL
Selenium, Dissolved	E200.8	0.010 mg/L	0.011 mg/L	9.5%
Selenium, Total	E200.8	0.013 mg/L	0.012 mg/L	8.0%
TPH DRO	SW8015	0.12 mg/L	0.091 mg/L	27.5% +/-RL
TPH GRO	SW8015	0.012 mg/L	0.012 mg/L	0.0% +/-RL
1,1-Dichloroethane	SW8260B	1.0 µg/L	ND (1.0 µg/L)	DL
Methylene Chloride	SW8260B	47 µg/L	ND (3.0 µg/L)	DL
MTBE	SW8260B	7.1 µg/L	7.3 µg/L	2.8%
1,4-Dioxane	SW8270C	3.3 µg/L	3.1 µg/L	6.3%
Pyrene	SW8270C	ND (1.0 µg/L)	0.60 µg/L	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	EB-6-8-22	2206528-001c	0.30	1.0	µg/L	J	MDLRL
Acenaphthene	SW8270C	OW-64	2206528-003c	0.16	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	OW-64	2206528-003c	0.22	0.30	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	OW-63	2206528-002E	0.00061	0.0010	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-10	2206528-004E	0.00065	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-8-22	2206528-006E	0.00067	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-64	2206528-003D	0.0026	0.0050	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-64	2206528-003D	0.0033	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-10	2206528-004E	0.0039	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	DUP-6-8-22	2206528-006E	0.0028	0.0060	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-64	2206528-003E	0.000080	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-10	2206528-004E	0.000080	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-6-8-22	2206528-006E	0.000074	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-63	2206528-002D	0.000076	0.00050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Total	E200.8	OW-10	2206528-004D	0.00021	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-6-8-22	2206528-006D	0.00021	0.00050	mg/L	J	MDLRL
Pyrene	SW8270C	DUP-6-8-22	2206528-006c	0.60	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-63	2206528-002a	8.3	50	µg/L	J	MDLRL
Toluene	SW8260B	OW-63	2206528-002a	46	50	µg/L	J	MDLRL
TPH DRO	SW8015	OW-63	2206528-002C	3.5	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-64	2206528-003C	0.40	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-10	2206528-004C	0.12	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	DUP-6-8-22	2206528-006C	0.091	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	EB-6-8-22	2206528-001C	0.044	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	OW-64	2206528-003A	0.53	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-10	2206528-004A	0.012	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	DUP-6-8-22	2206528-006A	0.012	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-63	2206528-002E	0.0027	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-64	2206528-003E	0.0035	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-10	2206528-004E	0.0055	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-8-22	2206528-006E	0.0063	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-64	2206528-003D	0.0080	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-10	2206528-004D	0.0061	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-8-22	2206528-006D	0.0067	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	EB-6-8-22	2206528-001E	0.0068	0.010	mg/L	J+	HR-LCS, MDLRL
Zinc, Dissolved	E 200.7	OW-63	2206528-002E	0.014	0.010	mg/L	JB	FBD, HR-LCS
Zinc, Dissolved	E 200.7	OW-64	2206528-003E	0.0054	0.010	mg/L	U	FBD, HR-LCS, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	OW-10	2206528-004E	0.0056	0.010	mg/L	U	FBD, HR-LCS, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-8-22	2206528-006E	0.0066	0.010	mg/L	U	FBD, HR-LCS, MDLRL
Zinc, Total	E 200.7	OW-64	2206528-003D	0.0057	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-10	2206528-004D	0.0081	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-8-22	2206528-006D	0.0071	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/09/2022
Date Validated: 12/27/2022	Sample End Date: 06/09/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206602	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-9-22	2206602-001
BW-5C	2206602-002
OW-50	2206602-003
OW-52	2206602-004
OW-29	2206602-005
OW-13	2206602-006
FB-6-9-22	2206602-007
DUP-6-9-22	2206602-008
BW-5B	2206602-009
Trip Blank	2206602-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C: Sample OW-29 had poor surrogate recoveries due to the emulsive nature of the sample.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

J – The identification of the analyte is acceptable; the reported value is an estimate.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

S – % Recovery outside of range due to dilution or matrix interference.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present nor required on the coolers because the samples were transferred to a courier for delivery to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.8	OW-29, OW-52, BW-5C	Select Dissolved and Total Metals	5
8260B	EB-6-9-22	Methylene Chloride	10
8260B	OW-29	MTBE	100

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.5°C and 5.8°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 5.9°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

VALIDATION CRITERIA CHECKLIST

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception.

TPH DRO was detected in the laboratory blank for Method 8015D batch 68123 at a concentration of 0.021 mg/L. Sample results detected below the blank concentration and/or the laboratory reporting limit were qualified with a U flag. The TPH DRO result for sample BW-5C was greater than the laboratory reporting limit but less than or equal to 10 times the blank concentration and was assigned a JB qualifier. The TPH DRO results in the associated samples OW-29 and OW-52 were greater than ten times the blank concentration and did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68127	BW-5B
200.7	Dissolved Metals	A88751	Not Prepared
200.7	Dissolved Metals	B88784	EB-6-9-22
200.8	Total Metals	68127	OW-29
200.8	Dissolved Metals	B88918	Not Prepared
200.8	Dissolved Metals	C88688	EB-6-9-22, BW-5C
245.1	Total and Dissolved Mercury	68089	BW-5B
504.1	EDB	68078	Not Prepared
4500CN E	Cyanide	WG1882743	Not Associated
8015D	TPH DRO and MRO	68123	Not Prepared
8015D	GRO	C88732	EB-6-9-22

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8260B	MTBE	A88912	Not Prepared
8260B	Methylene Chloride	A88962	Not Prepared
8260B	VOC	R88822	Not Prepared
8270C SIM	SVOC	68135	Not Prepared
8270C	SVOC	68135	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCS/LCSD QC Limits
200.7	**Total Cobalt**	**68127**	**133%**	**70-130%**
200.7	**Dissolved Nickel**	**B88784**	**64.9%**	**70-130%**

Total cobalt was detected in the associated sample BW-5C, and this result was qualified as J+ due to evidence of potential high bias. The remaining associated total cobalt results were non-detections, and qualification of data was not required.

Dissolved nickel was not detected in the associated sample EB-6-9-22. This result was qualified as UJ due to evidence of potential low bias.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**OW-29**	**20.4%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**OW-29**	**16.6%**	**28.5-64.7%**
8270C	**Nitrobenzene-d_5**	**OW-29**	**26.7%**	**36.9-103%**
8270C	**2-Fluorobiphenyl**	**OW-29**	**26.7%**	**38.1-99.9%**

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of sample OW-29, and qualification of sample data was not required. **Di-n-butyl phthalate was detected in the Method 8270C analysis of sample OW-29, and this result was qualified as J- to indicate a potential low bias. The remaining Method 8270C SVOC results for sample OW-29 were non-detections, and these results were qualified as UJ due to the evidence of potential low bias.**

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-6-9-22, and one equipment blank sample, EB-6-9-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-6-9-22	**200.7**	**Dissolved Zinc**	**0.0065 mg/L**
EB-6-9-22	8015D	TPH DRO	0.017 mg/L
EB-6-9-22	**8260B**	**Methylene Chloride**	**370 µg/L**

Detections of dissolved zinc and methylene chloride in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. The detections of dissolved zinc in the associated samples OW-50 and OW-52 that were greater than the reporting limit but less than 10 times the blank result were assigned JB qualifiers. Non-detections of methylene chloride in the associated samples and dissolved zinc results greater than ten times the blank concentration did not require qualification.

The TPH DRO results for the samples in batch 68123 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-6-9-22 was collected as a field duplicate of sample BW-5B.

VALIDATION CRITERIA CHECKLIST	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for MTBE exceeded the data validation limit of 30% at 53.2%, which was evidence of poor precision. The MTBE results were qualified as J for samples BW-5B and DUP-6-9-22.

An RPD value could not be calculated for methylene chloride for the field duplicate pair BW-5B and DUP-6-9-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, methylene chloride was qualified as J and UJ for the parent and duplicate samples, respectively.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1882743 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-29	Antimony	ND	0.00067
BW-5B	Antimony	ND	0.00070
OW-29	Arsenic	ND	0.00046
OW-29	Barium	0.082	0.085
BW-5B	Lead	ND	0.000064
BW-5C	Selenium	ND	0.00040
OW-13	Vanadium	ND	0.0031
BW-5B	Vanadium	0.0092	0.0096
OW-29	Zinc	ND	0.12
OW-52	Zinc	ND	0.013
OW-13	Zinc	0.0045	0.0076
DUP-6-9-22	Zinc	ND	0.0075
BW-5B	Zinc	ND	0.0096
EB-6-9-22	Zinc	ND	0.0065
BW-5C	Zinc	0.0065	0.0086
OW-50	Zinc	0.0043	0.011

FIELD DUPLICATE SUMMARY

Client Sample ID: BW-5B Field Duplicate Sample ID: DUP-6-9-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.26 mg/L	0.27 mg/L	3.8%
Barium, Total	E 200.7	0.28 mg/L	0.28 mg/L	0.0%
Vanadium, Dissolved	E 200.7	0.0096 mg/L	0.0095 mg/L	1.0% +/-RL
Vanadium, Total	E 200.7	0.0092 mg/L	0.0096 mg/L	4.3% +/-RL
Zinc, Dissolved	E 200.7	0.0096 mg/L	0.0075 mg/L	24.6% +/-RL
Antimony, Dissolved	E200.8	0.00070 mg/L	ND (0.0010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00088 mg/L	0.00089 mg/L	1.1% +/-RL
Arsenic, Total	E200.8	0.0011 mg/L	0.0010 mg/L	9.5% +/-RL
Lead, Dissolved	E200.8	0.000064 mg/L	ND (0.00050 mg/L)	DL
Selenium, Dissolved	E200.8	0.00055 mg/L	0.00082 mg/L	39.4% +/-RL
Selenium, Total	E200.8	0.0011 mg/L	0.0014 mg/L	24.0% +/-RL
TPH DRO	SW8015	0.030 mg/L	0.016 mg/L	60.9% +/-RL
TPH GRO	SW8015	0.014 mg/L	0.016 mg/L	13.3% +/-RL
Methylene Chloride	**SW8260B**	**52 µg/L**	**ND (3.0 µg/L)**	**DL**
MTBE	**SW8260B**	**8.7 µg/L**	**15 µg/L**	**53.2%**
1,4-Dioxane	SW8270C	0.76 µg/L	0.80 µg/L	5.1% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for MTBE exceeded the data validation limit of 30% at 53.2%, which was evidence of poor precision. The MTBE results were qualified as J for samples BW-5B and DUP-6-9-22.

An RPD value could not be calculated for methylene chloride for the field duplicate pair BW-5B and DUP-6-9-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, methylene chloride was qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2-Dichloroethane	SW8260B	OW-13	2206602-006a	0.77	1.0	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	OW-29	2206602-005c	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dioxane	SW8270C	OW-29	2206602-005c	0.46	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	DUP-6-9-22	2206602-008c	0.80	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	BW-5B	2206602-009c	0.76	1.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-29	2206602-005c	ND	20	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
Antimony, Dissolved	E200.8	OW-29	2206602-005E	0.00067	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	BW-5B	2206602-009E	0.00070	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5C	2206602-002E	0.00055	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-52	2206602-004E	0.00058	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-29	2206602-005E	0.00046	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	OW-13	2206602-006E	0.00069	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-9-22	2206602-008E	0.00089	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5B	2206602-009E	0.00088	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-5C	2206602-002D	0.00076	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-52	2206602-004D	0.00065	0.0010	mg/L	J	MDLRL
Benzoic Acid	SW8270C	OW-29	2206602-005c	ND	20	µg/L	UJ	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
Cobalt, Dissolved	E 200.7	BW-5C	2206602-002E	0.0029	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	BW-5C	2206602-002D	0.0040	0.0060	mg/L	J+	HR-LCS, MDLRL
Cyanide, Total	E335.4	OW-50	2206602-003F	2.18	5.0	µg/L	J	MDLRL
Diethylphthalate	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	OW-29	2206602-005c	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	OW-29	2206602-005c	9.7	10	µg/L	J-	LR-SUR, MDLRL
Di-n-octylphthalate	SW8270C	OW-29	2206602-005c	ND	20	µg/L	UJ	LR-SUR
Lead, Dissolved	E200.8	BW-5B	2206602-009E	0.000064	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	BW-5C	2206602-002D	0.0014	0.0025	mg/L	J	MDLRL
Mercury, Total	E245.1	BW-5C	2206602-002D	0.00019	0.00020	mg/L	J	MDLRL
Methylene Chloride	SW8260B	DUP-6-9-22	2206602-008a	ND	3.0	µg/L	UJ	ERPD-FD
Methylene Chloride	SW8260B	OW-29	2206602-005a	39	3.0	µg/L	U	EBD
Methylene Chloride	SW8260B	BW-5B	2206602-009a	52	3.0	µg/L	U	EBD, ERPD-FD
MTBE	SW8260B	DUP-6-9-22	2206602-008a	15	1.0	µg/L	J	ERPD-FD
MTBE	SW8260B	BW-5B	2206602-009a	8.7	1.0	µg/L	J	ERPD-FD
Nickel, Dissolved	E 200.7	EB-6-9-22	2206602-001E	ND	0.01	mg/L	UJ	LR-LCS
Phenol	SW8270C	OW-29	2206602-005c	ND	20	µg/L	UJ	LR-SUR
Pyridine	SW8270C	OW-29	2206602-005c	ND	60	µg/L	UJ	LR-SUR
Selenium, Dissolved	E200.8	BW-5C	2206602-002E	0.00040	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP-6-9-22	2206602-008E	0.00082	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Dissolved	E200.8	BW-5B	2206602-009E	0.00055	0.0010	mg/L	J	MDLRL
TPH DRO	SW8015	BW-5C	2206602-002C	0.078	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-6-9-22	2206602-001C	0.017	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-50	2206602-003C	0.046	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-13	2206602-006C	0.039	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	DUP-6-9-22	2206602-008C	0.016	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	BW-5B	2206602-009C	0.030	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	BW-5C	2206602-002a	0.023	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	OW-52	2206602-004a	0.0094	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	DUP-6-9-22	2206602-008a	0.016	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	BW-5B	2206602-009a	0.014	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-5C	2206602-002E	0.0026	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-13	2206602-006E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-9-22	2206602-008E	0.0095	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-5B	2206602-009E	0.0096	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-5C	2206602-002D	0.0089	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-9-22	2206602-008D	0.0096	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-5B	2206602-009D	0.0092	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-50	2206602-003E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-52	2206602-004E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-6-9-22	2206602-001E	0.0065	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	BW-5C	2206602-002E	0.0086	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-13	2206602-006E	0.0076	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-9-22	2206602-008E	0.0075	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	BW-5B	2206602-009E	0.0096	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	BW-5C	2206602-002D	0.0065	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-50	2206602-003D	0.0043	0.010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Total	E 200.7	OW-13	2206602-006D	0.0045	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Aqueous
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/14/2022
Date Validated: 09/20/2022	Sample End Date: 06/14/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206781	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-14-22	2206781-001
PW-3	2206781-002
PW-4	2206781-003
East LDU	2206781-004
West LDU	2206781-005
FB-6-9-22	2206781-006
DUP-6-9-22	2206781-007
Trip Blank	2206781-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 450 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C: Samples PW-3 and East LDU had poor surrogate recoveries due to the emulsive nature of the sample.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times

Samples FB-6-14-22 and DUP-6-14-22 were logged into the laboratory system as FB-6-9-22 and DUP-6-9-22, respectively.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	East LDU, DUP-6-9-22	Dissolved Chromium and Nickel	5
200.7	West LDU, DUP-6-9-22	Total Chromium and Nickel	5
200.8	Multiple Samples	Select Total and Dissolved Metals	5
200.7	East LDU	Total Chromium and Nickel	10
8015D	DUP-6-9-22	TPH DRO and TPH MRO	10
8260B	DUP-6-9-22	Methylene Chloride	10
200.8	DUP-6-9-22	Select Total Metals	20

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 0.8°C, 3.1°C, and 4.8°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.7°C as noted on the CoC. The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception.

TPH DRO was detected in the laboratory blank for Method 8015D batch 68185 at a concentration of 0.018 mg/L. TPH DRO was detected in associated samples EB-6-14-22 and PW-3 at concentrations less than the laboratory reporting limit and the results were qualified with U flags. Non-detections of this analyte in the associated samples and results greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68172	West LDU, DUP-6-9-22
200.7	Dissolved Metals	B88784	EB-6-14-22
200.7	Dissolved Silver	B88897	Not Prepared
200.8	Total Metals	68172	Not Prepared
200.8	Dissolved Metals	B88918	EB-6-14-22, PW-3
245.1	Total and Dissolved Mercury	68186	Not Prepared
504.1	EDB	68189	Not Prepared
Method	Analytes	Batch	MS Sample Source

VALIDATION CRITERIA CHECKLIST

4500CN E	Cyanide	WG1883737	Not Associated
8015D	TPH DRO and MRO	68185	Not Prepared
8015D	TPH GRO	G88994	Not Prepared
8260B	VOCs	A88912	Not Prepared
8260B	VOCs	A88962	Not Prepared
8270C and 8270C SIM	SVOCs	68202	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits, with the following exceptions.

The MS and MSD recoveries for total silver in Method 200.7 batch 68172 were outside the QC limits of 75-125% at 46.5% and 49.1%, respectively. Total silver was not detected in the associated samples and the results were qualified as UJ due to evidence of potential low bias.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Barium**	**68172**	**137%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Nickel**	**B88784**	**64.9%**	**-----**	**70-130%**	**-----**	**-----**
245.1	Total Mercury	68186	145%	-----	70-130%	-----	-----
8015D	**TPH DRO**	**68185**	**92.4%**	**90.2%**	**31.7-75.4%**	**Acceptable**	**20%**
8270C	**1,4-Dichlorobenzene**	**68202**	**Acceptable**	**Acceptable**	**15-89.8%**	**47.0%**	**39.6%**
8270C	**Phenol**	**68202**	**Acceptable**	**Acceptable**	**17-61.1%**	**52.4%**	**42.5%**
8270C	**Pyrene**	**68202**	**Acceptable**	**Acceptable**	**61-123%**	**28.9%**	**11.8%**

Total barium and TPH DRO were detected in the associated samples and these results were qualified as J+ due to evidence of potential high bias. The non-detections of total barium in the associated sample EB-6-14-22 and TPH DRO in sample PW-4 did not require qualification. Total mercury was not detected in the associated samples in Method 245.1 batch 68186 and the results did not require qualification based on the evidence of potential high bias.

Dissolved nickel was qualified as J- for detections and UJ for non-detections in the associated samples due to potential low bias.

The analytes with LCS/LCSD RPD values that exceeded the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**PW-3**	**24.0%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**PW-3**	**18.0%**	**28.5-64.7%**
8270C	**Nitrobenzene-d_5**	**PW-3**	**29.8%**	**36.9-103%**
8270C	**2-Fluorobiphenyl**	**PW-3**	**30.2%**	**38.1-99.9%**
8015D	**BFB**	**East LDU**	**213%**	**70-130%**
8270C	**2-Fluorophenol**	**East LDU**	**1.79%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**East LDU**	**10.9%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**East LDU**	**10.7%**	**18.6-129%**
8270C	Nitrobenzene-d_5	East LDU	33.5%	36.9-103%
8270C SIM	4-Terphenyl-d_{14}	East LDU	56.9%	72.3-147%
8270C	Phenol-d_5	West LDU	0%	28.5-64.7%
8015D	**BFB**	**DUP-6-9-22**	**230%**	**70-130%**
8270C SIM	4-Terphenyl-d_{14}	DUP-6-9-22	65.7%	72.3-147%

Since Method 8270C and Method 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples West LDU and DUP-6-9-22 and qualification of sample data was not required.

The associated target analytes in the samples with surrogate recoveries that were less than lower laboratory QC limits were not detected, and the results were qualified as UJ due to evidence of potential low bias.

TPH GRO was detected in samples East LDU and DUP-6-9-22 and these results were qualified as J+ due to evidence of potential high bias.

The TPH DRO and TPH MRO results for sample DUP-6-9-22 were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilution of 10 times resulted in a surrogate concentration below routinely calibrated levels and those results were deemed unreliable and possibly inaccurate

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample FB-6-9-22, and one equipment blank sample, EB 6-14-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Chloromethane**	**0.76 µg/L**
Trip Blank	**8260B**	**Methylene Chloride**	**0.52 µg/L**
FB-6-9-22	**8260B**	**Acetone**	**3.5 µg/L**
FB-6-9-22	8260B	Methylene Chloride	0.72 µg/L
FB-6-9-22	**8260B**	**Toluene**	**0.32 µg/L**
EB-6-14-22	8015D	TPH DRO	0.035 mg/L
EB-6-14-22	8260B	Chloromethane	0.67 µg/L
EB-6-14-22	8260B	Methylene Chloride	0.92 µg/L
EB-6-14-22	**200.7**	**Dissolved Zinc**	**0.0058 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of toluene and dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results in batch 68185 were previously qualified due to laboratory blank contamination; therefore, additional qualification based on the equipment blank detection was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-9-22 was collected as a field duplicate of sample East LDU.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

An RPD value could not be calculated for total zinc for the field duplicate pair LDU-East and DUP-6-9-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, total zinc was qualified as J and UJ for the duplicate and parent samples, respectively.

The RPD value for methylene chloride greatly exceeded the data validation limit of 30% at 156.3%. The methylene chloride results were qualified as J for the parent and duplicate samples, LDU-East and DUP-6-9-22, as well as the remaining associated samples based on evidence of extremely poor precision (RPD > 100%).

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: A laboratory duplicate was prepared for the analysis of total cyanide in batch WG1883737 from a sample not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP-6-9-22	Arsenic	ND	0.00081
PW-4	Selenium	ND	0.00070
PW-3	Silver	ND	0.0058
PW-4	Silver	ND	0.0050
PW-3	Vanadium	ND	0.0019
EB-6-14-22	Zinc	ND	0.0058
PW-4	Zinc	ND	0.0096
East LDU	Zinc	ND	0.12
West LDU	Zinc	ND	0.064

FIELD DUPLICATE SUMMARY

Client Sample ID: East LDU Field Duplicate Sample ID: DUP-6-9-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.053 mg/L	0.052 mg/L	1.9%
Barium, Total	E 200.7	0.14 mg/L	0.14 mg/L	0.0%
Beryllium, Dissolved	E 200.7	0.0045 mg/L	0.0044 mg/L	2.2%
Beryllium, Total	E 200.7	0.0045 mg/L	0.0046 mg/L	2.2%
Chromium, Dissolved	E 200.7	2.9 mg/L	2.8 mg/L	3.5%
Chromium, Total	E 200.7	5.3 mg/L	4.7 mg/L	12.0%
Cobalt, Dissolved	E 200.7	0.014 mg/L	0.014 mg/L	0.0%
Cobalt, Total	E 200.7	0.021 mg/L	0.024 mg/L	13.3%
Nickel, Dissolved	E 200.7	3.3 mg/L	3.2 mg/L	3.1%
Nickel, Total	E 200.7	3.3 mg/L	3.4 mg/L	3.0%
Vanadium, Dissolved	E 200.7	0.018 mg/L	0.018 mg/L	0.0% +/-RL
Vanadium, Total	E 200.7	0.12 mg/L	0.13 mg/L	8.0%
Zinc, Dissolved	E 200.7	0.12 mg/L	0.12 mg/L	0.0%
Zinc, Total	**E 200.7**	**ND (0.010 mg/L)**	**0.16 mg/L**	**DL**
Arsenic, Dissolved	E200.8	0.00098 mg/L	0.00081 mg/L	19.0% +/-RL
Arsenic, Total	E200.8	0.0013 mg/L	ND (0.020 mg/L)	DL
Lead, Total	E200.8	0.00048 mg/L	ND (0.010 mg/L)	DL
TPH GRO	SW8015	0.41 mg/L	0.52 mg/L	23.7%
TPH DRO	SW8015	3.6 mg/L	3.5 mg/L	2.8%
TPH ORO	SW8015	0.061 mg/L	ND (0.80 mg/L)	DL
1,2,4-Trimethylbenzene	SW8260B	10 µg/L	9.6 µg/L	4.1%
1,3,5-Trimethylbenzene	SW8260B	8.4 µg/L	8.2 µg/L	2.4%
Benzene	SW8260B	25 µg/L	21 µg/L	17.4%
Chloroform	SW8260B	0.24 µg/L	ND (1.0 µg/L)	DL
Chloromethane	SW8260B	0.94 µg/L	ND (3.0 µg/L)	DL
Ethylbenzene	SW8260B	20 µg/L	19 µg/L	5.1%
Isopropylbenzene	SW8260B	4.3 µg/L	4.2 µg/L	2.4%
Methylene Chloride	**SW8260B**	**27 µg/L**	**220 µg/L**	**156.3%**
MTBE	SW8260B	1.5 µg/L	1.5 µg/L	0.0% +/-RL
n-Butylbenzene	SW8260B	0.87 µg/L	0.81 µg/L	7.1% +/-RL
n-Propylbenzene	SW8260B	4.5 µg/L	4.3 µg/L	4.5%
p-Isopropyltoluene	SW8260B	1.3 µg/L	1.3 µg/L	0.0% +/-RL
sec-Butylbenzene	SW8260B	2.2 µg/L	2.0 µg/L	9.5%
Toluene	SW8260B	1.7 µg/L	1.7 µg/L	0.0% +/-RL
Vinyl Chloride	SW8260B	0.52 µg/L	ND (1.0 µg/L)	DL
Xylenes, Total	SW8260B	14 µg/L	14 µg/L	0.0%
1,4-Dioxane	SW8270C	0.40 µg/L	1.4 µg/L	111.1% +/-RL
1-Methylnaphthalene	SW8270C	0.48 µg/L	0.34 µg/L	34.1% +/-RL

Analyte	Method	Laboratory Result	Duplicate Result	Relative Percent Difference (RPD)
Acenaphthene	SW8270C	0.64 µg/L	0.68 µg/L	6.1%
Anthracene	SW8270C	0.46 µg/L	0.52 µg/L	12.2% +/-RL
Fluoranthene	SW8270C	0.68 µg/L	0.76 µg/L	11.1%
Fluorene	SW8270C	1.2 µg/L	1.3 µg/L	8.0%
Phenanthrene	SW8270C	2.2 µg/L	2.5 µg/L	12.8%
Pyrene	SW8270C	ND (1.0 µg/L)	0.34 µg/L	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

An RPD value could not be calculated for total zinc for the field duplicate pair LDU-East and DUP-6-9-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, total zinc was qualified as J and UJ for the duplicate and parent samples, respectively.

The RPD value for methylene chloride greatly exceeded the data validation limit of 30% at 156.3%. The methylene chloride results were qualified as J for the parent and duplicate samples, LDU-East and DUP-6-9-22, as well as the remaining associated samples based on evidence of extremely poor precision (RPD > 100%).

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
FBD	Field blank detection
EBD	Equipment blank detection
TBD	Trip blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,3,5-Trimethylbenzene	SW8260B	West LDU	2206781-005a	0.18	1.0	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	EB-6-14-22	2206781-001c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	PW-4	2206781-003c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	East LDU	2206781-004c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	West LDU	2206781-005c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	DUP-6-9-22	2206781-007c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	PW-3	2206781-002c	ND	5.0	µg/L	UJ	ERPD-LCS, LR-SUR
1,4-Dioxane	SW8270C	East LDU	2206781-004c	0.40	1.0	µg/L	J	MDLRL
2,4-Dimethylphenol	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	East LDU	2206781-004c	ND	10	µg/L	UJ	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dinitrophenol	SW8270C	PW-3	2206781-002c	ND	20	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	East LDU	2206781-004c	ND	20	µg/L	UJ	LR-SUR
2,4,6-Trichlorophenol	SW8270C	East LDU	2206781-004c	ND	10	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	East LDU	2206781-004c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	East LDU	2206781-004c	ND	10	µg/L	UJ	LR-SUR
Acetone	SW8260B	West LDU	2206781-005a	8.5	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	FB-6-9-22	2206781-006a	3.5	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	East LDU	2206781-004E	0.00098	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-9-22	2206781-007E	0.00081	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	PW-4	2206781-003D	0.0029	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	East LDU	2206781-004D	0.0013	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	West LDU	2206781-005D	0.00097	0.0050	mg/L	J	MDLRL
Barium, Total	E 200.7	PW-3	2206781-002D	0.012	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	PW-4	2206781-003D	0.014	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	East LDU	2206781-004D	0.14	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	West LDU	2206781-005D	0.067	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	DUP-6-9-22	2206781-007D	0.14	0.0030	mg/L	J+	HR-LCS
Benzene	SW8260B	West LDU	2206781-005a	0.43	1.0	µg/L	J	MDLRL
Benzoic Acid	SW8270C	PW-3	2206781-002c	ND	20	µg/L	UJ	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
Chloroform	SW8260B	East LDU	2206781-004a	0.24	1.0	µg/L	J	MDLRL
Chloromethane	SW8260B	Trip Blank	2206781-008a	0.76	3.0	µg/L	J	MDLRL
Chloromethane	SW8260B	EB-6-14-22	2206781-001a	0.67	3.0	µg/L	U	MDLRL, TBD
Chloromethane	SW8260B	East LDU	2206781-004a	0.94	3.0	µg/L	U	MDLRL, TBD
Cobalt, Dissolved	E 200.7	West LDU	2206781-005E	0.0039	0.0060	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Total	E 200.7	PW-3	2206781-002D	0.0036	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	PW-4	2206781-003D	0.0036	0.0060	mg/L	J	MDLRL
Diethylphthalate	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	PW-3	2206781-002c	ND	10	µg/L	UJ	LR-SUR
Di-n-octylphthalate	SW8270C	PW-3	2206781-002c	ND	20	µg/L	UJ	LR-SUR
Lead, Dissolved	E200.8	West LDU	2206781-005E	0.00043	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	PW-3	2206781-002D	0.00021	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	East LDU	2206781-004D	0.00048	0.00250	mg/L	J	MDLRL
Lead, Total	E200.8	West LDU	2206781-005D	0.0017	0.00250	mg/L	J	MDLRL
Methylene Chloride	SW8260B	East LDU	2206781-004a	27	3.0	µg/L	J	ERPD-FD
Methylene Chloride	SW8260B	West LDU	2206781-005a	15	3.0	µg/L	J	ERPD-FD
Methylene Chloride	SW8260B	DUP-6-9-22	2206781-007a	220	30	µg/L	J	ERPD-FD
Methylene Chloride	SW8260B	Trip Blank	2206781-008a	0.52	3.0	µg/L	J	ERPD-FD, MDLRL
Methylene Chloride	SW8260B	EB-6-14-22	2206781-001a	0.92	3.0	µg/L	U	ERPD-FD, MDLRL, TBD
Methylene Chloride	SW8260B	PW-3	2206781-002a	2.1	3.0	µg/L	U	ERPD-FD, MDLRL, TBD
Methylene Chloride	SW8260B	PW-4	2206781-003a	1.6	3.0	µg/L	U	ERPD-FD, MDLRL, TBD
Methylene Chloride	SW8260B	FB-6-9-22	2206781-006a	0.72	3.0	µg/L	U	ERPD-FD, MDLRL, TBD
n-Butylbenzene	SW8260B	East LDU	2206781-004a	0.87	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP-6-9-22	2206781-007a	0.81	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	East LDU	2206781-004E	3.3	0.050	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	West LDU	2206781-005E	0.96	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	DUP-6-9-22	2206781-007E	3.2	0.050	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	EB-6-14-22	2206781-001E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	PW-3	2206781-002E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	PW-4	2206781-003E	ND	0.010	mg/L	UJ	LR-LCS
Phenol	SW8270C	EB-6-14-22	2206781-001c	ND	20	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	PW-4	2206781-003c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	West LDU	2206781-005c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	DUP-6-9-22	2206781-007c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	PW-3	2206781-002c	ND	20	µg/L	UJ	ERPD-LCS, LR-SUR
Phenol	SW8270C	East LDU	2206781-004c	ND	20	µg/L	UJ	ERPD-LCS, LR-SUR
Pyrene	SW8270C	EB-6-14-22	2206781-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	PW-3	2206781-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	PW-4	2206781-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	East LDU	2206781-004c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	West LDU	2206781-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-6-9-22	2206781-007c	0.34	1.0	µg/L	J	ERPD-LCS, MDLRL
Selenium, Dissolved	E200.8	PW-4	2206781-003E	0.0007	0.0010	mg/L	J	MDLRL
Silver, Total	E 200.7	EB-6-14-22	2206781-001D	ND	0.0050	mg/L	UJ	LR-MS
Silver, Total	E 200.7	PW-3	2206781-002D	ND	0.0050	mg/L	UJ	LR-MS
Silver, Total	E 200.7	PW-4	2206781-003D	ND	0.0050	mg/L	UJ	LR-MS
Silver, Total	E 200.7	East LDU	2206781-004D	ND	0.0050	mg/L	UJ	LR-MS
Silver, Total	E 200.7	West LDU	2206781-005D	ND	0.0050	mg/L	UJ	LR-MS
Silver, Total	E 200.7	DUP-6-9-22	2206781-007D	ND	0.0050	mg/L	UJ	LR-MS
Toluene	SW8260B	East LDU	2206781-004a	1.7	1.0	µg/L	JB	FBD
Toluene	SW8260B	DUP-6-9-22	2206781-007a	1.7	1.0	µg/L	JB	FBD
Toluene	SW8260B	FB-6-9-22	2206781-006a	0.32	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	East LDU	2206781-004C	3.6	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	West LDU	2206781-005C	2.3	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	DUP-6-9-22	2206781-007C	3.5	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	EB-6-14-22	2206781-001C	0.035	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	PW-3	2206781-002C	0.036	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH GRO	SW8015	East LDU	2206781-004a	0.41	0.050	mg/L	J+	HR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	DUP-6-9-22	2206781-007a	0.52	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	West LDU	2206781-005a	0.050	0.050	mg/L	J	MDLRL
TPH ORO	SW8015	East LDU	2206781-004C	0.061	0.080	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	PW-3	2206781-002E	0.0019	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	East LDU	2206781-004E	0.018	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-9-22	2206781-007E	0.018	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	West LDU	2206781-005D	0.025	0.050	mg/L	J	MDLRL
Vinyl Chloride	SW8260B	East LDU	2206781-004a	0.52	1.0	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	PW-3	2206781-002E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	PW-4	2206781-003E	0.0096	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-14-22	2206781-001E	0.0058	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-9-22	2206781-007D	0.16	0.010	mg/L	J	ERPD-FD
Zinc, Total	E 200.7	East LDU	2206781-004D	ND	0.010	mg/L	UJ	ERPD-FD

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Aqueous
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/15/2022
Date Validated: 09/22/2022	Sample End Date: 06/15/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206866	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-15-22	2206866-001
OW-1	2206866-002
OW-54	2206866-003
OW-66	2206866-004
OW-55	2206866-005
OW-56	2206866-006
OW-59	2206866-007
DUP-6-15-22	2206866-008
FB-6-15-22	2206866-009
Trip Blank	2206866-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C: Sample OW-59 had poor surrogate recoveries due to the emulsive nature of the sample.

Naphthalene, 1-methylnaphthalene and 2-methylnaphthalene may be reported by either EPA Method 8270 or EPA Method 8270 SIM, depending which method needs the least dilution. In this report naphthalene, 1-methylnaphthalene and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM for samples OW-66 and OW-55.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-66	Total and Dissolved Barium	5
200.7	OW-59	Total Metals	5
200.8	Multiple Samples	Select Total and Dissolved Metals	5
8015D	OW-54	TPH GRO	5
8260B	OW-54	VOCs	5
200.8	OW-59	Total Metals	10
8015D	OW-66, OW-55	TPH DRO and TPH MRO	10
8260B	EB-6-15-22	Methylene Chloride	10
8015D	OW-66, OW-55	TPH GRO	50
8260B	OW-54	MTBE	50
8260B	OW-66, OW-55	Select VOCs	50
8260B	OW-66	Benzene, Toluene	500
8260B	OW-55	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 1.5°C and 5.1°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature below the recommended range at 1.8°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 68185 at a concentration of 0.018 mg/L. The samples EB-6-15-22 and OW-1 TPH DRO results detected below the laboratory reporting limit were qualified with U flags.** Non-detections of this analyte in the associated samples and results greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68172	Not Prepared
200.7	Dissolved Metals	B88897	EB-6-15-22
200.8	Total Metals	68172	DUP-6-15-22
200.8	Dissolved Metals	B88918	Not Prepared
200.8	Dissolved Metals	D88918	Not Prepared
245.1	Total and Dissolved Mercury	68219	Not Prepared
504.1	EDB	68190	Trip Blank
4500CN E	Cyanide	WG1884563	Not Associated, EB-6-15-22
4500CN E	Cyanide	WG1885513	Not Associated
8015D	TPH DRO and MRO	68185	Not Prepared
8015D	TPH GRO	G88994	Not Prepared
8260B	VOCs	R89027	EB-6-15-22
8260B	VOCs	W89041	Not Prepared
8270C and 8270C SIM	SVOCs	68202	Not Prepared
8270C and 8270C SIM	SVOCs	68218	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits, with the following exceptions.

The MSD recovery for total selenium in Method 200.8 batch 68172 was outside the QC limits of 75-125% at 127%. Detections in the associated samples were qualified as J+ due to potential high bias. Non-detections in the associated samples did not require qualification due to this non-conformance.

The MS/MSD RPD value for EDB in Method 504.1 batch 68190 was outside the QC limit of 20% at 22.9%. EDB was not detected in the associated samples. These EDB results were qualified as UJ due to evidence of poor precision.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Barium**	**68172**	**137%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**68185**	**92.4%**	**90.2%**	**31.7-75.4%**	**Acceptable**	**20%**
8270C	**1,4-Dichlorobenzene**	**68202**	**Acceptable**	**Acceptable**	**15-89.8%**	**47.0%**	**39.6%**
8270C	**Phenol**	**68202**	**Acceptable**	**Acceptable**	**17-61.1%**	**52.4%**	**42.5%**
8270C	**Pyrene**	**68202**	**Acceptable**	**Acceptable**	**61-123%**	**28.9%**	**11.8%**
8270C SIM	1-Methylnaphthalene	68218	82.0%	Acceptable	22.2-80.3%	Acceptable	25%
8270C SIM	2-Methylnaphthalene	68218	85.0%	Acceptable	20.6-80.1%	Acceptable	25%
8270C SIM	Fluorene	68218	93.0%	88.0%	33.3-86%	Acceptable	26.4%
8270C SIM	Phenanthrene	68218	94.0%	Acceptable	38.2-93.9%	Acceptable	27.9%
8270C SIM	Anthracene	68218	127%	102%	41.1-95.6%	Acceptable	25.6%
8270C SIM	Fluoranthene	68218	158%	Acceptable	52.9-123%	Acceptable	22.8%
8270C SIM	**Benzo(a)anthracene**	**68218**	**170%**	**Acceptable**	**51-147%**	**33.1%**	**24.1%**
8270C SIM	**Benzo(b)fluoranthene**	**68218**	**Acceptable**	**Acceptable**	**44.4-136%**	**28.6%**	**24.5%**
8270C SIM	**Indeno(1,2,3-cd)pyrene**	**68218**	**Acceptable**	**166%**	**31.4-165%**	**59.4%**	**21.1%**

Analytes with LCS and/or LCSD recoveries greater than the laboratory or data validation QC limits were detected in the associated samples, and the results were qualified as J+ to indicate estimated concentrations that may be biased high. Non-detections of these analytes in the associated samples did not require qualification.

The analytes with LCS/LCSD RPD values that were above the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C SIM	4-Terphenyl-d_{14}	OW-54	70.2%	72.3-147%
8270C	2-Fluorophenol	OW-66	0%	29.4-87.7%
8270C SIM	4-Terphenyl-d_{14}	OW-66	71.3%	72.3-147%
8270C SIM	4-Terphenyl-d_{14}	OW-55	71.4%	72.3-147%
8015D	**BFB**	**OW-56**	**1,240%**	**70-130%**
8270C SIM	4-Terphenyl-d_{14}	OW-56	71.9%	72.3-147%
8015D	**BFB**	**OW-59**	**6,400%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-59**	**27.8%**	**29.4-87.7%**
8270C	**2,4,6-Tribromophenol**	**OW-59**	**12.1%**	**18.6-129%**

Since Method 8270C and Method 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the samples OW-54, OW-66, OW-55, and OW-56, and qualification of sample data was not required.

VALIDATION CRITERIA CHECKLIST

The associated target analytes in sample OW-59 with surrogate recoveries that were less than the lower laboratory QC limits were not detected in sample OW-59, and these results were qualified as UJ due to evidence of potential low bias.

TPH GRO was detected in samples OW-56 and OW-59, and these TPH GRO results were qualified as J+ due to evidence of potential high bias.

The TPH DRO and TPH MRO results for samples OW-66 and OW-55 were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilutions of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample FB-6-15-22, and one equipment blank sample, EB 6-15-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB-6-15-22	**8260B**	**Acetone**	**4.2 µg/L**
EB-6-15-22	8260B	Acetone	3.4 µg/L
EB-6-15-22	8260B	Methylene Chloride	8.5 µg/L
EB-6-15-22	8015	TPH DRO	0.019 mg/L
EB-6-15-22	**200.7**	**Dissolved Zinc**	**0.0054 mg/L**

Detections of acetone and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results in batch 68185 were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-15-22 was collected as a field duplicate of sample OW-01.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 82.4%, which was evidence of poor precision. The dissolved zinc results were qualified as J for samples OW-1 and DUP-6-15-22.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1884563	Not Associated
4500CN E	Cyanide	WG1885513	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-56	Selenium	ND	0.00068
OW-59	Selenium	ND	0.0018
OW-54	Silver	ND	0.0013
OW-55	Silver	ND	0.0018
OW-56	Silver	ND	0.0017
OW-59	Silver	ND	0.0050
OW-59	Vanadium	ND	0.0052
EB-6-15-22	Zinc	ND	0.0054
OW-1	Zinc	ND	0.048
OW-66	Zinc	0.013	0.016
OW-55	Zinc	0.022	0.048
OW-56	Zinc	0.0066	0.011
OW-59	Zinc	ND	0.0062
DUP-6-15-22	Zinc	ND	0.020

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-1 Field Duplicate Sample ID: DUP-6-15-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.037 mg/L	0.037 mg/L	0.0%
Barium, Total	E 200.7	0.044 mg/L	0.045 mg/L	2.2%
Chromium, Total	E 200.7	0.0045 mg/L	0.0044 mg/L	2.2% +/-RL
Vanadium, Dissolved	E 200.7	0.039 mg/L	0.038 mg/L	2.6% +/-RL
Vanadium, Total	E 200.7	0.043 mg/L	0.045 mg/L	4.5% +/-RL
Zinc, Dissolved	**E 200.7**	**0.048 mg/L**	**0.020 mg/L**	**82.4%**
Arsenic, Dissolved	E200.8	0.00070 mg/L	0.00066 mg/L	5.9% +/-RL
Arsenic, Total	E200.8	0.00078 mg/L	0.00074 mg/L	5.3% +/-RL
Lead, Total	E200.8	0.00025 mg/L	0.00024 mg/L	4.1% +/-RL
Selenium, Dissolved	E200.8	0.0021 mg/L	0.0021 mg/L	0.0%
Selenium, Total	E200.8	0.0026 mg/L	0.0023 mg/L	12.2%
TPH DRO	SW8015	0.027 mg/L	ND (0.064 mg/L)	DL
MTBE	SW8260B	1.9 µg/L	2.2 µg/L	14.6%
1,4-Dioxane	SW8270C	0.26 µg/L	0.22 µg/L	16.7% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 82.4%, which was evidence of poor precision. The dissolved zinc results were qualified as J for samples OW-1 and DUP-6-15-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
ERPD-MS	The MS/MSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-MS	The MS and/or MSD percent recovery was greater than the upper acceptable limit indicating possible matrix interference.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	OW-56	2206866-006a	0.35	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-54	2206866-003a	2.4	5.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-56	2206866-006a	0.23	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-59	2206866-007a	0.19	1.0	µg/L	J	MDLRL
1,2-Dibromoethane	E504.1	EB-6-15-22	2206866-001B	ND	0.0093	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-1	2206866-002B	ND	0.0094	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-54	2206866-003B	ND	0.0093	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-66	2206866-004B	ND	0.0094	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-55	2206866-005B	ND	0.0094	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-56	2206866-006B	ND	0.0094	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	OW-59	2206866-007B	ND	0.0094	µg/L	UJ	ERPD-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2-Dibromoethane	E504.1	DUP-6-15-22	2206866-008B	ND	0.0095	µg/L	UJ	ERPD-MS
1,2-Dibromoethane	E504.1	Trip Blank	2206866-010B	ND	0.0093	µg/L	UJ	ERPD-MS
1,4-Dichlorobenzene	SW8270C	EB-6-15-22	2206866-001c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-1	2206866-002c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-54	2206866-003c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-66	2206866-004c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-55	2206866-005c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dichlorobenzene	SW8270C	OW-56	2206866-006c	ND	5.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	OW-1	2206866-002c	0.26	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	DUP-6-15-22	2206866-008c	0.22	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-54	2206866-003c	0.24	0.30	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-59	2206866-007c	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-59	2206866-007c	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-59	2206866-007c	ND	20	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-59	2206866-007c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-59	2206866-007c	ND	10	µg/L	UJ	LR-SUR
Acenaphthene	SW8270C	OW-66	2206866-004C	0.28	0.3	µg/L	J	MDLRL
Acetone	SW8260B	EB-6-15-22	2206866-001a	3.4	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	OW-55	2206866-005a	180	500	µg/L	U	FBD, MDLRL
Acetone	SW8260B	OW-56	2206866-006a	5.3	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	OW-59	2206866-007a	2.9	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	FB-6-15-22	2206866-009a	4.2	10	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-1	2206866-002E	0.00070	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-59	2206866-007E	0.0043	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-6-15-22	2206866-008E	0.00066	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-1	2206866-002D	0.00078	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-56	2206866-006D	0.0042	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Total	E200.8	OW-59	2206866-007D	0.0059	0.010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-15-22	2206866-008D	0.00074	0.0010	mg/L	J	MDLRL
Barium, Total	E 200.7	OW-1	2206866-002D	0.044	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-54	2206866-003D	0.47	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-66	2206866-004D	2.0	0.015	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-55	2206866-005D	0.74	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-56	2206866-006D	0.46	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-59	2206866-007D	0.092	0.015	mg/L	J+	HR-LCS
Barium, Total	E 200.7	DUP-6-15-22	2206866-008D	0.045	0.0030	mg/L	J+	HR-LCS
Benzo(a)anthracene	SW8270C	OW-59	2206866-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	DUP-6-15-22	2206866-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-59	2206866-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	DUP-6-15-22	2206866-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzoic Acid	SW8270C	OW-59	2206866-007c	ND	20	µg/L	UJ	LR-SUR
Chloromethane	SW8260B	OW-56	2206866-006a	0.93	3.0	µg/L	J	MDLRL
Chromium, Total	E 200.7	OW-1	2206866-002D	0.0045	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-54	2206866-003D	0.0059	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-6-15-22	2206866-008D	0.0044	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-66	2206866-004E	0.0033	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-56	2206866-006D	0.0047	0.0060	mg/L	J	MDLRL
Indeno(1,2,3-cd)pyrene	SW8270C	OW-59	2206866-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-6-15-22	2206866-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	OW-66	2206866-004a	17	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-55	2206866-005a	26	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-56	2206866-006a	0.76	1.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-59	2206866-007a	0.38	1.0	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-66	2206866-004E	0.00032	0.00050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Dissolved	E200.8	OW-55	2206866-005E	0.000059	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-56	2206866-006E	0.00025	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-1	2206866-002D	0.00025	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-59	2206866-007D	0.0016	0.0050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-6-15-22	2206866-008D	0.00024	0.00050	mg/L	J	MDLRL
Methylene Chloride	SW8260B	EB-6-15-22	2206866-001a	8.5	30	µg/L	J	MDLRL
Naphthalene	SW8270C	OW-54	2206866-003c	0.20	0.30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-66	2206866-004a	16	150	µg/L	J	MDLRL
Nickel, Total	E 200.7	OW-59	2206866-007D	0.037	0.050	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	OW-55	2206866-005a	50	50	µg/L	J	MDLRL
Phenol	SW8270C	OW-59	2206866-007c	ND	20	µg/L	UJ	LR-SUR
Phenol	SW8270C	OW-66	2206866-004c	32	20	µg/L	J	ERPD-LCS
Phenol	SW8270C	OW-55	2206866-005c	24	20	µg/L	J	ERPD-LCS
Phenol	SW8270C	EB-6-15-22	2206866-001c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-1	2206866-002c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-54	2206866-003c	ND	20	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	OW-56	2206866-006c	ND	20	µg/L	UJ	ERPD-LCS
p-Isopropyltoluene	SW8260B	OW-66	2206866-004a	12	50	µg/L	J	MDLRL
Pyrene	SW8270C	EB-6-15-22	2206866-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-1	2206866-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-54	2206866-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-66	2206866-004C	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-55	2206866-005C	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-56	2206866-006c	ND	1.0	µg/L	UJ	ERPD-LCS
sec-Butylbenzene	SW8260B	OW-56	2206866-006a	0.16	1.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-66	2206866-004E	0.00038	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-56	2206866-006E	0.00068	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Dissolved	E200.8	OW-59	2206866-007E	0.0018	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-1	2206866-002D	0.0026	0.0010	mg/L	J+	HR-MS
Selenium, Total	E200.8	DUP-6-15-22	2206866-008D	0.0023	0.0010	mg/L	J+	HR-MS
Selenium, Total	E200.8	OW-66	2206866-004D	0.0020	0.0050	mg/L	J+	HR-MS, MDLRL
Silver, Dissolved	E 200.7	OW-54	2206866-003E	0.0013	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-55	2206866-005E	0.0018	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-56	2206866-006E	0.0017	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-59	2206866-007E	0.0050	0.0050	mg/L	J	MDLRL
Styrene	SW8260B	OW-55	2206866-005a	9.3	50	µg/L	J	MDLRL
TPH DRO	SW8015	OW-54	2206866-003C	2.2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-66	2206866-004C	5.1	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-55	2206866-005C	3.9	0.64	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-56	2206866-006C	1.1	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-59	2206866-007C	0.58	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	EB-6-15-22	2206866-001C	0.019	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-1	2206866-002C	0.027	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH GRO	SW8015	OW-56	2206866-006a	0.45	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-59	2206866-007a	0.35	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	OW-56	2206866-006C	0.064	0.080	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-1	2206866-002E	0.039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-66	2206866-004E	0.0022	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-55	2206866-005E	0.0032	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-56	2206866-006E	0.0018	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-59	2206866-007E	0.0052	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-15-22	2206866-008E	0.038	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-1	2206866-002D	0.043	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-54	2206866-003D	0.016	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	OW-66	2206866-004D	0.026	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-55	2206866-005D	0.020	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-56	2206866-006D	0.0063	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-6-15-22	2206866-008D	0.045	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-54	2206866-003a	2.2	7.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-54	2206866-003E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-66	2206866-004E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-55	2206866-005E	0.048	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-56	2206866-006E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-1	2206866-002E	0.048	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	DUP-6-15-22	2206866-008E	0.020	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	OW-59	2206866-007E	0.0062	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-15-22	2206866-001E	0.0054	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-56	2206866-006D	0.0066	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q2 GW Sampling	Sample Matrix: Aqueous
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/15/2022
Date Validated: 09/22/2022	Sample End Date: 06/16/2022
Parameters Included: ▪ Volatile Organic Compounds (VOCs) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOCs) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2206938	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace National of Mount Juliet, Tennessee, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-16-22	2206938-001
OW-60	2206938-002
OW-68	2206938-003
OW-67	2206938-004
MKTF-43	2206938-005
MKTF-41	2206938-006
FB-6-16-22	2206938-007
DUP-6-16-22	2206938-008
Trip Blank	2206938-009
MKTF-32	2206938-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Twenty-eight points were rejected. The data completeness measure for this data package is calculated to be 95.56% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C: Analytical Notes Regarding sample MKTF-32. The 8270 LCSD had low recoveries for the phenol spikes. The LCS had acceptable recoveries for all compounds.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated Value. **The target analyte 1,4-dioxane was flagged by the laboratory with the E flag for sample MKTF-32. This result was assigned a J qualifier due to this calibration range non-conformance.**

J – Analyte detected below quantitation limits.

R – RPD value outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	MKTF-32	VOCs	2
200.7	Multiple Samples	Select Total Metals	5
200.8	OW-60, OW-67	Select Dissolved Metals	5
200.8	MKTF-41	Total Arsenic and Selenium	5
200.8	MKTF-43, DUP-6-16-22	Dissolved Antimony	10
200.8	OW-60, OW-67	Total Metals	10
200.8	OW-68	Dissolved Metals	10
8260B	MKTF-32	MTBE	20
200.8	OW-67, MKTF-43, DUP-6-16-22	Select Total and Dissolved Metals	20
200.8	MKTF-43	Dissolved Arsenic and Selenium	50

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 1.0°C and 4.7°C as noted on the CoC and the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature both within and outside the recommended range at 1.0°C and 2.1°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions. **TPH DRO was detected in the laboratory blank for Method 8015D batch 68262 at a concentration of 0.019 mg/L. The sample EB-6-16-22 TPH DRO result detected below the laboratory reporting limit was qualified with a U flag. Results greater than the blank detection and/or the laboratory reporting limit but less than 10 times the blank concentration were qualified with a JB flag.** Detections of this analyte in the associated samples greater than ten times the blank concentration did not require qualification. Pyrene was detected in the laboratory blank for Method 8270C SIM batch 68278 at a concentration of 0.36 µg/L. The non-detection of this analyte in the associated sample MKTF-32 did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68213	Not Prepared
200.7	Total Metals	68301	Not Prepared
200.7	Dissolved Metals	A88936	Not Prepared
200.7	Dissolved Metals	C88897	EB-6-16-22
200.8	Total Metals	68213	Not Prepared
200.8	Total Metals	68301	Not Prepared
200.8	Dissolved Metals	A88981	Not Prepared
200.8	Dissolved Metals	C88918	Not Prepared
245.1	Total and Dissolved Mercury	68220	EB-6-16-22
245.1	Total Mercury	68247	Not Prepared
245.1	Dissolved Mercury	68304	Not Prepared
504.1	EDB	68190	Not Prepared
504.1	EDB	68319	Not Prepared
4500CN E	Cyanide	WG1886384	OW-68, DUP-6-16-22
4500CN E	Cyanide	WG1886402	Not Associated
8015D	TPH DRO and MRO	68262	Not Prepared
8015D	TPH GRO	A89029	MKTF-41
8015D	TPH GRO	G88994	Not Prepared
8260B	VOCs	R89017	Not Prepared
8270C and 8270C SIM	SVOCs	68218	Not Prepared
8270C and 8270C SIM	SVOCs	68278	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**68213**	**53.3%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Zinc**	**68301**	**137%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Cadmium**	**A88936**	**138%**	**-----**	**70-130%**	**-----**	**-----**
504.1	**EDB**	**68319**	**Acceptable**	**Acceptable**	**70-130%**	**21.9%**	**20%**
8270C	**Phenol**	**68278**	**Acceptable**	**Acceptable**	**17-61.1%**	**91.3%**	**42.5%**
8270C SIM	**1-Methylnaphthalene**	**68218**	**82.0%**	**Acceptable**	**22.2-80.3%**	**Acceptable**	**25%**
8270C SIM	**2-Methylnaphthalene**	**68218**	**85.0%**	**Acceptable**	**20.6-80.1%**	**Acceptable**	**25%**
8270C SIM	Fluorene	68218	93.0%	88.0%	33.3-86%	Acceptable	26.4%
8270C SIM	Phenanthrene	68218	94.0%	Acceptable	38.2-93.9%	Acceptable	27.9%
8270C SIM	Anthracene	68218	127%	102%	41.1-95.6%	Acceptable	25.6%
8270C SIM	Fluoranthene	68218	158%	Acceptable	52.9-123%	Acceptable	22.8%
8270C SIM	**Benzo(a)anthracene**	**68218**	**170%**	**Acceptable**	**51-147%**	**33.1%**	**24.1%**
8270C SIM	**Benzo(b)fluoranthene**	**68218**	**Acceptable**	**Acceptable**	**44.4-136%**	**28.6%**	**24.5%**
8270C SIM	**Indeno(1,2,3-cd)pyrene**	**68218**	**Acceptable**	**166%**	**31.4-165%**	**59.4%**	**21.1%**
8270C SIM	**1,4-Dioxane**	**68278**	**53.0%**	**49.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
8270C SIM	Acenaphthene	68278	85.0%	Acceptable	29.8-82.7%	Acceptable	27.8%
8270C SIM	Fluorene	68278	88.0%	Acceptable	33.3-86%	Acceptable	26.4%
8270C SIM	Phenanthrene	68278	96.0%	Acceptable	38.2-93.9%	Acceptable	27.9%
8270 SIM	**Fluoranthene**	**68278**	**Acceptable**	**Acceptable**	**52.9-123%**	**24.6%**	**22.8%**

Total nickel with a MS percent recovery that was less than the lower laboratory QC limit was qualified as J- if detected and UJ if not detected in the associated samples due to evidence of potential low bias.

Analytes with LCS and/or LCSD recoveries greater than the laboratory or data validation QC limits were detected in the associated samples, and the results were qualified as J+ to indicate estimated concentrations that may be biased high. Non-detections of these analytes in the associated samples did not require qualification.

The analytes with LCS/LCSD RPD values that were above the QC limit were not detected in the associated samples. These results were qualified UJ due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	BFB	OW-60	145%	70-130%
8015D	**BFB**	**OW-68**	**3,120%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-68**	**2.09%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**OW-68**	**10.4%**	**28.5-64.7%**
8270C	**2,4,6-Tribromophenol**	**OW-68**	**2.60%**	**18.6-129%**
8015D	**BFB**	**OW-67**	**1,310%**	**70-130%**

VALIDATION CRITERIA CHECKLIST

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	2-Fluorophenol	OW-67	1.47%	29.4-87.7%
8270C	Phenol-d_5	OW-67	9.05%	28.5-64.7%
8270C	2,4,6-Tribromophenol	OW-67	0.0%	18.6-129%
8270C	2-Fluorophenol	MKTF-43	1.31%	29.4-87.7%
8270C	Phenol-d_5	MKTF-43	8.24%	28.5-64.7%
8270C	2,4,6-Tribromophenol	MKTF-43	2.35%	18.6-129%
8270C	2-Fluorophenol	MKTF-41	6.97%	29.4-87.7%
8270C	Phenol-d_5	MKTF-41	15.1%	28.5-64.7%
8270C	2,4,6-Tribromophenol	MKTF-41	11.4%	18.6-129%
8270C	Nitrobenzene-d_5	MKTF-41	32.5%	36.9-103%
8270C	2-Fluorobiphenyl	MKTF-41	31.5%	38.1-99.9%
8270C	2-Fluorophenol	DUP-6-16-22	1.27%	29.4-87.7%
8270C	Phenol-d_5	DUP-6-16-22	7.83%	28.5-64.7%
8270C	2,4,6-Tribromophenol	DUP-6-16-22	2.30%	18.6-129%

Since Method 8270C and Method 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the sample OW-60 Method 8270C analysis and the sample MKTF-41 Method 8270C SIM analysis, and qualification of sample data was not required.

The Method 8270C associated target analytes in samples OW-68, OW-67, MKTF-43, and DUP-6-16-22 with surrogate recoveries that were less than the lower laboratory QC limits, and 2 of 3 surrogate recoveries below 10%, were not detected in samples OW-68, OW-67, MKTF-43, and DUP-6-16-22. These results were qualified with R in the associated samples to indicate rejected (not usable) data based on evidence of extreme low bias (recovery less than 10%).

The Method 8270C associated target analyte in sample MKTF-41 with surrogate recoveries that were less than the lower laboratory QC limits were not detected in sample MKTF-41, and these results were qualified with UJ due to evidence of potential low bias.

TPH GRO was detected in samples OW-68 and OW-67, and these TPH GRO results were qualified as J+ due to evidence of potential high bias. TPH GRO was not detected in sample OW-60, and qualification of data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample FB-6-16-22, and one equipment blank sample, EB 6-16-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	1,2,3-Trichlorobenzene	0.25 µg/L
Trip Blank	8260B	1-Methylnaphthalene	1.0 µg/L
Trip Blank	8260B	2-Methylnaphthalene	1.0 µg/L
Trip Blank	**8260B**	**Acetone**	**2.7 µg/L**
Trip Blank	**8260B**	**Styrene**	**0.14 µg/L**
FB-6-16-22	8260B	Acetone	3.6 µg/L
FB-6-16-22	**8260B**	**Toluene**	**0.24 µg/L**
EB-6-16-22	**200.7**	**Dissolved Zinc**	**0.0058 mg/L**
EB-6-16-22	**200.8**	**Total Lead**	**0.000065 mg/L**
EB-6-16-22	8015D	TPH DRO	0.039 mg/L
EB-6-16-22	8260B	Acetone	3.4 µg/L
EB-6-16-22	8260B	Toluene	0.43 µg/L
EB-6-16-22	**8260B**	**Total Xylenes**	**0.41 µg/L**

Detections of the identified analytes in the associated samples that were less than or equal to the blank results and/or less than or equal to the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc and total xylenes in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples and results greater than 10 times the blank detection did not require qualification.

The analytes 1,2,3-trichlorobenzene, 1-methylnaphthalene, and 2-methylnaphthalene were only reported in the trip blank sample, Trip Blank, or analyzed and reported by Method 8270C SIM. Qualification was not required.

The TPH DRO results in batch 68262 were previously qualified due to laboratory blank contamination; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-6-16-22 was collected as a field duplicate of sample MKTF-43.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1886384	EB-6-16-22

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1886384	OW-67
4500CN E	Cyanide	WG1886402	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for laboratory duplicates prepared from project samples were within laboratory acceptance limits or were not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-68	Cadmium	ND	0.0020 mg/L
MKTF-43	Nickel	ND	0.0064 mg/L
DUP-6-16-22	Nickel	ND	0.0042 mg/L
MKTF-32	Nickel	ND	0.0038 mg/L
OW-60	Silver	ND	0.0029 mg/L
OW-68	Silver	ND	0.011 mg/L
OW-67	Silver	ND	0.020 mg/L
MKTF-43	Silver	ND	0.037 mg/L
DUP-6-16-22	Silver	ND	0.035 mg/L
MKTF-43	Vanadium	ND	0.0067 mg/L
DUP-6-16-22	Vanadium	ND	0.0057 mg/L
EB-6-16-22	Zinc	ND	0.0058 mg/L

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-43 Field Duplicate Sample ID: DUP-6-16-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.040 mg/L	0.040 mg/L	0.0%
Barium, Total	E 200.7	0.077 mg/L	0.071 mg/L	8.1%
Cobalt, Total	E 200.7	0.031 mg/L	0.028 mg/L	10.2% +/-RL
Nickel, Dissolved	E 200.7	0.0064 mg/L	0.0042 mg/L	41.5% +/-RL
Silver, Dissolved	E 200.7	0.037 mg/L	0.035 mg/L	5.6%
Vanadium, Dissolved	E 200.7	0.0067 mg/L	0.0057 mg/L	16.1% +/-RL
Zinc, Dissolved	E 200.7	0.0074 mg/L	0.0055 mg/L	29.5% +/-RL
Zinc, Total	E 200.7	0.021 mg/L	0.022 mg/L	4.7% +/-RL
Arsenic, Total	E200.8	0.0034 mg/L	0.0034 mg/L	0.0% +/-RL
Lead, Total	E200.8	0.0022 mg/L	0.0022 mg/L	0.0% +/-RL
TPH DRO	SW8015	0.15 mg/L	0.15 mg/L	0.0%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ECAL	The result exceeds the calibration range.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
MBD	Method blank detection
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,3-Trichlorobenzene	SW8260B	Trip Blank	2206938-009a	0.25	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-67	2206938-004a	0.14	1.0	µg/L	J	MDLRL
1,2-Dibromoethane	E504.1	MKTF-43	2206938-005B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-41	2206938-006B	ND	0.0095	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	DUP-6-16-22	2206938-008B	ND	0.0092	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	Trip Blank	2206938-009B	ND	0.0095	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-32	2206938-010B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,3,5-Trimethylbenzene	SW8260B	OW-68	2206938-003a	0.27	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	MKTF-41	2206938-006a	0.98	1.0	µg/L	J	MDLRL
1,4-Dichlorobenzene	SW8270C	MKTF-41	2206938-006c	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dioxane	SW8270C	OW-60	2206938-002c	0.24	1.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	MKTF-32	2206938-010c	63	1.0	µg/L	J+	ECAL, HR-LCS
1-Methylnaphthalene	SW8270C	MKTF-41	2206938-006c	0.40	0.30	µg/L	J+	HR-LCS
1-Methylnaphthalene	SW8260B	Trip Blank	2206938-009a	1.0	4.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-68	2206938-003c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-67	2206938-004c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-43	2206938-005c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	DUP-6-16-22	2206938-008c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-68	2206938-003c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-67	2206938-004c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-43	2206938-005c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	DUP-6-16-22	2206938-008c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-68	2206938-003c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-67	2206938-004c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-43	2206938-005c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	DUP-6-16-22	2206938-008c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-41	2206938-006c	ND	20	µg/L	UJ	LR-SUR
2-Methylnaphthalene	SW8270C	MKTF-41	2206938-006c	0.28	0.30	µg/L	J+	HR-LCS, MDLRL
2-Methylnaphthalene	SW8260B	Trip Blank	2206938-009a	1.0	4.0	µg/L	J	MDLRL
2-Methylphenol	SW8270C	OW-68	2206938-003c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-67	2206938-004c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-43	2206938-005c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	DUP-6-16-22	2206938-008c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-68	2206938-003c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-67	2206938-004c	ND	10	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
3,4-Methylphenol	SW8270C	MKTF-43	2206938-005c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	DUP-6-16-22	2206938-008c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
Acetone	SW8260B	Trip Blank	2206938-009a	2.7	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-6-16-22	2206938-001a	3.4	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-68	2206938-003a	9.8	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	MKTF-41	2206938-006a	3.2	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	FB-6-16-22	2206938-007a	3.6	10	µg/L	U	MDLRL, TBD
Arsenic, Dissolved	E200.8	OW-60	2206938-002E	0.0014	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-67	2206938-004E	0.0027	0.020	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-60	2206938-002D	0.0077	0.010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-68	2206938-003D	0.020	0.020	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-67	2206938-004D	0.0063	0.010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-43	2206938-005D	0.0034	0.020	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-41	2206938-006D	0.0025	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-6-16-22	2206938-008D	0.0034	0.020	mg/L	J	MDLRL
Benzene	SW8260B	MKTF-41	2206938-006a	0.28	1.0	µg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	EB-6-16-22	2206938-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-60	2206938-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-68	2206938-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	OW-67	2206938-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	MKTF-43	2206938-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	MKTF-41	2206938-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(a)anthracene	SW8270C	DUP-6-16-22	2206938-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	EB-6-16-22	2206938-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-60	2206938-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	OW-68	2206938-003c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Benzo(b)fluoranthene	SW8270C	OW-67	2206938-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	MKTF-43	2206938-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	MKTF-41	2206938-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzo(b)fluoranthene	SW8270C	DUP-6-16-22	2206938-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Benzoic Acid	SW8270C	OW-68	2206938-003c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-67	2206938-004c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	MKTF-43	2206938-005c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	DUP-6-16-22	2206938-008c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	MKTF-41	2206938-006c	ND	20	µg/L	UJ	LR-SUR
Beryllium, Total	E 200.7	OW-60	2206938-002D	0.0011	0.0020	mg/L	J	MDLRL
Bis(2-ethylhexyl)phthalate	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
Cadmium, Dissolved	E 200.7	OW-68	2206938-003E	0.0020	0.0020	mg/L	J+	HR-LCS, MDLRL
Chromium, Dissolved	E 200.7	OW-60	2206938-002E	0.0054	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-67	2206938-004D	0.014	0.030	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-67	2206938-004D	0.029	0.030	mg/L	J	MDLRL
Cobalt, Total	E 200.7	DUP-6-16-22	2206938-008D	0.028	0.030	mg/L	J	MDLRL
Diethylphthalate	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	MKTF-41	2206938-006c	ND	10	µg/L	UJ	LR-SUR
Di-n-octylphthalate	SW8270C	MKTF-41	2206938-006c	ND	20	µg/L	UJ	LR-SUR
Ethylbenzene	SW8260B	MKTF-41	2206938-006a	0.83	1.0	µg/L	J	MDLRL
Fluoranthene	SW8270C	MKTF-32	2206938-010c	ND	0.30	µg/L	UJ	HR-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	EB-6-16-22	2206938-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-60	2206938-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-68	2206938-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-67	2206938-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-43	2206938-005c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-41	2206938-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-6-16-22	2206938-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	MKTF-41	2206938-006a	0.30	1.0	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-32	2206938-010E	0.000087	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-43	2206938-005D	0.0022	0.010	mg/L	U	EBD, MDLRL
Lead, Total	E200.8	MKTF-41	2206938-006D	0.00011	0.00050	mg/L	U	EBD, MDLRL
Lead, Total	E200.8	DUP-6-16-22	2206938-008D	0.0022	0.010	mg/L	U	EBD, MDLRL
Lead, Total	E200.8	EB-6-16-22	2206938-001D	0.000065	0.00050	mg/L	J	MDLRL
MTBE	SW8260B	OW-60	2206938-002a	0.43	1.0	µg/L	J	MDLRL
MTBE	SW8260B	OW-68	2206938-003a	0.71	1.0	µg/L	J	MDLRL
MTBE	SW8260B	MKTF-41	2206938-006a	0.65	1.0	µg/L	J	MDLRL
Naphthalene	SW8270C	MKTF-41	2206938-006c	0.28	0.30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-68	2206938-003a	0.67	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-41	2206938-006a	0.26	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-60	2206938-002E	0.0037	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-43	2206938-005E	0.0064	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	DUP-6-16-22	2206938-008E	0.0042	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-32	2206938-010E	0.0038	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	OW-60	2206938-002D	0.077	0.010	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-68	2206938-003D	0.18	0.050	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	OW-67	2206938-004D	0.14	0.050	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-6-16-22	2206938-001D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-43	2206938-005D	ND	0.050	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-41	2206938-006D	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	DUP-6-16-22	2206938-008D	ND	0.050	mg/L	UJ	LR-LCS
n-Propylbenzene	SW8260B	MKTF-41	2206938-006a	0.35	1.0	µg/L	J	MDLRL
Phenol	SW8270C	OW-68	2206938-003c	ND	20	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	OW-67	2206938-004c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	MKTF-43	2206938-005c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	DUP-6-16-22	2206938-008c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	MKTF-41	2206938-006c	ND	20	µg/L	UJ	LR-SUR
Phenol	SW8270C	MKTF-32	2206938-010c	ND	20	µg/L	UJ	ERPD-LCS
p-Isopropyltoluene	SW8260B	OW-68	2206938-003a	0.29	1.0	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-41	2206938-006a	0.26	1.0	µg/L	J	MDLRL
Pyridine	SW8270C	MKTF-41	2206938-006c	ND	40	µg/L	UJ	LR-SUR
sec-Butylbenzene	SW8260B	OW-68	2206938-003a	0.65	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-41	2206938-006a	0.18	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-32	2206938-010a	0.44	2.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-68	2206938-003E	0.0075	0.010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-68	2206938-003D	0.016	0.020	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-32	2206938-010D	0.00052	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-60	2206938-002E	0.0029	0.0050	mg/L	J	MDLRL
Styrene	SW8260B	Trip Blank	2206938-009a	0.14	1.0	µg/L	J	MDLRL
Styrene	SW8260B	OW-68	2206938-003a	0.14	1.0	µg/L	U	MDLRL, TBD
Styrene	SW8260B	MKTF-41	2206938-006a	0.21	1.0	µg/L	U	MDLRL, TBD
Toluene	SW8260B	OW-68	2206938-003a	1.0	1.0	µg/L	U	FBD
Toluene	SW8260B	EB-6-16-22	2206938-001a	0.43	1.0	µg/L	U	FBD, MDLRL
Toluene	SW8260B	OW-60	2206938-002a	0.24	1.0	µg/L	U	FBD, MDLRL
Toluene	SW8260B	MKTF-41	2206938-006a	0.21	1.0	µg/L	U	FBD, MDLRL
Toluene	SW8260B	FB-6-16-22	2206938-007a	0.24	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	OW-60	2206938-002C	0.082	0.064	mg/L	JB	MBD
TPH DRO	SW8015	MKTF-43	2206938-005C	0.15	0.064	mg/L	JB	MBD
TPH DRO	SW8015	DUP-6-16-22	2206938-008C	0.15	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-6-16-22	2206938-001C	0.039	0.064	mg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	OW-68	2206938-003a	0.95	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-67	2206938-004a	0.27	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-41	2206938-006a	0.038	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-60	2206938-002E	0.012	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-68	2206938-003E	0.012	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-67	2206938-004E	0.0055	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-43	2206938-005E	0.0067	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-41	2206938-006E	0.027	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-6-16-22	2206938-008E	0.0057	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-32	2206938-010E	0.0049	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-68	2206938-003D	0.024	0.25	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-67	2206938-004D	0.042	0.25	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-41	2206938-006D	0.028	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-32	2206938-010D	0.0085	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-68	2206938-003a	4.1	1.5	µg/L	JB	EBD
Xylenes, Total	SW8260B	EB-6-16-22	2206938-001a	0.41	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-60	2206938-002E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-68	2206938-003E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-67	2206938-004E	0.0072	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-43	2206938-005E	0.0074	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-41	2206938-006E	0.0075	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-16-22	2206938-008E	0.0055	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-32	2206938-010E	0.0087	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-16-22	2206938-001E	0.0058	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-60	2206938-002D	0.12	0.010	mg/L	J+	HR-LCS
Zinc, Total	E 200.7	MKTF-41	2206938-006D	0.016	0.010	mg/L	J+	HR-LCS
Zinc, Total	E 200.7	MKTF-32	2206938-010D	0.011	0.010	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Total	E 200.7	OW-68	2206938-003D	0.039	0.050	mg/L	J+	HR-LCS, MDLRL
Zinc, Total	E 200.7	OW-67	2206938-004D	0.035	0.050	mg/L	J+	HR-LCS, MDLRL
Zinc, Total	E 200.7	MKTF-43	2206938-005D	0.021	0.050	mg/L	J+	HR-LCS, MDLRL
Zinc, Total	E 200.7	DUP-6-16-22	2206938-008D	0.022	0.050	mg/L	J+	HR-LCS, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 06/30/2022
Date Validated: 01/16/2023	Sample End Date: 06/30/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2207002	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-6-30-22	2207002-001
OW-14	2207002-002
OW-30	2207002-003
DUP-6-30-22	2207002-004
FB-6-30-22	2207002-005
Trip Blank	2207002-006

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 270 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? Yes

Comments: The laboratory did not report non-conformances related to the analytical data for this sample set.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

The analyses required for sample Trip Blank were not identified on the CoC for this sample set. The laboratory assigned and completed the appropriate analyses for this sample type. Further validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-14, DUP-6-30-22	Total and Dissolved Barium	5
8260B	OW-30	Select VOCs	5
8015D	OW-14, DUP-6-30-22	TPH GRO	20
8260B	OW-14, DUP-6-30-22	Select VOCs	50
8260B	OW-30	MTBE	50
8260B	OW-14, DUP-6-30-22	Benzene	500

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C at 2.2°C and 2.3°C as noted on the CoC and the Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.4°C as noted on the CoC.

The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

TPH DRO was detected in the laboratory blank for Method 8015D batch 68572 at a concentration of 0.022 mg/L. TPH DRO was detected in the associated sample EB-6-30-22at a concentration less than the laboratory reporting limit and the result was qualified with a U flag. TPH DRO was detected in the associated samples at concentrations above the reporting limit and greater than ten times the blank concentration and the results did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	68545	EB-6-30-22
200.7	Dissolved Metals	B89290	EB-6-30-22
200.8	Total Metals	68545	OW-14
200.8	Dissolved Metals	A89215	Not Prepared
245.1	Total and Dissolved Mercury	68567	Not Prepared
504.1	EDB	68566	Not Prepared
4500CN E	Cyanide	WG1893803	Not Associated

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8015D	TPH DRO and MRO	68572	Not Prepared
8015D	TPH GRO	G89271	Not Prepared
8260B	VOCs	R89347	Not Prepared
8270C SIM	SVOCs	68563	Not Prepared
8270C	SVOCs	68563	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSD prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**68545**	**132%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**68572**	**77.8%**	**Acceptable**	**31.7-75.4%**	**25.5%**	**20%**
8270C	**Pyrene**	**68563**	**60.3%**	**57.4%**	**61-123%**	**Acceptable**	**11.8%**
8270C SIM	**1,4-Dioxane**	**68563**	**51.0%**	**53.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
8270C SIM	**Acenaphthene**	**68563**	**Acceptable**	**83.0%**	**29.8-82.7%**	**Acceptable**	**27.8%**
8270C SIM	**Fluorene**	**68563**	**Acceptable**	**87.0%**	**33.3-86%**	**Acceptable**	**26.4%**
8270C SIM	**Phenanthrene**	**68563**	**Acceptable**	**94.0%**	**38.2-93.9%**	**Acceptable**	**27.9%**

Pyrene was detected in sample EB-6-30-22 and the result was qualified as J- due to evidence of potential low bias. Pyrene was not detected in the remaining associated samples and the results were assigned UJ qualifiers.

Detections of the remaining identified analytes in the associated samples were qualified as J+ due to evidence of potential high bias. Non-detection of these analytes in the associated samples did not require qualification.

TPD DRO was detected in the associated samples and the results were qualified as J due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**EB-6-30-22**	**24.7%**	**29.4-87.7%**
8270C	**Phenol-d_5**	**EB-6-30-22**	**18.1%**	**28.5-64.7%**
8270C	**Nitrobenzene-d_5**	**EB-6-30-22**	**33.1%**	**36.9-103%**
8270C	**2-Fluorobiphenyl**	**EB-6-30-22**	**32.2%**	**38.1-99.9%**
8270C	**4-Terphenyl-d_{14}**	**EB-6-30-22**	**47.0%**	**48-155%**
8270C-SIM	4-Terphenyl-d_{14}	EB-6-30-22	48.8%	72.3-147%
8270C-SIM	4-Terphenyl-d_{14}	OW-30	67.2%	72.3-147%
8270C-SIM	4-Terphenyl-d_{14}	DUP-6-30-22	67.6%	72.3-147%

Since Method 8270C and 8270C-SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C-SIM analyses of samples EB-6-30-22, OW-30, and DUP-6-30-22, and qualification of sample data was not required. **Di-n-butyl phthalate was detected in the Method 8270C analysis of sample EB-6-30-22, and this result was qualified as J- due to evidence of potential low bias. The remaining Method 8270C SVOC analytes were not detected in sample EB-6-30-22, and these results were qualified as UJ due to the evidence of potential low bias.**

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 6-30-22, and one equipment blank sample, EB-6-30-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip, field, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	8260B	Acetone	3.8 µg/L
EB-6-30-22	**200.7**	**Dissolved Zinc**	**0.0067 mg/L**
EB-6-30-22	8015D	TPH DRO	0.047 mg/L
EB-6-30-22	8260B	Toluene	0.20 µg/L
EB-6-30-22	8270C	Di-n-butylphthalate	17 µg/L
EB-6-30-22	8270C	Pyrene	0.34 µg/L

Detections of dissolved zinc in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 68572 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

VALIDATION CRITERIA CHECKLIST

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-6-30-22 was collected as a field duplicate of sample OW-14.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1893803 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-14	Barium	2.3	2.4
OW-30	Nickel	0.088	0.089
OW-14	Zinc	0.0071	0.0084
OW-30	Zinc	0.0097	0.013
DUP-6-30-22	Zinc	0.0090	0.0092

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-14 Field Duplicate Sample ID: DUP-6-30-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	2.4 mg/L	2.4 mg/L	0.0%
Barium, Total	E 200.7	2.3 mg/L	2.5 mg/L	8.3%
Cobalt, Dissolved	E 200.7	0.0077 mg/L	0.0079 mg/L	2.6% +/-RL
Cobalt, Total	E 200.7	0.010 mg/L	0.0095 mg/L	5.1% +/-RL
Nickel, Dissolved	E 200.7	0.097 mg/L	0.10 mg/L	3.0%
Nickel, Total	E 200.7	0.10 mg/L	0.10 mg/L	0.0%
Zinc, Dissolved	E 200.7	0.0084 mg/L	0.0092 mg/L	9.1% +/-RL
Zinc, Total	E 200.7	0.0071 mg/L	0.0090 mg/L	23.6% +/-RL
Arsenic, Dissolved	E200.8	0.0034 mg/L	0.0032 mg/L	6.1%
Arsenic, Total	E200.8	0.0038 mg/L	0.0038 mg/L	0.0%
Lead, Total	E200.8	0.00074 mg/L	0.00051 mg/L	36.8% +/-RL
Cyanide, Total	E335.4	ND (0.00500 mg/L)	0.00873 mg/L	DL
TPH DRO	SW8015	2.5 mg/L	2.1 mg/L	17.4%
TPH GRO	SW8015	61 mg/L	61 mg/L	0.0%
TPH ORO	SW8015	ND (0.080 mg/L)	0.074 mg/L	DL
Benzene	SW8260B	22,000 µg/L	23,000 µg/L	4.4%
Ethylbenzene	SW8260B	930 µg/L	870 µg/L	6.7%
Isopropylbenzene	SW8260B	19 µg/L	18 µg/L	5.4% +/-RL
MTBE	SW8260B	610 µg/L	600 µg/L	1.7%
n-Propylbenzene	SW8260B	50 µg/L	47 µg/L	6.2% +/-RL
1,4-Dioxane	SW8270C	ND (1.0 µg/L)	1.3 µg/L	DL
1-Methylnaphthalene	SW8270C	17 µg/L	16 µg/L	6.1%
Acenaphthene	SW8270C	0.48 µg/L	0.46 µg/L	4.3% +/-RL
Fluorene	SW8270C	0.68 µg/L	0.62 µg/L	9.2%
Naphthalene	SW8270C	15 µg/L	14 µg/L	6.9%
Phenanthrene	SW8270C	0.36 µg/L	0.30 µg/L	18.2% +/-RL
Phenol	SW8270C	38 µg/L	34 µg/L	11.1% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
EBD	Equipment blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dichlorobenzene	SW8270C	EB-6-30-22	2207002-001C	ND	5.0	µg/L	UJ	LR-SUR
1,4-Dioxane	SW8270C	DUP-6-30-22	2207002-004c	1.3	1.0	µg/L	J+	HR-LCS
1,4-Dioxane	SW8270C	OW-30	2207002-003c	0.50	1.0	µg/L	J+	HR-LCS, MDLRL
2,4,6-Trichlorophenol	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	EB-6-30-22	2207002-001C	ND	20	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
Acenaphthene	SW8270C	OW-14	2207002-002c	0.48	0.30	µg/L	J+	HR-LCS
Acenaphthene	SW8270C	DUP-6-30-22	2207002-004c	0.46	0.30	µg/L	J+	HR-LCS
Acetone	SW8260B	Trip Blank	2207002-006a	3.8	10	µg/L	J	MDLRL
Anthracene	SW8270C	OW-30	2207002-003c	0.20	0.30	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-30	2207002-003E	0.00079	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-30	2207002-003D	0.00092	0.0010	mg/L	J	MDLRL
Benzoic Acid	SW8270C	EB-6-30-22	2207002-001C	ND	20	µg/L	UJ	LR-SUR
Bis(2-ethylhexyl)phthalate	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Dissolved	E 200.7	OW-30	2207002-003E	0.0037	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-30	2207002-003D	0.0043	0.0060	mg/L	J	MDLRL
Diethylphthalate	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
Dimethylphthalate	SW8270C	EB-6-30-22	2207002-001C	ND	10	µg/L	UJ	LR-SUR
Di-n-butylphthalate	SW8270C	EB-6-30-22	2207002-001C	17	10	µg/L	J-	LR-SUR
Di-n-octylphthalate	SW8270C	EB-6-30-22	2207002-001C	ND	20	µg/L	UJ	LR-SUR
Fluorene	SW8270C	OW-14	2207002-002c	0.68	0.30	µg/L	J+	HR-LCS
Fluorene	SW8270C	DUP-6-30-22	2207002-004c	0.62	0.30	µg/L	J+	HR-LCS
Isopropylbenzene	SW8260B	OW-14	2207002-002a	19	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	DUP-6-30-22	2207002-004a	18	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-30	2207002-003E	0.00035	0.00050	mg/L	J	MDLRL
Nickel, Total	E 200.7	OW-14	2207002-002D	0.10	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-30	2207002-003D	0.088	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	DUP-6-30-22	2207002-004D	0.10	0.010	mg/L	J+	HR-LCS
n-Propylbenzene	SW8260B	DUP-6-30-22	2207002-004a	47	50	µg/L	J	MDLRL
Phenanthrene	SW8270C	OW-14	2207002-002c	0.36	0.30	µg/L	J+	HR-LCS
Phenanthrene	SW8270C	DUP-6-30-22	2207002-004c	0.30	0.30	µg/L	J+	HR-LCS
Phenol	SW8270C	EB-6-30-22	2207002-001C	ND	20	µg/L	UJ	LR-SUR
Pyrene	SW8270C	OW-14	2207002-002c	ND	1.0	µg/L	UJ	LR-LCS
Pyrene	SW8270C	OW-30	2207002-003c	ND	1.0	µg/L	UJ	LR-LCS
Pyrene	SW8270C	DUP-6-30-22	2207002-004c	ND	1.0	µg/L	UJ	LR-LCS
Pyrene	SW8270C	EB-6-30-22	2207002-001c	0.34	1.0	µg/L	J-	LR-LCS, MDLRL
Pyridine	SW8270C	EB-6-30-22	2207002-001C	ND	40	µg/L	UJ	LR-SUR
Toluene	SW8260B	EB-6-30-22	2207002-001a	0.20	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	OW-14	2207002-002C	2.5	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-30	2207002-003C	2.6	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	DUP-6-30-22	2207002-004C	2.1	0.064	mg/L	J+	ERPD-LCS, HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	EB-6-30-22	2207002-001C	0.047	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH ORO	SW8015	OW-30	2207002-003C	0.056	0.080	mg/L	U	MBD, MDLRL
TPH ORO	SW8015	DUP-6-30-22	2207002-004C	0.074	0.080	mg/L	U	MBD, MDLRL
Zinc, Dissolved	E 200.7	OW-30	2207002-003E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-14	2207002-002E	0.0084	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-6-30-22	2207002-004E	0.0092	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-6-30-22	2207002-001E	0.0067	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-14	2207002-002D	0.0071	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-30	2207002-003D	0.0097	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	DUP-6-30-22	2207002-004D	0.0090	0.010	mg/L	J	MDLRL

Appendix D-3. 3rd Quarter Data Validation Reports

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/20/2022
Date Validated: 01/24/2023	Sample End Date: 09/20/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Per- and Polyfluorinated Alkyl Substances (PFAS) by Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS) and Isotope Dilution (ID)	
Laboratory Project ID: 2209A41	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee, and Vista Analytical Laboratory of El Dorado Hills, California, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-20-22	2209A41-001
EB-09-20-22	2209A41-002
OW-63	2209A41-003
OW-58A	2209A41-004
OW-58	2209A41-005
OW-64	2209A41-006
STP-1-NW	2209A41-007
OW-60	2209A41-008
OW-68	2209A41-009
OW-67	2209A41-010
FB 9-20-22	2209A41-011
DUP 9-20-22	2209A41-012
Trip Blank	2209A41-013

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ⊗ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Data review and evaluation was performed following criteria set forth in Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFASs) Analyzed Using EPA Method 537, document number EPA 910-R-18-001, November 2018.
- Data were reviewed and evaluated according to criteria set forth in the Department of Defense (DoD) / Department of Energy (DOE) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3, 2019.

Tier II Data Validation Report Summary

- Data were reviewed and evaluated according to criteria set forth in Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15, United States Department of Defense, Environmental Data Quality Workgroup, May 2020.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 810 data points. The data completeness calculation does not include any submitted blank sample results. Fourteen data points were rejected. The data completeness measure for this data package is calculated to be 98.27% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for sample OW-58, OW-58A, OW-63, Dup 9-20-22.

Method 8015D DRO: The LCS/LCSD had slightly elevated recoveries.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

E – Estimated value. **TPH DRO and TPH MRO results were flagged by the laboratory with the E flag in the submitted samples. These results were assigned J qualifiers if detected, and non-detections were assigned UJ due to this lab identified non-conformance.**

J – Analyte detected below quantitation limits.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The trip blank sample was received but was not included on the CoC. The laboratory logged in the sample and performed the appropriate volatile analysis. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8015D	OW-58	TPH DRO and MRO	2
200.7	Multiple Samples	Total and Dissolved Barium	5
200.8	OW-67, OW-68	Select Total and Dissolved Metals	5
245.1	OW-67	Total Mercury	5
8015D	OW-58A	TPH DRO and MRO	5
8015D	DUP 9-20-22	TPH DRO and MRO	10
8015D	OW-58A	TPH GRO	20
8260B	OW-58A	Select VOC	20
8015D	OW-63, OW-58, DUP 9-20-22	TPH GRO	50
8260B	OW-63, OW-58, DUP 9-20-22	Select VOC	50
8260B	OW-58A	Benzene, Toluene	200
8260B	OW-58, DUP 9-20-22	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C between 3.1°C and 5.4°C as noted on the Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.0°C as noted on the CoC. Samples transferred to Vista Analytical Laboratory were received in good condition with the cooler temperature outside the recommended range at 1.4°C as noted on the CoC and the Sample Login Checklist. The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	No
Comments: The samples were extracted/digested and analyzed within method-specific holding times. PFAS Method: **Samples EB-09-20-22 and OW-63 were extracted for PFAs outside the defined holding time of 14 days by approximately 21 days. Detected results for samples EB-09-20-22 and OW-63 by Method PFAS were assigned J qualifiers based on the holding time exceedances. Non-detect results were assigned UJ qualifiers based on the holding time exceedances.**	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of nanograms per liter (ng/L), micrograms per liter (µg/L), and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
8015D	**TPH DRO**	**70323**	**0.021 mg/L**
8015D	TPH DRO	70376	0.025 mg/L

The detection of TPH DRO in the associated sample EB-09-20-22 that was less than the applicable reporting limit was assigned a U qualifier. TPH DRO results in samples OW-60 and STP-1-NW that were greater than the blank detection and/or the laboratory reporting limit but less than 10 times the blank concentration were qualified with JB flags. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70359	Not Prepared
200.7	Dissolved Silver	A91423	DUP 9-20-22
200.7	Dissolved Silver	A91594	EB-09-20-22
200.7	Dissolved Metals	B91392	Not Prepared
200.8	Total Metals	70359	Not Prepared
200.8	Dissolved Metals	B91237	EB-09-20-22
245.1	Total and Dissolved Mercury	70390	OW-67
504.1	EDB	70321	DUP 9-20-22
PFAS Method	PFAs	B22J201	Not Prepared
4500CN E	Cyanide	WG1930995	Not Associated, EB-09-20-22
8015D	TPH DRO and MRO	70323	Not Prepared
8015D	TPH DRO and MRO	70376	Not Prepared
8015D	TPH GRO	A91300	Not Prepared
8015D	TPH GRO	R91291	OW-63
8260B	VOCs	R91223	Not Prepared
8270C SIM	SVOCs	70340	Not Prepared
8270C	SVOCs	70340	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

The LCS and LCSD recoveries for TPH DRO in Method 8015D batch 70376 were outside the acceptance limits of 31.7-75.4% at 77.7% and 76.9%, respectively, indicating a potential high bias. Associated samples with detections for TPH DRO or TPH MRO were qualified with J+ flags due to potential high bias. Associated samples with non-detections for TPH DRO or TPH MRO did not require qualification.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270 SIM	**Nitrobenzene-d_5**	**EB-09-20-22**	**23.3%**	**31.6-100%**
8270 SIM	**2-Fluorobiphenyl**	**EB-09-20-22**	**25.5%**	**26.7-90.1%**
8270 SIM	**4-Terphenyl-d_{14}**	**EB-09-20-22**	**31.9%**	**72.3-147%**
8015D	**BFB**	**OW-58A**	**171%**	**70-130%**
8015D	**BFB**	**OW-64**	**278%**	**70-130%**
8015D	BFB	OW-60	189%	70-130%
8015D	**BFB**	**OW-68**	**3,180%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-68**	**2.59%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-68**	**10.2%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**OW-68**	**2.97%**	**15-108%**
8015D	**BFB**	**OW-67**	**1,060%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-67**	**0.299%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-67**	**0.653%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**OW-67**	**0.0%**	**15-108%**

TPH GRO was detected in the Method 8015D analysis of samples OW-58A, OW-64, OW-68, and OW-67, and these results were qualified as J+ to indicate a potential high bias. TPH GRO was not detected in sample OW-60, and qualification of data was not required.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of samples OW-63, OW-58A, OW-58, OW-64, STP-1-NW, OW-60, OW-68, OW-67, and DUP 9-20-22, and for the Method 8270C analysis of samples EB-09-20-22 and OW-58A, and qualification of sample data was not required.

The analyte pyrene was detected in the sample EB-09-20-22 Method 8270C SIM analysis, and this result was qualified as J- due to evidence of potential low bias. The remaining associated analytes in the sample EB-09-20-22 Method 8270C SIM analysis were not detected, and these results were qualified as UJ.

The analytes in the acid fraction of samples OW-68 and OW-67 were not detected. Since at least 2 of 3 surrogates were recovered below 10%, these results were qualified as R to indicate rejected (not usable) data based on evidence of extreme low bias.

VALIDATION CRITERIA CHECKLIST

The TPH DRO and TPH MRO results for sample DUP 9-20-22 were not qualified based on the surrogate non-conformance in the Method 8015D analysis since the applied dilution of 10 times resulted in a surrogate concentration below routinely calibrated levels, and that result was deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-20-22, and one equipment blank sample, EB-09-20-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**6.8 µg/L**
FB 9-20-22	8260B	Acetone	11 µg/L
EB-09-20-22	**200.7**	**Dissolved Chromium**	**0.0023 mg/L**
EB-09-20-22	**200.7**	**Dissolved Vanadium**	**0.0022 mg/L**
EB-09-20-22	**200.7**	**Dissolved Zinc**	**0.0066 mg/L**
EB-09-20-22	8015D	TPH DRO	0.027 mg/L
EB-09-20-22	8260B	Acetone	7.0 µg/L
EB-09-20-22	8270C	Di-n-butylphthalate	12 µg/L
EB-09-20-22	**8270C SIM**	**Pyrene**	**0.34 µg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of acetone and dissolved zinc in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batches 70323 and 70376 were previously qualified due to laboratory blank detections; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP 9-20-22 was collected as a field duplicate of sample OW-58A.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD values for multiple analytes exceeded the data validation limit of 30%. The results for these analytes in samples OW-58A and DUP 9-20-22 were assigned J qualifiers due to evidence of poor precision.

The RPD value for TPH DRO greatly exceeded the data validation limit of 30% at 113.7%. The reported results for TPH DRO were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for TPH DRO in the associated samples due to evidence of extremely poor precision (RPD > 100%).

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1930995 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-58	Mercury	ND	0.00016
OW-64	Mercury	0.00016	0.00017
OW-68	Mercury	0.00025	0.00027
OW-64	Arsenic	0.0024	0.0026
EB-09-20-22	Chromium	ND	0.0023
OW-58	Nickel	0.037	0.038
OW-58	Selenium	ND	0.00044
STP-1-NW	Selenium	0.0050	0.0059
OW-63	Silver	ND	0.0015
OW-58	Silver	ND	0.0013
STP-1-NW	Silver	ND	0.0020
OW-60	Silver	ND	0.0021
OW-68	Silver	0.0059	0.0087
OW-67	Silver	0.015	0.020

VALIDATION CRITERIA CHECKLIST

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP 9-20-22	Silver	ND	0.0016
EB-09-20-22	Vanadium	ND	0.0022
OW-63	Vanadium	ND	0.0045
OW-58	Vanadium	0.0045	0.0050
OW-64	Vanadium	0.0068	0.0074
STP-1-NW	Vanadium	0.0033	0.0039
EB-09-20-22	Zinc	ND	0.0066
OW-63	Zinc	ND	0.012
OW-58	Zinc	ND	0.0059
OW-64	Zinc	ND	0.038
OW-68	Zinc	0.013	0.036
OW-67	Zinc	0.011	0.035

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-58A Field Duplicate Sample ID: DUP 9-20-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.92 mg/L	0.90 mg/L	2.2%
Barium, Total	E 200.7	1.1 mg/L	1.1 mg/L	0.0%
Chromium, Total	E 200.7	0.0045 mg/L	0.0037 mg/L	19.5% +/-RL
Cobalt, Total	E 200.7	ND (0.0060 mg/L)	0.0086 mg/L	DL
Nickel, Dissolved	E 200.7	0.038 mg/L	0.035 mg/L	8.2%
Nickel, Total	E 200.7	0.037 mg/L	0.037 mg/L	0.0%
Silver, Dissolved	E 200.7	ND (0.0050 mg/L)	0.0016 mg/L	DL
Vanadium, Dissolved	E 200.7	0.0059 mg/L	0.0045 mg/L	26.9% +/-RL
Vanadium, Total	E 200.7	0.016 mg/L	0.020 mg/L	22.2% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	0.0099 mg/L	10.5% +/-RL
Zinc, Total	E 200.7	0.014 mg/L	0.013 mg/L	7.4% +/-RL
Arsenic, Dissolved	E200.8	0.0036 mg/L	0.0037 mg/L	2.7%
Arsenic, Total	E200.8	0.0047 mg/L	0.0050 mg/L	6.2%
Lead, Dissolved	E200.8	0.0012 mg/L	0.0011 mg/L	8.7%
Lead, Total	E200.8	0.012 mg/L	0.0089 mg/L	29.7%
Selenium, Dissolved	E200.8	0.00042 mg/L	ND (0.0010 mg/L)	DL
Selenium, Total	E200.8	0.00081 mg/L	0.00070 mg/L	14.6% +/-RL
TPH DRO	**SW8015**	**16 mg/L**	**4.4 mg/L**	**113.7%**
TPH GRO	SW8015	58 mg/L	46 mg/L	23.1%
1,2,4-Trimethylbenzene	**SW8260B**	**780 µg/L**	**520 µg/L**	**40.0%**
1,3,5-Trimethylbenzene	**SW8260B**	**210 µg/L**	**140 µg/L**	**40.0%**
Benzene	SW8260B	8900 µg/L	8700 µg/L	2.3%
Ethylbenzene	SW8260B	1000 µg/L	840 µg/L	17.4%
Isopropylbenzene	SW8260B	71 µg/L	58 µg/L	20.2%
MTBE	SW8260B	2200 µg/L	2200 µg/L	0.0%
n-Butylbenzene	SW8260B	19 µg/L	19 µg/L	0.0% +/-RL
n-Propylbenzene	SW8260B	130 µg/L	110 µg/L	16.7%
p-Isopropyltoluene	SW8260B	13 µg/L	12 µg/L	8.0% +/-RL
sec-Butylbenzene	SW8260B	16 µg/L	14 µg/L	13.3% +/-RL
Toluene	**SW8260B**	**6,300 µg/L**	**4,600 µg/L**	**31.2%**
Xylenes, Total	**SW8260B**	**4,300 µg/L**	**3,100 µg/L**	**32.4%**
1-Methylnaphthalene	SW8270C	76 µg/L	64 µg/L	17.1%
2,4-Dimethylphenol	SW8270C	6.5 µg/L	7.7 µg/L	16.9% +/-RL
2-Methylnaphthalene	SW8270C	87 µg/L	71 µg/L	20.3%
2-Methylphenol	SW8270C	11 µg/L	8.5 µg/L	25.6% +/-RL

Analyte	Method	Laboratory Result	Duplicate Result	Relative Percent Difference (RPD)
3,4-Methylphenol	SW8270C	5.4 µg/L	ND (10 µg/L)	DL
Acenaphthene	SW8270C	2.6 µg/L	2.3 µg/L	12.2%
Anthracene	**SW8270C**	**0.66 µg/L**	**0.48 µg/L**	**31.6%**
Benzo(a)anthracene	SW8270C	0.20 µg/L	ND (0.30 µg/L)	DL
Fluoranthene	SW8270C	0.50 µg/L	0.34 µg/L	38.1% +/-RL
Fluorene	SW8270C	4.7 µg/L	3.9 µg/L	18.6%
Naphthalene	SW8270C	160 µg/L	130 µg/L	20.7%
Phenanthrene	SW8270C	5.8 µg/L	4.5 µg/L	25.2%
Phenol	SW8270C	22 µg/L	ND (20 µg/L)	DL
Pyrene	SW8270C	0.58 µg/L	0.38 µg/L	41.7% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD values for multiple analytes exceeded the data validation limit of 30%, which was evidence of poor precision. These analyte results were qualified as J for samples OW-58A and DUP 9-20-22.

The RPD value for TPH DRO greatly exceeded the data validation limit of 30% at 113.7%. The reported results for TPH DRO were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for TPH DRO in the associated samples due to evidence of extremely poor precision (RPD > 100%).

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
EBL	Flagged as estimated by the laboratory.
ERPD-FD	High field duplicate RPD.
HT-EX	Sample was extracted outside of the method holding time.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	OW-58A	2209A41-004a	780	20	µg/L	J	ERPD-FD
1,2,4-Trimethylbenzene	SW8260B	DUP 9-20-22	2209A41-012a	520	50	µg/L	J	ERPD-FD
1,2,4-Trimethylbenzene	SW8260B	OW-58	2209A41-005a	8.6	50	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	OW-58A	2209A41-004a	210	20	µg/L	J	ERPD-FD
1,3,5-Trimethylbenzene	SW8260B	DUP 9-20-22	2209A41-012a	140	50	µg/L	J	ERPD-FD
1,4-Dioxane	SW8270C	EB-09-20-22	2209a41-001c	ND	1.0	µg/L	UJ	LR-SUR
1,4-Dioxane	SW8270C	OW-60	2209a41-008c	0.26	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-68	2209A41-009C	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-67	2209A41-010C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-68	2209A41-009C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-67	2209A41-010C	ND	10	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dimethylphenol	SW8270C	OW-58A	2209A41-004C	6.5	10	µg/L	J	MDLRL
2,4-Dimethylphenol	SW8270C	DUP 9-20-22	2209A41-012C	7.7	10	µg/L	J	MDLRL
2,4-Dinitrophenol	SW8270C	OW-68	2209A41-009C	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-67	2209A41-010C	ND	20	µg/L	R	LR-SUR
2-Methylnaphthalene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-68	2209A41-009C	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-67	2209A41-010C	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	DUP 9-20-22	2209A41-012C	8.5	10	µg/L	J	MDLRL
3,4-Methylphenol	SW8270C	OW-68	2209A41-009C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-67	2209A41-010C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-58A	2209A41-004C	5.4	10	µg/L	J	MDLRL
Acenaphthene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Acenaphthene	SW8270C	OW-64	2209a41-006c	0.16	0.30	µg/L	J	MDLRL
Acetone	SW8260B	FB 9-20-22	2209A41-011a	11	10	µg/L	JB	TBD
Acetone	SW8260B	Trip Blank	2209A41-013a	6.8	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-09-20-22	2209A41-001a	7.0	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-64	2209A41-006a	9.0	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	STP-1-NW	2209A41-007a	7.1	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-60	2209A41-008a	5.0	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	OW-68	2209A41-009a	7.2	10	µg/L	U	MDLRL, TBD
Anthracene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Anthracene	SW8270C	OW-58A	2209a41-004c	0.66	0.30	µg/L	J	ERPD-FD
Anthracene	SW8270C	DUP 9-20-22	2209a41-012c	0.48	0.30	µg/L	J	ERPD-FD
Anthracene	SW8270C	OW-64	2209a41-006c	0.24	0.30	µg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Benzo(a)anthracene	SW8270C	OW-58A	2209a41-004c	0.2	0.30	µg/L	J	MDLRL
Benzo(b)fluoranthene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Benzoic Acid	SW8270C	OW-68	2209A41-009C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-67	2209A41-010C	ND	20	µg/L	R	LR-SUR
Beryllium, Total	E 200.7	OW-60	2209A41-008D	0.0012	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	OW-68	2209A41-009D	0.0011	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	OW-67	2209A41-010D	0.0014	0.0020	mg/L	J	MDLRL
Chromium, Dissolved	E 200.7	OW-60	2209A41-008E	0.0046	0.0060	mg/L	U	EBD, MDLRL
Chromium, Dissolved	E 200.7	EB-09-20-22	2209A41-001E	0.0023	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-58A	2209A41-004D	0.0045	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP 9-20-22	2209A41-012D	0.0037	0.0060	mg/L	J	MDLRL
Chrysene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Fluoranthene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Fluoranthene	SW8270C	OW-58	2209a41-005c	0.2	0.30	µg/L	J	MDLRL
Fluorene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Fluorene	SW8270C	OW-68	2209a41-009c	0.18	0.30	µg/L	J	MDLRL
Indeno(1,2,3-cd)pyrene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
Isopropylbenzene	SW8260B	OW-58	2209A41-005a	28	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-64	2209A41-006E	0.000065	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-63	2209A41-003D	0.000087	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-58	2209A41-005D	0.00020	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-64	2209A41-006D	0.00039	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-58	2209A41-005E	0.00016	0.00020	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-64	2209A41-006E	0.00017	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-64	2209A41-006D	0.00016	0.00020	mg/L	J	MDLRL
MTBE	SW8260B	OW-68	2209A41-009a	0.60	1.0	µg/L	J	MDLRL
Naphthalene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30	µg/L	UJ	LR-SUR
n-Butylbenzene	SW8260B	OW-58A	2209A41-004a	19	60	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-58	2209A41-005a	14	150	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
n-Butylbenzene	SW8260B	OW-68	2209A41-009a	0.66	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP 9-20-22	2209A41-012a	19	150	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-60	2209A41-008E	0.0038	0.01	mg/L	J	MDLRL
Phenanthrene	SW8270C	EB-09-20-22	2209a41-001c	ND	0.30.	µg/L	UJ	LR-SUR
Phenol	SW8270C	OW-68	2209A41-009C	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	OW-67	2209A41-010C	ND	20	µg/L	R	LR-SUR
p-Isopropyltoluene	SW8260B	OW-58A	2209A41-004a	13	20	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	OW-68	2209A41-009a	0.24	10	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	DUP 9-20-22	2209A41-012a	12	50	µg/L	J	MDLRL
Pyrene	SW8270C	EB-09-20-22	2209a41-001c	0.34	1.0	µg/L	J-	LR-SUR, MDLRL
Pyrene	SW8270C	OW-58A	2209a41-004c	0.58	1.0	µg/L	U	EBD, MDLRL
Pyrene	SW8270C	OW-64	2209a41-006c	0.36	1.0	µg/L	U	EBD, MDLRL
Pyrene	SW8270C	DUP 9-20-22	2209a41-012c	0.38	1.0	µg/L	U	EBD, MDLRL
sec-Butylbenzene	SW8260B	OW-58A	2209A41-004a	16	20	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-68	2209A41-009a	0.60	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	DUP 9-20-22	2209A41-012a	14	50	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-58A	2209A41-004E	0.00042	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-58	2209A41-005E	0.00044	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-67	2209A41-010E	0.00095	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-58A	2209A41-004D	0.00081	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP 9-20-22	2209A41-012D	0.0007	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-63	2209A41-003E	0.0015	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-58	2209A41-005E	0.0013	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	STP-1-NW	2209A41-007E	0.0020	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-60	2209A41-008E	0.0021	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP 9-20-22	2209A41-012E	0.0016	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	OW-58A	2209A41-004a	6300	200	µg/L	J	ERPD-FD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Toluene	SW8260B	DUP 9-20-22	2209A41-012a	4600	50	µg/L	J	ERPD-FD
Toluene	SW8260B	OW-63	2209A41-003a	43	50	µg/L	J	MDLRL
Toluene	SW8260B	OW-58	2209A41-005a	42	50	µg/L	J	MDLRL
Toluene	SW8260B	OW-64	2209A41-006a	0.71	1.0	µg/L	J	MDLRL
Toluene	SW8260B	OW-68	2209A41-009a	0.80	1.0	µg/L	J	MDLRL
TPH DRO	SW8015	OW-63	2209A41-003C	2.8	0.064	mg/L	J	EBL, ERPD-FD
TPH DRO	SW8015	OW-58A	2209A41-004C	16	0.32	mg/L	J	EBL, ERPD-FD
TPH DRO	SW8015	OW-58	2209A41-005C	7.3	0.13	mg/L	J	EBL, ERPD-FD
TPH DRO	SW8015	OW-64	2209A41-006C	0.57	0.064	mg/L	J	EBL, ERPD-FD
TPH DRO	SW8015	OW-68	2209A41-009C	1.5	0.064	mg/L	J+	EBL, ERPD-FD, HR-LCS
TPH DRO	SW8015	OW-67	2209A41-010C	0.73	0.064	mg/L	J+	EBL, ERPD-FD, HR-LCS
TPH DRO	SW8015	DUP 9-20-22	2209A41-012C	4.4	0.64	mg/L	J+	EBL, ERPD-FD, HR-LCS
TPH DRO	SW8015	STP-1-NW	2209A41-007C	0.16	0.064	mg/L	JB	EBL, ERPD-FD, MBD
TPH DRO	SW8015	OW-60	2209A41-008C	0.097	0.064	mg/L	JB	EBL, ERPD-FD, MBD
TPH DRO	SW8015	EB-09-20-22	2209A41-001C	0.027	0.064	mg/L	U	EBL, ERPD-FD, MBD, MDLRL
TPH GRO	SW8015	OW-58A	2209a41-004a	58	1.0	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-64	2209a41-006a	0.52	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-68	2209a41-009a	0.84	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-67	2209a41-010a	0.12	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	EB-09-20-22	2209A41-001C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	OW-63	2209A41-003C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	OW-58A	2209A41-004C	ND	0.40	mg/L	UJ	EBL
TPH ORO	SW8015	OW-58	2209A41-005C	ND	0.16	mg/L	UJ	EBL
TPH ORO	SW8015	OW-64	2209A41-006C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	STP-1-NW	2209A41-007C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	OW-60	2209A41-008C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	OW-67	2209A41-010C	ND	0.08	mg/L	UJ	EBL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH ORO	SW8015	DUP 9-20-22	2209A41-012C	ND	0.80	mg/L	UJ	EBL
TPH ORO	SW8015	OW-68	2209A41-009C	0.076	0.080	mg/L	J+	EBL, HR-LCS, MDLRL
Vanadium, Dissolved	E 200.7	OW-63	2209A41-003E	0.0045	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-58A	2209A41-004E	0.0059	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-58	2209A41-005E	0.005	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-64	2209A41-006E	0.0074	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	STP-1-NW	2209A41-007E	0.039	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-60	2209A41-008E	0.013	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-68	2209A41-009E	0.016	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-67	2209A41-010E	0.0068	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	DUP 9-20-22	2209A41-012E	0.0045	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EB-09-20-22	2209A41-001E	0.0022	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58A	2209A41-004D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58	2209A41-005D	0.0045	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-64	2209A41-006D	0.0068	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	STP-1-NW	2209A41-007D	0.033	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-60	2209A41-008D	0.042	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-68	2209A41-009D	0.031	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-67	2209A41-010D	0.030	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP 9-20-22	2209A41-012D	0.020	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-58A	2209A41-004a	4,300	30	µg/L	J	ERPD-FD
Xylenes, Total	SW8260B	DUP 9-20-22	2209A41-012a	3,100	75	µg/L	J	ERPD-FD
Zinc, Dissolved	E 200.7	OW-63	2209A41-003E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-58A	2209A41-004E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-64	2209A41-006E	0.038	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	STP-1-NW	2209A41-007E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-60	2209A41-008E	0.011	0.010	mg/L	JB	EBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	OW-68	2209A41-009E	0.036	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-67	2209A41-010E	0.035	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-58	2209A41-005E	0.0059	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP 9-20-22	2209A41-012E	0.0099	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-09-20-22	2209A41-001E	0.0066	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Q3 GW Sampling	Sample Matrix: Groundwater
Project Number: 697-080-002 Task 0006	Sample Start Date: 09/27/2022
Date Validated: 12/02/2022	Sample End Date: 09/27/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270 with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Modified Method 8015D ▪ Total and Dissolved Metals by EPA Methods 200.7 and 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209E92	
Data Validator: Kyle Power, Environmental Chemist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blank
- Field blank
- Equipment blank

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-27-22	2209E92-001
OW-1	2209E92-002
BW-4B	2209E92-003
BW-5C	2209E92-004
BW-5B	2209E92-005
MKTF-44	2209E92-006
MKTF-43	2209E92-007
OW-10	2209E92-008
MKTF-32	2209E92-009
MKTF-41	2209E92-010
DUP-9-27-22	2209E92-011
FB 9-27-22	2209E92-012
Trip Blank	2209E92-013

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Calibration Ranges (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ✓ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicate (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 900 data points. The data completeness calculation does not include any submitted blank sample results. Six data points were rejected. The data completeness measure for this data package is calculated to be 99.33% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	No
Comments: The laboratory noted the following non-conformances regarding the analytical data. "S" flagged surrogate/spikes denote that the analyte recovery was outside of the standard limits. Method 8270C: 1,4-Dioxane is "E" flagged for sample MKTF-32 because the result was slightly above the calibration range. Method 8015D (DRO): The LCS had slightly elevated recovery. The LCSD had acceptable recoveries.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	No
Comments: The laboratory used the following data qualification flags with this data set. E – Estimated value. **The 1,4-dioxane result for sample MKTF-32 with this laboratory flag was qualified as J to indicate an estimated concentration.** J – Analyte detected below quantitation limits R – RPD outside of range S – % Recovery outside of range due to dilution or matrix interference. * – Value exceeds maximum contaminant level.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present or required since the samples were delivered to the laboratory by courier, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The detection limits appeared to be acceptable. The following dilutions were applied. Method 8260B: A dilution of 10 times was applied for the methyl tert-butyl ether (MTBE) analysis of sample MKTF-32. Method 200.7: A dilution of 5 times was applied for the total metals analyses of sample MKTF-43. Method 200.8: Dilutions of 5 times were applied for the total and dissolved metals analysis of select samples.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 1.0°C and 3.9°C as noted on the *Sample Log-In Check List* and CoC. The cooler temperature below 2°C was judged as acceptable since the samples were not reported to be frozen upon receipt at the laboratory, and the sample containers were reported to be intact.	

VALIDATION CRITERIA CHECKLIST

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception.

Modified Method 8015D: **The analyte TPH DRO was detected in the method blank from batch 70480 at 0.043 mg/L. Detections of TPH DRO in the associated samples that were less than the reporting limits were qualified as U. Results greater than the blank detection but less than 10 times the blank concentration were qualified as JB.**

TPH-DRO was detected in sample MKTF-41 at a concentration greater than 10 times the blank detection and did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70455	Not Prepared
200.7	Dissolved Metals	A91551	Not Prepared
200.8	Dissolved Metals	A91411	Not Prepared
200.8	Total Metals	70455	Not Prepared
200.8	Dissolved Metals	B91411	Not Prepared
200.8	Dissolved Selenium	B91488	OW-1
200.8	Dissolved Selenium	A91522	Not Prepared
245.1	Total Mercury	70473	MKTF-41
504.1	EDB	70493	Not Prepared
8015D	TPH DRO and MRO	70480	Not Prepared
8015D	TPH GRO	A91419	Not Prepared
8260B	VOC	B91469	Not Prepared

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8260B	Methyl tert-Butyl Ether	A91498	Not Prepared
8270C	SVOC	70506	Not Prepared
8270 SIM	SVOC	70506	Not Prepared
4500 CN E	Cyanide	WG1935264	BW-4B
4500 CN E	Cyanide	WG1935876	Not Associated

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

Recoveries and RPDs for MS/MSDs prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the exceptions listed in the following table.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	Cadmium, Total	70455	133%	-----	70-130%	-----	-----
200.7	**Nickel, Total**	**70455**	**69.1%**	-----	**70-130%**	-----	-----
200.7	**Beryllium, Dissolved**	**A91551**	**64.9%**	-----	**70-130%**	-----	-----
200.8	**Selenium, Dissolved**	**B91488**	**59.6%**	-----	**70-130%**	-----	-----
8015D	**TPH DRO**	**70480**	**90.9%**	Acceptable	**31.7-75.4%**	**20.7%**	**20%**
8270 SIM	**1,4-Dioxane**	**70506**	Acceptable	Acceptable	15-60.5%	**30.1%**	**29.7%**
8270 SIM	**Naphthalene**	**70506**	Acceptable	Acceptable	15-78.3%	**41.6%**	**31.7%**
8270 SIM	**1-Methylnaphthalene**	**70506**	Acceptable	Acceptable	15-79.6%	**43.1%**	**31.4%**
8270 SIM	**2-Methylnaphthalene**	**70506**	Acceptable	Acceptable	15-78.6%	**44.0%**	**30.5%**
8270 SIM	**Acenaphthene**	**70506**	Acceptable	Acceptable	15-92%	**38.0%**	**30.5%**
8270 SIM	**Phenanthrene**	**70506**	Acceptable	Acceptable	21-103%	**31.9%**	**26.4%**
8270 SIM	**Anthracene**	**70506**	Acceptable	Acceptable	21.1-106%	**31.8%**	**14.4%**
8270 SIM	**Fluoranthene**	**70506**	Acceptable	Acceptable	32.8-119%	**29.5%**	**14.8%**
8270 SIM	**Pyrene**	**70506**	Acceptable	Acceptable	34.1-110%	**27.8%**	**19.2%**
8270 SIM	**Chrysene**	**70506**	Acceptable	Acceptable	31.3-112%	**26.3%**	**19%**
8270 SIM	**Indeno(1,2,3-cd)pyrene**	**70506**	Acceptable	Acceptable	24.7-152%	**30.4%**	**21.3%**

TPH DRO was detected in the associated samples, and the results were qualified as J+ due to evidence of high bias. Qualification was not required for total cadmium based on evidence of potential high bias as it was not detected in the associated samples.

VALIDATION CRITERIA CHECKLIST

Results for total nickel, dissolved barium, and dissolved selenium were qualified as J- if detected and UJ if not detected in the associated samples due to possible low bias.

Analytes with LCS/LCSD RPD values exceeding laboratory QC limits were qualified as J if detected and UJ if not detected in the associated samples due to poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the exceptions listed in the following table.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-43**	**1.82%**	**15-84.5%**
8270C	**Phenol-d_5**	**MKTF-43**	**5.85%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**MKTF-43**	**2.98%**	**15-108%**

Since Methods 8270C and 8270 SIM surrogate associations were not available from the laboratory, qualification was assigned to all the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. **This condition existed for the sample MKTF-43 for the acid surrogate, and associated analytes were qualified as R to indicate rejected data due to evidence of extremely low bias (recoveries less than 10%).**

Qualification was not required based on surrogate nonconformance in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-27-22, and one equipment blank sample, EB-09-27-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples, with the exceptions listed in the following table.

Blank Sample ID	Method	Analyte	Concentration
FB 9-27-22	8260B	2-Butanone	7.5 µg/L
EB-09-27-22	**200.7**	**Dissolved Zinc**	**0.0077 mg/L**
EB-09-27-22	8015D	TPH DRO	0.022 mg/L

Dissolved zinc was detected in the associated samples greater than the reporting limits but less than 10 times the blank result and was assigned JB qualifiers. Qualification was not required for 2-butanone as it was not detected in the associated samples.

The TPH DRO results were previously qualified due to laboratory blank contamination in batch 70480; therefore, additional qualification due to the equipment blank detection was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-9-27-22 was collected as a field duplicate of sample OW-1.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for dissolved zinc greatly exceeded the data validation QC limit for samples OW-1 and DUP-9-27-22 at 105.1%. Dissolved zinc was qualified as J for the parent, field duplicate, and associated samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? Yes

Comments: Laboratory duplicates prepared for these analyses and laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500 CN E	Cyanide	WG1935264	EB-09-27-22 and OW-1
4500CN E	Cyanide	WG1935876	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

Laboratory duplicate RPDs were within laboratory QC limits.

The RPD values for laboratory duplicate samples prepared from non-project samples were considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-43	Antimony	ND	0.004
MKTF-44	Antimony	ND	0.0007
MKTF-41	Arsenic	0.0017	0.0019
OW-10	Arsenic	0.00051	0.00058
OW-10	Barium	0.048	0.049
OW-10	Lead	0.000088	0.0001
BW-4B	Nickel	0.0069	0.016
MKTF-32	Nickel	ND	0.0033
MKTF-43	Nickel	ND	0.027
BW-5B	Selenium	0.00057	0.00081
DUP-9-27-22	Selenium	0.0024	0.0025
OW-1	Selenium	0.002	0.0025

VALIDATION CRITERIA CHECKLIST

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
BW-5C	Silver	ND	0.0022
MKTF-43	Silver	0.031	0.039
OW-10	Silver	ND	0.0023
MKTF-43	Vanadium	ND	0.0081
DUP-9-27-22	Zinc	ND	0.014
EB-09-27-22	Zinc	ND	0.0077
MKTF-32	Zinc	ND	0.014
MKTF-41	Zinc	ND	0.016
MKTF-43	Zinc	ND	0.016
OW-1	Zinc	ND	0.045
OW-10	Zinc	ND	0.066

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-1 Field Duplicate Sample ID: DUP-9-27-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
MTBE	8260B	2.7 µg/L	3.0 µg/L	10.5%
TPH DRO	8015D	0.031 mg/L	0.045 mg/L	36.8% +/-RL
Bis(2-ethylhexyl)phthalate	8270C	9.0 µg/L	ND (10 µg/L)	DL
Di-n-butyl phthalate	8270C	18 µg/L	ND (10 µg/L)	DL
1,4-Dioxane	8270 SIM	ND (1.0 µg/L)	0.28 µg/L	DL
Pyrene	8270 SIM	0.32 µg/L	ND (1.0 µg/L)	DL
Barium, Dissolved	200.7	0.041 mg/L	0.041 mg/L	0.0%
Barium, Total	200.7	0.041 mg/L	0.043 mg/L	4.8%
Vanadium, Dissolved	200.7	0.036 mg/L	0.037 mg/L	2.7% +/-RL
Vanadium, Total	200.7	0.041 mg/L	0.042 mg/L	2.4% +/-RL
Zinc, Dissolved	**200.7**	**0.045 mg/L**	**0.014 mg/L**	**105.1%**
Arsenic, Dissolved	200.8	0.00060 mg/L	0.00064 mg/L	6.5% +/-RL
Arsenic, Total	200.8	0.00065 mg/L	0.00065 mg/L	0.0% +/-RL
Lead, Total	200.8	0.00014 mg/L	0.00014 mg/L	0.0% +/-RL
Selenium, Dissolved	200.8	0.0025 mg/L	0.0025 mg/L	0.0%
Selenium, Total	200.8	0.0020 mg/L	0.0024 mg/L	18.2%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for dissolved zinc greatly exceeded the data validation QC limit and the results were qualified as J for the associated samples due to evidence of poor precision.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
ECAL	The result exceeds the calibration range.
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	BW-5C	2209e92-004a	0.76	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	BW-5B	2209e92-005a	0.42	1	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	OW-10	2209e92-008a	0.55	1	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	OW-10	2209e92-008a	0.43	1	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	MKTF-41	2209e92-010a	0.17	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	BW-5C	2209e92-004a	0.59	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	BW-5B	2209e92-005a	0.37	1	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-10	2209e92-008a	0.37	1	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-32	2209e92-009c	27	1	µg/L	J	ECAL, ERPD-LCS
1,4-Dioxane	SW8270C	BW-5C	2209e92-004c	3.5	1	µg/L	J	ERPD-LCS
1,4-Dioxane	SW8270C	OW-10	2209e92-008c	1	1	µg/L	J	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-41	2209e92-010c	1.9	1	µg/L	J	ERPD-LCS
1,4-Dioxane	SW8270C	EB-09-27-22	2209e92-001c	ND	1	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	OW-1	2209e92-002c	ND	1	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-4B	2209e92-003c	ND	1	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-44	2209e92-006c	ND	1	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MKTF-43	2209E92-007C	ND	1	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-5B	2209e92-005c	0.96	1	µg/L	J	ERPD-LCS, MDLRL
1,4-Dioxane	SW8270C	DUP-9-27-22	2209e92-011c	0.28	1	µg/L	J	ERPD-LCS, MDLRL
1-Methylnaphthalene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
2,4,6-Trichlorophenol	SW8270C	MKTF-43	2209E92-007C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-43	2209E92-007C	ND	10	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-43	2209E92-007C	ND	20	µg/L	R	LR-SUR
2-Butanone	SW8260B	FB 9-27-22	2209e92-012a	7.5	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Methylnaphthalene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
2-Methylphenol	SW8270C	MKTF-43	2209E92-007C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-43	2209E92-007C	ND	10	µg/L	R	LR-SUR
Acenaphthene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Acetone	SW8260B	BW-5B	2209e92-005a	4.3	10	µg/L	J	MDLRL
Anthracene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Anthracene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Antimony, Dissolved	E200.8	MKTF-44	2209E92-006E	0.0007	0.001	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-43	2209E92-007E	0.004	0.005	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-1	2209E92-002E	0.0006	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5C	2209E92-004E	0.00031	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-5B	2209E92-005E	0.00085	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-43	2209E92-007E	0.0026	0.005	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-10	2209E92-008E	0.00058	0.001	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-9-27-22	2209E92-011E	0.00064	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-1	2209E92-002D	0.00065	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-5B	2209E92-005D	0.00094	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-10	2209E92-008D	0.00051	0.001	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-9-27-22	2209E92-011D	0.00065	0.001	mg/L	J	MDLRL
Benzene	SW8260B	MKTF-32	2209e92-009a	0.35	1	µg/L	J	MDLRL
Benzene	SW8260B	MKTF-41	2209e92-010a	0.4	1	µg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	EB-09-27-22	2209E92-001E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	OW-1	2209E92-002E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-4B	2209E92-003E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-5C	2209E92-004E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-5B	2209E92-005E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MKTF-44	2209E92-006E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MKTF-43	2209E92-007E	ND	0.002	mg/L	UJ	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Beryllium, Dissolved	E 200.7	OW-10	2209E92-008E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MKTF-32	2209E92-009E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MKTF-41	2209E92-010E	ND	0.002	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	DUP-9-27-22	2209E92-011E	ND	0.002	mg/L	UJ	LR-LCS
Bis(2-ethylhexyl)phthalate	SW8270C	OW-1	2209E92-002C	9	10	µg/L	J	MDLRL
Chrysene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Chrysene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Cobalt, Total	E 200.7	OW-10	2209E92-008D	0.0042	0.006	mg/L	J	MDLRL
Fluoranthene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluoranthene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	MKTF-44	2209E92-006E	0.00013	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-43	2209E92-007E	0.00047	0.0025	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-10	2209E92-008E	0.0001	0.0005	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-32	2209E92-009E	0.000094	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	OW-1	2209E92-002D	0.00014	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	BW-5B	2209E92-005D	0.00021	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-43	2209E92-007D	0.002	0.0025	mg/L	J	MDLRL
Lead, Total	E200.8	OW-10	2209E92-008D	0.000088	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-9-27-22	2209E92-011D	0.00014	0.0005	mg/L	J	MDLRL
Naphthalene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Naphthalene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-41	2209e92-010c	ND	0.3	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Nickel, Dissolved	E 200.7	MKTF-32	2209E92-009E	0.0033	0.01	mg/L	J	MDLRL
Nickel, Total	E 200.7	BW-5C	2209E92-004D	0.013	0.01	mg/L	J-	LR-LCS
Nickel, Total	E 200.7	EB-09-27-22	2209E92-001D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-1	2209E92-002D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	BW-5B	2209E92-005D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-44	2209E92-006D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-43	2209E92-007D	ND	0.05	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-10	2209E92-008D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-32	2209E92-009D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	MKTF-41	2209E92-010D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	DUP-9-27-22	2209E92-011D	ND	0.01	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	BW-4B	2209E92-003D	0.0069	0.01	mg/L	J-	LR-LCS, MDLRL
Phenanthrene	SW8270C	MKTF-41	2209e92-010c	0.42	0.3	µg/L	J	ERPD-LCS
Phenanthrene	SW8270C	EB-09-27-22	2209e92-001c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	OW-1	2209e92-002c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	BW-4B	2209e92-003c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	BW-5C	2209e92-004c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	BW-5B	2209e92-005c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	MKTF-44	2209e92-006c	ND	0.3	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenanthrene	SW8270C	MKTF-43	2209E92-007C	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	OW-10	2209e92-008c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	MKTF-32	2209e92-009c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	DUP-9-27-22	2209e92-011c	ND	0.3	µg/L	UJ	ERPD-LCS
Phenol	SW8270C	MKTF-43	2209E92-007C	ND	20	µg/L	R	LR-SUR
Pyrene	SW8270C	EB-09-27-22	2209e92-001c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	BW-4B	2209e92-003c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	BW-5C	2209e92-004c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	BW-5B	2209e92-005c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-44	2209e92-006c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-43	2209E92-007C	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-10	2209e92-008c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-32	2209e92-009c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-41	2209e92-010c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-9-27-22	2209e92-011c	ND	1	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-1	2209e92-002c	0.32	1	µg/L	J	ERPD-LCS, MDLRL
sec-Butylbenzene	SW8260B	MKTF-32	2209e92-009a	0.41	1	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OW-1	2209E92-002E	0.0025	0.001	mg/L	J-	LR-LCS
Selenium, Dissolved	E200.8	MKTF-44	2209E92-006E	0.012	0.001	mg/L	J-	LR-LCS
Selenium, Dissolved	E200.8	BW-5C	2209E92-004E	0.00036	0.001	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	BW-5B	2209E92-005E	0.00081	0.001	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP-9-27-22	2209E92-011E	0.0025	0.005	mg/L	J	MDLRL
Selenium, Total	E200.8	BW-4B	2209E92-003D	0.00046	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	BW-5B	2209E92-005D	0.00057	0.001	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-32	2209E92-009D	0.00076	0.001	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	BW-5C	2209E92-004E	0.0022	0.005	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Silver, Dissolved	E 200.7	OW-10	2209E92-008E	0.0023	0.005	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-41	2209E92-010C	1.9	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	MKTF-43	2209E92-007C	0.1	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	OW-10	2209E92-008C	0.068	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	MKTF-32	2209E92-009C	0.21	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	EB-09-27-22	2209E92-001C	0.039	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-1	2209E92-002C	0.031	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	BW-4B	2209E92-003C	0.041	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	BW-5C	2209E92-004C	0.064	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	BW-5B	2209E92-005C	0.06	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-44	2209E92-006C	0.048	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	DUP-9-27-22	2209E92-011C	0.045	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	BW-5C	2209e92-004a	0.023	0.05	mg/L	J	MDLRL
TPH GRO	SW8015	BW-5B	2209e92-005a	0.013	0.05	mg/L	J	MDLRL
TPH GRO	SW8015	MKTF-41	2209e92-010a	0.014	0.05	mg/L	J	MDLRL
TPH ORO	SW8015	MKTF-41	2209E92-010C	0.061	0.08	mg/L	J	MDLRL
Trichloroethene	SW8260B	MKTF-32	2209e92-009a	0.28	1	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-1	2209E92-002E	0.036	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-4B	2209E92-003E	0.0094	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-5B	2209E92-005E	0.007	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-43	2209E92-007E	0.0081	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-10	2209E92-008E	0.0055	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-32	2209E92-009E	0.0042	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-41	2209E92-010E	0.024	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-9-27-22	2209E92-011E	0.037	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-1	2209E92-002D	0.041	0.05	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	BW-5C	2209E92-004D	0.036	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-5B	2209E92-005D	0.013	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-10	2209E92-008D	0.0072	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-32	2209E92-009D	0.012	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-41	2209E92-010D	0.024	0.05	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-9-27-22	2209E92-011D	0.042	0.05	mg/L	J	MDLRL
Xylenes, Total	SW8260B	MKTF-41	2209e92-010a	0.8	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	EB-09-27-22	2209E92-001E	0.0077	0.01	mg/L	J	ERPD-FD, MDLRL
Zinc, Dissolved	E 200.7	OW-1	2209E92-002E	0.045	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	BW-4B	2209E92-003E	0.014	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	BW-5C	2209E92-004E	0.036	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	BW-5B	2209E92-005E	0.048	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	MKTF-44	2209E92-006E	0.014	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	MKTF-43	2209E92-007E	0.016	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	OW-10	2209E92-008E	0.066	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	MKTF-32	2209E92-009E	0.014	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	MKTF-41	2209E92-010E	0.016	0.01	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	DUP-9-27-22	2209E92-011E	0.014	0.01	mg/L	JB	EBD, ERPD-FD

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0004	Sample Start Date: 09/28/2022
Date Validated: 01/30/2023	Sample End Date: 09/28/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209F93	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-28-22	2209F93-001
BW-1C	2209F93-002
BW-2C	2209F93-003
BW-2B	2209F93-004
BW-3C	2209F93-005
BW-3B	2209F93-006
DUP-9-28-22	2209F93-007
FB 9-28-22	2209F93-008
Trip Blank	2209F93-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	No
Comments: The laboratory noted the following analytical non-conformance related to this data set. Method 8270C SIM: The method blank had a low surrogate recovery for 2,4,6-tribromophenol.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	No
Comments: The laboratory used the following data qualification flags with this data set. J – Analyte detected below quantitation limits. R – % RPD outside of range. S – % Recovery outside of range due to dilution or matrix interference.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The detection limits appeared to be acceptable. The following dilution was applied. Method 200.8: Sample EB-09-28-22 was diluted by a factor of 5 times for the analysis of dissolved antimony.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 0.2°C, 0.3°C, and 3.3°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 3.1°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	

VALIDATION CRITERIA CHECKLIST

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception.

TPH DRO was detected in the laboratory blank for Method 8015D batch 70492 at a concentration of 0.019 mg/L. Sample results detected below or equal to the blank concentration and/or the laboratory reporting limit were qualified with a U flag. Non-detections of this analyte in the associated samples and results greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70489	Not Prepared
200.7	Dissolved Metals	B91551	Not Prepared
200.7	Dissolved Metals	C91551	DUP-9-28-22
200.8	Total Metals	70489	EB-09-28-22
200.8	Dissolved Metals	A91411	DUP-9-28-22
200.8	Dissolved Antimony	B91488	Not Prepared
245.1	Total and Dissolved Mercury	70626	DUP-9-28-22
504.1	EDB	70493	EB-09-28-22
504.1	EDB	70550	Not Prepared
4500CN E	Cyanide	WG1935876	BW-1C
8015D	TPH DRO and MRO	70492	Not Prepared
8015D	TPH GRO	A91437	EB-09-28-22
8260B	VOCs	B91553	FB 9-28-22
8260B	VOCs	R91553	Not Prepared
8270C SIM	SVOCs	70506	Not Prepared
8270C	SVOCs	70506	Not Prepared
8270C SIM	SVOCs	70536	Not Prepared
8270C	SVOCs	70536	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits, with the following exception.

The MS/MSD RPD for benzene in batch B91553 exceeded the QC limit of 20% at 20.5%. Benzene was not detected in the associated samples, and these results were qualified as UJ due to evidence of poor precision.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Cobalt**	**70489**	**135%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Beryllium**	**B91551**	**61.9%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Beryllium**	**C91551**	**67.2%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Zinc**	**C91551**	**137%**	**-----**	**70-130%**	**-----**	**-----**
200.8	Total Selenium	70489	149%	-----	70-130%	-----	-----
8270C SIM	**1,4-Dioxane**	**70506**	**Acceptable**	**Acceptable**	**15-60.5%**	**30.1%**	**29.7%**
8270C SIM	**Naphthalene**	**70506**	**Acceptable**	**Acceptable**	**15-78.3%**	**41.6%**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**70506**	**Acceptable**	**Acceptable**	**15-79.6%**	**43.1%**	**31.4%**
8270C SIM	**2-Methylnaphthalene**	**70506**	**Acceptable**	**Acceptable**	**15-78.6%**	**44.0%**	**30.5%**
8270C SIM	**Acenaphthene**	**70506**	**Acceptable**	**Acceptable**	**15-92%**	**38.0%**	**30.5%**
8270C SIM	**Phenanthrene**	**70506**	**Acceptable**	**Acceptable**	**21-103%**	**31.9%**	**26.4%**
8270C SIM	**Anthracene**	**70506**	**Acceptable**	**Acceptable**	**21.1-106%**	**31.8%**	**14.4%**
8270C SIM	**Fluoranthene**	**70506**	**Acceptable**	**Acceptable**	**32.8-119%**	**29.5%**	**14.8%**
8270C SIM	**Pyrene**	**70506**	**Acceptable**	**Acceptable**	**34.1-110%**	**27.8%**	**19.2%**
8270C SIM	**Chrysene**	**70506**	**Acceptable**	**Acceptable**	**31.3-112%**	**26.3%**	**19%**
8270C SIM	**Indeno(1,2,3-cd)pyrene**	**70506**	**Acceptable**	**Acceptable**	**24.7-152%**	**30.4%**	**21.3%**
8270C SIM	**1,4-Dioxane**	**70536**	**Acceptable**	**Acceptable**	**15-60.5%**	**55.1%**	**29.7%**
8270C SIM	**Naphthalene**	**70536**	**Acceptable**	**Acceptable**	**15-78.3%**	**38.6%**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**70536**	**Acceptable**	**Acceptable**	**15-79.6%**	**35.9%**	**31.4%**
8270C SIM	**2-Methylnaphthalene**	**70536**	**Acceptable**	**Acceptable**	**15-78.6%**	**31.9%**	**30.5%**
8270C SIM	**Acenaphthene**	**70536**	**Acceptable**	**Acceptable**	**15-92%**	**43.3%**	**30.5%**
8270C SIM	**Fluorene**	**70536**	**Acceptable**	**Acceptable**	**15-96%**	**29.4%**	**25.1%**

Detections of total cobalt, dissolved zinc, and total selenium in the associated samples were qualified as J+ due to evidence of potential high bias. Non-detection of these analytes in the associated samples did not require qualification.

Dissolved beryllium was not detected in the associated samples and the results were assigned UJ qualifiers due to evidence of potential low bias,

VALIDATION CRITERIA CHECKLIST

The identified analytes with LCS/LCSD RPD values that exceeded the defined QC limits were not detected in the associated samples. These results were qualified as UJ due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-28-22, and one equipment blank sample, EB-09-28-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**3.4 µg/L**
FB 9-28-22	8260B	2-Butanone	16 µg/L
FB 9-28-22	8260B	Acetone	4.8 µg/L
EB-9-28-22	8260B	Acetone	12 µg/L
EB-9-28-22	8015D	TPH DRO	0.019 mg/L
EB-9-28-22	**200.7**	**Dissolved Zinc**	**0.0048 mg/L**

Detections of acetone in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections of acetone and dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples and results greater than 10 times the blank detection did not require qualification.

The TPH DRO results for the samples in batch 70492 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-28-22 was collected as a field duplicate of sample BW-1C.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1935876 from sample EB-09-28-22 and a sample not associated with this data set.

The sample EB-09-28-22 and the laboratory duplicate were both non-detect for cyanide, and an RPD could not be calculated.

The RPD value for the laboratory duplicate sample pair prepared from a non-project sample was evaluated and considered, but data were not qualified based on that result since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
BW-3C	Antimony	ND	0.00057
BW-3B	Antimony	ND	0.0013
DUP-9-28-22	Antimony	ND	0.00055
BW-1C	Arsenic	0.00015	0.00017
DUP-9-28-22	Arsenic	ND	0.00015
BW-1C	Nickel	ND	0.0077
BW-3C	Selenium	ND	0.00067
EB-09-28-22	Zinc	ND	0.0048
BW-1C	Zinc	ND	0.024
BW-2C	Zinc	ND	0.018
BW-3C	Zinc	ND	0.028
BW-3B	Zinc	ND	0.30
DUP-9-28-22	Zinc	ND	0.026

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: BW-1C Field Duplicate Sample ID: DUP-9-28-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.017 mg/L	0.017 mg/L	0.0%
Barium, Total	E 200.7	0.018 mg/L	0.018 mg/L	0.0%
Chromium, Total	E 200.7	ND (0.0060 mg/L)	0.0024 mg/L	DL
Nickel, Dissolved	E 200.7	0.0077 mg/L	ND (0.010 mg/L)	DL
Zinc, Dissolved	E 200.7	0.024 mg/L	0.026 mg/L	8.0%
Antimony, Dissolved	E200.8	ND (0.0010 mg/L)	0.00055 mg/L	DL
Arsenic, Dissolved	E200.8	0.00017 mg/L	0.00015 mg/L	12.5% +/-RL
Arsenic, Total	E200.8	0.00015 mg/L	ND (0.0010 mg/L)	DL
TPH DRO	SW8015	0.025 mg/L	0.018 mg/L	32.6% +/-RL
Acetone	SW8260B	7.1 µg/L	11 µg/L	43.1% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
ERPD-MS	The MS/MSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	EB-09-28-22	2209f93-001c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-1C	2209f93-002c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-2C	2209f93-003c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-2B	2209f93-004c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-3C	2209f93-005c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	BW-3B	2209f93-006c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	DUP-9-28-22	2209f93-007c	ND	1.0	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-1C	2209f93-002c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-2C	2209f93-003c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-2B	2209f93-004c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-3C	2209f93-005c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	BW-3B	2209f93-006c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-9-28-22	2209f93-007c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Methylnaphthalene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-1C	2209f93-002c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-2C	2209f93-003c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-2B	2209f93-004c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-3C	2209f93-005c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	BW-3B	2209f93-006c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-9-28-22	2209f93-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-1C	2209f93-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-2C	2209f93-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-2B	2209f93-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-3C	2209f93-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	BW-3B	2209f93-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-9-28-22	2209f93-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Acetone	SW8260B	EB-09-28-22	2209F93-001a	12	10	µg/L	JB	TBD
Acetone	SW8260B	DUP-9-28-22	2209F93-007a	11	10	µg/L	JB	TBD
Acetone	SW8260B	Trip Blank	2209F93-009a	3.4	10	µg/L	J	MDLRL
Acetone	SW8260B	BW-1C	2209F93-002a	7.1	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	BW-2B	2209F93-004a	3.8	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	FB 9-28-22	2209F93-008a	4.8	10	µg/L	U	MDLRL, TBD
Anthracene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Antimony, Dissolved	E200.8	BW-3C	2209F93-005E	0.00057	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	DUP-9-28-22	2209F93-007E	0.00055	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-1C	2209F93-002E	0.00017	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-2C	2209F93-003E	0.00080	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-2B	2209F93-004E	0.00053	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	BW-3C	2209F93-005E	0.00078	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	DUP-9-28-22	2209F93-007E	0.00015	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-1C	2209F93-002D	0.00015	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-2B	2209F93-004D	0.00064	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	BW-3C	2209F93-005D	0.00085	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	FB 9-28-22	2209F93-008a	ND	1.0	µg/L	UJ	ERPD-MS
Benzene	SW8260B	Trip Blank	2209F93-009a	ND	1.0	µg/L	UJ	ERPD-MS
Beryllium, Dissolved	E 200.7	EB-09-28-22	2209F93-001E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-1C	2209F93-002E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-2C	2209F93-003E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-2B	2209F93-004E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-3C	2209F93-005E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	BW-3B	2209F93-006E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	DUP-9-28-22	2209F93-007E	ND	0.0020	mg/L	UJ	LR-LCS
Chromium, Total	E 200.7	BW-2B	2209F93-004D	0.0029	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	BW-3C	2209F93-005D	0.004	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-9-28-22	2209F93-007D	0.0024	0.0060	mg/L	J	MDLRL
Chrysene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Cobalt, Dissolved	E 200.7	BW-3B	2209F93-006E	0.0025	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	BW-2B	2209F93-004D	0.0063	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	BW-3B	2209F93-006D	0.0042	0.0060	mg/L	J+	HR-LCS, MDLRL
Fluoranthene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	BW-1C	2209f93-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	BW-2C	2209f93-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	BW-2B	2209f93-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	BW-3C	2209f93-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	BW-3B	2209f93-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	DUP-9-28-22	2209f93-007c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Indeno(1,2,3-cd)pyrene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	BW-3C	2209F93-005E	0.000088	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	BW-3B	2209F93-006E	0.000070	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	BW-3C	2209F93-005D	0.00037	0.00050	mg/L	J	MDLRL
Naphthalene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-1C	2209f93-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-2C	2209f93-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-2B	2209f93-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-3C	2209f93-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	BW-3B	2209f93-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-9-28-22	2209f93-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Nickel, Dissolved	E 200.7	BW-1C	2209F93-002E	0.0077	0.010	mg/L	J	MDLRL
Phenanthrene	SW8270C	EB-09-28-22	2209f93-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	EB-09-28-22	2209f93-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Selenium, Dissolved	E200.8	BW-3C	2209F93-005E	0.00067	0.0010	mg/L	J	MDLRL
TPH DRO	SW8015	EB-09-28-22	2209F93-001C	0.019	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	BW-1C	2209F93-002C	0.025	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	BW-2B	2209F93-004C	0.049	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	BW-3B	2209F93-006C	0.021	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	DUP-9-28-22	2209F93-007C	0.018	0.064	mg/L	U	MBD, MDLRL
Vanadium, Total	E 200.7	BW-2C	2209F93-003D	0.0056	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-3B	2209F93-006D	0.0046	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	BW-3B	2209F93-006E	0.30	0.010	mg/L	J+	HR-LCS
Zinc, Dissolved	E 200.7	BW-1C	2209F93-002E	0.024	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	BW-2C	2209F93-003E	0.018	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	BW-2B	2209F93-004E	0.043	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	BW-3C	2209F93-005E	0.028	0.010	mg/L	JB	EBD, HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	DUP-9-28-22	2209F93-007E	0.026	0.010	mg/L	JB	EBD, HR-LCS
Zinc, Dissolved	E 200.7	EB-09-28-22	2209F93-001E	0.0048	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/29/2022
Date Validated: 01/23/2023	Sample End Date: 09/29/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209H02	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-29-22	2209H02-001
MW-1	2209H02-002
SMW-4	2209H02-003
MW-2	2209H02-004
MW-5	2209H02-005
DUP-9-29-22	2209H02-006
FB 9-29-22	2209H02-007
Trip Blank	2209H02-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 450 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? Yes

Comments: The laboratory did not report non-conformances related to the analytical data for this sample set.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	MW-5	Dissolved Metals	5
245.1	SMW-4	Total Mercury	5

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C at 0.6°C, 1.0°C, and 1.7°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 3.0°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

VALIDATION CRITERIA CHECKLIST

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**70537**	**0.0055 mg/L**
8015D	**TPH DRO**	**70521**	**0.019 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70537	Not Prepared
200.7	Dissolved Metals	C91551	Not Prepared
200.8	Total Metals	70537	Not Prepared
200.8	Dissolved Metals	A91522	Not Prepared
245.1	Total and Dissolved Mercury	70627	SMW-4
504.1	EDB	70550	Not Prepared
4500CN E	Cyanide	WG1937600	Not Associated
8015D	TPH DRO and MRO	70521	Not Prepared

VALIDATION CRITERIA CHECKLIST

Method	Analytes	Batch	MS Sample Source
8015D	TPH GRO	GW91584	MW-1
8260B	VOCs	R91600	MW-1
8270C SIM	SVOCs	70536	Not Prepared
8270C	SVOCs	70536	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exception.

The reported MS and MSD percent recoveries for mercury in Method 245.1 batch 70627 were outside the QC limits of 75-125% at 126%, 72.1%, and 74.7%. The results for all of the associated samples in the batch would typically be qualified based on the MS/MSD results. However, since conflicting results (low and high recoveries) were reported for this batch, the determination of which qualifier to be applied would be arbitrary. Therefore, only the non-detected dissolved mercury and total mercury results for the parent sample SMW-4 were qualified UJ due to these non-conformances.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	Total Chromium	70537	152%	-----	70-130%	-----	-----
200.7	Dissolved Beryllium	C91551	67.2%	-----	70-130%	-----	-----
200.7	Dissolved Zinc	C91551	137%	-----	70-130%	-----	-----
8270C SIM	1,4-Dioxane	70536	Acceptable	Acceptable	15-60.5%	55.1%	29.7%
8270C SIM	Naphthalene	70536	Acceptable	Acceptable	15-78.3%	38.6%	31.7%
8270C SIM	1-Methynaphthalene	70536	Acceptable	Acceptable	15-79.6%	35.9%	31.4%
8270C SIM	2-Methynaphthalene	70536	Acceptable	Acceptable	15-78.6%	31.9%	30.5%
8270C SIM	Acenaphthene	70536	Acceptable	Acceptable	15-92%	43.3%	30.5%
8270C SIM	Fluorene	70536	Acceptable	Acceptable	15-96%	29.4%	25.1%

Detections of total chromium and dissolved zinc were qualified as J+ due to the evidence of potential high bias. The non-detection of total chromium in sample MW-5 did not require qualification.

Dissolved beryllium was not detected in the associated samples, and these results were qualified as UJ due to the evidence of potential low bias.

The identified analytes with LCS/LCSD RPD values that were above the QC limit were not detected in the associated samples. These results were qualified as UJ due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-29-22, and one equipment blank sample, EB-09-29-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**3.2 µg/L**
EB-09-29-22	8260B	Acetone	5.4 µg/L
EB-09-29-22	8260B	Total Xylenes	0.46 µg/L
EB-09-29-22	8015D	TPH DRO	0.045 mg/L
EB-09-29-22	**200.7**	**Total Chromium**	**0.0025 mg/L**
EB-09-29-22	**200.7**	**Dissolved Zinc**	**0.0072 mg/L**

Detections of acetone, total chromium, and dissolved zinc in the associated samples that were less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results for the samples in batch 70521 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-29-22 was collected as a field duplicate of sample MW-1.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for dissolved zinc greatly exceeded the data validation limit of 30% at 107.2%. The reported results for dissolved zinc were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for dissolved zinc in the associated samples due to evidence of extremely poor precision (RPD > 100%).

An RPD value could not be calculated for dissolved nickel for the field duplicate pair MW-1 and DUP-9-29-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, dissolved nickel was qualified as J for the parent sample MW-1 and UJ for the duplicate sample DUP-9-29-22.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1937600 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MW-1	Arsenic	0.0013	0.0014
MW-1	Nickel	ND	0.022
EB-09-29-22	Zinc	ND	0.0072
MW-1	Zinc	0.0047	0.096
SMW-4	Zinc	ND	0.055
MW-2	Zinc	ND	0.037
MW-5	Zinc	ND	0.029
DUP-9-29-22	Zinc	ND	0.029

FIELD DUPLICATE SUMMARY

Client Sample ID: MW-1 Field Duplicate Sample ID: DUP-9-29-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.013 mg/L	0.013 mg/L	0.0%
Barium, Total	E 200.7	0.013 mg/L	0.013 mg/L	0.0%
Chromium, Total	E 200.7	0.0029 mg/L	0.0033 mg/L	12.9% +/-RL
Nickel, Dissolved	**E 200.7**	**0.022 mg/L**	**ND (0.010 mg/L)**	**DL**
Zinc, Dissolved	**E 200.7**	**0.096 mg/L**	**0.029 mg/L**	**107.2%**
Zinc, Total	E 200.7	0.0047 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0014 mg/L	0.0013 mg/L	7.4% +/-RL
Arsenic, Total	E200.8	0.0013 mg/L	0.0015 mg/L	14.3% +/-RL
Lead, Dissolved	E200.8	0.00013 mg/L	0.00012 mg/L	8.0% +/-RL
Lead, Total	E200.8	0.00073 mg/L	0.00066 mg/L	10.1% +/-RL
TPH DRO	SW8015	0.017 mg/L	0.030 mg/L	55.3% +/-RL
Acetone	SW8260B	3.3 µg/L	ND (10 µg/L)	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for dissolved zinc greatly exceeded the data validation limit of 30% at 107.2%. The reported results for dissolved zinc were assigned J qualifiers for the parent and field duplicate samples, and J qualifiers for the results for dissolved zinc in the associated samples due to evidence of extremely poor precision (RPD > 100%).

An RPD value could not be calculated for dissolved nickel for the field duplicate pair MW-1 and DUP-9-29-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detection in the parent sample was greater than two times the reporting limit, dissolved nickel was qualified as J for the parent sample MW-1 and UJ for the duplicate sample DUP-9-29-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	EB-09-29-22	2209h02-001c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MW-1	2209h02-002c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	SMW-4	2209h02-003c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MW-2	2209h02-004c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	MW-5	2209h02-005c	ND	1.0	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	DUP-9-29-22	2209h02-006c	ND	1.0	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	EB-09-29-22	2209h02-001c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MW-1	2209h02-002c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	SMW-4	2209h02-003c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MW-2	2209h02-004c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MW-5	2209h02-005c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-9-29-22	2209h02-006c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	EB-09-29-22	2209h02-001c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Methylnaphthalene	SW8270C	MW-1	2209h02-002c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	SMW-4	2209h02-003c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MW-2	2209h02-004c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MW-5	2209h02-005c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-9-29-22	2209h02-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	EB-09-29-22	2209h02-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MW-1	2209h02-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	SMW-4	2209h02-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MW-2	2209h02-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MW-5	2209h02-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-9-29-22	2209h02-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Acetone	SW8260B	Trip Blank	2209H02-008a	3.2	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-09-29-22	2209H02-001a	5.4	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	MW-1	2209H02-002a	3.3	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	SMW-4	2209H02-003a	3.7	10	µg/L	U	MDLRL, TBD
Arsenic, Dissolved	E200.8	MW-5	2209H02-005E	0.00086	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MW-5	2209H02-005D	0.00097	0.0010	mg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	EB-09-29-22	2209H02-001E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MW-1	2209H02-002E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	SMW-4	2209H02-003E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MW-2	2209H02-004E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MW-5	2209H02-005E	ND	0.010	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	DUP-9-29-22	2209H02-006E	ND	0.0020	mg/L	UJ	LR-LCS
Chromium, Total	E 200.7	EB-09-29-22	2209H02-001D	0.0025	0.0060	mg/L	J+	HR-LCS, MDLRL
Chromium, Total	E 200.7	MW-1	2209H02-002D	0.0029	0.0060	mg/L	U	EBD, HR-LCS, MDLRL
Chromium, Total	E 200.7	SMW-4	2209H02-003D	0.0040	0.0060	mg/L	U	EBD, HR-LCS, MDLRL
Chromium, Total	E 200.7	MW-2	2209H02-004D	0.0050	0.0060	mg/L	U	EBD, HR-LCS, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chromium, Total	E 200.7	DUP-9-29-22	2209H02-006D	0.0033	0.0060	mg/L	U	EBD, HR-LCS, MDLRL
Fluorene	SW8270C	EB-09-29-22	2209h02-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MW-1	2209h02-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	SMW-4	2209h02-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MW-2	2209h02-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MW-5	2209h02-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	DUP-9-29-22	2209h02-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	MW-1	2209H02-002E	0.00013	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-9-29-22	2209H02-006E	0.00012	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	SMW-4	2209H02-003D	0.00036	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	SMW-4	2209H02-003E	ND	0.00020	mg/L	UJ	LR-MS
Mercury, Total	E245.1	SMW-4	2209H02-003D	ND	0.0010	mg/L	UJ	LR-MS
Nickel, Dissolved	200.7	DUP-9-29-22	2209H02-006E	ND	0.010	mg/L	UJ	ERPD-FD
Nickel, Dissolved	200.7	MW-1	2209H02-002E	0.022	0.010	mg/L	J	ERPD-FD
Naphthalene	SW8270C	EB-09-29-22	2209h02-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MW-1	2209h02-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	SMW-4	2209h02-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MW-2	2209h02-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MW-5	2209h02-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-9-29-22	2209h02-006c	ND	0.30	µg/L	UJ	ERPD-LCS
TPH DRO	SW8015	EB-09-29-22	2209H02-001C	0.045	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	MW-1	2209H02-002C	0.017	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	SMW-4	2209H02-003C	0.022	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	MW-2	2209H02-004C	0.038	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	DUP-9-29-22	2209H02-006C	0.030	0.064	mg/L	U	MBD, MDLRL
Vanadium, Dissolved	E 200.7	SMW-4	2209H02-003E	0.046	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	EB-09-29-22	2209H02-001a	0.46	1.5	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	MW-1	2209H02-002E	0.096	0.010	mg/L	J+	ERPD-FD, HR-LCS
Zinc, Dissolved	E 200.7	EB-09-29-22	2209H02-001E	0.0072	0.010	mg/L	J+	ERPD-FD, HR-LCS, MDLRL
Zinc, Dissolved	E 200.7	SMW-4	2209H02-003E	0.055	0.010	mg/L	JB	EBD, ERPD-FD, HR-LCS
Zinc, Dissolved	E 200.7	MW-2	2209H02-004E	0.037	0.010	mg/L	JB	EBD, ERPD-FD, HR-LCS
Zinc, Dissolved	E 200.7	DUP-9-29-22	2209H02-006E	0.029	0.010	mg/L	JB	EBD, ERPD-FD, HR-LCS
Zinc, Dissolved	E 200.7	MW-5	2209H02-005E	0.029	0.050	mg/L	U	EBD, ERPD-FD, HR-LCS, MDLRL
Zinc, Total	E 200.7	MW-1	2209H02-002D	0.0047	0.010	mg/L	U	MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0004	Sample Start Date: 09/30/2022
Date Validated: 01/31/2023	Sample End Date: 09/30/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209H72	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-9-30-22	2209H72-001
MW-4	2209H72-002
SMW-2	2209H72-003
OW-59	2209H72-004
OW-14	2209H72-005
OW-30	2209H72-006
DUP-9-30-22	2209H72-007
FB-9-30-22	2209H72-008
Trip Blank	2209H72-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Methods 8270C and 8270C SIM: 1-Methylnaphthalene was reported by EPA Method 8270C instead of EPA Method 8270C SIM because of their elevated concentrations for sample OW-14.

The LCSD had elevated recoveries for the "S" flagged compounds.

Method 8015D DRO/MRO: The LCS had elevated recovery. The LCSD had elevated recovery due to sample carryover.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

The trip blank sample was received but was not included on the CoC. The laboratory logged in the sample and performed the appropriate volatile analysis. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-14	Dissolved and Total Barium	5
8015D	OW-30	TPH DRO and MRO	10
8015D	OW-14	TPH GRO	50
8260B	OW-14	Select VOCs	50
8260B	OW-30	MTBE	50
8260B	OW-14	Benzene	500

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 5.6°C and 9.1°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.6°C as noted on the CoC.

The cooler temperatures above 6°C were evaluated to be acceptable since the samples were received at the laboratory on the same day (within 24 hours) of the last sample collection time, and temperature equilibrium had not been established.

The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**70537**	**0.0055 mg/L**
8015D	**TPH DRO**	**70553**	**0.045 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70537	Not Prepared
200.7	Dissolved Metals	A91612	Not Prepared
200.7	Dissolved Metals	C91551	EB-9-30-22
200.8	Total Metals	70537	Not Prepared
200.8	Dissolved Metals	A91522	OW-30, DUP-9-30-22
245.1	Total and Dissolved Mercury	70628	OW-14
504.1	EDB	70550	MW-4
504.1	EDB	70551	Not Prepared
4500CN E	Cyanide	WG1937600	Not Associated, EB-9-30-22
4500CN E	Cyanide	WG1937792	Not Associated
8015D	TPH DRO and MRO	70553	Not Prepared
8015D	TPH GRO	R91497	MW-4
8260B	VOCs	R91600	Not Prepared
8270C SIM	SVOCs	70583	Not Prepared
8270C	SVOCs	70583	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Chromium**	**70537**	**152%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Beryllium**	**C91551**	**67.2%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Zinc**	**C91551**	**137%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**70553**	**88.5%**	**537%**	**31.7-75.4%**	**143%**	**20%**
8270C SIM	**Naphthalene**	**70583**	**Acceptable**	**84.0%**	**15-78.3%**	**Acceptable**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**70583**	**Acceptable**	**85.0%**	**15-79.6%**	**Acceptable**	**31.4%**
8270C SIM	2-Methylnaphthalene	70583	Acceptable	85.0%	15-78.6%	Acceptable	30.5%
8270C SIM	**Fluorene**	**70583**	**Acceptable**	**96.0%**	**15-96%**	**Acceptable**	**25.1%**
8270C SIM	**Anthracene**	**70583**	**Acceptable**	**Acceptable**	**21.1-106%**	**18.0%**	**14.4%**
8270C SIM	**Fluoranthene**	**70583**	**Acceptable**	**Acceptable**	**32.8-119%**	**18.7%**	**14.8%**
8270C SIM	**Pyrene**	**70583**	**Acceptable**	**Acceptable**	**34.1-110%**	**19.2%**	**19.2%**
8270C SIM	**Indeno(1,2,3-cd)pyrene**	**70583**	**Acceptable**	**Acceptable**	**24.7-152%**	**22.4%**	**21.3%**

Target analytes with LCS and/or LCSD recoveries greater than the data validation and/or laboratory QC limits were qualified as J+ if detected in the associated samples due to evidence of potential high bias. Non-detection of these analytes in the associated samples did not require qualification.

Dissolved beryllium was not detected in the associated samples and the results were qualified as UJ due to evidence of potential low bias,

The analytes with LCS/LCSD RPD values that were greater than the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	**BFB**	**SMW-2**	**1,020%**	**70-130%**
8015D	**BFB**	**OW-59**	**6,210%**	**70-130%**

TPH GRO was detected in the Method 8015D analyses of samples SMW-2 and OW-59, and these results were assigned J+ qualifiers to indicate potential high bias.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C analysis of samples SMW-2 and OW-30, and qualification of sample data was not required**.**

The TPH DRO and TPH MRO results for sample OW-30 were not qualified based on the surrogate non-conformances in the Method 8015D analysis since the applied dilution of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-9-30-22, and one equipment blank sample, EB-9-30-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Total Xylenes**	**0.47 µg/L**
FB-9-30-22	8260B	Total Xylenes	0.47 µg/L
EB-9-30-22	**8260B**	**Acetone**	**7.0 µg/L**
EB-9-30-22	8260B	Total Xylenes	0.43 µg/L
EB-9-30-22	**200.7**	**Dissolved Zinc**	**0.0062 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples detection did not require qualification.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-30-22 was collected as a field duplicate of sample MW-4.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 73.2%. The dissolved zinc results for samples MW-4 and DUP-9-30-22 were assigned J qualifiers due to evidence of poor precision.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batches WG1937600 and WG1937792 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MW-4	Mercury	ND	0.000098
MW-4	Arsenic	0.00068	0.00072
SMW-2	Arsenic	0.0019	0.0021
OW-59	Nickel	0.031	0.040
OW-14	Nickel	0.067	0.078
OW-30	Nickel	0.075	0.081
SMW-2	Silver	0.0057	0.0078
OW-59	Silver	0.0023	0.0048
OW-14	Silver	ND	0.0014
EB-9-30-22	Zinc	ND	0.0062
MW-4	Zinc	ND	0.026
SMW-2	Zinc	ND	0.020
OW-59	Zinc	0.0091	0.014
OW-14	Zinc	ND	0.0092
OW-30	Zinc	ND	0.016
DUP-9-30-22	Zinc	ND	0.056

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: MW-4 Field Duplicate Sample ID: DUP-9-30-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.021 mg/L	0.018 mg/L	15.4%
Barium, Total	E 200.7	0.021 mg/L	0.021 mg/L	0.0%
Chromium, Total	E 200.7	0.0036 mg/L	ND (0.0060 mg/L)	DL
Zinc, Dissolved	**E 200.7**	**0.026 mg/L**	**0.056 mg/L**	**73.2%**
Arsenic, Dissolved	E200.8	0.00072 mg/L	0.00073 mg/L	1.4% +/-RL
Arsenic, Total	E200.8	0.00068 mg/L	0.00078 mg/L	13.7% +/-RL
Mercury, Dissolved	E245.1	0.000098 mg/L	ND (0.00020 mg/L)	DL
TPH DRO	SW8015	0.020 mg/L	0.022 mg/L	9.5% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD value for dissolved zinc exceeded the data validation limit of 30% at 73.2%, which was evidence of poor precision. The dissolved zinc results were qualified as J for samples MW-4 and DUP-9-30-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	SMW-2	2209H72-003a	0.21	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-59	2209H72-004a	0.27	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-30	2209H72-006a	0.23	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-30	2209h72-006c	0.72	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-14	2209H72-005C	20	5.0	µg/L	J+	HR-LCS
Acetone	SW8260B	OW-30	2209H72-006a	3.2	10	µg/L	U	EBD, MDLRL
Acetone	SW8260B	EB-9-30-22	2209H72-001a	7.0	10	µg/L	J	MDLRL
Anthracene	SW8270C	OW-14	2209h72-005c	0.68	0.30	µg/L	J	ERPD-LCS
Anthracene	SW8270C	EB-9-30-22	2209h72-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	MW-4	2209h72-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	SMW-2	2209h72-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	OW-59	2209h72-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	DUP-9-30-22	2209h72-007c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Anthracene	SW8270C	OW-30	2209h72-006c	0.22	0.30	µg/L	J	ERPD-LCS, MDLRL
Arsenic, Dissolved	E200.8	MW-4	2209H72-002E	0.00072	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-30	2209H72-006E	0.00076	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-9-30-22	2209H72-007E	0.00073	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MW-4	2209H72-002D	0.00068	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-30	2209H72-006D	0.00092	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-9-30-22	2209H72-007D	0.00078	0.0010	mg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	EB-9-30-22	2209H72-001E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	MW-4	2209H72-002E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	SMW-2	2209H72-003E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	OW-59	2209H72-004E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	OW-14	2209H72-005E	ND	0.0020	mg/L	UJ	LR-LCS
Beryllium, Dissolved	E 200.7	OW-30	2209H72-006E	ND	0.0020	mg/L	UJ	LR-LCS
Bis(2-ethylhexyl)phthalate	SW8270C	OW-30	2209H72-006C	8.6	10	µg/L	J	MDLRL
Chromium, Total	E 200.7	SMW-2	2209H72-003D	0.022	0.0060	mg/L	J+	HR-LCS
Chromium, Total	E 200.7	MW-4	2209H72-002D	0.0036	0.0060	mg/L	J+	HR-LCS, MDLRL
Cobalt, Dissolved	E 200.7	OW-30	2209H72-006E	0.0025	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-30	2209H72-006D	0.0057	0.0060	mg/L	J	MDLRL
Fluoranthene	SW8270C	EB-9-30-22	2209h72-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	MW-4	2209h72-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	SMW-2	2209h72-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	OW-59	2209h72-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	OW-14	2209h72-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	OW-30	2209h72-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluoranthene	SW8270C	DUP-9-30-22	2209h72-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-14	2209h72-005c	0.78	0.30	µg/L	J+	HR-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	EB-9-30-22	2209h72-001c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Indeno(1,2,3-cd)pyrene	SW8270C	MW-4	2209h72-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	SMW-2	2209h72-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-59	2209h72-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-14	2209h72-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	OW-30	2209h72-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Indeno(1,2,3-cd)pyrene	SW8270C	DUP-9-30-22	2209h72-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	SMW-2	2209H72-003a	0.27	1.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-14	2209H72-005a	26	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	SMW-2	2209H72-003E	0.000058	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-30	2209H72-006E	0.00044	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	MW-4	2209H72-002E	0.000098	0.00020	mg/L	J	MDLRL
Naphthalene	SW8270C	OW-14	2209h72-005c	15	0.30	µg/L	J+	HR-LCS
n-Butylbenzene	SW8260B	OW-14	2209H72-005a	16	150	µg/L	J	MDLRL
Pyrene	SW8270C	EB-9-30-22	2209h72-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MW-4	2209h72-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	SMW-2	2209h72-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-59	2209h72-004c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-14	2209h72-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-30	2209h72-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-9-30-22	2209h72-007c	ND	1.0	µg/L	UJ	ERPD-LCS
sec-Butylbenzene	SW8260B	SMW-2	2209H72-003a	0.2	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-59	2209H72-004a	0.23	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-14	2209H72-005a	11	50	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	OW-30	2209H72-006a	0.21	1.0	µg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-59	2209H72-004E	0.0048	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-14	2209H72-005E	0.0014	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	OW-59	2209H72-004D	0.0023	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	EB-9-30-22	2209H72-001C	ND	0.064	mg/L	UJ	ERPD-LCS
TPH DRO	SW8015	OW-14	2209H72-005C	3.1	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-30	2209H72-006C	7.9	0.64	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	SMW-2	2209H72-003C	0.34	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	OW-59	2209H72-004C	0.39	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	MW-4	2209H72-002C	0.020	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	DUP-9-30-22	2209H72-007C	0.022	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	SMW-2	2209h72-003a	0.11	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-59	2209h72-004a	0.28	0.050	mg/L	J+	HR-SUR
Vanadium, Dissolved	E 200.7	OW-59	2209H72-004E	0.0029	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-59	2209H72-004D	0.014	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-30	2209H72-006D	0.0048	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	Trip Blank	2209H72-009a	0.47	1.5	µg/L	J	MDLRL
Xylenes, Total	SW8260B	EB-9-30-22	2209H72-001a	0.43	1.5	µg/L	U	MDLRL, TBD
Xylenes, Total	SW8260B	FB-9-30-22	2209H72-008a	0.47	1.5	µg/L	U	MDLRL, TBD
Zinc, Dissolved	E 200.7	SMW-2	2209H72-003E	0.020	0.010	mg/L	JB	EBD, HR-LCS
Zinc, Dissolved	E 200.7	OW-59	2209H72-004E	0.014	0.010	mg/L	JB	EBD, HR-LCS
Zinc, Dissolved	E 200.7	OW-30	2209H72-006E	0.016	0.010	mg/L	JB	EBD, HR-LCS
Zinc, Dissolved	E 200.7	EB-9-30-22	2209H72-001E	0.0062	0.010	mg/L	U	EBD, HR-LCS, MDLRL
Zinc, Dissolved	E 200.7	OW-14	2209H72-005E	0.0092	0.010	mg/L	U	EBD, HR-LCS, MDLRL
Zinc, Dissolved	E 200.7	MW-4	2209H72-002E	0.026	0.010	mg/L	JB	EBD, ERPD-FD, HR-LCS
Zinc, Dissolved	E 200.7	DUP-9-30-22	2209H72-007E	0.056	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Total	E 200.7	OW-59	2209H72-004D	0.0091	0.010	mg/L	U	MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/07/2022
Date Validated: 01/17/2023	Sample End Date: 09/07/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209349	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-9-7-22	2209349-001
OW-50	2209349-002
OW-52	2209349-003
OW-29	2209349-004
OW-54	2209349-005
OW-66	2209349-006
OW-55	2209349-007
OW-13	2209349-008
OW-56	2209349-009
FB-9-7-22	2209349-010
DUP-9-7-22	2209349-011
Trip Blank	2209349-012

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 808 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: 1-methylnaphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIMs because of its elevated concentration for sample OW-55.

Naphthalene and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for sample OW-66.

Method 8015D DRO: The LCS/LCSD had slightly elevated recoveries.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

J – The identification of the analyte is acceptable; the reported value is an estimate.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-66	Total and Dissolved Barium	5
200.8	OW-54, OW-66	Total Lead	5
8015D	OW-66, OW-55	TPH DRO and MRO	5
8260B	OW-54	Select VOCs	5
8015D	OW-66, OW-55	TPH GRO	50
8260B	OW-54	MTBE	50
8260B	OW-66, OW-55	Select VOCs	50
8260B	OW-29	MTBE	100
8260B	OW-66	Benzene, Toluene	500
8260B	OW-55	Benzene	500

VALIDATION CRITERIA CHECKLIST

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? — No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

6. Were samples received in good condition within method-specified requirements? — No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.3°C and 2.9°C as noted on the Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.9°C as noted on the CoC.

The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? — Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. — Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? — No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? — N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? — Yes

Comments: The number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? — No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**70055**	**0.0040 mg/L**
8015D	**TPH DRO**	**70050**	**0.031 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentrations did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70055	EB-9-7-22
200.7	Dissolved Metals	B91088	OW-50
200.8	Total Metals	70055	Not Prepared
200.8	Dissolved Metals	A91030	EB-9-7-22, OW-50
245.1	Total and Dissolved Mercury	70231	DUP-9-7-22
504.1	EDB	70123	Not Prepared
4500CN E	Cyanide	WG1925221	Not Associated, OW-50
4500CN E	Cyanide	WG1925290	DUP-9-7-22, Not Associated
8015D	TPH DRO and MRO	70050	Not Prepared
8015D	TPH GRO	R90998	Not Prepared
8260B	VOCs	R91002	OW-50
8260B	VOCs	R91045	Not Prepared
8270C SIM	SVOCs	70053	Not Prepared
8270C	SVOCs	70053	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

The MS and MSD recoveries for cyanide in Method 4500CN E batch WG1925221 were outside the laboratory QC limits of 90.0-110% at 78.6% and 79.7%, respectively. However, the recoveries were within data validation limits of 75-125%. Validation action was not required.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Barium**	**70055**	**51.0%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Nickel**	**70055**	**142%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Zinc**	**70055**	**140%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Selenium**	**70055**	**135%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**70050**	**91.6%**	**84.5%**	**31.7-75.4%**	**Acceptable**	**20%**
8270C	**Pyrene**	**70053**	**Acceptable**	**Acceptable**	**61-123%**	**15.7%**	**11.8%**
8270C SIM	**Naphthalene**	**70053**	**Acceptable**	**Acceptable**	**21.3-79.9%**	**63.4%**	**25.6%**
8270C SIM	**1-Methylnaphthalene**	**70053**	**Acceptable**	**Acceptable**	**22.2-80.3%**	**64.9%**	**25%**
8270C SIM	**2-Methylnaphthalene**	**70053**	**Acceptable**	**Acceptable**	**20.6-80.1%**	**68.4%**	**25%**
8270C SIM	**Acenaphthene**	**70053**	**Acceptable**	**Acceptable**	**29.8-82.7%**	**51.7%**	**27.8%**
8270C SIM	**Fluorene**	**70053**	**Acceptable**	**Acceptable**	**33.3-86%**	**32.7%**	**26.4%**

Total barium was detected in associated samples in Method 200.7 batch 70055 and the results were assigned J- qualifiers due to evidence of potential low bias. Total barium was not detected in associated sample EB-9-7-22 and the result was assigned a UJ qualifier.

The target analytes total nickel, total selenium, total zinc, and TPH DRO were detected in associated samples, and the results were qualified as J+ based on the evidence of potential high bias. Non-detections of these analytes in the associated samples did not require qualification based on the evidence of potential high bias.

The analytes with LCS/LCSD RPD values that were above the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

The recovery of the Method 8015D surrogate BFB for sample OW-56 was outside the laboratory acceptance range of 70-130% at 951%. TPH GRO was detected in the analysis of sample OW-56, and this result was qualified as J+ to indicate a potential high bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of samples OW-29, OW-54, OW-66, OW-55, OW-13, OW-56, and DUP-9-7-22 and for the Method 8270C analysis of sample OW-66, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-9-7-22, and one equipment blank sample, EB-9-7-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB-9-7-22	**8260B**	**2-Butanone**	**6.8 µg/L**
EB-9-7-22	8260B	2-Butanone	22 µg/L
EB-9-7-22	8260B	Acetone	18 µg/L
EB-9-7-22	**8015D**	**TPH DRO**	**0.64 mg/L**
EB-9-7-22	**8015D**	**TPH MRO**	**0.91 mg/L**
EB-9-7-22	200.7	Dissolved Chromium	0.0025 mg/L
EB-9-7-22	**200.7**	**Dissolved Zinc**	**0.0046 mg/L**
EB-9-7-22	200.7	Total Zinc	0.0062 mg/L
EB-9-7-22	**245.1**	**Dissolved Mercury**	**0.00019 mg/L**
EB-9-7-22	**245.1**	**Total Mercury**	**0.00018 mg/L**

Detections of TPH DRO, TPH MRO, dissolved mercury, and total mercury in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of 2-butanone, dissolved zinc, and total mercury in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The total zinc results in Method 200.7 batch 70055 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-7-22 was collected as a field duplicate of sample OW-52.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 70.3%. The dissolved zinc results for samples OW-52 and DUP-9-7-22 were assigned J qualifiers due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for these analyses and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
4500CN E	Cyanide	WG1925221	Not Associated, EB-9-7-22
4500CN E	Cyanide	WG1925200	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD for the laboratory duplicate prepared from a project sample was not applicable since the result for both measurements were non-detections for cyanide and an RPD could not be calculated.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP-9-7-22	Mercury	0.00015	0.00017
EB-9-7-22	Mercury	0.00018	0.00019
OW-29	Mercury	0.00016	0.00017
OW-50	Barium	0.047	0.052
OW-29	Barium	0.075	0.078
OW-13	Barium	0.019	0.021
EB-9-7-22	Chromium	ND	0.0025
OW-29	Nickel	0.023	0.027
OW-54	Nickel	0.21	0.23
OW-66	Nickel	0.30	0.33
OW-55	Nickel	0.22	0.23
OW-56	Nickel	0.064	0.065
OW-29	Silver	ND	0.0016
OW-54	Silver	ND	0.0019
OW-55	Silver	ND	0.0019
OW-29	Vanadium	ND	0.0017
OW-13	Vanadium	ND	0.0031

VALIDATION CRITERIA CHECKLIST

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP-9-7-22	Zinc	ND	0.025
OW-50	Zinc	ND	0.044
OW-52	Zinc	ND	0.012
OW-29	Zinc	ND	0.030
OW-66	Zinc	0.0078	0.010
OW-13	Zinc	ND	0.031
OW-56	Zinc	0.0093	0.012

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-52 Field Duplicate Sample ID: DUP-9-7-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.029 mg/L	0.032 mg/L	9.8%
Barium, Total	E 200.7	0.038 mg/L	0.036 mg/L	5.4%
Chromium, Total	E 200.7	0.0020 mg/L	0.0033 mg/L	49.1% +/-RL
Zinc, Dissolved	**E 200.7**	**0.012 mg/L**	**0.025 mg/L**	**70.3%**
Arsenic, Dissolved	E200.8	0.00061 mg/L	0.00051 mg/L	17.9% +/-RL
Arsenic, Total	E200.8	0.00078 mg/L	0.00064 mg/L	19.7% +/-RL
Lead, Dissolved	E200.8	ND (0.00050 mg/L)	0.00013 mg/L	DL
Lead, Total	E200.8	0.00045 mg/L	0.00032 mg/L	33.8% +/-RL
Mercury, Dissolved	E245.1	0.00019 mg/L	0.00017 mg/L	11.1% +/-RL
Mercury, Total	E245.1	0.00019 mg/L	0.00015 mg/L	23.5% +/-RL
TPH DRO	SW8015	0.029 mg/L	0.031 mg/L	6.7% +/-RL
MTBE	SW8260B	4.1 µg/L	4.2 µg/L	2.4%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD value for dissolved zinc exceeded the data validation limit of 30% at 70.3%, which was evidence of poor precision. The dissolved zinc results were qualified as J for samples OW-52 and DUP-9-7-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	OW-54	2209349-005a	2.7	5.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-29	2209349-004a	0.56	1.0	µg/L	J	MDLRL
1,2-Dichloroethane	SW8260B	OW-13	2209349-008a	0.83	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	OW-55	2209349-007a	41	50	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-29	2209349-004c	0.82	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-54	2209349-005c	0.68	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-56	2209349-009c	0.68	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-66	2209349-006c	19	0.30	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-55	2209349-007c	25	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	EB-9-7-22	2209349-001c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-50	2209349-002c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-52	2209349-003c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-29	2209349-004c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1-Methylnaphthalene	SW8270C	OW-54	2209349-005c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-13	2209349-008c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-56	2209349-009c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-9-7-22	2209349-011c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Butanone	SW8260B	EB-9-7-22	2209349-001a	22	10	µg/L	JB	FBD
2-Butanone	SW8260B	FB-9-7-22	2209349-010a	6.8	10	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-66	2209349-006c	40	5.0	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-55	2209349-007c	10	0.30	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	EB-9-7-22	2209349-001c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-50	2209349-002c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-52	2209349-003c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-29	2209349-004c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-54	2209349-005c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-13	2209349-008c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-56	2209349-009c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP-9-7-22	2209349-011c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-55	2209349-007c	0.56	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	EB-9-7-22	2209349-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-50	2209349-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-52	2209349-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-29	2209349-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-54	2209349-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-13	2209349-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-56	2209349-009c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-9-7-22	2209349-011c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	OW-66	2209349-006c	0.24	0.30	µg/L	J	ERPD-LCS, MDLRL
Anthracene	SW8270C	OW-66	2209349-006c	0.20	0.30	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	OW-52	2209349-003E	0.00061	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-29	2209349-004E	0.00055	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-13	2209349-008E	0.00057	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-9-7-22	2209349-011E	0.00051	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-52	2209349-003D	0.00078	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-29	2209349-004D	0.00055	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-13	2209349-008D	0.00063	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-9-7-22	2209349-011D	0.00064	0.0010	mg/L	J	MDLRL
Barium, Total	E 200.7	OW-50	2209349-002D	0.047	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-52	2209349-003D	0.038	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-29	2209349-004D	0.075	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-54	2209349-005D	0.47	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-66	2209349-006D	2.5	0.0150	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-55	2209349-007D	0.69	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-13	2209349-008D	0.019	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	OW-56	2209349-009D	0.41	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	DUP-9-7-22	2209349-011D	0.036	0.0030	mg/L	J-	LR-SUR
Barium, Total	E 200.7	EB-9-7-22	2209349-001D	ND	0.0030	mg/L	UJ	LR-SUR
Benzene	SW8260B	OW-56	2209349-009a	0.88	1.0	µg/L	J	MDLRL
Chromium, Dissolved	E 200.7	EB-9-7-22	2209349-001E	0.0025	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-52	2209349-003D	0.0020	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-56	2209349-009D	0.0049	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP-9-7-22	2209349-011D	0.0033	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	OW-50	2209349-002F	2.3	5.0	µg/L	J	MDLRL
Cyanide, Total	E335.4	OW-29	2209349-004F	4.74	5.0	µg/L	J	MDLRL
Cyanide, Total	E335.4	OW-56	2209349-009F	3.73	5.0	µg/L	J	MDLRL
Fluorene	SW8270C	OW-66	2209349-006c	0.74	0.30	µg/L	J	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluorene	SW8270C	OW-55	2209349-007c	1.6	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	EB-9-7-22	2209349-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-50	2209349-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-52	2209349-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-29	2209349-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-54	2209349-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-13	2209349-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	OW-56	2209349-009c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	DUP-9-7-22	2209349-011c	ND	0.30	µg/L	UJ	ERPD-LCS
Isopropylbenzene	SW8260B	OW-55	2209349-007a	19	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-66	2209349-006E	0.00045	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-56	2209349-009E	0.00041	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-9-7-22	2209349-011E	0.00013	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-50	2209349-002D	0.000078	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-52	2209349-003D	0.00045	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-9-7-22	2209349-011D	0.00032	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-50	2209349-002E	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-52	2209349-003E	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-29	2209349-004E	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-54	2209349-005E	0.00016	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-66	2209349-006E	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-55	2209349-007E	0.00016	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-13	2209349-008E	0.00016	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-56	2209349-009E	0.00015	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	DUP-9-7-22	2209349-011E	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EB-9-7-22	2209349-001E	0.00019	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-54	2209349-005D	0.00022	0.00020	mg/L	JB	EBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Mercury, Total	E245.1	OW-50	2209349-002D	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-52	2209349-003D	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-29	2209349-004D	0.00016	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-66	2209349-006D	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-55	2209349-007D	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-13	2209349-008D	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-56	2209349-009D	0.00016	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	DUP-9-7-22	2209349-011D	0.00015	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	EB-9-7-22	2209349-001D	0.00018	0.00020	mg/L	J	MDLRL
Naphthalene	SW8270C	OW-66	2209349-006c	160	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-55	2209349-007c	19	0.30	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	EB-9-7-22	2209349-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-50	2209349-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-52	2209349-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-29	2209349-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-54	2209349-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-13	2209349-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	OW-56	2209349-009c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP-9-7-22	2209349-011c	ND	0.30	µg/L	UJ	ERPD-LCS
Nickel, Total	E 200.7	OW-29	2209349-004D	0.023	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-54	2209349-005D	0.21	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-66	2209349-006D	0.30	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-55	2209349-007D	0.22	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-56	2209349-009D	0.064	0.010	mg/L	J+	HR-LCS
n-Propylbenzene	SW8260B	OW-55	2209349-007a	41	50	µg/L	J	MDLRL
Pyrene	SW8270C	EB-9-7-22	2209349-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-50	2209349-002c	ND	1.0	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Pyrene	SW8270C	OW-52	2209349-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-29	2209349-004c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-54	2209349-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-66	2209349-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-55	2209349-007c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-13	2209349-008c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-56	2209349-009c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP-9-7-22	2209349-011c	ND	1.0	µg/L	UJ	ERPD-LCS
Selenium, Dissolved	E200.8	OW-66	2209349-006E	0.00045	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	OW-54	2209349-005D	0.0017	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	OW-66	2209349-006D	0.0023	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	OW-55	2209349-007D	0.0015	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	OW-56	2209349-009D	0.0005	0.0010	mg/L	J+	HR-LCS, MDLRL
Silver, Dissolved	E 200.7	OW-29	2209349-004E	0.0016	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-54	2209349-005E	0.0019	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-55	2209349-007E	0.0019	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	EB-9-7-22	2209349-001C	0.64	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-66	2209349-006C	7.1	0.32	mg/L	J+	HR-LCS
TPH DRO	SW8015	OW-54	2209349-005C	2.0	0.064	mg/L	JB	EBD, HR-LCS
TPH DRO	SW8015	OW-55	2209349-007C	4.5	0.32	mg/L	JB	EBD, HR-LCS
TPH DRO	SW8015	OW-29	2209349-004C	0.44	0.064	mg/L	U	EBD, HR-LCS
TPH DRO	SW8015	OW-50	2209349-002C	0.065	0.064	mg/L	U	EBD, HR-LCS, MBD
TPH DRO	SW8015	OW-13	2209349-008C	0.076	0.064	mg/L	U	EBD, HR-LCS, MBD
TPH DRO	SW8015	OW-52	2209349-003C	0.029	0.064	mg/L	U	EBD, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	DUP-9-7-22	2209349-011C	0.031	0.064	mg/L	U	EBD, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	OW-56	2209349-009a	0.27	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	OW-54	2209349-005C	0.12	0.080	mg/L	U	EBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH ORO	SW8015	OW-29	2209349-004C	0.068	0.080	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-29	2209349-004E	0.0017	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-54	2209349-005E	0.0034	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-66	2209349-006E	0.0041	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-55	2209349-007E	0.0052	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-13	2209349-008E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-56	2209349-009E	0.0067	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-54	2209349-005D	0.025	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-66	2209349-006D	0.036	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-55	2209349-007D	0.027	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-56	2209349-009D	0.014	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-50	2209349-002E	0.044	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-29	2209349-004E	0.030	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-54	2209349-005E	0.017	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-66	2209349-006E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-55	2209349-007E	0.014	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-13	2209349-008E	0.031	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-56	2209349-009E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-52	2209349-003E	0.012	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	DUP-9-7-22	2209349-011E	0.025	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	EB-9-7-22	2209349-001E	0.0046	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-54	2209349-005D	0.020	0.010	mg/L	JB	HR-SUR, MBD
Zinc, Total	E 200.7	OW-55	2209349-007D	0.026	0.010	mg/L	JB	HR-SUR, MBD
Zinc, Total	E 200.7	EB-9-7-22	2209349-001D	0.0062	0.010	mg/L	U	HR-SUR, MBD, MDLRL
Zinc, Total	E 200.7	OW-66	2209349-006D	0.0078	0.010	mg/L	U	HR-SUR, MBD, MDLRL
Zinc, Total	E 200.7	OW-56	2209349-009D	0.0093	0.010	mg/L	U	HR-SUR, MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/08/2022
Date Validated: 01/17/2023	Sample End Date: 09/08/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209441	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-08-22	2209441-001
PW-3	2209441-002
PW-4	2209441-003
EAST LDU	2209441-004
WEST LDU	2209441-005
DUP 9-8-22	2209441-006
FB 9-8-22	2209441-007
TRIP BLANK	2209441-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Chromatography (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 450 data points. The data completeness calculation does not include any submitted blank sample results. Fourteen data points were rejected. The data completeness measure for this data package is calculated to be 96.89% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: The recovery for chrysene was low in the LCS/LCSD. This compound is reported in both the 8270 SIM method and the standard 8270 method and is non-detect.

The recovery for 1,4-dioxane was low in the LCSD.

The "S" flagged surrogates for samples "East LDU" and "West LDU" were low due to the emulsive nature of the sample.

Method 8015D DRO: The LCS/LCSD had elevated recoveries.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated value. **Multiple analytes were flagged by the laboratory with the E flag. These results were assigned J qualifiers if detected, and non-detections were assigned UJ due to this lab identified non-conformance.** *The application of this laboratory flag to QC sample results in the laboratory report did not require qualification.*

J – Analyte detected below quantitation limits.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	East LDU	Total and Dissolved Chromium	5
200.7	East LDU	Total and Dissolved Nickel	5
200.7	West LDU	Dissolved Nickel	5

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures within the recommended temperature range of 4°C ± 2°C at 2.4°C and 3.8°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.4°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Barium**	**70092**	**0.0018 mg/L**
200.8	Total Antimony	70092	0.00063 mg/L
200.8	**Total Lead**	**70092**	**0.00040 mg/L**
8015D	**TPH DRO**	**70105**	**0.052 mg/L**

Detections of total lead and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total barium and total lead in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70092	DUP 9-8-22
200.7	Dissolved Metals	B91088	Not Prepared
200.8	Total Metals	70092	Not Prepared
200.8	Dissolved Metals	A91030	Not Prepared
200.8	Dissolved Selenium	A91078	Not Prepared
200.8	Dissolved Metals	B91030	DUP 9-8-22
245.1	Total and Dissolved Mercury	70232	Not Prepared
504.1	EDB	70123	PW-3
504.1	EDB	70173	Not Prepared
4500CN E	Cyanide	WG1925290	Not Associated, PW-3
8015D	TPH DRO and MRO	70105	Not Prepared
8015D	TPH GRO	R90998	Not Prepared
8260B	VOCs	R90977	PW-3
8270C SIM	SVOCs	70094	Not Prepared
8270C	SVOCs	70094	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.8	Total Antimony	70092	144%	-----	70-130%	-----	-----
8015D	**TPH DRO**	**70105**	**81.4%**	**120%**	**31.7-75.4%**	**38.5%**	**20%**
8270C	**Pyrene**	**70094**	**Acceptable**	**Acceptable**	**61-123%**	**32.8%**	**11.8%**
8270C SIM	**1,4-Dioxane**	**70094**	**Acceptable**	**20.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
8270C SIM	**Chrysene**	**70094**	**51.0%**	**48.0%**	**55.3-115%**	**Acceptable**	**20%**

Total antimony was not detected in the associated samples in Method 200.8 batch 70092 and qualification of the results was not required based on the evidence of potential high bias.

The target analyte TPH DRO was detected in associated samples, and the results were qualified as J+ based on the evidence of potential high bias.

The analytes with LCS/LCSD RPD values that exceeded the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

Non-detections of 1,4-dioxane and chrysene were qualified as UJ, and the detections of 1,4-dioxane in samples East LDU and West LDU were qualified as J-, due to evidence of low bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	**BFB**	**East LDU**	**166%**	**70-130%**
8270C	**2-Fluorophenol**	**East LDU**	**0.745%**	**15-84.5%**
8270C	**Phenol-d_5**	**East LDU**	**2.53%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**East LDU**	**4.59%**	**15-108%**
8270C	**2-Fluorophenol**	**West LDU**	**1.54%**	**15-84.5%**
8270C	**Phenol-d_5**	**West LDU**	**0.0%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**West LDU**	**5.29%**	**15-108%**
8270C-SIM	4-Terphenyl-d_{14}	EB-09-08-22	62.3%	72-147%
8270C-SIM	4-Terphenyl-d_{14}	PW-3	63.6%	72-147%
8270C-SIM	4-Terphenyl-d_{14}	PW-4	65.7%	72-147%
8270C-SIM	4-Terphenyl-d_{14}	EAST LDU	53.5%	72-147%
8270C-SIM	4-Terphenyl-d_{14}	WEST LDU	55.8%	72-147%
8270C-SIM	4-Terphenyl-d_{14}	DUP 9-8-22	45.9%	72-147%

TPH GRO was detected in the Method 8015D analysis of sample East LDU, and this result was qualified as J+ to indicate a potential high bias.

The associated analytes in the acid fraction of samples East LDU and West LDU were not detected. Since these surrogates recovered at less than 10%, these associated results were qualified as R indicating rejected results, data not usable due to evidence of extreme low bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same

VALIDATION CRITERIA CHECKLIST

fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of samples EB-09-08-22, PW-3, PW-4, East LDU, West LDU, and DUP 9-8-22, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, TRIP BLANK, one field blank sample, FB 9-8-22, and one equipment blank sample, EB-9-8-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
TRIP BLANK	**8260B**	**Methylene Chloride**	**4.8 µg/L**
FB 9-8-22	**8260B**	**2-Butanone**	**29 µg/L**
FB 9-8-22	**8260B**	**Acetone**	**20 µg/L**
EB-9-8-22	**8260B**	**Dissolved Zinc**	**0.0067 mg/L**
EB-9-8-22	**245.1**	**Dissolved Mercury**	**0.00012 mg/L**
EB-9-8-22	**245.1**	**Total Mercury**	**0.00017 mg/L**
EB-9-8-22	8015D	TPH DRO	0.058 mg/L
EB-9-8-22	8260B	Acetone	8.3 µg/L

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples and results greater than 10 times the blank detection did not require qualification.

The TPH DRO results for the samples in batch 70105 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP 9-8-22 was collected as a field duplicate of sample PW-3.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1925290 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: The target analyte chrysene was reported by both Method 8270C and Method 8270C SIM. This analyte was reported as not detected by both methods.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
DUP 9-8-22	Mercury	0.00015	0.00018
East LDU	Arsenic	ND	0.00079
PW-3	Barium	0.010	0.011
East LDU	Beryllium	0.0014	0.0020
West LDU	Beryllium	ND	0.0013
East LDU	Cobalt	0.027	0.028
East LDU	Nickel	2.4	2.5
West LDU	Nickel	0.99	1.1
PW-3	Selenium	0.00077	0.0010
East LDU	Selenium	ND	0.00045
West LDU	Selenium	ND	0.00070
PW-3	Silver	0.0019	0.0058
PW-4	Silver	ND	0.0037
DUP 9-8-22	Silver	ND	0.0056
PW-3	Vanadium	ND	0.0024
PW-4	Vanadium	ND	0.0024
DUP 9-8-22	Vanadium	ND	0.0026
EB-09-08-22	Zinc	ND	0.0067
PW-3	Zinc	0.0087	0.021
PW-4	Zinc	ND	0.042
DUP 9-8-22	Zinc	ND	0.016

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: PW-3 Field Duplicate Sample ID: DUP 9-8-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.011 mg/L	0.01 mg/L	9.5%
Barium, Total	E 200.7	0.010 mg/L	0.011 mg/L	9.5%
Cobalt, Total	E 200.7	0.013 mg/L	0.013 mg/L	0.0%
Silver, Dissolved	E 200.7	0.0058 mg/L	0.0056 mg/L	3.5% +/-RL
Silver, Total	E 200.7	0.0019 mg/L	ND (0.0050 mg/L)	DL
Vanadium, Dissolved	E 200.7	0.0024 mg/L	0.0026 mg/L	8.0% +/-RL
Zinc, Dissolved	E 200.7	0.021 mg/L	0.016 mg/L	27.0%
Zinc, Total	E 200.7	0.0087 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00013 mg/L	0.00024 mg/L	59.5% +/-RL
Arsenic, Total	E200.8	0.0038 mg/L	0.0041 mg/L	7.6%
Lead, Total	E200.8	0.00007 mg/L	0.00013 mg/L	60.0% +/-RL
Selenium, Dissolved	E200.8	0.0010 mg/L	0.00071 mg/L	33.9% +/-RL
Selenium, Total	E200.8	0.00077 mg/L	0.0012 mg/L	43.7% +/-RL
Mercury, Dissolved	E245.1	0.00017 mg/L	0.00018 mg/L	5.7% +/-RL
Mercury, Total	E245.1	0.00018 mg/L	0.00015 mg/L	18.2% +/-RL
TPH DRO	SW8015	0.058 mg/L	0.047 mg/L	21.0% +/-RL
Acetone	SW8260B	7.9 µg/L	7.1 µg/L	10.7% +/-RL
Methylene Chloride	SW8260B	ND (3.0 µg/L)	2.6 µg/L	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBL	Flagged as estimated by the laboratory.
MBD	Method blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
FBD	Field blank detection
EBD	Equipment blank detection
TBD	Trip blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,3,5-Trimethylbenzene	SW8260B	WEST LDU	2209441-005a	0.61	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	WEST LDU	2209441-005c	7.1	1.0	µg/L	J-	EBL, LR-LCS
1,4-Dioxane	SW8270C	EB-09-08-22	2209441-001c	ND	1.0	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	PW-3	2209441-002c	ND	1.0	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	PW-4	2209441-003c	ND	1.0	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	DUP 9-8-22	2209441-006c	ND	1.0	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	EAST LDU	2209441-004c	0.34	1.0	µg/L	J-	EBL, LR-LCS, MDLRL
2,4,6-Trichlorophenol	SW8270C	EAST LDU	2209441-004C	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	WEST LDU	2209441-005C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	EAST LDU	2209441-004C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	WEST LDU	2209441-005C	ND	10	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dinitrophenol	SW8270C	EAST LDU	2209441-004C	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	WEST LDU	2209441-005C	ND	20	µg/L	R	LR-SUR
2-Butanone	SW8260B	EAST LDU	2209441-004a	8.2	10	µg/L	U	FBD, MDLRL
2-Methylphenol	SW8270C	EAST LDU	2209441-004C	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	WEST LDU	2209441-005C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	EAST LDU	2209441-004C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	WEST LDU	2209441-005C	ND	10	µg/L	R	LR-SUR
Acetone	SW8260B	EAST LDU	2209441-004a	56	10	µg/L	JB	FBD
Acetone	SW8260B	WEST LDU	2209441-005a	10	10	µg/L	U	FBD
Acetone	SW8260B	EB-09-08-22	2209441-001a	8.3	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	PW-3	2209441-002a	7.9	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	PW-4	2209441-003a	9.9	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	DUP 9-8-22	2209441-006a	7.1	10	µg/L	U	FBD, MDLRL
Arsenic, Dissolved	E200.8	PW-3	2209441-002E	0.00013	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	EAST LDU	2209441-004E	0.00079	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	WEST LDU	2209441-005E	0.00059	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP 9-8-22	2209441-006E	0.00024	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	WEST LDU	2209441-005D	0.00074	0.0010	mg/L	J	MDLRL
Barium, Total	E 200.7	PW-3	2209441-002D	0.010	0.0030	mg/L	JB	MBD
Barium, Total	E 200.7	PW-4	2209441-003D	0.013	0.0030	mg/L	JB	MBD
Barium, Total	E 200.7	DUP 9-8-22	2209441-006D	0.011	0.0030	mg/L	JB	MBD
Benzene	SW8260B	WEST LDU	2209441-005a	0.93	1.0	µg/L	J	MDLRL
Benzoic Acid	SW8270C	EAST LDU	2209441-004C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	WEST LDU	2209441-005C	ND	20	µg/L	R	LR-SUR
Beryllium, Dissolved	E 200.7	EAST LDU	2209441-004E	0.0020	0.0020	mg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	WEST LDU	2209441-005E	0.0013	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	EAST LDU	2209441-004D	0.0014	0.0020	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Chrysene	SW8270C	EB-09-08-22	2209441-001c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	PW-3	2209441-002c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	PW-4	2209441-003c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	EAST LDU	2209441-004c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	WEST LDU	2209441-005c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	DUP 9-8-22	2209441-006c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Cobalt, Dissolved	E 200.7	WEST LDU	2209441-005E	0.0031	0.0060	mg/L	J	MDLRL
Ethylbenzene	SW8260B	WEST LDU	2209441-005a	0.69	1.0	µg/L	J	MDLRL
Fluorene	SW8270C	WEST LDU	2209441-005c	0.20	0.30	µg/L	J	MDLRL
Lead, Dissolved	E200.8	WEST LDU	2209441-005E	0.00011	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	WEST LDU	2209441-005D	0.00054	0.00050	mg/L	JB	MBD
Lead, Total	E200.8	PW-3	2209441-002D	0.00007	0.00050	mg/L	U	MBD, MDLRL
Lead, Total	E200.8	DUP 9-8-22	2209441-006D	0.00013	0.00050	mg/L	U	MBD, MDLRL
Mercury, Dissolved	E245.1	PW-3	2209441-002E	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	PW-4	2209441-003E	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EAST LDU	2209441-004E	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	WEST LDU	2209441-005E	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	DUP 9-8-22	2209441-006E	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EB-09-08-22	2209441-001E	0.00012	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	EAST LDU	2209441-004D	0.00023	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	PW-3	2209441-002D	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	PW-4	2209441-003D	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	WEST LDU	2209441-005D	0.00019	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	DUP 9-8-22	2209441-006D	0.00015	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	EB-09-08-22	2209441-001D	0.00017	0.00020	mg/L	J	MDLRL
Methylene Chloride	SW8260B	DUP 9-8-22	2209441-006a	2.6	3.0	µg/L	U	MDLRL, TBD
MTBE	SW8260B	EAST LDU	2209441-004a	0.94	1.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Naphthalene	SW8270C	EAST LDU	2209441-004c	0.24	0.3	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	EAST LDU	2209441-004a	0.89	3.0	µg/L	J	MDLRL
Phenol	SW8270C	EAST LDU	2209441-004C	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	WEST LDU	2209441-005C	ND	20	µg/L	R	LR-SUR
Pyrene	SW8270C	EB-09-08-22	2209441-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	PW-3	2209441-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	PW-4	2209441-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	WEST LDU	2209441-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP 9-8-22	2209441-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	EAST LDU	2209441-004c	0.36	1.0	µg/L	J	ERPD-LCS, MDLRL
sec-Butylbenzene	SW8260B	EAST LDU	2209441-004a	0.89	1.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	EAST LDU	2209441-004E	0.00045	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	WEST LDU	2209441-005E	0.00070	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP 9-8-22	2209441-006E	0.00071	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	PW-3	2209441-002D	0.00077	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	PW-4	2209441-003E	0.0037	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	PW-3	2209441-002D	0.0019	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	EAST LDU	2209441-004C	3.3	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	WEST LDU	2209441-005C	3.0	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	EB-09-08-22	2209441-001C	0.058	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	PW-3	2209441-002C	0.058	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	PW-4	2209441-003C	0.049	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	DUP 9-8-22	2209441-006C	0.047	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	EAST LDU	2209441-004a	0.35	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	EAST LDU	2209441-004C	0.21	0.080	mg/L	J	EBL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH ORO	SW8015	EB-09-08-22	2209441-001C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	PW-3	2209441-002C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	PW-4	2209441-003C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	DUP 9-8-22	2209441-006C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	WEST LDU	2209441-005C	0.073	0.080	mg/L	J	EBL, MDLRL
Vanadium, Dissolved	E 200.7	PW-3	2209441-002E	0.0024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	PW-4	2209441-003E	0.0024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	EAST LDU	2209441-004E	0.011	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	WEST LDU	2209441-005E	0.0052	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP 9-8-22	2209441-006E	0.0026	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	WEST LDU	2209441-005D	0.032	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	PW-3	2209441-002E	0.021	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	PW-4	2209441-003E	0.042	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP 9-8-22	2209441-006E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-09-08-22	2209441-001E	0.0067	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	PW-3	2209441-002D	0.0087	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/09/2022
Date Validated: 01/18/2023	Sample End Date: 09/09/2022

Parameters Included:

- Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B
- 1,2-Dibromoethane (EDB) by EPA Method 504.1
- Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM)
- Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D
- TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified
- Total and Dissolved Metals by EPA Method 200.7 and Method 200.8
- Total and Dissolved Mercury by EPA Method 245.1
- Chemical Oxygen Demand (COD) by EPA Method 410.4
- Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E
- Biochemical Oxygen Demand (BOD) by SM Method 5210B
- E. Coli by SM Method 9223B

Laboratory Project ID: 2209478
Data Validator: Daran O'Hollearn, Lead Project Scientist
Reviewer: Mike Phillips, Senior Chemist

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

Tier II Data Validation Report Summary

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-9-9-22	2209478-001
STP-1 to EP-2	2209478-002
EP-2	2209478-003
FB-9-9-22	2209478-004
DUP 9-9-22	2209478-005
Trip Blank	2209478-006

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 279 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: The recovery for chrysene was low in the LCS/LCSD. This compound is reported in both the 8270 SIM method and the standard 8270 method and is non-detect.

The recovery for 1,4-dioxane was low in the LCSD.

Method 8015D DRO: The LCS/LCSD had elevated recoveries.

Method 5210B: For sample EP-2, the RPD between bottles was greater than 30%.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

E – Estimated value. **Multiple analytes were flagged by the laboratory with the E flag for samples EB-9-9-22, STP-1 to EP-2, EP-2, and DUP 9-9-22. These results were assigned J qualifiers if detected and non-detections were assigned UJ due to this non-conformance. Note that the BOD result for sample STP-1 to EP-2 was reported as >67.56 mg/L in the laboratory report; however, the result could not be reported as >67.56 mg/L in Project Direct due to limitations of the data management system.**

H – Holding times for preparation or analysis exceeded

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD outside of range.

R – RPD between bottles >30%. **This laboratory flag was applied to the BOD result for sample EP-2. This result was assigned a J qualifier to indicate an estimated result due to evidence of poor precision.**

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8270C	STP-1 to EP-2, EP-2, DUP 9-9-22	SVOC	10
8270C SIM	STP-1 to EP-2, EP-2, DUP 9-9-22	SVOC	10
9223B	STP-1 to EP-2, EP-2, DUP 9-9-22	E. Coli	10

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between -0.5°C and 5.8°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.4°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L), milligrams per liter (mg/L), and most probable number per 100 milliliters (MPN/ 100mL), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	Total Barium	70092	0.0018 mg/L
200.8	**Total Antimony**	**70092**	**0.00063 mg/L**
200.8	**Total Lead**	**70092**	**0.00040 mg/L**
8015D	**TPH DRO**	**70105**	**0.052 mg/L**

Detections of total lead and TPH DRO in the associated samples that were less than the blank results and less than the applicable reporting limits were assigned U qualifiers. Detections of total antimony and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70092	Not Prepared
200.7	Dissolved Metals	B91139	EB-9-9-22
200.8	Total Metals	70092	DUP 9-9-22
200.8	Dissolved Metals	B91030	Not Prepared
245.1	Total and Dissolved Mercury	70232	EP-2
410.4	COD	WG1931912	Not Associated
504.1	EDB	70173	Not Prepared
4500CN E	Cyanide	WG1925290	Not Associated
4500CN E	Cyanide	WG1928505	Not Associated
5210B	BOD	70067	Not Prepared
8015D	TPH DRO and MRO	70105	Not Prepared
8015D	TPH GRO	A91113	Not Prepared
8015D	TPH GRO	B91113	DUP 9-9-22
8260B	VOCs	R90977	Not Prepared
8270C SIM	SVOCs	70094	Not Prepared
8270C	SVOCs	70094	Not Prepared
9223B	E.Coli	70088	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Dissolved Barium**	**B91139**	**135%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Antimony**	**70092**	**144%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**70105**	**81.4%**	**120%**	**31.7-75.4%**	**38.5%**	**20%**
8270C	**Pyrene**	**70094**	**Acceptable**	**Acceptable**	**61-123%**	**32.8%**	**11.8%**
8270C SIM	**1,4-Dioxane**	**70094**	**Acceptable**	**20.0%**	**20.2-48.4%**	**Acceptable**	**30.1%**
8270C SIM	**Chrysene**	**70094**	**51.0%**	**48.0%**	**55.3-115%**	**Acceptable**	**20.0%**
5210B	**BOD**	**70067**	**84.3%**	**-----**	**84.6-115.4%**	**-----**	**-----**

The target analytes dissolved barium and total antimony were detected in associated samples, and the results were qualified as J+ based on the evidence of potential high bias. Non-detections of these analytes in the associated samples did not require qualification based on the evidence of potential high bias.

The analytes with LCS/LCSD RPD values that exceeded the QC limit were assigned J qualifiers for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

The target analytes 1,4-dioxane, chrysene, and BOD were not detected in associated samples, and the results were qualified as UJ based on the evidence of potential low bias. Detections of BOD in the associated samples EP-2 and DUP 9-9-22 were qualified as J- due to the evidence of potential low bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of sample EB-9-9-22, and qualification of sample data was not required.

The SVOC results for samples STP-1 to EP-2, EP-2, and DUP 9-9-22 were not qualified based on the surrogate non-conformances in the Method 8270C and Method 8270C SIM analyses since the applied dilution of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

VALIDATION CRITERIA CHECKLIST

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-9-9-22, and one equipment blank sample, EB-9-9-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**6.9 µg/L**
EB-9-9-22	**200.7**	**Dissolved Vanadium**	**0.0019 mg/L**
EB-9-9-22	**200.7**	**Dissolved Zinc**	**0.0065 mg/L**
EB-9-9-22	**245.1**	**Dissolved Mercury**	**0.00018 mg/L**
EB-9-9-22	**245.1**	**Total Mercury**	**0.00019 mg/L**
EB-9-9-22	**410.4**	**COD**	**44.7 mg/L**
EB-9-9-22	8015D	TPH DRO	0.043 mg/L
EB-9-9-22	8260B	Acetone	8.70 µg/L

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of the identified analytes in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 70105 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP 9-9-22 was collected as a field duplicate of sample STP-1 to EP-2.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 51.0%. The dissolved zinc results for samples STP-1 to EP-2 and DUP 9-9-22 were assigned J qualifiers due to evidence of poor precision.

An RPD value could not be calculated for BOD for the field duplicate pair STP-1 to EP-2 and DUP 9-9-22 since the analyte was detected in the duplicate sample and the concentration was uncertain in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, BOD was qualified as J for both the duplicate and parent samples.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for these analyses, and the laboratory duplicate sample sources are summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
410.4	COD	WG1931912	EB 9-9-22, Not Associated
4500CN E	Cyanide	WG1925290	Not Associated
4500CN E	Cyanide	WG1928505	EP-2, Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPDs for laboratory duplicates prepared from project samples were within laboratory acceptance limits or were not applicable since the results for one or both measurements were within 5 times the reporting limit.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: The target analyte chrysene was reported by both Method 8270C and Method 8270C SIM. This analyte was reported as not detected by both methods.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
STP-1 to EP-2	Antimony	ND	0.00065
DUP 9-9-22	Antimony	ND	0.00058
EP-2	Nickel	0.037	0.038
EP-2	Selenium	0.0011	0.0016
STP-1 to EP-2	Silver	0.0022	0.0051
EP-2	Silver	0.0042	0.010
DUP 9-9-22	Silver	0.0020	0.0055
EB-9-9-22	Vanadium	ND	0.0019
STP-1 to EP-2	Vanadium	ND	0.0043
EP-2	Vanadium	ND	0.0068
DUP 9-9-22	Vanadium	ND	0.0037
EB-9-9-22	Zinc	ND	0.0065
STP-1 to EP-2	Zinc	0.022	0.032
EP-2	Zinc	ND	0.0059

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: STP-1 to EP-2 Field Duplicate Sample ID: DUP 9-9-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.024 mg/L	0.025 mg/L	4.1%
Barium, Total	E 200.7	0.032 mg/L	0.03 mg/L	6.5%
Cobalt, Total	E 200.7	0.013 mg/L	0.012 mg/L	8.0%
Silver, Dissolved	E 200.7	0.0051 mg/L	0.0055 mg/L	7.5% +/-RL
Silver, Total	E 200.7	0.0022 mg/L	0.0020 mg/L	9.5% +/-RL
Vanadium, Dissolved	E 200.7	0.0043 mg/L	0.0037 mg/L	15.0% +/-RL
Zinc, Dissolved	**E 200.7**	**0.032 mg/L**	**0.019 mg/L**	**51.0%**
Zinc, Total	E 200.7	0.022 mg/L	0.025 mg/L	12.8%
Antimony, Dissolved	E200.8	0.00065 mg/L	0.00058 mg/L	11.4% +/-RL
Arsenic, Dissolved	E200.8	0.0021 mg/L	0.0023 mg/L	9.1%
Arsenic, Total	E200.8	0.0025 mg/L	0.0025 mg/L	0.0%
Lead, Total	E200.8	0.00015 mg/L	0.00016 mg/L	6.5% +/-RL
Selenium, Dissolved	E200.8	0.0011 mg/L	0.0013 mg/L	16.7% +/-RL
Selenium, Total	E200.8	0.0011 mg/L	0.0018 mg/L	48.3% +/-RL
Mercury, Dissolved	E245.1	0.00018 mg/L	0.00018 mg/L	0.0% +/-RL
Mercury, Total	E245.1	0.00022 mg/L	0.00024 mg/L	8.7% +/-RL
COD	410.4	190 mg/L	181 mg/L	4.9%
BOD	**SM 5210 B**	**>67.56 (2.0 mg/L)**	**47 mg/L**	**DL**
TPH DRO	SW8015	0.18 mg/L	0.20 mg/L	10.5%
TPH ORO	SW8015	0.11 mg/L	0.13 mg/L	16.7% +/-RL
Acetone	SW8260B	8.7 µg/L	7.0 µg/L	21.7% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for dissolved zinc exceeded the data validation limit of 30% at 51.0%, which was evidence of poor precision. The dissolved zinc results were qualified as J for samples STP-1 to EP-2 and DUP 9-9-22.

An RPD value could not be calculated for BOD for the field duplicate pair STP-1 to EP-2 and DUP 9-9-22 since the analyte was detected in the duplicate sample and the concentration was uncertain in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, BOD was qualified as J for both the duplicate and parent samples.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
EBL	Flagged as estimated by the laboratory.
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
OTHER	Other
TBD	Trip blank detection

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	EB-9-9-22	2209478-001c	ND	1.0	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	STP-1 to EP-2	2209478-002c	ND	10	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	EP-2	2209478-003c	ND	10	µg/L	UJ	EBL, LR-LCS
1,4-Dioxane	SW8270C	DUP 9-9-22	2209478-005c	ND	10	µg/L	UJ	EBL, LR-LCS
Acetone	SW8260B	EP-2	2209478-003a	15	10	µg/L	JB	TBD
Acetone	SW8260B	Trip Blank	2209478-006a	6.9	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-9-9-22	2209478-001a	8.7	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	STP-1 to EP-2	2209478-002a	8.7	10	µg/L	U	MDLRL, TBD
Acetone	SW8260B	DUP 9-9-22	2209478-005a	7.0	10	µg/L	U	MDLRL, TBD
Antimony, Dissolved	E200.8	STP-1 to EP-2	2209478-002E	0.00065	0.0010	mg/L	J	MDLRL
Antimony, Dissolved	E200.8	DUP 9-9-22	2209478-005E	0.00058	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Antimony, Total	E200.8	EP-2	2209478-003D	0.0018	0.0010	mg/L	JB	HR-LCS, MBD
Barium, Dissolved	E 200.7	STP-1 to EP-2	2209478-002E	0.024	0.0020	mg/L	J+	HR-LCS
Barium, Dissolved	E 200.7	EP-2	2209478-003E	0.14	0.0020	mg/L	J+	HR-LCS
Barium, Dissolved	E 200.7	DUP 9-9-22	2209478-005E	0.025	0.0020	mg/L	J+	HR-LCS
BOD	5210 B	EB-9-9-22	2209478-001H	ND	2.0	mg/L	UJ	LR-LCS
BOD	5210 B	EP-2	2209478-003H	46	2.0	mg/L	J-	OTHER, LR-LCS
BOD	5210 B	DUP 9-9-22	2209478-005H	47	2.0	mg/L	J-	ERPD-FD, LR-LCS
BOD	5210 B	STP-1 to EP-2	2209478-002H	>67.56	2.0	mg/L	J-	EBL, ERPD-FD, LR-LCS
Carbon Disulfide	SW8260B	EP-2	2209478-003a	2.2	10	µg/L	J	MDLRL
COD	410.4	STP-1 to EP-2	2209478-002I	190	20	mg/L	JB	EBD
COD	410.4	DUP 9-9-22	2209478-005I	181	20	mg/L	JB	EBD
Chrysene	SW8270C	EB-9-9-22	2209478-001c	ND	0.30	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	STP-1 to EP-2	2209478-002c	ND	3.0	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	EP-2	2209478-003c	ND	3.0	µg/L	UJ	EBL, LR-LCS
Chrysene	SW8270C	DUP 9-9-22	2209478-005c	ND	3.0	µg/L	UJ	EBL, LR-LCS
Lead, Total	E200.8	STP-1 to EP-2	2209478-002D	0.00015	0.00050	mg/L	U	MBD, MDLRL
Lead, Total	E200.8	DUP 9-9-22	2209478-005D	0.00016	0.00050	mg/L	U	MBD, MDLRL
Mercury, Dissolved	E245.1	STP-1 to EP-2	2209478-002E	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EP-2	2209478-003E	0.00015	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	DUP 9-9-22	2209478-005E	0.00018	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EB-9-9-22	2209478-001E	0.00018	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	STP-1 to EP-2	2209478-002D	0.00022	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	DUP 9-9-22	2209478-005D	0.00024	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	EP-2	2209478-003D	0.00015	0.00020	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Mercury, Total	E245.1	EB-9-9-22	2209478-001D	0.00019	0.00020	mg/L	J	MDLRL
Pyrene	SW8270C	EB-9-9-22	2209478-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	STP-1 to EP-2	2209478-002c	ND	10	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	EP-2	2209478-003c	ND	10	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP 9-9-22	2209478-005c	ND	10	µg/L	UJ	ERPD-LCS
Silver, Total	E 200.7	STP-1 to EP-2	2209478-002D	0.0022	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	EP-2	2209478-003D	0.0042	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	DUP 9-9-22	2209478-005D	0.0020	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	STP-1 to EP-2	2209478-002C	0.18	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	EP-2	2209478-003C	0.28	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	DUP 9-9-22	2209478-005C	0.20	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	EB-9-9-22	2209478-001C	0.043	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	EP-2	2209478-003a	0.0094	0.050	mg/L	J	MDLRL
TPH ORO	SW8015	STP-1 to EP-2	2209478-002C	0.11	0.080	mg/L	J	EBL
TPH ORO	SW8015	EP-2	2209478-003C	0.11	0.080	mg/L	J	EBL
TPH ORO	SW8015	DUP 9-9-22	2209478-005C	0.13	0.080	mg/L	J	EBL
TPH ORO	SW8015	EB-9-9-22	2209478-001C	ND	0.080	mg/L	UJ	EBL
Vanadium, Dissolved	E 200.7	STP-1 to EP-2	2209478-002E	0.0043	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EP-2	2209478-003E	0.0068	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	DUP 9-9-22	2209478-005E	0.0037	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EB-9-9-22	2209478-001E	0.0019	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	STP-1 to EP-2	2209478-002E	0.032	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	DUP 9-9-22	2209478-005E	0.019	0.010	mg/L	JB	EBD, ERPD-FD
Zinc, Dissolved	E 200.7	EP-2	2209478-003E	0.0059	0.010	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Dissolved	E 200.7	EB-9-9-22	2209478-001E	0.0065	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/13/2022
Date Validated: 01/23/2023	Sample End Date: 09/13/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209635	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-13-22	2209635-001
MKTF-46	2209635-002
MKTF-18R	2209635-003
MKTF-38	2209635-004
MKTF-40	2209635-005
MKTF-31	2209635-006
FB 9-13-22	2209635-007
DUP-9-13-22	2209635-008
Trip Blank	2209635-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Identified Issues (Item 1)
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample MKTF-18R.

For sample MKTF-31, the analyte 1,4 dioxane is E flagged because the result is above the calibration range of the curve. **The target analyte 1,4-dioxane that was flagged by the laboratory with the E flag for sample MKTF-31 was assigned a J qualifiers to indicate an estimated concentration.**

Method 8015D DRO: The LCS had slightly elevated recovery. The LCSD had acceptable recoveries.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

E – Estimated value. **TPH DRO and TPH MRO were flagged by the laboratory with the E flag in multiple samples. These results were assigned J qualifiers if detected, and non-detections were assigned UJ due to this laboratory identified non-conformance.**

J – Analyte detected below quantitation limits.

J – The identification of the analyte is acceptable; the reported value is an estimate.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	MKTF-31	Select VOCs	2
200.7	MKTF-18R	Total and Dissolved Barium	5
8260B	MKTF-18R	Select VOCs	10
8015D	MKTF-18R	TPH GRO	20
8260B	MKTF-31	MTBE	20
8260B	MKTF-18R	Benzene	100

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.4°C and 4.7°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.1°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**70179**	**0.0056 mg/L**
245.1	**Total and Dissolved Mercury**	**70278**	**0.00012 mg/L**
8015D	**TPH DRO**	**70190**	**0.030 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total zinc and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70179	Not Prepared
200.7	Dissolved Metals	C91139	EB-09-13-22
200.8	Total Metals	70179	DUP-9-13-22
200.8	Dissolved Metals	C91078	Not Prepared
245.1	Total and Dissolved Mercury	70278	Not Prepared
504.1	EDB	70173	EB-09-13-22
4500CN E	Cyanide	WG1928511	Not Associated
8015D	TPH DRO and MRO	70190	Not Prepared
8015D	TPH GRO	A91113	MKTF-46
8260B	VOCs	R91021	Not Prepared
8260B	VOCs	R91060	Not Prepared
8260B	VOCs	R91090	Not Prepared
8270C SIM	SVOCs	70174	Not Prepared
8270C	SVOCs	70174	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.8	**Dissolved Selenium**	**C91078**	**62.2%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**70190**	**89.3%**	**Acceptable**	**31.7-75.4%**	**25.3%**	**20%**

Detections of dissolved selenium in the associated samples were qualified as J-, and non-detections of this analyte were qualified as UJ due to the evidence of potential low bias.

TPH DRO was detected in the associated samples. These results were qualified as J due to evidence of poor precision and as J+ due to the evidence of high bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

The recovery of the surrogate BFB for sample MKTF-38 was outside the laboratory acceptance range of 70-130% at 162%. TPH GRO was detected in the Method 8015D analysis of samples MKTF-38, and this result was qualified as J+ to indicate a potential high bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of samples MKTF-46, MKTF-18R, MKTF-38, MKTF-40, MKTF-31, and DUP-9-13-22 or the Method 8270C analysis of sample MKTF-40, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-13-22, and one equipment blank sample, EB-09-13-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB 9-13-22	**8260B**	**2-Butanone**	**12 µg/L**
FB 9-13-22	**8260B**	**Acetone**	**16 µg/L**
EB-09-13-22	8260B	2-Butanone	11 µg/L
EB-09-13-22	8260B	Acetone	14 µg/L
EB-09-13-22	**8270C SIM**	**1,4-Dioxane**	**0.16 µg/L**
EB-09-13-22	8015D	TPH DRO	0.030 mg/L
EB-09-13-22	**200.7**	**Dissolved Zinc**	**0.0064 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of acetone and dissolved zinc in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The TPH DRO results for the samples in batch 70190 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-13-22 was collected as a field duplicate of sample MKTF-46.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD values for 1,4-dioxane and total cobalt exceeded the data validation limit of 30% at 72.7% and 40.7%, respectively, which was evidence of poor precision. The 1,4-dioxane and total cobalt results were qualified as J for samples MKTF-46 and DUP 9-13-22.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1928511 from a sample not associated with this data set.

The RPD value for the laboratory duplicate samples prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results. The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-18R	Arsenic	0.0072	0.0073
MKTF-46	Beryllium	ND	0.00097
MKTF-38	Nickel	ND	0.0040
MKTF-40	Nickel	0.0059	0.0088
MKTF-46	Silver	ND	0.0039
MKTF-18R	Silver	ND	0.0015
MKTF-38	Silver	ND	0.0040
MKTF-40	Silver	ND	0.0066
NKTF-31	Silver	ND	0.0020
DUP-9-13-22	Silver	ND	0.0036
Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-46	Vanadium	0.0043	0.0056
DUP-9-13-22	Vanadium	0.0038	0.0050
EB-09-13-22	Zinc	ND	0.0064
MKTF-46	Zinc	0.0072	0.0099
MKTF-38	Zinc	0.013	0.015
MKTF-31	Zinc	0.0071	0.010
DUP-9-13-22	Zinc	ND	0.013

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-46 Field Duplicate Sample ID: DUP-9-13-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.037 mg/L	0.036 mg/L	2.70%
Barium, Total	E 200.7	0.068 mg/L	0.075 mg/L	9.80%
Beryllium, Dissolved	E 200.7	0.00097 mg/L	ND (0.0020 mg/L)	DL
Cobalt, Total	**E 200.7**	**0.013 mg/L**	**0.0086 mg/L**	**40.7%**
Silver, Dissolved	E 200.7	0.0039 mg/L	0.0036 mg/L	8.0% +/-RL
Vanadium, Dissolved	E 200.7	0.0056 mg/L	0.0050 mg/L	11.3% +/-RL
Vanadium, Total	E 200.7	0.0043 mg/L	0.0038 mg/L	12.3% +/-RL
Zinc, Dissolved	E 200.7	0.0099 mg/L	0.013 mg/L	27.1% +/-RL
Zinc, Total	E 200.7	0.0072 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00077 mg/L	0.00081 mg/L	5.1% +/-RL
Arsenic, Total	E200.8	0.00082 mg/L	0.00081 mg/L	1.2% +/-RL
Lead, Total	E200.8	0.00073 mg/L	0.00083 mg/L	12.8% +/-RL
Selenium, Total	E200.8	0.00040 mg/L	0.00063 mg/L	44.7% +/-RL
Mercury, Total	E245.1	0.00010 mg/L	0.00011 mg/L	9.5% +/-RL
Cyanide, Total	E335.4	ND (5.0 µg/L)	3.06 µg/L	DL
TPH DRO	SW8015	0.068 mg/L	0.058 mg/L	15.9% +/-RL
TPH GRO	SW8015	0.025 mg/L	0.021 mg/L	17.4% +/-RL
Acetone	SW8260B	6.4 µg/L	8.1 µg/L	23.4% +/-RL
Chlorobenzene	SW8260B	0.29 µg/L	0.33 µg/L	12.9% +/-RL
sec-Butylbenzene	SW8260B	0.18 µg/L	ND (1.0 µg/L)	DL
Di-n-butylphthalate	SW8270C	15 µg/L	ND (10 µg/L)	DL
Pyrene	SW8270C	0.40 µg/L	ND (1.0 µg/L)	DL
1,4-Dioxane	**SW8270C**	**0.98 µg/L**	**2.1 µg/L**	**72.7%**

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD values for 1,4-dioxane and total cobalt exceeded the data validation limit of 30% at 72.7% and 40.7%, respectively, which was evidence of poor precision. The 1,4-dioxane and total cobalt results were qualified as J for samples MKTF-46 and DUP 9-13-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
EBL	Flagged as estimated by the laboratory.
ECAL	The result exceeds the calibration range.
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
FBD	Field blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1,1-Trichloroethane	SW8260B	MKTF-31	2209635-006a	1.7	2.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	MKTF-40	2209635-005a	0.96	1.0	µg/L	J	MDLRL
1,2-Dibromoethane	E504.1	MKTF-31	2209635-006B	0.0057	0.0093	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	DUP-9-13-22	2209635-008c	2.1	1.0	µg/L	J	ERPD-FD
1,4-Dioxane	SW8270C	MKTF-46	2209635-002c	0.98	1.0	µg/L	U	EBD, ERPD-FD, MDLRL
1,4-Dioxane	SW8270C	EB-09-13-22	2209635-001c	0.16	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-31	2209635-006c	75	1.0	µg/L	J	ECAL
2-Butanone	SW8260B	EB-09-13-22	2209635-001a	11	10	µg/L	U	FBD
3,4-Methylphenol	SW8270C	MKTF-18R	2209635-003C	5.9	10	µg/L	J	MDLRL
Acetone	SW8260B	MKTF-38	2209635-004a	19	10	µg/L	JB	FBD
Acetone	SW8260B	EB-09-13-22	2209635-001a	14	10	µg/L	U	FBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Acetone	SW8260B	MKTF-46	2209635-002a	6.4	10	µg/L	U	FBD, MDLRL
Acetone	SW8260B	DUP-9-13-22	2209635-008a	8.1	10	µg/L	U	FBD, MDLRL
Arsenic, Dissolved	E200.8	MKTF-46	2209635-002E	0.00077	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-40	2209635-005E	0.00066	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-31	2209635-006E	0.00070	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-9-13-22	2209635-008E	0.00081	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-46	2209635-002D	0.00082	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-9-13-22	2209635-008D	0.00081	0.0010	mg/L	J	MDLRL
Benzo(a)anthracene	SW8270C	MKTF-18R	2209635-003c	0.18	0.30	µg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	MKTF-46	2209635-002E	0.00097	0.0020	mg/L	J	MDLRL
Chlorobenzene	SW8260B	MKTF-46	2209635-002a	0.29	1.0	µg/L	J	MDLRL
Chlorobenzene	SW8260B	DUP-9-13-22	2209635-008a	0.33	1.0	µg/L	J	MDLRL
Chloromethane	SW8260B	MKTF-38	2209635-004a	1.8	3.0	µg/L	J	MDLRL
cis-1,2-Dichloroethene	SW8260B	MKTF-18R	2209635-003a	8.7	10	µg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-46	2209635-002D	0.013	0.0060	mg/L	J	ERPD-FD
Cobalt, Total	E 200.7	DUP-9-13-22	2209635-008D	0.0086	0.0060	mg/L	J	ERPD-FD
Cyanide, Total	E335.4	DUP-9-13-22	2209635-008F	3.06	5.0	µg/L	J	MDLRL
Fluoranthene	SW8270C	MKTF-18R	2209635-003c	0.28	0.30	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-18R	2209635-003a	3.7	10	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-38	2209635-004E	0.00021	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-31	2209635-006E	0.000082	0.00050	mg/L	J	MDLRL
Mercury, Total	E245.1	MKTF-46	2209635-002D	0.00010	0.00020	mg/L	U	MBD, MDLRL
Mercury, Total	E245.1	DUP-9-13-22	2209635-008D	0.00011	0.00020	mg/L	U	MBD, MDLRL
MTBE	SW8260B	MKTF-40	2209635-005a	0.73	1.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-18R	2209635-003a	3.3	30	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-38	2209635-004a	1.2	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-18R	2209635-003E	0.0041	0.010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Nickel, Dissolved	E 200.7	MKTF-38	2209635-004E	0.0040	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-40	2209635-005E	0.0088	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-31	2209635-006E	0.0039	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-18R	2209635-003D	0.0074	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-40	2209635-005D	0.0059	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-31	2209635-006D	0.0099	0.010	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-18R	2209635-003a	4.9	10	µg/L	J	MDLRL
Phenanthrene	SW8270C	MKTF-38	2209635-004c	0.16	0.30	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	MKTF-18R	2209635-003a	2.3	10	µg/L	J	MDLRL
Pyrene	SW8270C	MKTF-46	2209635-002c	0.40	1.0	µg/L	J	MDLRL
Pyrene	SW8270C	MKTF-18R	2209635-003c	0.64	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-46	2209635-002a	0.18	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-18R	2209635-003a	2.2	10	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	EB-09-13-22	2209635-001E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-46	2209635-002E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-18R	2209635-003E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	DUP-9-13-22	2209635-008E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-38	2209635-004E	0.00075	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Dissolved	E200.8	MKTF-40	2209635-005E	0.00039	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Dissolved	E200.8	MKTF-31	2209635-006E	0.00051	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Total	E200.8	MKTF-46	2209635-002D	0.00040	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-18R	2209635-003D	0.00046	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-40	2209635-005D	0.00088	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	DUP-9-13-22	2209635-008D	0.00063	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-46	2209635-002E	0.0039	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-18R	2209635-003E	0.0015	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-38	2209635-004E	0.0040	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Silver, Dissolved	E 200.7	MKTF-31	2209635-006E	0.0020	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP-9-13-22	2209635-008E	0.0036	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	EB-09-13-22	2209635-001C	0.030	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-40	2209635-005C	0.050	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	DUP-9-13-22	2209635-008C	0.058	0.064	mg/L	U	EBL, ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-18R	2209635-003C	3.1	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	MKTF-38	2209635-004C	0.73	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	MKTF-46	2209635-002C	0.068	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	MKTF-31	2209635-006C	0.26	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH GRO	SW8015	MKTF-38	2209635-004a	0.35	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-46	2209635-002a	0.025	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	DUP-9-13-22	2209635-008a	ND	0.050	mg/L	J	MDLRL
TPH ORO	SW8015	EB-09-13-22	2209635-001C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	MKTF-46	2209635-002C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	MKTF-18R	2209635-003C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	MKTF-38	2209635-004C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	MKTF-40	2209635-005C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	MKTF-31	2209635-006C	ND	0.080	mg/L	UJ	EBL
TPH ORO	SW8015	DUP-9-13-22	2209635-008C	ND	0.080	mg/L	UJ	EBL
Vanadium, Dissolved	E 200.7	MKTF-46	2209635-002E	0.0056	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-18R	2209635-003E	0.0017	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-38	2209635-004E	0.0040	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-40	2209635-005E	0.011	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-31	2209635-006E	0.0063	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-9-13-22	2209635-008E	0.0050	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	MKTF-46	2209635-002D	0.0043	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-18R	2209635-003D	0.0089	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-38	2209635-004D	0.023	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-40	2209635-005D	0.023	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-31	2209635-006D	0.032	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-9-13-22	2209635-008D	0.0038	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-38	2209635-004E	0.015	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-31	2209635-006E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-9-13-22	2209635-008E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-46	2209635-002E	0.0099	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-18R	2209635-003E	0.0093	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-40	2209635-005E	0.0077	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-09-13-22	2209635-001E	0.0064	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-18R	2209635-003D	0.028	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	MKTF-38	2209635-004D	0.013	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	MKTF-46	2209635-002D	0.0072	0.010	mg/L	U	MBD, MDLRL
Zinc, Total	E 200.7	MKTF-40	2209635-005D	0.0096	0.010	mg/L	U	MBD, MDLRL
Zinc, Total	E 200.7	MKTF-31	2209635-006D	0.0071	0.010	mg/L	U	MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 09/14/2022
Date Validated: 01/18/2023	Sample End Date: 09/14/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2209730	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-14-22	2209730-001
MKTF-27	2209730-002
MKTF-28	2209730-003
MKTF-29	2209730-004
MKTF-30	2209730-005
OPIS-1	2209730-006
NAPI-2	2209730-007
NAPI-3	2209730-008
KA-3	2209730-009
DUP 9-14-22	2209730-010
FB 9-14-22	2209730-011
Trip Blank	2209730-012

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 810 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: Naphthalene and 1-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for sample NAPI-2.

Method 8015D DRO: The LCS had slightly elevated recoveries.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

E – The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL). *This laboratory flag was applied only to QC sample results in the laboratory report, and qualification of sample data was not required.*

J – Analyte detected below quantitation limits.

S – % Recovery outside of range due to dilution or matrix interference.

V – The sample concentration is too high to evaluate accurate spike recoveries.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	NAPI-2	Select VOCs	2
200.7	NAPI-2	Dissolved Barium	5
200.7	NAPI-3	Total and Dissolved Barium	5
8015D	OPIS-1	TPH GRO, DRO, and MRO	5
8260B	OPIS-1	VOCs	5
200.7	NAPI-2	Total Barium	10
8015D	NAPI-2	TPH GRO	10
8270C	OPIS-1	SVOCs	10
8270C SIM	OPIS-1	SVOCs	10
8260B	NAPI-2	Benzene	20

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.4°C and 2.4°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.8°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 70201 at a concentration of 0.025 mg/L. Results greater than the blank detection and/or the laboratory reporting limit but less than 10 times the blank concentration were qualified with a JB flag.** Detections of this analyte in the associated samples with results greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70240	Not Prepared
200.7	Dissolved Silver	A91392	DUP 9-14-22
200.7	Dissolved Metals	B91347	Not Prepared
200.7	Dissolved Metals	C91347	Not Prepared
200.8	Total Metals	70240	KA-3, DUP 9-14-22
200.8	Dissolved Metals	C91078	KA-3, DUP 9-14-22
245.1	Total and Dissolved Mercury	70279	EB-09-14-22
504.1	EDB	70247	Not Prepared
4500CN E	Cyanide	WG1928522	Not Associated
4500CN E	Cyanide	WG1928523	Not Associated, MKTF-27
8015D	TPH DRO and MRO	70201	Not Prepared
8015D	TPH GRO	A91113	Not Prepared
8260B	VOCs	R91115	Not Prepared
8270C SIM	SVOCs	70216	Not Prepared
8270C	SVOCs	70216	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits
200.7	**Dissolved Barium**	**B91347**	**68.2%**	**-----**	**70-130%**
200.7	**Dissolved Nickel**	**B91347**	**133%**	**-----**	**70-130%**
200.8	**Dissolved Selenium**	**C91078**	**62.2%**	**-----**	**70-130%**
8015D	**TPH DRO**	**70201**	**75.5%**	**Acceptable**	**31.7-75.4%**

Detections of dissolved barium and dissolved selenium were qualified as J-, and non-detections of these analytes were qualified as UJ, due to the evidence of potential low bias.

Detections of dissolved nickel and TPH DRO were qualified as J+ due to the evidence of potential high bias. The non-detection of dissolved nickel in sample EB-09-14-22 did not require qualification due to this non-conformance.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

The recoveries of the surrogate BFB for samples NAPI-2, NAPI-3, and KA-3 were outside the laboratory acceptance range of 70-130% at 131%, 201%, and 147%, respectively. TPH GRO was detected in the Method 8015D analysis of samples NAPI-2, NAPI-3, KA-3, and these results were qualified as J+ to indicate a potential high bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C SIM analysis of samples MKTF-27, MKTF-28, MKTF-29, MKTF-30, NAPI-2, NAPI-3, KA-3, and DUP 9-14-22, and qualification of sample data was not required.

The SVOC results for sample OPIS-1 were not qualified based on the surrogate non-conformances in the Method 8270C and Method 8270C SIM analyses since the applied dilution of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-14-22, and one equipment blank sample, EB-9-14-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
FB 9-14-22	8260B	2-Butanone	12 µg/L
FB 9-14-22	8260B	Acetone	59 µg/L
EB-9-14-22	**200.7**	**Dissolved Zinc**	**0.0069 mg/L**
EB-9-14-22	**200.7**	**Total Zinc**	**0.0052 mg/L**
EB-9-14-22	8015D	TPH DRO	0.71 mg/L
EB-9-14-22	**8015D**	**TPH MRO**	**0.89 mg/L**

Detections of dissolved zinc, total zinc, and TPH MRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc, total zinc, and TPH MRO in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 70201 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP 9-14-22 was collected as a field duplicate of sample MKTF-27.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exception.

The RPD value for total cobalt exceeded the data validation limit of 30% at 30.8%, which was evidence of poor precision. The total cobalt results were qualified as J for samples MKTF-27 and DUP 9-14-22.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batches WG1928522 and WG1928523 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-28	Antimony	ND	0.00077
MKTF-27	Nickel	0.029	0.032
MKTF-28	Nickel	ND	0.0050
MKTF-29	Nickel	0.015	0.018
MKTF-30	Nickel	0.014	0.018
KA-3	Nickel	0.020	0.022
DUP 9-14-22	Nickel	0.029	0.033
KA-3	Selenium	0.00080	0.0014
MKTF-27	Silver	ND	0.0043
MKTF-28	Silver	ND	0.0019
MKTF-29	Silver	0.0026	0.0077
MKTF-30	Silver	ND	0.0022
Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OPIS-1	Silver	ND	0.0025
NAPI-2	Silver	ND	0.0026
NAPI-3	Silver	ND	0.0028
DUP 9-14-22	Silver	ND	0.0040
EB-09-14-22	Zinc	0.0052	0.0069
MKTF-27	Zinc	0.0040	0.011
MKTF-28	Zinc	0.024	0.043
MKTF-29	Zinc	ND	0.011
MKTF-30	Zinc	ND	0.0090
OPIS-1	Zinc	0.0068	0.023
NAPI-2	Zinc	ND	0.0096
NAPI-3	Zinc	ND	0.012
KA-3	Zinc	0.0089	0.032
DUP 9-14-22	Zinc	ND	0.010

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-27 Field Duplicate Sample ID: DUP 9-14-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.059 mg/L	0.058 mg/L	1.7%
Barium, Total	E 200.7	0.18 mg/L	0.17 mg/L	5.7%
Cobalt, Total	**E 200.7**	**0.011 mg/L**	**0.015 mg/L**	**30.8%**
Nickel, Dissolved	E 200.7	0.032 mg/L	0.033 mg/L	3.1%
Nickel, Total	E 200.7	0.029 mg/L	0.029 mg/L	0.0%
Silver, Dissolved	E 200.7	0.0043 mg/L	0.0040 mg/L	7.2% +/-RL
Vanadium, Dissolved	E 200.7	0.0038 mg/L	0.0048 mg/L	23.3% +/-RL
Vanadium, Total	E 200.7	0.015 mg/L	0.016 mg/L	6.5% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	0.010 mg/L	9.5% +/-RL
Zinc, Total	E 200.7	0.0040 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00042 mg/L	0.00049 mg/L	15.4% +/-RL
Arsenic, Total	E200.8	0.0011 mg/L	0.0013 mg/L	16.7% +/-RL
Lead, Dissolved	E200.8	0.000093 mg/L	0.000080 mg/L	15.0% +/-RL
Lead, Total	E200.8	0.0032 mg/L	0.0029 mg/L	9.8%
Selenium, Dissolved	E200.8	0.00051 mg/L	0.00094 mg/L	59.3% +/-RL
Selenium, Total	E200.8	0.0011 mg/L	0.0014 mg/L	24.0% +/-RL
Cyanide, Total	E335.4	0.00799 mg/L	0.00901 mg/L	12.0% +/-RL
TPH DRO	SW8015	0.20 mg/L	0.21 mg/L	4.9%
TPH GRO	SW8015	0.030 mg/L	0.032 mg/L	6.5% +/-RL
TPH ORO	SW8015	0.068 mg/L	0.061 mg/L	10.9% +/-RL
1,1-Dichloroethane	SW8260B	1.6 µg/L	1.6 µg/L	0.0% +/-RL
MTBE	SW8260B	33 µg/L	33 µg/L	0.0%
1,4-Dioxane	SW8270C	5.0 µg/L	5.7 µg/L	13.1%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for total cobalt exceeded the data validation limit of 30% at 30.8%, which was evidence of poor precision. The total cobalt results were qualified as J for samples MKTF-27 and DUP 9-14-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-29	2209730-004a	0.90	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-28	2209730-003c	0.36	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	NAPI-3	2209730-008c	0.74	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	KA-3	2209730-009c	0.48	1.0	µg/L	J	MDLRL
Anthracene	SW8270C	NAPI-3	2209730-008c	0.18	0.30	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-28	2209730-003E	0.00077	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-27	2209730-002E	0.00042	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-28	2209730-003E	0.00093	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-29	2209730-004E	0.00078	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-30	2209730-005E	0.00060	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	KA-3	2209730-009E	0.00067	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP 9-14-22	2209730-010E	0.00049	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-29	2209730-004D	0.00094	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	KA-3	2209730-009D	0.00071	0.0010	mg/L	J	MDLRL
Barium, Dissolved	E 200.7	MKTF-27	2209730-002E	0.059	0.0020	mg/L	J-	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Barium, Dissolved	E 200.7	MKTF-28	2209730-003E	0.073	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	MKTF-29	2209730-004E	0.20	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	MKTF-30	2209730-005E	0.036	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	OPIS-1	2209730-006E	0.82	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	NAPI-2	2209730-007E	4.9	0.010	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	NAPI-3	2209730-008E	2.3	0.010	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	KA-3	2209730-009E	0.21	0.0020	mg/L	J-	LR-LCS
Barium, Dissolved	E 200.7	EB-09-14-22	2209730-001E	ND	0.0020	mg/L	UJ	LR-LCS
Chromium, Total	E 200.7	OPIS-1	2209730-006D	0.0023	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OPIS-1	2209730-006E	0.0048	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-27	2209730-002D	0.011	0.0060	mg/L	J	ERPD-FD
Cobalt, Total	E 200.7	DUP 9-14-22	2209730-010D	0.015	0.0060	mg/L	J	ERPD-FD
Ethylbenzene	SW8260B	OPIS-1	2209730-006a	4.6	5.0	µg/L	J	MDLRL
Ethylbenzene	SW8260B	KA-3	2209730-009a	0.31	1.0	µg/L	J	MDLRL
Fluorene	SW8270C	NAPI-3	2209730-008c	0.24	0.30	µg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-27	2209730-002E	0.000093	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-28	2209730-003E	0.00014	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-30	2209730-005E	0.000098	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	NAPI-2	2209730-007E	0.00032	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	KA-3	2209730-009E	0.00021	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP 9-14-22	2209730-010E	0.00008	0.00050	mg/L	J	MDLRL
n-Butylbenzene	SW8260B	NAPI-2	2209730-007a	1.2	6.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-27	2209730-002E	0.032	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	MKTF-29	2209730-004E	0.018	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	MKTF-30	2209730-005E	0.018	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	OPIS-1	2209730-006E	0.17	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	NAPI-2	2209730-007E	0.068	0.010	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Nickel, Dissolved	E 200.7	NAPI-3	2209730-008E	0.022	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	KA-3	2209730-009E	0.022	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	MKTF-28	2209730-003E	0.005	0.010	mg/L	J+	HR-LCS, MDLRL
sec-Butylbenzene	SW8260B	NAPI-3	2209730-008a	0.73	1.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	OPIS-1	2209730-006E	0.0012	0.0010	mg/L	J-	LR-LCS
Selenium, Dissolved	E200.8	KA-3	2209730-009E	0.0014	0.0010	mg/L	J-	LR-LCS
Selenium, Dissolved	E200.8	EB-09-14-22	2209730-001E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-29	2209730-004E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-30	2209730-005E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	NAPI-3	2209730-008E	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Dissolved	E200.8	MKTF-27	2209730-002E	0.00051	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Dissolved	E200.8	MKTF-28	2209730-003E	0.00044	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Dissolved	E200.8	NAPI-2	2209730-007E	0.00053	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Dissolved	E200.8	DUP 9-14-22	2209730-010E	0.00094	0.0010	mg/L	J-	LR-LCS, MDLRL
Selenium, Total	E200.8	MKTF-30	2209730-005D	0.00053	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	NAPI-2	2209730-007D	0.00063	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	NAPI-3	2209730-008D	0.00054	0.0010	mg/L	J	MDLRL
Selenium, Total	E200.8	KA-3	2209730-009D	0.0008	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-27	2209730-002E	0.0043	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-28	2209730-003E	0.0019	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-30	2209730-005E	0.0022	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OPIS-1	2209730-006E	0.0025	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	NAPI-2	2209730-007E	0.0026	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	NAPI-3	2209730-008E	0.0028	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP 9-14-22	2209730-010E	0.0040	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	MKTF-29	2209730-004D	0.0026	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	NAPI-2	2209730-007a	0.62	2.0	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	EB-09-14-22	2209730-001C	0.71	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-29	2209730-004C	1.2	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	OPIS-1	2209730-006C	7.3	0.32	mg/L	J+	HR-LCS
TPH DRO	SW8015	NAPI-2	2209730-007C	2.7	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	NAPI-3	2209730-008C	0.86	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	KA-3	2209730-009C	0.61	0.064	mg/L	J+	HR-LCS
TPH DRO	SW8015	MKTF-27	2209730-002C	0.2	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	MKTF-28	2209730-003C	0.16	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	MKTF-30	2209730-005C	0.15	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	DUP 9-14-22	2209730-010C	0.21	0.064	mg/L	JB	HR-LCS, MBD
TPH GRO	SW8015	NAPI-2	2209730-007a	4.1	0.50	mg/L	J+	HR-SUR
TPH GRO	SW8015	NAPI-3	2209730-008a	0.47	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	KA-3	2209730-009a	0.12	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-27	2209730-002a	0.03	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	MKTF-29	2209730-004a	0.02	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	MKTF-30	2209730-005a	0.028	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	DUP 9-14-22	2209730-010a	0.032	0.050	mg/L	J	MDLRL
TPH ORO	SW8015	OPIS-1	2209730-006C	1.0	0.40	mg/L	JB	EBD
TPH ORO	SW8015	MKTF-29	2209730-004C	0.84	0.080	mg/L	U	EBD
TPH ORO	SW8015	NAPI-2	2209730-007C	0.14	0.080	mg/L	U	EBD
TPH ORO	SW8015	NAPI-3	2209730-008C	0.086	0.080	mg/L	U	EBD
TPH ORO	SW8015	KA-3	2209730-009C	0.11	0.080	mg/L	U	EBD
TPH ORO	SW8015	MKTF-27	2209730-002C	0.068	0.080	mg/L	U	EBD, MDLRL
TPH ORO	SW8015	DUP 9-14-22	2209730-010C	0.061	0.080	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	MKTF-27	2209730-002E	0.0038	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-28	2209730-003E	0.0064	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-29	2209730-004E	0.0083	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Dissolved	E 200.7	MKTF-30	2209730-005E	0.0046	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OPIS-1	2209730-006E	0.029	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	NAPI-2	2209730-007E	0.0042	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	NAPI-3	2209730-008E	0.0023	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	KA-3	2209730-009E	0.015	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP 9-14-22	2209730-010E	0.0048	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-27	2209730-002D	0.015	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-28	2209730-003D	0.034	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-29	2209730-004D	0.011	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-30	2209730-005D	0.021	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OPIS-1	2209730-006D	0.041	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPI-2	2209730-007D	0.0092	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPI-3	2209730-008D	0.0041	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	KA-3	2209730-009D	0.019	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP 9-14-22	2209730-010D	0.016	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	NAPI-3	2209730-008a	1.2	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-27	2209730-002E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-28	2209730-003E	0.043	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-29	2209730-004E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OPIS-1	2209730-006E	0.023	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	NAPI-3	2209730-008E	0.012	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	KA-3	2209730-009E	0.032	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP 9-14-22	2209730-010E	0.010	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-30	2209730-005E	0.009	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	NAPI-2	2209730-007E	0.0096	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-09-14-22	2209730-001E	0.0069	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-28	2209730-003D	0.024	0.010	mg/L	JB	EBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Total	E 200.7	MKTF-27	2209730-002D	0.004	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	OPIS-1	2209730-006D	0.0068	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	KA-3	2209730-009D	0.0089	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	EB-09-14-22	2209730-001D	0.0052	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0004	Sample Start Date: 09/15/2022
Date Validated: 01/16/2023	Sample End Date: 09/15/2022

Parameters Included:

- Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B
- 1,2-Dibromoethane (EDB) by EPA Method 504.1
- Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM)
- Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D
- TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified
- Total and Dissolved Metals by EPA Method 200.7 and Method 200.8
- Total and Dissolved Mercury by EPA Method 245.1
- Anions by EPA Method 300.0
- Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E

Laboratory Project ID: 2209816
Data Validator: Daran O'Hollearn, Lead Project Scientist
Reviewer: Charles Ballek, Senior Chemist

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-09-15-22	2209816-001
MKTF-16	2209816-002
OW-12A	2209816-003
OW-70	2209816-004
OW-57	2209816-005
FB 9-15-22	2209816-006
DUP 9-15-22	2209816-007
Trip Blank	2209816-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ✓ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 456 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformance related to this data set.

Method 8270C: Naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for sample OW-57.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The container for sample MKTF-16 Method 8015 DRO/MRO was not received by the laboratory.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8015D	OW-57	TPH DRO and MRO	2
200.7	MKTF-16, OW-12A, OW-57	Select Total and Dissolved Metals	5
200.8	MKTF-16	Total Lead	5
300.0	MKTF-16	Anions	5
8015D	MKTF-16, OW-12A	TPH GRO	5
8260B	MKTF-16	VOCs	5
200.7	MKTF-16	Total Barium	10
200.8	OW-57	Total Lead and Selenium	20
200.7	OW-57	Total Barium	50
8015D	OW-57	TPH GRO	50
8260B	OW-12A, OW-57	Select VOCs	50
200.7	MKTF-16	Total Iron	100
8260B	OW-57	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C at 0.4°C, 1.3°C, and 1.4°C as noted on the *Sample Log-in Check List*. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 5.7°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 70323 at a concentration of 0.021 mg/L. The sample EB-09-15-22 TPH DRO result that was detected at a concentration equal to the blank concentration and less than the laboratory reporting limit was qualified with a U flag.** The TPH DRO results in the remaining associated samples were greater than ten times the blank concentration and did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	70299	MKTF-16, OW-12A
200.7	Total Metals	70359	Not Prepared
200.7	Dissolved Silver	A91392	EB-09-15-22
200.7	Dissolved Metals	C91347	Not Prepared
200.8	Total Metals	70299	Not Prepared
200.8	Total Metals	70359	Not Prepared
200.8	Dissolved Metals	A91132	Not Prepared
245.1	Total and Dissolved Mercury	70307	Not Prepared
245.1	Total Mercury	70391	Not Prepared
300.0	Anions	R91119	Not Prepared
504.1	EDB	70321	Not Prepared
4500CN E	Cyanide	WG1929558	Not Associated
8015D	TPH DRO and MRO	70323	Not Prepared
8015D	TPH GRO	B91113	Not Prepared
8015D	TPH GRO	C91131	Not Prepared
8260B	VOCs	A91114	Not Prepared
8260B	VOCs	R91137	Not Prepared
8270C SIM	SVOCs	70290	Not Prepared
8270C	SVOCs	70290	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exception.

The LCS recovery for total cobalt in Method 200.7 batch 70299 was outside the acceptance limits of 70-130% at 141%. Total cobalt was detected in associated samples and the results were qualified with J+ flags due to potential high bias. Total cobalt was not detected in the associated sample EB-09-15-22 and the result did not require qualification.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D (GRO)	**Bromofluorobenzene (BFB)**	**OW-12A**	**158%**	**70-130%**
8015D (GRO)	**BFB**	**OW-70**	**517%**	**70-130%**
8015D (GRO)	**BFB**	**DUP 9-15-22**	**493%**	**70-130%**
8270C-SIM	4-Terphenyl-d_{14}	EB-09-15-22	70.0%	72.2-147%
8270C-SIM	4-Terphenyl-d_{14}	MKTF-16	53.5%	72.2-147%
8270C-SIM	4-Terphenyl-d_{14}	OW-12A	53.9%	72.2-147%
8270C-SIM	4-Terphenyl-d_{14}	OW-70	54.7%	72.2-147%
8270C-SIM	4-Terphenyl-d_{14}	OW-57	51.1%	72.2-147%
8270C-SIM	4-Terphenyl-d_{14}	DUP 9-15-22	48.5%	72.2-147%

The associated analyte TPH GRO was detected in the identified samples. These results were qualified as J+ due to evidence of potential high bias.

Since Method 8270C and 8270C-SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C-SIM analysis for samples EB-09-15-22, MKTF-16, OW-12A, OW-70, OW-57, and DUP 9-15-22 and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB 9-15-22, and one equipment blank sample, EB-09-15-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
Trip Blank	**8260B**	**Acetone**	**2.7 µg/L**
FB 9-15-22	8260B	2-Butanone	17 µg/L
FB 9-15-22	8260B	Acetone	11 µg/L
EB-09-15-22	8260B	Acetone	4.3 µg/L
EB-09-15-22	8015D	TPH DRO	0.021 mg/L
EB-09-15-22	**200.7**	**Dissolved Zinc**	**0.0066 mg/L**

Detections of acetone in the sample EB-09-15-22 and dissolved zinc in sample OW-57 that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. The detections of acetone and dissolved zinc in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 70323 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-9-15-22 was collected as a field duplicate of sample OW-70.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for total lead exceeded the data validation limit of 30% at 35.9%. The MTBE results for samples OW-70 and DUP-9-15-22 were assigned J qualifiers due to evidence of poor precision.

An RPD value could not be calculated for 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene for the field duplicate pair OW-70 and DUP-9-15-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detections in the parent sample were greater than two times the reporting limit, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were qualified as J and UJ for the parent and duplicate samples, respectively.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1929558 from sample EB-09-15-22 and from a sample not associated with this data set.

The sample EB-09-15-22 and the laboratory duplicate were both non-detect for cyanide and a RPD could not be calculated.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method in this data set.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-16	Antimony	0.00049	0.00060
OW-70	Cadmium	ND	0.0010
OW-12A	Silver	ND	0.0020
OW-57	Silver	ND	0.0019
EB-09-15-22	Zinc	ND	0.0066
OW-12A	Zinc	0.0083	0.013
OW-70	Zinc	0.0047	0.011
DUP 9-15-22	Zinc	ND	0.013

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-70 Field Duplicate Sample ID: DUP 9-15-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.53 mg/L	0.55 mg/L	3.7%
Barium, Total	E 200.7	0.79 mg/L	0.70 mg/L	12.1%
Cadmium, Dissolved	E 200.7	0.0010 mg/L	ND (0.0020 mg/L)	DL
Chromium, Total	E 200.7	0.0070 mg/L	0.0031 mg/L	77.2% +/-RL
Cobalt, Dissolved	E 200.7	0.0042 mg/L	0.0046 mg/L	9.1% +/-RL
Cobalt, Total	E 200.7	0.0094 mg/L	0.012 mg/L	24.3% +/-RL
Nickel, Dissolved	E 200.7	0.044 mg/L	0.043 mg/L	2.3%
Nickel, Total	E 200.7	0.046 mg/L	0.044 mg/L	4.4%
Vanadium, Dissolved	E 200.7	0.0031 mg/L	0.0025 mg/L	21.4% +/-RL
Vanadium, Total	E 200.7	0.014 mg/L	0.0083 mg/L	51.1% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	0.013 mg/L	16.7% +/-RL
Zinc, Total	E 200.7	0.0047 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0012 mg/L	0.0012 mg/L	0.0% +/-RL
Arsenic, Total	E200.8	0.0028 mg/L	0.0025 mg/L	11.3%
Lead, Dissolved	E200.8	0.00012 mg/L	0.00013 mg/L	8.0% +/-RL
Lead, Total	**E200.8**	**0.0023 mg/L**	**0.0016 mg/L**	**35.9%**
Selenium, Total	E200.8	0.00069 mg/L	ND (0.0010) mg/L	DL
TPH DRO	SW8015	0.94 mg/L	0.96 mg/L	2.1%
TPH GRO	SW8015	0.39 mg/L	0.35 mg/L	10.8%
1,1-Dichloroethane	SW8260B	0.49 µg/L	0.47 µg/L	4.2% +/-RL
1,2,4-Trimethylbenzene	SW8260B	0.13 µg/L	0.15 µg/L	14.3% +/-RL
1,2-Dichloroethane	SW8260B	6.8 µg/L	5.9 µg/L	14.2%
Benzene	SW8260B	1.0 µg/L	0.99 µg/L	1.0% +/-RL
Isopropylbenzene	SW8260B	30 µg/L	28 µg/L	6.9%
MTBE	SW8260B	60 µg/L	55 µg/L	8.7%
n-Butylbenzene	SW8260B	1.5 µg/L	1.4 µg/L	6.9% +/-RL
n-Propylbenzene	SW8260B	1.1 µg/L	1.0 µg/L	9.5% +/-RL
sec-Butylbenzene	SW8260B	6.5 µg/L	6.4 µg/L	1.6%
1,4-Dioxane	SW8270C	0.70 µg/L	0.66 µg/L	5.9% +/-RL
1-Methylnaphthalene	**SW8270C**	**1.0 µg/L**	**ND (0.30 µg/L)**	**DL**
2-Methylnaphthalene	**SW8270C**	**0.74 µg/L**	**ND (0.30 µg/L)**	**DL**
Acenaphthene	SW8270C	0.18 µg/L	0.14 µg/L	25.0% +/-RL
Anthracene	SW8270C	0.18 µg/L	0.20 µg/L	10.5% +/-RL
Di-n-butylphthalate	SW8270C	ND (10 µg/L)	20 µg/L	DL
Fluoranthene	SW8270C	ND (0.30 µg/L)	0.20 µg/L	DL

Analyte	Method	Laboratory Result	Duplicate Result	Relative Percent Difference (RPD)
Naphthalene	**SW8270C**	**1.3 µg/L**	**ND (0.30 µg/L)**	**DL**
Phenanthrene	SW8270C	0.40 µg/L	0.34 µg/L	16.2% +/-RL
Phenol	SW8270C	29 µg/L	ND (20 µg/L)	DL
Pyrene	SW8270C	ND (1.0 µg/L)	0.44 µg/L	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for total lead exceeded the data validation limit of 30% at 35.9%, which was evidence of poor precision. The MTBE results were qualified as J for samples OW-70 and DUP 9-15-22.

An RPD value could not be calculated for 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene for the field duplicate pair OW-70 and DUP 9-15-22 since the analyte was detected in the parent sample and was undetected in the duplicate sample. As the detections in the parent sample were greater than two times the reporting limit, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene were qualified as J and UJ for the parent and duplicate samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
MBD	Method blank detection
HR-MS	The MS and/or MSD percent recovery was greater than the upper acceptable limit indicating possible matrix interference.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
EBD	Equipment blank detection
TBD	Trip blank detection
ERPD-FD	High field duplicate RPD.
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	OW-70	2209816-004a	0.49	1.0	µg/L	J	MDLRL
1,1-Dichloroethane	SW8260B	DUP 9-15-22	2209816-007a	0.47	1.0	µg/L	J	MDLRL
1,1-Dichloroethene	SW8260B	OW-12A	2209816-003a	0.34	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	OW-70	2209816-004a	0.13	1.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP 9-15-22	2209816-007a	0.15	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	OW-12A	2209816-003a	0.44	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-70	2209816-004c	0.70	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-57	2209816-005c	0.80	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	DUP 9-15-22	2209816-007c	0.66	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-70	2209816-004c	1.0	0.30	µg/L	J	ERPD-FD
1-Methylnaphthalene	SW8270C	DUP 9-15-22	2209816-007c	ND	0.30	µg/L	UJ	ERPD-FD
2-Methylnaphthalene	SW8270C	OW-70	2209816-004c	0.74	0.30	µg/L	J	ERPD-FD
2-Methylnaphthalene	SW8270C	DUP 9-15-22	2209816-007c	ND	0.30	µg/L	UJ	ERPD-FD
2-Methylnaphthalene	SW8270C	MKTF-16	2209816-002c	0.16	0.30	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-12A	2209816-003c	0.16	0.30	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Acenaphthene	SW8270C	OW-70	2209816-004c	0.18	0.30	µg/L	J	MDLRL
Acenaphthene	SW8270C	DUP 9-15-22	2209816-007c	0.14	0.30	µg/L	J	MDLRL
Acetone	SW8260B	FB 9-15-22	2209816-006a	11	10	µg/L	JB	TBD
Acetone	SW8260B	Trip Blank	2209816-008a	2.7	10	µg/L	J	MDLRL
Acetone	SW8260B	EB-09-15-22	2209816-001a	4.3	10	µg/L	U	MDLRL, TBD
Anthracene	SW8270C	OW-70	2209816-004c	0.18	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	OW-57	2209816-005c	0.20	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	DUP 9-15-22	2209816-007c	0.20	0.30	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-16	2209816-002E	0.0006	0.0010	mg/L	J	MDLRL
Antimony, Total	E200.8	MKTF-16	2209816-002D	0.00049	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	DUP 9-15-22	2209816-007a	0.99	1.0	µg/L	J	MDLRL
Cadmium, Dissolved	E 200.7	OW-70	2209816-004E	0.0010	0.0020	mg/L	J	MDLRL
Chromium, Total	E 200.7	DUP 9-15-22	2209816-007D	0.0031	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-70	2209816-004E	0.0042	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	DUP 9-15-22	2209816-007E	0.0046	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-16	2209816-002D	0.012	0.0060	mg/L	J+	HR-MS
Cobalt, Total	E 200.7	OW-12A	2209816-003D	0.011	0.0060	mg/L	J+	HR-MS
Cobalt, Total	E 200.7	OW-70	2209816-004D	0.0094	0.0060	mg/L	J+	HR-MS
Cobalt, Total	E 200.7	DUP 9-15-22	2209816-007D	0.012	0.0060	mg/L	J+	HR-MS
Fluoranthene	SW8270C	DUP 9-15-22	2209816-007c	0.20	0.30	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-16	2209816-002a	1.7	5.0	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-57	2209816-005a	16	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-70	2209816-004E	0.00012	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP 9-15-22	2209816-007E	0.00013	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-70	2209816-004D	0.0023	0.00050	mg/L	J	ERPD-FD
Lead, Total	E200.8	DUP 9-15-22	2209816-007D	0.0016	0.00050	mg/L	J	ERPD-FD
MTBE	SW8260B	OW-57	2209816-005a	41	50	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Naphthalene	SW8270C	OW-70	2209816-004c	1.3	0.30	µg/L	J	ERPD-FD
Naphthalene	SW8270C	DUP 9-15-22	2209816-007c	ND	0.30	µg/L	UJ	ERPD-FD
n-Butylbenzene	SW8260B	OW-12A	2209816-003a	0.89	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	OW-70	2209816-004a	1.5	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	DUP 9-15-22	2209816-007a	1.4	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-16	2209816-002E	0.0075	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-12A	2209816-003E	0.0076	0.010	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-16	2209816-002a	1.4	5.0	µg/L	J	MDLRL
n-Propylbenzene	SW8260B	OW-57	2209816-005a	42	50	µg/L	J	MDLRL
Pyrene	SW8270C	DUP 9-15-22	2209816-007c	0.44	1.0	µg/L	J	MDLRL
Selenium, Total	E200.8	OW-70	2209816-004D	0.00069	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-12A	2209816-003E	0.0020	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-57	2209816-005E	0.0019	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	MKTF-16	2209816-002a	1.4	5.0	µg/L	J	MDLRL
Toluene	SW8260B	OW-57	2209816-005a	27	50	µg/L	J	MDLRL
TPH DRO	SW8015	EB-09-15-22	2209816-001C	0.021	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-12A	2209816-003a	3.6	0.25	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-70	2209816-004a	0.39	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	DUP 9-15-22	2209816-007a	0.35	0.050	mg/L	J+	HR-SUR
Vanadium, Dissolved	E 200.7	MKTF-16	2209816-002E	0.0042	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-12A	2209816-003E	0.0044	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-70	2209816-004E	0.0031	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-57	2209816-005E	0.0039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP 9-15-22	2209816-007E	0.0025	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-12A	2209816-003D	0.027	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-70	2209816-004D	0.014	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP 9-15-22	2209816-007D	0.0083	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vinyl Chloride	SW8260B	MKTF-16	2209816-002a	2.0	5.0	µg/L	J	MDLRL
Xylenes, Total	SW8260B	MKTF-16	2209816-002a	5.6	7.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-57	2209816-005E	0.0098	0.010	mg/L	U	MBD, MDLRL
Zinc, Dissolved	E 200.7	MKTF-16	2209816-002E	0.017	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-12A	2209816-003E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-70	2209816-004E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP 9-15-22	2209816-007E	0.013	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	EB-09-15-22	2209816-001E	0.0066	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-12A	2209816-003D	0.0083	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-70	2209816-004D	0.0047	0.010	mg/L	J	MDLRL

Appendix D-4. 4th Quarter Data Validation Reports

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 12/15/2022
Date Validated: 01/31/2023	Sample End Date: 12/15/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212A11	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-15-22	2212a11-001
MKTF-30	2212a11-002
STP-1-NW	2212a11-003
OPIS-1	2212a11-004
FB-12-15-22	2212a11-005
Dup-12-15-22	2212a11-006
Trip Blank	2212a11-007

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ✓ Trip, Field, and Equipment Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 360 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 80156D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % PRD is out of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The trip blank sample was received by the laboratory but was not included on the CoC. The laboratory logged in the sample and performed the appropriate volatile analyses. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.8	Multiple Samples	Total and Dissolved Metals	5
8015D	OPIS-1	TPH DRO and MRO	5
8015D	OPIS-1	VOCs	5
8270C	OPIS-1	SVOCs	10
8270C SIM	OPIS-1	SVOCs	10

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 0.4°C, 0.6°C, and 3.1°C as noted on Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 4.0°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Beryllium**	**72221**	**0.00082 mg/L**
8015D	**TPH DRO**	**72199**	**0.097 mg/L**

Detections of total beryllium and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72221	Not Prepared
200.7	Dissolved Metals	C93558	EB-12-15-22, MKTF-30
200.8	Total Metals	72221	Not Prepared
200.8	Dissolved Metals	A93438	EB-12-15-22, MKTF-30
200.8	Dissolved Antimony	A93556	MKTF-30, STP-1-NW
245.1	Total and Dissolved Mercury	72295	Not Prepared
504.1	EDB	72313	Not Prepared
4500CN E	Cyanide	WG1977924	Not Associated
8015D	TPH DRO and MRO	72199	Not Prepared
8015D	TPH GRO	B93549	MKTF-30
8260B	VOCs	R93599	MKTF-30
8270C SIM	SVOCs	72138	Not Prepared
8270C	SVOCs	72138	Not Prepared
8270C SIM	SVOCs	72239	Not Prepared
8270C	SVOCs	72239	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	MS Recovery	MSD Recovery	MS/MSD QC Limits
200.7	**Dissolved Barium**	**C93558**	**65.3%**	**62.2%**	**75-125%**
200.7	**Dissolved Beryllium**	**C93558**	**Acceptable**	**73.0%**	**75-125%**
200.7	**Dissolved Cadmium**	**C93558**	**70.1%**	**66.7%**	**75-125%**
200.7	**Dissolved Chromium**	**C93558**	**64.4%**	**60.9%**	**75-125%**
200.7	**Dissolved Cobalt**	**C93558**	**64.0%**	**60.9%**	**75-125%**
200.7	**Dissolved Nickel**	**C93558**	**64.0%**	**61.2%**	**75-125%**
200.7	**Dissolved Silver**	**C93558**	**58.1%**	**56.5%**	**75-125%**
200.7	**Dissolved Vanadium**	**C93558**	**72.2%**	**69.4%**	**75-125%**
200.7	**Dissolved Zinc**	**C93558**	**64.9%**	**61.5%**	**75-125%**

Detections of the identified analytes in the associated samples were qualified as J- due to evidence of potential low bias. Non-detections of these analytes in the associated samples were qualified as UJ.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Nickel**	**72221**	**148%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Nickel**	**C93558**	**137%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Chromium**	**C93558**	**50.7%**	**-----**	**70-130%**	**-----**	**-----**
245.1	**Mercury**	**72295**	**148%**	**-----**	**70-130%**	**-----**	**-----**
504.1	**EDB**	**72313**	**Acceptable**	**Acceptable**	**70-130%**	**40.2%**	**20%**
8270C	**Pyrene**	**72239**	**Acceptable**	**Acceptable**	**61-123%**	**16.6%**	**11.8%**
8270C SIM	**1,4-Dioxane**	**72239**	**Acceptable**	**Acceptable**	**15-60.5%**	**32.3%**	**29.7%**
8270C SIM	**Anthracene**	**72239**	**Acceptable**	**Acceptable**	**21.1-106%**	**22.5%**	**14.4%**
8270C SIM	**Fluoranthene**	**72239**	**Acceptable**	**Acceptable**	**32.8-119%**	**24.9%**	**14.8%**
8270C SIM	**Pyrene**	**72239**	**Acceptable**	**Acceptable**	**34.1-110%**	**24.7%**	**19.2%**

Dissolved chromium was not detected in the associated samples, and these results were qualified as UJ due to evidence of potential low bias.

Detections of total nickel, dissolved nickel, and mercury were assigned J+ qualifiers due to evidence of potential high bias. Non-detections of these analytes in the associated samples did not require qualification.

The analytes with LCS/LCSD RPD values that exceeded the QC limits were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

The Method 8015D surrogate BFB in sample OPIS-1 was recovered outside the acceptance limits of 70-130% at 164%. TPH GRO was detected in the Method 8015D analysis of sample OPIS-1, and this result was qualified as J+ due to evidence of potential high bias.

The SVOC results for sample OPIS-1 were not qualified based on the surrogate non-conformances in the Method 8270C analyses since the applied dilution of 10 times resulted in surrogate concentrations below routinely calibrated levels and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-15-22, and one equipment blank sample, EB-12-15-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration (mg/L)
EB-12-15-22	245.1	Total Mercury	0.000099
EB-12-15-22	245.1	Dissolved Mercury	0.000097
EB-12-15-22	8015D	TPH DRO	0.030

Total mercury and dissolved mercury were not detected in the associated samples and the results did not require qualification based on the equipment blank detections.

The TPH DRO results in Method 8015D batch 72199 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample Dup-12-15-22 was collected as a field duplicate of sample STP-1-NW.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1977924 from a samples not associated with this data set.

The RPD value for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OPIS-1	Antimony	ND	0.0032
STP-1-NW	Arsenic	0.0018	0.0022
DUP-12-15-22	Arsenic	0.0019	0.0023
DUP-12-15-22	Selenium	0.0058	0.0070
STP-1-NW	Vanadium	0.028	0.039
DUP-12-15-22	Vanadium	0.028	0.029
OPIS-1	Zinc	0.0079	0.0097

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: STP-1-NW Field Duplicate Sample ID: DUP-12-15-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.063 mg/L	0.056 mg/L	11.8%
Barium, Total	E 200.7	0.098 mg/L	0.10 mg/L	2.0%
Chromium, Total	E 200.7	0.0023 mg/L	0.0022 mg/L	4.4% +/-RL
Silver, Dissolved	E 200.7	0.0016 mg/L	0.0013 mg/L	20.7% +/-RL
Silver, Total	E 200.7	0.0022 mg/L	0.0019 mg/L	14.6% +/-RL
Vanadium, Dissolved	E 200.7	0.039 mg/L	0.029 mg/L	29.4% +/-RL
Vanadium, Total	E 200.7	0.028 mg/L	0.028 mg/L	0.0% +/-RL
Arsenic, Dissolved	E200.8	0.0022 mg/L	0.0023 mg/L	4.4% +/-RL
Arsenic, Total	E200.8	0.0018 mg/L	0.0019 mg/L	5.4% +/-RL
Selenium, Dissolved	E200.8	0.0073 mg/L	0.0070 mg/L	4.2% +/-RL
Selenium, Total	E200.8	0.0093 mg/L	0.0058 mg/L	46.4% +/-RL
Cyanide, Total	E335.4	0.0538 mg/L	0.0503 mg/L	6.7%
TPH DRO	SW8015	0.20 mg/L	0.20 mg/L	0.0%
TPH ORO	SW8015	0.074 mg/L	ND (0.080 mg/L)	DL
1,4-Dioxane	SW8270C	0.12 µg/L	0.12 µg/L	0.0% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2-Dibromoethane	E504.1	EB-12-15-22	2212A11-001B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	MKTF-30	2212A11-002B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	STP-1-NW	2212A11-003B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	OPIS-1	2212A11-004B	ND	0.0094	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	Dup-12-15-22	2212A11-006B	ND	0.0093	µg/L	UJ	ERPD-LCS
1,2-Dibromoethane	E504.1	Trip Blank	2212A11-007B	ND	0.0096	µg/L	UJ	ERPD-LCS
1,4-Dioxane	SW8270C	STP-1-NW	2212a11-003c	0.12	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	Dup-12-15-22	2212a11-006c	0.12	1.0	µg/L	J	ERPD-LCS, MDLRL
Anthracene	SW8270C	Dup-12-15-22	2212a11-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Antimony, Dissolved	E200.8	OPIS-1	2212A11-004E	0.0032	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	STP-1-NW	2212A11-003E	0.0022	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OPIS-1	2212A11-004E	0.0043	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	Dup-12-15-22	2212A11-006E	0.0023	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	STP-1-NW	2212A11-003D	0.0018	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Total	E200.8	OPIS-1	2212A11-004D	0.0044	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	Dup-12-15-22	2212A11-006D	0.0019	0.0050	mg/L	J	MDLRL
Barium, Dissolved	E 200.7	MKTF-30	2212A11-002E	0.029	0.0020	mg/L	J-	LR-MS
Barium, Dissolved	E 200.7	STP-1-NW	2212A11-003E	0.063	0.0020	mg/L	J-	LR-MS
Barium, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.71	0.0020	mg/L	J-	LR-MS
Barium, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	0.056	0.0020	mg/L	J-	LR-MS
Barium, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0020	mg/L	UJ	LR-MS
Beryllium, Total	E 200.7	MKTF-30	2212A11-002D	0.00081	0.0020	mg/L	U	MBD, MDLRL
Beryllium, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0020	mg/L	UJ	LR-MS
Beryllium, Dissolved	E 200.7	MKTF-30	2212A11-002E	ND	0.0020	mg/L	UJ	LR-MS
Beryllium, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.0020	mg/L	UJ	LR-MS
Beryllium, Dissolved	E 200.7	OPIS-1	2212A11-004E	ND	0.0020	mg/L	UJ	LR-MS
Beryllium, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.0020	mg/L	UJ	LR-MS
Cadmium, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0020	mg/L	UJ	LR-MS
Cadmium, Dissolved	E 200.7	MKTF-30	2212A11-002E	ND	0.0020	mg/L	UJ	LR-MS
Cadmium, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.0020	mg/L	UJ	LR-MS
Cadmium, Dissolved	E 200.7	OPIS-1	2212A11-004E	ND	0.0020	mg/L	UJ	LR-MS
Cadmium, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.0020	mg/L	UJ	LR-MS
Chromium, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0060	mg/L	UJ	LR-LCS, LR-MS
Chromium, Dissolved	E 200.7	MKTF-30	2212A11-002E	ND	0.0060	mg/L	UJ	LR-LCS, LR-MS
Chromium, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.0060	mg/L	UJ	LR-LCS, LR-MS
Chromium, Dissolved	E 200.7	OPIS-1	2212A11-004E	ND	0.0060	mg/L	UJ	LR-LCS, LR-MS
Chromium, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.0060	mg/L	UJ	LR-LCS, LR-MS
Chromium, Total	E 200.7	MKTF-30	2212A11-002D	0.0054	0.006	mg/L	J	MDLRL
Chromium, Total	E 200.7	STP-1-NW	2212A11-003D	0.0023	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	Dup-12-15-22	2212A11-006D	0.0022	0.0060	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0060	mg/L	UJ	LR-MS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Dissolved	E 200.7	MKTF-30	2212A11-002E	ND	0.0060	mg/L	UJ	LR-MS
Cobalt, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.0060	mg/L	UJ	LR-MS
Cobalt, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.0060	mg/L	UJ	LR-MS
Cobalt, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.0041	0.0060	mg/L	J-	LR-MS, MDLRL
Cobalt, Total	E 200.7	OPIS-1	2212A11-004D	0.0048	0.0060	mg/L	J	MDLRL
Ethylbenzene	SW8260B	OPIS-1	2212a11-004a	4.6	5.0	µg/L	J	MDLRL
Fluoranthene	SW8270C	Dup-12-15-22	2212a11-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Mercury, Dissolved	E245.1	EB-12-15-22	2212A11-001E	0.000097	0.0002	mg/L	J+	HR-LCS, MDLRL
Mercury, Total	E245.1	EB-12-15-22	2212A11-001D	0.000099	0.0002	mg/L	J+	HR-LCS, MDLRL
Nickel, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.010	mg/L	UJ	LR-MS
Nickel, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.010	mg/L	UJ	LR-MS
Nickel, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.010	mg/L	UJ	LR-MS
Nickel, Dissolved	E 200.7	MKTF-30	2212A11-002E	0.013	0.010	mg/L	J	HR-LCS, LR-MS
Nickel, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.15	0.010	mg/L	J	HR-LCS, LR-MS
Nickel, Total	E 200.7	MKTF-30	2212A11-002D	0.024	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OPIS-1	2212A11-004D	0.18	0.010	mg/L	J+	HR-LCS
Pyrene	SW8270C	Dup-12-15-22	2212a11-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Selenium, Dissolved	E200.8	OPIS-1	2212A11-004E	0.0022	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	OPIS-1	2212A11-004D	0.0045	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.0050	mg/L	UJ	LR-MS
Silver, Dissolved	E 200.7	MKTF-30	2212A11-002E	0.0020	0.0050	mg/L	J-	LR-MS, MDLRL
Silver, Dissolved	E 200.7	STP-1-NW	2212A11-003E	0.0016	0.0050	mg/L	J-	LR-MS, MDLRL
Silver, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.0019	0.0050	mg/L	J-	LR-MS, MDLRL
Silver, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	0.0013	0.0050	mg/L	J-	LR-MS, MDLRL
Silver, Total	E 200.7	MKTF-30	2212A11-002D	0.0021	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	STP-1-NW	2212A11-003D	0.0022	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	OPIS-1	2212A11-004D	0.0019	0.0050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Silver, Total	E 200.7	Dup-12-15-22	2212A11-006D	0.0019	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-30	2212A11-002C	0.33	0.064	mg/L	JB	MBD
TPH DRO	SW8015	STP-1-NW	2212A11-003C	0.20	0.064	mg/L	JB	MBD
TPH DRO	SW8015	Dup-12-15-22	2212A11-006C	0.20	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-12-15-22	2212A11-001C	0.03	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OPIS-1	2212a11-004a	0.44	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-30	2212a11-002a	0.020	0.050	mg/L	J	MDLRL
TPH ORO	SW8015	STP-1-NW	2212A11-003C	0.074	0.080	mg/L	J	MDLRL
Trichloroethene	SW8260B	MKTF-30	2212a11-002a	0.95	1.0	µg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.050	mg/L	UJ	LR-MS
Vanadium, Dissolved	E 200.7	MKTF-30	2212A11-002E	0.0031	0.050	mg/L	J-	LR-MS, MDLRL
Vanadium, Dissolved	E 200.7	STP-1-NW	2212A11-003E	0.039	0.050	mg/L	J-	LR-MS, MDLRL
Vanadium, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.010	0.050	mg/L	J-	LR-MS, MDLRL
Vanadium, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	0.029	0.050	mg/L	J-	LR-MS, MDLRL
Vanadium, Total	E 200.7	MKTF-30	2212A11-002D	0.015	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	STP-1-NW	2212A11-003D	0.028	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OPIS-1	2212A11-004D	0.018	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	Dup-12-15-22	2212A11-006D	0.028	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	EB-12-15-22	2212A11-001E	ND	0.010	mg/L	UJ	LR-MS
Zinc, Dissolved	E 200.7	MKTF-30	2212A11-002E	ND	0.010	mg/L	UJ	LR-MS
Zinc, Dissolved	E 200.7	STP-1-NW	2212A11-003E	ND	0.010	mg/L	UJ	LR-MS
Zinc, Dissolved	E 200.7	Dup-12-15-22	2212A11-006E	ND	0.010	mg/L	UJ	LR-MS
Zinc, Dissolved	E 200.7	OPIS-1	2212A11-004E	0.0097	0.010	mg/L	J-	LR-MS, MDLRL
Zinc, Total	E 200.7	MKTF-30	2212A11-002D	0.0096	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OPIS-1	2212A11-004D	0.0079	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-082-003 Task: 0002	Sample Start Date: 12/22/2022
Date Validated: 02/14/2023	Sample End Date: 12/22/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212D48	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-22-22	2212d48-001
OW-1	2212d48-002
BW-4B	2212d48-003
BW-5C	2212d48-004
BW-5B	2212d48-005
MKTF-44	2212d48-006
OW-10	2212d48-007
MKTF-43	2212d48-008
FB-12-22-22	2212d48-009
DUP-12-22-22	2212d48-010
Trip Blank	2212d48-011

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Trip, Field, and Equipment Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
JB	Estimated concentration due to blank contamination
U	Evaluated to be undetected at the reporting limit
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 720 data points. The data completeness calculation does not include any submitted blank sample results. Seven data points were rejected. The data completeness measure for this data package is calculated to be 99.03% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for samples OW-1.

1-Methylnaphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample BW-5C

Method 80156D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B". The laboratory control spike (LCS) had an elevated recovery.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

E – Above quantitation range / estimated value. *This flag was mistakenly applied according to the results reported.*

J – Analyte detected below quantitation limits.

J3 – The associated batch QC was outside the established quality control range for precision.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The trip blank sample was received by the laboratory, but the parameters requested were not indicated on the CoC. The laboratory logged in the sample and performed the appropriate volatile analyses. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	MKTF-43	Total Metals	5
200.8	OW-10, BW-5C	Select Total and Dissolved Metals	5
200.8	MKTF-43	Dissolved Metals	10
200.8	MKTF-43	Total Metals	20

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 0.4°C to 3.1°C as noted on Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.4°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**72387**	**0.0051 mg/L**
8015D	**TPH DRO**	**72336**	**0.079 mg/L**

Detections of total zinc and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total zinc and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72387	Not Prepared
200.7	Dissolved Metals	A93766	Not Prepared
200.8	Total Metals	72387	Not Prepared
200.8	Dissolved Metals	A93855	Not Prepared
200.8	Dissolved Metals	A93877	Not Prepared
200.8	Dissolved Metals	A93915	Not Prepared
245.1	Total and Dissolved Mercury	72445	EB-12-22-22
504.1	EDB	72358	Not Prepared
4500CN E	Cyanide	WG1980609	Not Associated
4500CN E	Cyanide	WG1980984	MKTF-43, FB-12-22-22
8015D	TPH DRO and MRO	72336	Not Prepared
8015D	TPH GRO	R93580	OW-1
8015D	TPH GRO	R93606	Not Prepared
8260B	VOCs	R93684	Not Prepared
8270C SIM	SVOCs	72320	Not Prepared
8270C	SVOCs	72320	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation or laboratory QC limits.

The MS recovery for cyanide in Method 4500CN E batch WG1980984 was outside the laboratory QC limits of 90.0-110% at 89.3%. However, the recovery was within data validation limits of 75-125%. Validation action was not required.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits
200.7	**Total Cobalt**	**72387**	**195%**	**-----**	**70-130%**
8015D	**TPH DRO**	**72336**	**137%**	**134%**	**31.2-125%**

Detections of total cobalt and TPH DRO were assigned J+ qualifiers due to evidence of potential high bias. Non-detections of total cobalt in the associated samples did not require qualification.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-43**	**1.10%**	**15-84.5%**
8270C	**Phenol-d_5**	**MKTF-43**	**4.92%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**MKTF-43**	**1.52%**	**15-108%**

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

The analytes in the acid fraction of sample MKTF-43 were not detected. Since the recoveries of the surrogates in sample MKTF-43 were less than 10%, the results for the associated acid fraction analytes were assigned R qualifiers to indicate rejected (not usable) data based on evidence of extreme low bias.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-22-22, and one equipment blank sample, EB-12-22-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration (mg/L)
EB-12-22-22	8015D	TPH DRO	0.019
EB-12-22-22	**245.1**	**Total Mercury**	**0.00014**
EB-12-22-22	**245.1**	**Dissolved Mercury**	**0.00013**

Detections of total mercury and dissolved mercury in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total mercury in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers.

The TPH DRO results in Method 8015D batch 72366 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample Dup-12-22-22 was collected as a field duplicate of sample OW-1.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1980609 from samples not associated with this data set and the analysis of cyanide in batch WG1980984 from samples MKTF-44 and OW-10.

The RPDs for laboratory duplicates prepared from project samples were not applicable because the measurements were reported as not detected in samples MKTF-44 and OW-10.

The RPD value for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-1	Mercury	0.00012	0.00014
BW-5B	Arsenic	0.0013	0.0017
BW-5C	Arsenic	ND	0.0013
OW-1	Barium	0.034	0.035
MKTF-43	Beryllium	ND	0.00085
MKTF-43	Nickel	ND	0.0056
BW-4B	Selenium	ND	0.0016
BW-5B	Selenium	0.0015	0.0064
BW-5C	Selenium	ND	0.010
DUP-12-22-22	Selenium	ND	0.0044
MKTF-43	Selenium	ND	0.088
MKTF-44	Selenium	0.014	0.015
OW-1	Selenium	0.0015	0.0047
OW-10	Selenium	0.0076	0.015
BW-5C	Silver	ND	0.0013
MKTF-43	Silver	ND	0.025
MKTF-43	Vanadium	ND	0.0058
BW-5C	Zinc	ND	0.0088
BW-5B	Zinc	ND	0.011
OW-10	Zinc	ND	0.0069

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-1 Field Duplicate Sample ID: DUP-12-22-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.035 mg/L	0.034 mg/L	2.9%
Barium, Total	E 200.7	0.034 mg/L	0.037 mg/L	8.5%
Vanadium, Dissolved	E 200.7	0.044 mg/L	0.043 mg/L	2.3% +/-RL
Vanadium, Total	E 200.7	0.049 mg/L	0.052 mg/L	5.9% +/-RL
Arsenic, Dissolved	E200.8	0.00078 mg/L	0.00075 mg/L	3.9% +/-RL
Arsenic, Total	E200.8	0.00088 mg/L	0.00092 mg/L	4.4% +/-RL
Selenium, Dissolved	E200.8	0.0047 mg/L	0.0044 mg/L	6.6%
Selenium, Total	E200.8	0.0015 mg/L	ND (0.0010 mg/L)	DL
Mercury, Dissolved	E245.1	0.00014 mg/L	0.00012 mg/L	15.4% +/-RL
Mercury, Total	E245.1	0.00012 mg/L	0.00012 mg/L	0.0% +/-RL
TPH DRO	SW8015	0.028 mg/L	0.029 mg/L	3.5% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	BW-5B	2212d48-005c	0.64	1.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	MKTF-43	2212d48-008c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-43	2212d48-008c	ND	10	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-43	2212d48-008c	ND	20	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	MKTF-43	2212d48-008c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-43	2212d48-008c	ND	10	µg/L	R	LR-SUR
Arsenic, Dissolved	E200.8	OW-1	2212D48-002E	0.00078	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-12-22-22	2212D48-010E	0.00075	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-1	2212D48-002D	0.00088	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-10	2212D48-007D	0.00061	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP-12-22-22	2212D48-010D	0.00092	0.0010	mg/L	J	MDLRL
Benzoic Acid	SW8270C	MKTF-43	2212d48-008c	ND	20	µg/L	R	LR-SUR
Beryllium, Dissolved	E 200.7	MKTF-43	2212D48-008E	0.00085	0.0020	mg/L	J	MDLRL
Chromium, Total	E 200.7	BW-4B	2212D48-003D	0.0053	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	BW-5C	2212D48-004D	0.0046	0.0060	mg/L	J	MDLRL
Chromium, Total	E 200.7	MKTF-44	2212D48-006D	0.0038	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-10	2212D48-007D	0.0062	0.0060	mg/L	J+	HR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Total	E 200.7	MKTF-43	2212D48-008D	0.095	0.030	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	BW-4B	2212D48-003D	0.0037	0.0060	mg/L	J+	HR-LCS, MDLRL
Cobalt, Total	E 200.7	BW-5C	2212D48-004D	0.0059	0.0060	mg/L	J+	HR-LCS, MDLRL
Cobalt, Total	E 200.7	BW-5B	2212D48-005D	0.0057	0.0060	mg/L	J+	HR-LCS, MDLRL
Cobalt, Total	E 200.7	MKTF-44	2212D48-006D	0.0054	0.0060	mg/L	J+	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	EB-12-22-22	2212D48-001E	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-1	2212D48-002E	0.00014	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	BW-4B	2212D48-003E	0.00010	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	BW-5C	2212D48-004E	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	BW-5B	2212D48-005E	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	MKTF-44	2212D48-006E	0.00010	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	OW-10	2212D48-007E	0.00011	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	MKTF-43	2212D48-008E	0.000093	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	DUP-12-22-22	2212D48-010E	0.00012	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	BW-5C	2212D48-004D	0.00027	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	EB-12-22-22	2212D48-001D	0.00014	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-1	2212D48-002D	0.00012	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	BW-4B	2212D48-003D	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	BW-5B	2212D48-005D	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	MKTF-44	2212D48-006D	0.00011	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	OW-10	2212D48-007D	0.00011	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	MKTF-43	2212D48-008D	0.000097	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	DUP-12-22-22	2212D48-010D	0.00012	0.00020	mg/L	U	EBD, MDLRL
Nickel, Dissolved	E 200.7	MKTF-43	2212D48-008E	0.0056	0.010	mg/L	J	MDLRL
Phenol	SW8270C	MKTF-43	2212d48-008c	ND	20	µg/L	R	LR-SUR
Silver, Dissolved	E 200.7	BW-5C	2212D48-004E	0.0013	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	BW-5C	2212D48-004C	0.081	0.064	mg/L	JB	HR-LCS, MBD

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH DRO	SW8015	MKTF-43	2212D48-008C	0.13	0.064	mg/L	JB	HR-LCS, MBD
TPH DRO	SW8015	EB-12-22-22	2212D48-001C	0.019	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-1	2212D48-002C	0.028	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	BW-4B	2212D48-003C	0.063	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	BW-5B	2212D48-005C	0.039	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	MKTF-44	2212D48-006C	0.024	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-10	2212D48-007C	0.069	0.064	mg/L	U	HR-LCS, MBD
TPH DRO	SW8015	DUP-12-22-22	2212D48-010C	0.029	0.064	mg/L	U	HR-LCS, MBD, MDLRL
TPH GRO	SW8015	BW-5C	2212d48-004a	0.02	0.05	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-1	2212D48-002E	0.044	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-4B	2212D48-003E	0.016	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-5C	2212D48-004E	0.0034	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	BW-5B	2212D48-005E	0.012	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-10	2212D48-007E	0.0064	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-43	2212D48-008E	0.0058	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-12-22-22	2212D48-010E	0.043	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-1	2212D48-002D	0.049	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-4B	2212D48-003D	0.037	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-5C	2212D48-004D	0.0099	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	BW-5B	2212D48-005D	0.013	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-10	2212D48-007D	0.0073	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	BW-5C	2212D48-004E	0.0088	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-10	2212D48-007E	0.0069	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-44	2212D48-006D	0.014	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	BW-4B	2212D48-003D	0.0065	0.010	mg/L	U	MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-082-003 Task: 0002	Sample Start Date: 12/27/2022
Date Validated: 02/14/2023	Sample End Date: 12/27/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212E09	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-27-22	2212e09-001
OW-50	2212e09-002
OW-52	2212e09-003
OW-29	2212e09-004
OW-54	2212e09-005
OW-66	2212e09-006
OW-55	2212e09-007
FB-12-27-22	2212e09-008
Dup-12-27-22	2212e09-009
Trip Blank	2212e09-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Trip, Field, and Equipment Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for samples OW-55 and OW-66.

Method 80156D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The trip blank sample was received by the laboratory, but the parameters requested were not indicated on the CoC. The laboratory logged in the sample and performed the appropriate volatile analyses. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8015D	OW-66, OW-55	TPH DRO and MRO	2
8260B	OW-29	Select VOCs	2
200.7	OW-66	Total and Dissolved Barium	5
200.8	OW-54	Total Lead	5
8260B	OW-54	Select VOCs	5
8260B	OW-29	MTBE	20
8015D	OW-66, OW-55	TPH GRO	50
8260B	OW-54	MTBE	50
8260B	OW-66, OW-55	Select VOCs	50
8260B	OW-66	Benzene, Toluene, Total Xylenes	500

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

VALIDATION CRITERIA CHECKLIST	
The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.2°C and 4.6°C as noted on Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 2.5°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**72409**	**0.0045 mg/L**
200.8	Total Antimony	72409	0.00062 mg/L
245.1	**Mercury**	**72446**	**0.000099 mg/L**
8015D	**TPH DRO**	**72386**	**0.10 mg/L**

Detections of total zinc, total and dissolved mercury, and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total zinc, total mercury, and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples and results greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72409	Not Prepared
200.7	Dissolved Zinc	A93838	OW-52
200.7	Dissolved Metals	B93766	Not Prepared
200.8	Total Metals	72409	OW-50, EB-12-27-22
200.8	Dissolved Metals	A93855	Not Prepared
245.1	Total and Dissolved Mercury	72446	Not Prepared
504.1	EDB	72358	Not Prepared
4500CN E	Cyanide	WG1980984	Not Associated
4500CN E	Cyanide	WG1981929	OW-55, Not Associated
8015D	TPH DRO and MRO	72386	Not Prepared
8015D	TPH GRO	R93693	OW-66
8260B	VOCs	R93710	Not Prepared
8270C SIM	SVOCs	72347	Not Prepared
8270C	SVOCs	R93725	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation or laboratory QC limits, with the following exception.

The recovery for TPH GRO in the MS for Method 8015D batch R93693 was outside the QC limits of 70-130% at 43.0%. Detections of TPH GRO in the associated samples were qualified as J-, and non-detections were qualified as UJ due to evidence of potential low bias.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits
200.7	**Total Cobalt**	**72409**	**140%**	**-----**	**70-130%**
200.7	**Total Nickel**	**72409**	**139%**	**-----**	**70-130%**
200.7	**Dissolved Nickel**	**B93766**	**68.9%**	**-----**	**70-130%**
200.8	**Total Selenium**	**72409**	**69.0%**	**-----**	**70-130%**
245.1	**Mercury**	**72446**	**144%**	**-----**	**70-130%**

Detections of total cobalt, total nickel, and mercury were assigned J+ qualifiers due to evidence of potential high bias. Non-detections of total cobalt and mercury in the associated samples did not require qualification.

Detections of dissolved nickel and total selenium were assigned J- qualifiers, and non-detections of dissolved nickel and total selenium were qualified as UJ due to evidence of potential low bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C analysis of sample OW-66 since only the recovery for the surrogate 2-fluorophenol was outside laboratory limits of 15-84.5% at 0%, and qualification of sample data was not required.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-27-22, and one equipment blank sample, EB-12-27-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration (mg/L)
EB-12-27-22	8015D	TPH DRO	0.041
EB-12-27-22	**200.7**	**Dissolved Vanadium**	**0.0017**
EB-12-27-22	245.1	Total Mercury	0.000099
EB-12-27-22	245.1	Dissolved Mercury	0.00010

Detections of dissolved vanadium in the associated samples that were less than the applicable reporting limits were assigned U qualifiers.

The TPH DRO results in Method 8015D batch 72386 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank detection was not required.

The total and dissolved mercury results in Method 245.1 batch 72446 were previously qualified due to laboratory blank detections; therefore, additional qualification due to the equipment blank detections was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample Dup-12-27-22 was collected as a field duplicate of sample OW-50.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? Yes

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1980984 from samples not associated with this data set, and the analysis of cyanide in batch WG1981929 from sample OW-66 and from a sample not associated with this data set.

The RPD for the laboratory duplicate prepared from project sample OW-66 was within laboratory acceptance limits

The RPD value for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-52	Mercury	0.000097	0.00012
OW-54	Arsenic	0.0040	0.0054
OW-55	Arsenic	0.0059	0.0095
OW-50	Barium	0.052	0.053
OW-52	Barium	0.027	0.028
OW-29	Barium	0.086	0.091
DUP-12-27-22	Barium	0.049	0.053
DUP-12-27-22	Selenium	ND	0.0017
OW-29	Selenium	0.0012	0.0069
OW-50	Selenium	ND	0.0019
OW-52	Selenium	ND	0.0012
OW-54	Selenium	0.0028	0.0092
OW-66	Selenium	0.0018	0.0059
EB-12-27-22	Vanadium	ND	0.0017
OW-50	Vanadium	ND	0.0025
OW-52	Vanadium	ND	0.0027
OW-29	Vanadium	ND	0.0025
DUP-12-27-22	Vanadium	ND	0.0021
OW-50	Zinc	0.0044	0.0073
OW-52	Zinc	0.0092	0.014
OW-29	Zinc	ND	0.024

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-50 Field Duplicate Sample ID: DUP-12-27-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
MTBE	SW8260B	69 µg/L	64 µg/L	7.5%
TPH GRO	SW8015	0.062 mg/L	0.063 mg/L	1.6% +/-RL
TPH DRO	SW8015	0.023 mg/L	0.059 mg/L	87.8% +/-RL
Barium, Dissolved	E 200.7	0.053 mg/L	0.053 mg/L	0.0%
Barium, Total	E 200.7	0.052 mg/L	0.049 mg/L	5.9%
Vanadium, Dissolved	E 200.7	0.0025 mg/L	0.0021 mg/L	17.4% +/-RL
Zinc, Dissolved	E 200.7	0.0073 mg/L	ND (0.010 mg/L)	DL
Zinc, Total	E 200.7	0.0044 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0028 mg/L	0.0026 mg/L	7.4%
Arsenic, Total	E200.8	0.0023 mg/L	0.0021 mg/L	9.1%
Mercury, Dissolved	E245.1	0.00010 mg/L	0.00010 mg/L	0.0% +/-RL
Mercury, Total	E245.1	0.00010 mg/L	0.00011 mg/L	9.5% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-MS	The MS and/or MSD percent recovery was less than the lower acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	OW-29	2212E09-004C	0.86	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-54	2212e09-005c	0.84	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-54	2212e09-005c	0.20	0.30	µg/L	J	MDLRL
Acenaphthene	SW8270C	OW-66	2212E09-006C	0.24	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	OW-55	2212E09-007C	0.22	0.30	µg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-52	2212E09-003E	0.00096	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-52	2212E09-003D	0.00045	0.0010	mg/L	J	MDLRL
Beryllium, Total	E 200.7	OW-54	2212E09-005D	0.0012	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	OW-66	2212E09-006D	0.00076	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	OW-55	2212E09-007D	0.0018	0.0020	mg/L	J	MDLRL
Cobalt, Dissolved	E 200.7	OW-55	2212E09-007E	0.0057	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-54	2212E09-005D	0.085	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-55	2212E09-007D	0.036	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-66	2212E09-006D	0.0040	0.0060	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	EB-12-27-22	2212E09-001E	0.00010	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	OW-50	2212E09-002E	0.00010	0.00020	mg/L	U	HR-LCS, MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Mercury, Dissolved	E245.1	OW-52	2212E09-003E	0.00012	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	OW-54	2212E09-005E	0.000099	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	OW-66	2212E09-006E	0.00010	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Dissolved	E245.1	Dup-12-27-22	2212E09-009E	0.00010	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-54	2212E09-005D	0.00023	0.00020	mg/L	JB	HR-LCS, MBD
Mercury, Total	E245.1	EB-12-27-22	2212E09-001D	0.000099	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-50	2212E09-002D	0.00010	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-52	2212E09-003D	0.000097	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-29	2212E09-004D	0.000097	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-66	2212E09-006D	0.00012	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	OW-55	2212E09-007D	0.00011	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Mercury, Total	E245.1	Dup-12-27-22	2212E09-009D	0.00011	0.00020	mg/L	U	HR-LCS, MBD, MDLRL
Nickel, Dissolved	E 200.7	OW-29	2212E09-004E	0.028	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	OW-54	2212E09-005E	0.21	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	OW-66	2212E09-006E	0.30	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	OW-55	2212E09-007E	0.22	0.010	mg/L	J-	LR-LCS
Nickel, Dissolved	E 200.7	EB-12-27-22	2212E09-001E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	OW-50	2212E09-002E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	OW-52	2212E09-003E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Dissolved	E 200.7	Dup-12-27-22	2212E09-009E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-29	2212E09-004D	0.029	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-54	2212E09-005D	0.23	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-66	2212E09-006D	0.33	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-55	2212E09-007D	0.25	0.010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	OW-29	2212E09-004D	0.0012	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-54	2212E09-005D	0.0028	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-66	2212E09-006D	0.0018	0.0010	mg/L	J-	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Total	E200.8	OW-55	2212E09-007D	0.0048	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	EB-12-27-22	2212E09-001D	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Total	E200.8	OW-50	2212E09-002D	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Total	E200.8	OW-52	2212E09-003D	ND	0.0010	mg/L	UJ	LR-LCS
Selenium, Total	E200.8	Dup-12-27-22	2212E09-009D	ND	0.0010	mg/L	UJ	LR-LCS
TPH DRO	SW8015	OW-29	2212E09-004C	0.43	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-12-27-22	2212E09-001C	0.041	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-50	2212E09-002C	0.023	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-52	2212E09-003C	0.045	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	Dup-12-27-22	2212E09-009C	0.059	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	OW-50	2212e09-002a	0.062	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	OW-29	2212e09-004a	2.7	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	OW-54	2212e09-005a	1.4	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	OW-66	2212e09-006a	240	2.5	mg/L	J-	LR-MS
TPH GRO	SW8015	OW-55	2212e09-007a	27	2.5	mg/L	J-	LR-MS
TPH GRO	SW8015	Dup-12-27-22	2212e09-009a	0.063	0.050	mg/L	J-	LR-MS
TPH GRO	SW8015	EB-12-27-22	2212e09-001a	ND	0.050	mg/L	UJ	LR-MS
TPH GRO	SW8015	OW-52	2212e09-003a	ND	0.050	mg/L	UJ	LR-MS
Vanadium, Dissolved	E 200.7	OW-50	2212E09-002E	0.0025	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-52	2212E09-003E	0.0027	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-29	2212E09-004E	0.0025	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-54	2212E09-005E	0.0051	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-66	2212E09-006E	0.0062	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-55	2212E09-007E	0.0057	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	Dup-12-27-22	2212E09-009E	0.0021	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EB-12-27-22	2212E09-001E	0.0017	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-54	2212E09-005D	0.027	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	OW-66	2212E09-006D	0.027	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-55	2212E09-007D	0.036	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-50	2212E09-002E	0.0073	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-54	2212E09-005E	0.0058	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-66	2212E09-006E	0.0070	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-55	2212E09-007E	0.0041	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-54	2212E09-005D	0.023	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	OW-66	2212E09-006D	0.012	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	OW-55	2212E09-007D	0.040	0.010	mg/L	JB	MBD
Zinc, Total	E 200.7	OW-50	2212E09-002D	0.0044	0.010	mg/L	U	MBD, MDLRL
Zinc, Total	E 200.7	OW-52	2212E09-003D	0.0092	0.010	mg/L	U	MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-082-003 Task: 0002	Sample Start Date: 12/28/2022
Date Validated: 02/15/2023	Sample End Date: 12/28/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212E57	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-28-22	2212E57-001
OW-13	2212E57-002
OW-56	2212E57-003
OW-59	2212E57-004
OW-67	2212E57-005
OW-68	2212E57-006
OW-60	2212E57-007
FB-12-28-22	2212E57-008
Dup-12-28-22	2212E57-009
Trip Blank	2212E57-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ⊗ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Trip, Field, and Equipment Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 630 data points. The data completeness calculation does not include any submitted blank sample results. Twenty-one data points were rejected. The data completeness measure for this data package is calculated to be 96.67% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 80156D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B". The laboratory control spike for DRO/MRO had an elevated recovery for OW-67, OW-68, OW60, and Dup-12-28-22.

Method 80156D GRO: The surrogate recoveries for OW-56, OW59, OW67, OW 68, and OW60 all had elevated surrogate recoveries because of matrix interference. A large peak was detected at the same retention time as the surrogate.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

E – Above quantitation range / estimated value. *This flag was mistakenly applied according to the results reported.*

J – Analyte detected below quantitation limits.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

The trip blank sample was received by the laboratory, but the parameters requested were not indicated on the CoC. The laboratory logged in the sample and performed the appropriate volatile analyses. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-60	Dissolved Metals	5
200.8	OW-67	Select Dissolved Metals	5
200.8	OW-59, OW-67, OW-68	Total Metals	5
200.7	Dup-12-28-22	Dissolved Metals	10

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.2°C to 1.1°C as noted on Sample Log-in Check List and on the CoC. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 1.6°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Zinc**	**72409**	**0.0045 mg/L**
200.8	Total Antimony	72409	0.00062 mg/L
8015D	**TPH DRO**	**72386**	**0.10 mg/L**
8015D	**TPH DRO**	**72395**	**0.10 mg/L**

Detections of total zinc and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total zinc and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of these analytes in the associated samples and results greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72409	EB-12-28-22, OW-13
200.7	Dissolved Metals	A93838	Not Prepared
200.7	Dissolved Cobalt	A94009	Not Prepared
200.7	Dissolved Metals	B93766	Not Prepared
200.7	Dissolved Metals	C93766	OW-56
200.8	Total Metals	72409	Not Prepared
200.8	Dissolved Metals	A93877	Not Prepared
200.8	Dissolved Metals	B93855	EB-12-28-22, OW-13
245.1	Total and Dissolved Mercury	72553	Dup-12-28-22
504.1	EDB	72430	Not Prepared
4500CN E	Cyanide	WG1981929	Not Associated, OW-13
8015D	TPH DRO and MRO	72386	Not Prepared
8015D	TPH DRO and MRO	72395	Not Prepared
8015D	TPH GRO	R93693	Not Prepared
8260B	VOCs	R93727	Not Prepared
8260B	VOCs	R93747	Not Prepared
8270C SIM	SVOCs	72406	Not Prepared
8270C	SVOCs	72406	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation or laboratory QC limits, with the following exception.

The MS percent recovery for total zinc in Method 200.7 batch 72409 was outside the QC limits of 75-125% at 127%. Detections of total zinc in the associated samples were assigned J+ qualifiers due to evidence of potential high bias. Non-detections of total zinc in the associated samples did not require qualification based on this non-conformance. The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Cobalt**	**72409**	**140%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Nickel**	**72409**	**139%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Dissolved Nickel**	**B93766**	**68.9%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Selenium**	**72409**	**69.0%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**72395**	**138%**	**Acceptable**	**31.2-125%**	**25.2%**	**20%**

Detections of total cobalt, total nickel, and TPH DRO in the associated samples were assigned J+ qualifiers due to evidence of potential high bias. Non-detections of total cobalt and total nickel in the associated samples did not require qualification.

Detections of total selenium were assigned J- qualifiers, and non-detections of dissolved nickel and total selenium were qualified as UJ due to evidence of potential low bias.

TPH DRO was detected in the associated samples, and these results were qualified as J due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8015D	**BFB**	**OW-56**	**551%**	**70-130%**
8260B	**Dibromofluoromethane**	**OW-56**	**144%**	**70-130%**
8015D	**BFB**	**OW-59**	**5,320%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-59**	**9.65%**	**15-84.5%**
8270C	**2,4,6-Tribromophenol**	**OW-59**	**5.51%**	**15-108%**
8015D	**BFB**	**OW-67**	**607%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-67**	**1.92%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-67**	**6.32%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**OW-67**	**2.88%**	**15-108%**
8015D	**BFB**	**OW-68**	**2,720%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-68**	**3.37%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-68**	**10.7%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**OW-68**	**5.87%**	**15-108%**
8015D	BFB	OW-60	134%	70-130%
8270C	**2-Fluorophenol**	**OW-60**	**12.2%**	**15-84.5%**
8270C	**2,4,6-Tribromophenol**	**OW-60**	**7.99%**	**15-108%**

TPH GRO was detected in the Method 8015D analysis of samples OW-56, OW-59, OW-67, and OW-68, and these results were assigned J+ qualifiers due to evidence of potential high bias. TPH GRO was not detected in sample OW-60, and qualification of data was not required.

Since Method 8260B surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes when one or more surrogates was outside the acceptance range. **The associated target analytes in sample OW-56 with the surrogate dibromofluoromethane recovery that was greater than the upper laboratory QC limit were qualified as J+ if detected in affected samples due to potential high bias.** Qualification was not required for non-detected analytes associated with this surrogate.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. **The analytes in the acid fraction of samples OW-59, OW-67, OW-68, and OW-60 were not detected. Since the recoveries of at least 2 of 3 surrogates in samples OW-59, OW-67, and OW-68 were less than 10%, the results for the associated acid fraction analytes were assigned R qualifiers to indicate rejected (not usable) data based on evidence of extreme low bias. Only 1 of 3 acid fraction surrogates was less than 10% for sample OW-60; therefore, the associated acid fraction analytes were assigned UJ qualifiers due to evidence of potential low bias.**

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-28-22, and one equipment blank sample, EB-12-28-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration (mg/L)
EB-12-28-22	**200.7**	**Dissolved Vanadium**	**0.0020**
EB-12-28-22	**245.1**	**Total Mercury**	**0.00018**
EB-12-28-22	**245.1**	**Dissolved Mercury**	**0.000091**
EB-12-28-22	8015D	TPH DRO	0.025

Detections of dissolved vanadium, total mercury, and dissolved mercury in the associated samples that were less than or equal to the applicable reporting limits were assigned U qualifiers. Detections of total and dissolved mercury in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results in Method 8015D batch 72386 and batch 72395 were previously qualified due to laboratory blank detections; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample Dup-12-28-22 was collected as a field duplicate of sample OW-13.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1981929 from samples not associated with this data set.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-13	Mercury	0.00017	0.00020
OW-13	Arsenic	0.00061	0.0013
DUP-12-28-22	Arsenic	0.00067	0.0010
OW-13	Barium	0.019	0.020
DUP-12-28-22	Barium	0.019	0.022
OW-59	Beryllium	ND	0.00072
OW-13	Selenium	ND	0.0022
OW-56	Selenium	0.0023	0.0075
OW-59	Selenium	0.0069	0.019
OW-67	Selenium	0.0067	0.031
OW-68	Selenium	0.0065	0.017
OW-60	Selenium	0.016	0.034
DUP-12-28-22	Selenium	0.0011	0.0022
OW-59	Silver	ND	0.0028
OW-67	Silver	ND	0.014
OW-68	Silver	ND	0.0065
EB-12-28-22	Vanadium	ND	0.0020
OW-13	Vanadium	ND	0.0040
Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-60	Vanadium	0.011	0.015
OW-13	Zinc	ND	0.016

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-13 Field Duplicate Sample ID: DUP-12-28-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.020 mg/L	0.022 mg/L	9.5%
Barium, Total	E 200.7	0.019 mg/L	0.019 mg/L	0.0%
Vanadium, Dissolved	E 200.7	0.0040 mg/L	ND (0.50 mg/L)	DL
Zinc, Dissolved	E 200.7	0.016 mg/L	ND (0.10 mg/L)	DL
Zinc, Total	E 200.7	ND (0.010 mg/L)	0.0068 mg/L	DL
Arsenic, Dissolved	E200.8	0.0013 mg/L	0.0010 mg/L	26.1% +/-RL
Arsenic, Total	E200.8	0.00061 mg/L	0.00067 mg/L	9.4% +/-RL
Selenium, Dissolved	E200.8	0.0022 mg/L	0.0022 mg/L	0.0%
Selenium, Total	E200.8	ND (0.0010 mg/L)	0.0011 mg/L	DL
Mercury, Dissolved	E245.1	0.00020 mg/L	ND (0.00020 mg/L)	DL
Mercury, Total	E245.1	0.00017 mg/L	ND (0.00020 mg/L)	DL
TPH DRO	SW8015	0.061 mg/L	0.059 mg/L	3.3% +/-RL
TPH GRO	SW8015	0.098 mg/L	0.094 mg/L	4.2% +/-RL
MTBE	SW8260B	97 µg/L	99 µg/L	2.0%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
HR-MS	The MS and/or MSD percent recovery was greater than the upper acceptable limit indicating possible matrix interference.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	OW-56	2212e57-003a	1.4	1.0	µg/L	J+	HR-SUR
1,2-Dichloroethane	SW8260B	OW-56	2212e57-003a	5.2	1.0	µg/L	J+	HR-SUR
1,4-Dioxane	SW8270C	OW-56	2212e57-003c	0.22	1.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-59	2212E57-004C	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-67	2212e57-005c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-68	2212e57-006c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	OW-60	2212e57-007c	ND	10	µg/L	UJ	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-59	2212E57-004C	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-67	2212e57-005c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-68	2212e57-006c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-60	2212e57-007c	ND	10	µg/L	UJ	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-59	2212E57-004C	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-67	2212e57-005c	ND	20	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2,4-Dinitrophenol	SW8270C	OW-68	2212e57-006c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-60	2212e57-007c	ND	20	µg/L	UJ	LR-SUR
2-Methylphenol	SW8270C	OW-59	2212E57-004C	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-67	2212e57-005c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-68	2212e57-006c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-60	2212e57-007c	ND	10	µg/L	UJ	LR-SUR
3,4-Methylphenol	SW8270C	OW-59	2212E57-004C	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-67	2212e57-005c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-68	2212e57-006c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-60	2212e57-007c	ND	10	µg/L	UJ	LR-SUR
Arsenic, Total	E200.8	OW-13	2212E57-002D	0.00061	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-59	2212E57-004D	0.0048	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-67	2212E57-005D	0.0034	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	Dup-12-28-22	2212E57-009D	0.00067	0.0010	mg/L	J	MDLRL
Benzene	SW8260B	OW-56	2212e57-003a	1.9	1.0	µg/L	J+	HR-SUR
Benzoic Acid	SW8270C	OW-59	2212E57-004C	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-67	2212e57-005c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-68	2212e57-006c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	OW-60	2212e57-007c	ND	20	µg/L	UJ	LR-SUR
Beryllium, Dissolved	E 200.7	OW-59	2212E57-004E	0.00072	0.0020	mg/L	J	MDLRL
Chromium, Total	E 200.7	OW-68	2212E57-006D	0.0060	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	OW-56	2212E57-003D	0.0073	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-59	2212E57-004D	0.0087	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-67	2212E57-005D	0.032	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-68	2212E57-006D	0.086	0.0060	mg/L	J+	HR-LCS
Cobalt, Total	E 200.7	OW-60	2212E57-007D	0.0054	0.0060	mg/L	J+	HR-LCS, MDLRL
Fluoranthene	SW8270C	OW-59	2212E57-004C	0.14	0.30	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluorene	SW8270C	OW-68	2212e57-006c	0.12	0.30	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-56	2212e57-003a	3.0	1.0	µg/L	J+	HR-SUR
Lead, Dissolved	E200.8	OW-56	2212E57-003E	0.00022	0.0005	mg/L	J	MDLRL
Lead, Total	E200.8	OW-59	2212E57-004D	0.0013	0.0025	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-56	2212E57-003E	0.00022	0.00020	mg/L	JB	EBD
Mercury, Dissolved	E245.1	OW-13	2212E57-002E	0.00020	0.00020	mg/L	U	EBD, MDLRL
Mercury, Dissolved	E245.1	EB-12-28-22	2212E57-001E	0.000091	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-56	2212E57-003D	0.00029	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	OW-13	2212E57-002D	0.00017	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	EB-12-28-22	2212E57-001D	0.00018	0.00020	mg/L	J	MDLRL
MTBE	SW8260B	OW-56	2212e57-003a	14	1.0	µg/L	J+	HR-SUR
Nickel, Dissolved	E 200.7	EB-12-28-22	2212E57-001E	ND	0.010	mg/L	UJ	LR-LCS
Nickel, Total	E 200.7	OW-56	2212E57-003D	0.078	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-59	2212E57-004D	0.044	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-67	2212E57-005D	0.12	0.010	mg/L	J+	HR-LCS
Nickel, Total	E 200.7	OW-68	2212E57-006D	0.2	0.010	mg/L	J+	HR-LCS
Phenol	SW8270C	OW-59	2212E57-004C	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	OW-67	2212e57-005c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	OW-68	2212e57-006c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	OW-60	2212e57-007c	ND	20	µg/L	UJ	LR-SUR
Selenium, Total	E200.8	OW-56	2212E57-003D	0.0023	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-59	2212E57-004D	0.0069	0.0050	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-67	2212E57-005D	0.0067	0.0050	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-68	2212E57-006D	0.0065	0.0050	mg/L	J-	LR-LCS
Selenium, Total	E200.8	OW-60	2212E57-007D	0.016	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	Dup-12-28-22	2212E57-009D	0.0011	0.0010	mg/L	J-	LR-LCS
Selenium, Total	E200.8	EB-12-28-22	2212E57-001D	ND	0.0010	mg/L	UJ	LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Selenium, Total	E200.8	OW-13	2212E57-002D	ND	0.0010	mg/L	UJ	LR-LCS
Silver, Dissolved	E 200.7	OW-59	2212E57-004E	0.0028	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	OW-56	2212E57-003C	0.82	0.064	mg/L	JB	MBD
TPH DRO	SW8015	OW-59	2212E57-004C	0.50	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-12-28-22	2212E57-001C	0.025	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-13	2212E57-002C	0.061	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-68	2212E57-006C	1.7	0.064	mg/L	J+	ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-67	2212E57-005C	0.67	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	OW-60	2212E57-007C	0.15	0.064	mg/L	JB	ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	Dup-12-28-22	2212E57-009C	0.059	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH GRO	SW8015	OW-56	2212e57-003a	0.22	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-59	2212e57-004a	0.26	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-67	2212e57-005a	0.077	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-68	2212e57-006a	0.85	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	OW-67	2212E57-005C	0.060	0.080	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-13	2212E57-002E	0.004	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-56	2212E57-003E	0.0034	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-59	2212E57-004E	0.0061	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-67	2212E57-005E	0.0063	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-68	2212E57-006E	0.012	0.050	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	OW-60	2212E57-007E	0.015	0.25	mg/L	U	EBD, MDLRL
Vanadium, Dissolved	E 200.7	EB-12-28-22	2212E57-001E	0.0020	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-56	2212E57-003D	0.0057	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-59	2212E57-004D	0.0094	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-67	2212E57-005D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-68	2212E57-006D	0.045	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Total	E 200.7	OW-60	2212E57-007D	0.011	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-56	2212e57-003a	2.1	1.5	µg/L	J+	HR-SUR
Zinc, Dissolved	E 200.7	OW-56	2212E57-003E	0.0033	0.010	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-68	2212E57-006E	0.0069	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-56	2212E57-003D	0.011	0.010	mg/L	JB	HR-MS, MBD
Zinc, Total	E 200.7	OW-59	2212E57-004D	0.011	0.010	mg/L	JB	HR-MS, MBD
Zinc, Total	E 200.7	OW-68	2212E57-006D	0.045	0.010	mg/L	JB	HR-MS, MBD
Zinc, Total	E 200.7	OW-60	2212E57-007D	0.012	0.010	mg/L	JB	HR-MS, MBD
Zinc, Total	E 200.7	OW-67	2212E57-005D	0.0073	0.010	mg/L	U	HR-MS, MBD, MDLRL
Zinc, Total	E 200.7	Dup-12-28-22	2212E57-009D	0.0068	0.010	mg/L	U	HR-MS, MBD, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-082-003 Task: 0002	Sample Start Date: 12/29/2022
Date Validated: 02/15/2023	Sample End Date: 12/29/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Chemical Oxygen Demand (COD) by EPA Method 410.4 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Biochemical Oxygen Demand (BOD) by SM Method 5210B	
Laboratory Project ID: 2212F05	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-29-22	2212F05-001
OW-30	2212F05-002
OW-14	2212F05-003
STP-1 to EP-2	2212F05-004
MKTF-41	2212F05-005
MKTF-32	2212F05-006
FB-12-29-22	2212F05-007
Dup-12-29-22	2212F05-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ⊗ Laboratory Qualifiers (Item 2)
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ✓ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field and Equipment Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 542 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 9223B: The sample to be analyzed for E. Coli was received on Friday 12/30/2022 and the laboratory was not accepting E. Coli samples on this day due to the New Year holiday.

Method 8015D DRO: The method blank had a low-level detection for TPH DRO. Samples with detections are flagged with a "B". The laboratory control spike for DRO / MRO had an elevated recovery.

Method 8270C SIM: The 1,4-dioxane detection for sample MKTF-32 is "E" flagged because the result is above the calibration range.

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

E – Estimated value. **TPH DRO results for multiple samples and the 1,4-dioxane for sample MKTF-32 were flagged by the laboratory with the E flag. These results were detections and were assigned J qualifiers based on the laboratory flags.**

J – Analyte detected below quantitation limits.

J5 – The sample matrix interfered with the ability to make any accurate determination; spike value is high.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	OW-30, MKTF-41	Dissolved Metals	5
200.7	OW-14	Total and Dissolved Barium	5
200.8	MKTF-41	Dissolved Arsenic	5
8260B	OW-30, MKTF-32, Dup-12-29-22	MTBE	10
8015D	OW-14	TPH GRO	50
8260B	OW-14	Select VOCs	50
8260B	OW-14	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C between 0.5°C and 2.2°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 5.0°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	No
Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exception. **TPH DRO was detected in the laboratory blank for Method 8015D batch 72395 at a concentration of 0.10 mg/L. TPH DRO was detected in associated sample EB-12-29-22 at a concentration less than the laboratory reporting limit and the result was qualified with a U flag. TPH DRO results for the associated samples that were greater than the blank detection and the laboratory reporting limit but less than 10 times the blank concentration were qualified with a JB flag.** Detections of this analyte in the associated samples greater than ten times the blank concentration did not require qualification.	

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72410	Not Prepared
200.7	Dissolved Metals	A93838	Not Prepared
200.7	Dissolved Zinc	A94009	Not Prepared
200.7	Dissolved Metals	C93766	Not Prepared
200.8	Total Metals	72410	Not Prepared
200.8	Dissolved Arsenic	A93877	Not Prepared
200.8	Dissolved Metals	B93855	Not Prepared
245.1	Total and Dissolved Mercury	72676	Not Prepared
410.4	COD	WG1983632	Not Associated
504.1	EDB	72430	STP-1 to EP-2
4500CN E	Cyanide	WG1982605	Not Associated
5210B	BOD	72380	Not Prepared
8015D	TPH DRO and MRO	72395	Not Prepared
8015D	TPH GRO	R93719	OW-30
8260B	VOCs	R93747	OW-30
8260B	VOCs	R93792	Not Prepared
8270C	SVOCs	72406	Not Prepared
8270C SIM	SVOCs	72406	Not Prepared
8270C	SVOCs	72443	Not Prepared
8270C SIM	SVOCs	72443	Not Prepared
8270C SIM	SVOCs	R93750	Not Prepared

Not Associated – The MS sample source was not associated with this project.
Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Barium**	**72410**	**145%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**72395**	**138%**	**Acceptable**	**31.2-125%**	**25.2%**	**20%**
8270C SIM	**Naphthalene**	**72443**	**Acceptable**	**Acceptable**	**15-78.3%**	**63.0%**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**72443**	**Acceptable**	**Acceptable**	**15-79.6%**	**70.6%**	**31.4%**
8270C SIM	**2-Methylnaphthalene**	**72443**	**Acceptable**	**Acceptable**	**15-78.6%**	**76.9%**	**30.5%**
8270C SIM	**Acenaphthene**	**72443**	**Acceptable**	**Acceptable**	**15-92%**	**70.3%**	**30.5%**
8270C SIM	**Fluorene**	**72443**	**Acceptable**	**Acceptable**	**15-96%**	**50.5%**	**25.1%**
8270C SIM	**Phenanthrene**	**72443**	**Acceptable**	**Acceptable**	**21-103%**	**28.1%**	**26.4%**
8270C SIM	**Anthracene**	**72443**	**Acceptable**	**Acceptable**	**21.1-106%**	**19.5%**	**14.4%**
5210B	**BOD**	**72380**	**69.2%**	**-----**	**84.6-115.4%**	**-----**	**-----**

Total barium and TPH DRO were detected in associated samples, and the results were qualified as J+ based on the evidence of potential high bias. Non-detections of total barium in the associated samples did not require qualification based on the evidence of potential high bias.

The analytes with LCS/LCSD RPD values that exceeded the QC limit were assigned J qualifiers for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

The target analyte BOD was detected in associated sample STP-1 to EP-2, and the result was qualified as J- based on the evidence of potential low bias.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	2-Fluorophenol	MKTF-32	103%	15-84.5%
8270C	Phenol-d_5	MKTF-32	71.9%	15-67%
8270C	2,4,6-Tribromophenol	MKTF-32	151%	15-108%
8270C	Nitrobenzene-d_5	MKTF-32	116%	16.8-112%
8270C	2-Fluorobiphenyl	MKTF-32	106%	15-101%
8270C	4-Terphenyl-d_{14}	MKTF-32	142%	34.4-134%
8270C	2,4,6-Tribromophenol	OW-14	10.7%	15-108%
8270C SIM	Nitrobenzene-d_5	MKTF-32	113%	15-108%

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C analysis of sample OW-14 and the Method 8270C SIM analysis of sample MKTF-32, and qualification of sample data was not required.

The associated analytes were not detected in sample MKTF-32. Qualification of data was not required due to evidence of potential high bias.

VALIDATION CRITERIA CHECKLIST

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One field blank sample, FB-12-29-22, and one equipment blank sample, EB-12-29-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-9-9-22	**200.7**	**Total Zinc**	**0.0065 mg/L**
EB-9-9-22	**200.8**	**Total Selenium**	**0.00090 mg/L**
EB-9-9-22	8015D	TPH DRO	0.024 mg/L

Detections of total zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total zinc and total selenium in the associated samples that were greater than the reporting limits but less than 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batch 72395 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank detection was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample Dup-12-29-22 was collected as a field duplicate of sample OW-30.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? No

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions.

The RPD value for dissolved barium greatly exceeded the data validation limit of 30% at 166.2%. The reported results for dissolved barium were assigned J qualifiers for the parent and field duplicate samples, and J/UJ qualifiers for the associated samples due to evidence of extremely poor precision (RPD > 100%).

The RPD value for total cyanide exceeded the data validation limit of 30% at 72.3%. The total cyanide results for samples OW-30 and Dup-12-29-22 were assigned J qualifiers due to evidence of poor precision.

VALIDATION CRITERIA CHECKLIST

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared as summarized in the following table.

Method	Analytes	Batch	Laboratory Duplicate Sample Source
410.4	COD	WG1983632	Not Associated
4500CN E	Cyanide	WG1982605	Not Associated

Not Associated – The laboratory duplicate sample source was not associated with this project.

The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
STP-1 to EP-2	Antimony	ND	0.0013
OW-30	Arsenic	0.00085	0.0011
OW-14	Arsenic	0.0023	0.0039
STP-1 to EP-2	Arsenic	0.0019	0.0021
Dup-12-29-22	Arsenic	0.00063	0.00094
OW-30	Barium	0.12	0.13
OW-14	Barium	2.0	2.2
MKTF-41	Barium	0.079	0.082
OW-30	Beryllium	ND	0.0029
OW-14	Nickel	0.084	0.086
OW-30	Selenium	0.0015	0.0065
OW-14	Selenium	ND	0.0080
MKTF-41	Selenium	0.027	0.035
MKTF-32	Selenium	0.0020	0.0044
Dup-12-29-22	Selenium	ND	0.0057
STP-1 to EP-2	Silver	ND	0.0036
OW-14	Vanadium	ND	0.0019
STP-1 to EP-2	Vanadium	ND	0.0024
MKTF-41	Vanadium	0.015	0.016

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-30 Field Duplicate Sample ID: Dup-12-29-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
MTBE	SW8260B	910 µg/L	1,000 µg/L	9.4%
Anthracene	SW8270C	0.26 µg/L	ND (0.30 µg/L)	DL
TPH GRO	SW8015	0.94 mg/L	0.99 mg/L	5.2%
TPH DRO	SW8015	2.0 mg/L	2.4 mg/L	18.2%
TPH ORO	SW8015	0.11 mg/L	0.13 mg/L	16.7% +/-RL
Cyanide, Total	**E335.4**	**0.00727 mg/L**	**0.0155 mg/L**	**72.3%**
Barium, Dissolved	**E 200.7**	**0.13 mg/L**	**0.012 mg/L**	**166.2%**
Barium, Total	E 200.7	0.12 mg/L	0.13 mg/L	8.0%
Beryllium, Dissolved	E 200.7	0.0029 mg/L	ND (0.0020 mg/L)	DL
Nickel, Dissolved	E 200.7	0.089 mg/L	0.0070 mg/L	170.8% +/-RL
Nickel, Total	E 200.7	0.098 mg/L	0.10 mg/L	2.0%
Zinc, Total	E 200.7	ND (0.010 mg/L)	0.0074 mg/L	DL
Arsenic, Dissolved	E200.8	0.0011 mg/L	0.00094 mg/L	15.7% +/-RL
Arsenic, Total	E200.8	0.00085 mg/L	0.00063 mg/L	29.7% +/-RL
Lead, Dissolved	E200.8	0.00025 mg/L	0.00031 mg/L	21.4% +/-RL
Lead, Total	E200.8	0.00067 mg/L	0.00078 mg/L	15.2% +/-RL
Selenium, Dissolved	E200.8	0.0065 mg/L	0.0057 mg/L	13.1%
Selenium, Total	E200.8	0.0015 mg/L	ND (0.0010 mg/L)	DL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD value for dissolved barium greatly exceeded the data validation limit of 30% at 166.2%. The reported results for dissolved barium were assigned J qualifiers for the parent and field duplicate samples, and J/UJ qualifiers for the results for dissolved barium in the associated samples due to evidence of extremely poor precision (RPD > 100%).

The RPD value for total cyanide exceeded the data validation limit of 30% at 72.3%. The total cyanide results for samples OW-30 and Dup-12-29-22 were assigned J qualifiers due to evidence of poor precision.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
EBL	Flagged as estimated by the laboratory.
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,4-Dioxane	SW8270C	MKTF-32	2212f05-006c	34	1.0	µg/L	J	EBL
1-Methylnaphthalene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	OW-30	2212F05-002C	0.26	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Anthracene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	Dup-12-29-22	2212F05-008E	0.00094	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	OW-30	2212F05-002D	0.00085	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	Dup-12-29-22	2212F05-008D	0.00063	0.0010	mg/L	J	MDLRL
Barium, Dissolved	E 200.7	OW-30	2212F05-002E	0.13	0.010	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	OW-14	2212F05-003E	2.2	0.010	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	STP-1 to EP-2	2212F05-004E	0.017	0.0020	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	MKTF-41	2212F05-005E	0.082	0.010	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	MKTF-32	2212F05-006E	0.0039	0.0020	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	Dup-12-29-22	2212F05-008E	0.012	0.0020	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	EB-12-29-22	2212F05-001E	ND	0.0020	mg/L	UJ	ERPD-FD
Barium, Total	E 200.7	OW-30	2212F05-002D	0.12	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	OW-14	2212F05-003D	2.0	0.015	mg/L	J+	HR-LCS
Barium, Total	E 200.7	STP-1 to EP-2	2212F05-004D	0.02	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-41	2212F05-005D	0.079	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-32	2212F05-006D	0.11	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	Dup-12-29-22	2212F05-008D	0.13	0.0030	mg/L	J+	HR-LCS
Beryllium, Dissolved	E 200.7	OW-30	2212F05-002E	0.0029	0.010	mg/L	J	MDLRL
Biochemical Oxygen Demand	SM 5210	STP-1 to EP-2	2212F05-004G	400	2.0	mg/L	J-	LR-LCS
Cyanide, Total	E335.4	OW-30	2212F05-002F	0.00727	0.00500	mg/L	J	ERPD-FD
Cyanide, Total	E335.4	Dup-12-29-22	2212F05-008F	0.0155	0.00500	mg/L	J	ERPD-FD
Fluorene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	OW-30	2212F05-002E	0.00025	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	Dup-12-29-22	2212F05-008E	0.00031	0.00050	mg/L	J	MDLRL
Naphthalene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Naphthalene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Nickel, Dissolved	E 200.7	Dup-12-29-22	2212F05-008E	0.0070	0.010	mg/L	J	MDLRL
Phenanthrene	SW8270C	MKTF-41	2212f05-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	MKTF-32	2212f05-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Phenanthrene	SW8270C	Dup-12-29-22	2212f05-008c	ND	0.30	µg/L	UJ	ERPD-LCS
Selenium, Total	E200.8	OW-30	2212F05-002D	0.0015	0.0010	mg/L	JB	EBD
Selenium, Total	E200.8	STP-1 to EP-2	2212F05-004D	0.0024	0.0010	mg/L	JB	EBD
Selenium, Total	E200.8	MKTF-32	2212F05-006D	0.0020	0.0010	mg/L	JB	EBD
Selenium, Total	E200.8	EB-12-29-22	2212F05-001D	0.00090	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	STP-1 to EP-2	2212F05-004E	0.0036	0.005	mg/L	J	MDLRL
TPH DRO	SW8015	EB-12-29-22	2212F05-001C	0.024	0.064	mg/L	U	ERPD-LCS, HR-LCS, MBD, MDLRL
TPH DRO	SW8015	OW-30	2212F05-002C	2.0	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	OW-14	2212F05-003C	3.4	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	Dup-12-29-22	2212F05-008C	2.4	0.064	mg/L	J+	EBL, ERPD-LCS, HR-LCS
TPH DRO	SW8015	STP-1 to EP-2	2212F05-004C	0.65	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	MKTF-41	2212F05-005C	1.0	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
TPH DRO	SW8015	MKTF-32	2212F05-006C	0.19	0.064	mg/L	JB	EBL, ERPD-LCS, HR-LCS, MBD
Vanadium, Dissolved	E 200.7	OW-14	2212F05-003E	0.0019	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	STP-1 to EP-2	2212F05-004E	0.0024	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-41	2212F05-005E	0.016	0.25	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-41	2212F05-005D	0.015	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-32	2212F05-006D	0.015	0.050	mg/L	J	MDLRL
Zinc, Total	E 200.7	STP-1 to EP-2	2212F05-004D	0.028	0.010	mg/L	JB	EBD
Zinc, Total	E 200.7	MKTF-32	2212F05-006D	0.012	0.010	mg/L	JB	EBD
Zinc, Total	E 200.7	OW-14	2212F05-003D	0.0066	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	MKTF-41	2212F05-005D	0.0049	0.010	mg/L	U	EBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Zinc, Total	E 200.7	Dup-12-29-22	2212F05-008D	0.0074	0.010	mg/L	U	EBD, MDLRL
Zinc, Total	E 200.7	EB-12-29-22	2212F05-001D	0.0065	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 12/06/2022
Date Validated: 02/14/2023	Sample End Date: 12/06/2022
Parameters Included: • Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B • 1,2-Dibromoethane (EDB) by EPA Method 504.1 • Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) • Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D • TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified • Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 • Total and Dissolved Mercury by EPA Method 245.1 • Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212303	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-6-22	2212303-001
MKTF-46	2212303-002
MKTF-18R	2212303-003
MKTF-16	2212303-004
PW-3	2212303-005
East LDU	2212303-006
West LDU	2212303-007
FB-12-6-22	2212303-008
DUP-12-6-22	2212303-009
MKTF-38	2212303-010
Trip Blank	2212303-011

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 661 data points. The data completeness calculation does not include any submitted blank sample results. Data points were not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for sample MKTF-18R

Method 8015D DRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

J – Analyte detected below quantitation limits.

J4 – The associated batch QC was outside the established quality control range for accuracy.

R – %RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC record from field to laboratory was not complete, but custody was maintained as evidenced by laboratory personnel signatures, dates, times of receipt, and the CoC confirmation letter (Attachment A). Custody seals were not present nor required on the coolers because the samples were transferred to a Hall Environmental Field Service courier for delivery to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
200.7	MKTF-18R, East LDU, West LDU	Select Total and Dissolved Metals	5
200.8	DUP-12-6-22, MKTF-38	Select Dissolved Metals	5
8260B	MKTF-16	VOCs	5
8260B	MKTF-18R	Select VOCs	10
8015D	MKTF-18R	TPH GRO	10
8260B	MKTF-18R	Benzene	100

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.2°C and 1.3°C as noted on the Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 0.4°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken and/or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? Yes

Comments: Detailed calibration information was not provided as part of this laboratory report but limited initial calibration summary data were available for Method 4500CN E.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? Yes

Comments: The available initial calibration summary data were within the acceptance limits.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Dissolved Barium**	**B93514**	**0.0013 mg/L**
200.8	**Dissolved Antimony**	**A93132**	**0.0012 mg/L**
8015D	**TPH DRO**	**71994**	**0.15 mg/L**

Detections of the identified analytes in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved barium and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	71965	Not Prepared
200.7	Dissolved Metals	B93514	DUP-12-6-22, MKTF-38
200.8	Total Metals	71965	Not Prepared
200.8	Dissolved Metals	A93132	EB-12-6-22, MKTF-46
200.8	Dissolved Metals	A93305	Not Prepared
200.8	Dissolved Lead	A93335	MKTF-46
200.8	Dissolved Metals	D93335	Not Prepared
245.1	Total and Dissolved Mercury	72127	East LDU
504.1	EDB	71922	Not Prepared
4500CN E	Cyanide	WG1971426	Not Associated
8015D	TPH DRO and MRO	71994	Not Prepared
8015D	TPH GRO	R93213	Not Prepared
8260B	VOCs	R93183	Not Prepared
8260B	VOCs	R93209	MKTF-38
8270C SIM	SVOCs	71974	Not Prepared
8270C	SVOCs	71974	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The MS/MSD percent recoveries and RPDs for project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered, but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

The LCS recovery for cyanide in Method 4500CN E batch WG1971426 (R93762) was outside the acceptance limits of 87.1-120% at 83.8%. Cyanide was not detected in the associated samples, and these results were qualified as UJ due to evidence of potential low bias.

The reported recovery for mercury in the LCS for Method 245.1 batch 72127 was outside the acceptance limits of 70-130% at 134%. Mercury was detected in associated samples and the results were assigned J+ qualifiers due to

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evidence of potential high bias. The non-detect results for mercury in associated samples did not require qualification based on this LCS non-conformity.

The RPD value for pyrene in the LCS/LCSD analyses for Method 8270C batch 71974 exceeded the laboratory limit of 11.8% at 12.3%. Pyrene was not detected in the associated samples and the results were assigned UJ qualifiers due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within QC limits, with the following exceptions.

Method	Surrogate/ EIS	Sample	Surrogate Recovery	QC Limits
8015D	**BFB**	**MKTF-16**	**152%**	**70-130%**
8015D	**BFB**	**East LDU**	**206%**	**70-130%**
8015D	**BFB**	**West LDU**	**230%**	**70-130%**
8015D	**BFB**	**MKTF-38**	**149%**	**70-130%**
8270C	2,4,6-Tribromophenol	PW-3	12.3%	15-108%
8270C	Phenol-d_5	West LDU	0%	15-67%

TPH GRO was detected in the Method 8015D analyses of samples MKTF-16, East LDU, West LDU, and MKTF-38 and these results were qualified as J+ due to evidence of a potential high bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range. This condition did not exist for the Method 8270C analyses of samples PW-3 and West LDU and qualification of sample data was not required**.**

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-6-22, and one equipment blank sample, EB-12-6-22, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-12-6-22	200.7	Total Chromium	0.0027 mg/L
EB-12-6-22	**200.7**	**Total Cobalt**	**0.0050 mg/L**
EB-12-6-22	200.7	Barium Dissolved	0.0016 mg/L
EB-12-6-22	**200.7**	**Beryllium Dissolved**	**0.0010 mg/L**
EB-12-6-22	**200.7**	**Dissolved Zinc**	**0.0072 mg/L**
EB-12-6-22	8015D	TPH DRO	0.037 mg/L

Detections of dissolved beryllium and dissolved zinc in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifier. Detections of total cobalt and dissolved zinc in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples

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and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

The dissolved barium and TPH DRO results for the samples in batches B93514 and 71994, respectively, were previously qualified due to laboratory blank detections; therefore, additional qualification based on the equipment blank detections was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-12-6-22 was collected as a field duplicate of sample MKTF-46.

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1971426 from a sample not associated with this data set and sample EB-12-6-22.

The RPD for the laboratory duplicate prepared from a project sample could not be calculated because both measurements were reported as not detected.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-18R	Mercury	ND	0.00013
PW-3	Mercury	0.00010	0.00011
East LDU	Mercury	0.00013	0.00014
MKTF-46	Antimony	ND	0.00057
MKTF-18R	Antimony	ND	0.00061
PW-3	Antimony	ND	0.00066
MKTF-38	Antimony	ND	0.00085
PW-3	Arsenic	0.0035	0.0038

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Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
West LDU	Arsenic	0.00059	0.00062
EB-12-6-22	Barium	ND	0.0016
EB-12-6-22	Beryllium	ND	0.0010
East LDU	Beryllium	0.0012	0.0016
West LDU	Beryllium	ND	0.0010
MKTF-38	Beryllium	ND	0.0019
MKTF-38	Cadmium	ND	0.0011
MKTF-46	Selenium	ND	0.00069
West LDU	Selenium	ND	0.00048
DUP-12-6-22	Selenium	ND	0.00060
MKTF-46	Silver	0.0019	0.0032
MKTF-18R	Silver	ND	0.0014
PW-3	Silver	0.0033	0.0040
DUP-12-6-22	Silver	0.0022	0.0030
PW-3	Vanadium	ND	0.0038
MKTF-38	Vanadium	ND	0.0038
EB-12-6-22	Zinc	ND	0.0072
MKTF-46	Zinc	ND	0.0080
MKTF-18R	Zinc	0.0066	0.19
PW-3	Zinc	0.034	0.065
East LDU	Zinc	0.22	0.086
West LDU	Zinc	0.026	0.13
DUP-6-22	Zinc	ND	0.0044
MKTF-38	Zinc	ND	0.016

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-46 Field Duplicate Sample ID: DUP-12-6-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Chlorobenzene	SW8260B	ND (1.0 µg/L)	0.67 µg/L	DL
Methylene Chloride	SW8260B	3.9 µg/L	ND (3.0 µg/L)	DL
1,4-Dioxane	SW8270C	0.84 µg/L	1.1 µg/L	26.8% +/-RL
TPH GRO	SW8015	0.033 mg/L	0.030 mg/L	9.5% +/-RL
TPH DRO	SW8015	0.051 mg/L	0.077 mg/L	40.6% +/-RL
Barium, Dissolved	E 200.7	0.042 mg/L	0.041 mg/L	2.4%
Barium, Total	E 200.7	0.081 mg/L	0.087 mg/L	7.1%
Cobalt, Total	E 200.7	0.016 mg/L	0.016 mg/L	0.0%
Silver, Dissolved	E 200.7	0.0032 mg/L	0.0030 mg/L	6.5% +/-RL
Silver, Total	E 200.7	0.0019 mg/L	0.0022 mg/L	14.6% +/-RL
Vanadium, Dissolved	E 200.7	0.0037 mg/L	0.0034 mg/L	8.5% +/-RL
Vanadium, Total	E 200.7	0.0040 mg/L	0.0044 mg/L	9.5% +/-RL
Zinc, Dissolved	E 200.7	0.0080 mg/L	0.0044 mg/L	58.1% +/-RL
Antimony, Dissolved	E200.8	0.00057 mg/L	ND (0.0010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.00081 mg/L	0.00071 mg/L	13.2% +/-RL
Arsenic, Total	E200.8	0.0011 mg/L	0.0010 mg/L	9.5% +/-RL
Lead, Total	E200.8	0.0011 mg/L	0.0011 mg/L	0.0%
Selenium, Dissolved	E200.8	0.00069 mg/L	0.00060 mg/L	14.0% +/-RL
Mercury, Dissolved	E245.1	0.00013 mg/L	ND (0.00020 mg/L)	DL
Mercury, Total	E245.1	0.00017 mg/L	0.00014 mg/L	19.4% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	West LDU	2212303-007a	0.85	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-46	2212303-002c	0.84	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	East LDU	2212303-006c	0.26	1.0	µg/L	J	MDLRL
2,4-Dimethylphenol	SW8270C	MKTF-18R	2212303-003c	10	10	µg/L	J	MDLRL
2-Butanone	SW8260B	MKTF-38	2212303-010a	3.7	10	µg/L	J	MDLRL
Acenaphthene	SW8270C	MKTF-38	2212303-010c	0.24	0.30	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	MKTF-46	2212303-002E	0.00057	0.0010	mg/L	U	MBD, MDLRL
Antimony, Dissolved	E200.8	MKTF-18R	2212303-003E	0.00061	0.0010	mg/L	U	MBD, MDLRL
Antimony, Dissolved	E200.8	PW-3	2212303-005E	0.00066	0.0010	mg/L	U	MBD, MDLRL
Antimony, Dissolved	E200.8	MKTF-38	2212303-010E	0.00085	0.0010	mg/L	U	MBD, MDLRL
Arsenic, Dissolved	E200.8	MKTF-46	2212303-002E	0.00081	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	East LDU	2212303-006E	0.00058	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	West LDU	2212303-007E	0.00062	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-12-6-22	2212303-009E	0.00071	0.0010	mg/L	J	MDLRL
Arsenic, Total	E200.8	East LDU	2212303-006D	0.00079	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Total	E200.8	West LDU	2212303-007D	0.00059	0.0010	mg/L	J	MDLRL
Barium, Dissolved	E 200.7	PW-3	2212303-005E	0.012	0.0020	mg/L	JB	MBD
Barium, Dissolved	E 200.7	EB-12-6-22	2212303-001E	0.0016	0.0020	mg/L	U	MBD, MDLRL
Benzo(a)anthracene	SW8270C	MKTF-18R	2212303-003c	0.16	0.30	µg/L	J	MDLRL
Beryllium, Dissolved	E 200.7	East LDU	2212303-006E	0.0016	0.0020	mg/L	U	EBD, MDLRL
Beryllium, Dissolved	E 200.7	West LDU	2212303-007E	0.0010	0.0020	mg/L	U	EBD, MDLRL
Beryllium, Dissolved	E 200.7	MKTF-38	2212303-010E	0.0019	0.0020	mg/L	U	EBD, MDLRL
Beryllium, Dissolved	E 200.7	EB-12-6-22	2212303-001E	0.0010	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	East LDU	2212303-006D	0.0012	0.0020	mg/L	J	MDLRL
Cadmium, Dissolved	E 200.7	MKTF-38	2212303-010E	0.0011	0.0020	mg/L	J	MDLRL
Chlorobenzene	SW8260B	DUP-12-6-22	2212303-009a	0.67	1.0	µg/L	J	MDLRL
Chromium, Total	E 200.7	EB-12-6-22	2212303-001D	0.0027	0.0060	mg/L	J	MDLRL
Cobalt, Total	E 200.7	MKTF-46	2212303-002D	0.016	0.0060	mg/L	JB	EBD
Cobalt, Total	E 200.7	MKTF-18R	2212303-003D	0.0097	0.0060	mg/L	JB	EBD
Cobalt, Total	E 200.7	PW-3	2212303-005D	0.013	0.0060	mg/L	JB	EBD
Cobalt, Total	E 200.7	DUP-12-6-22	2212303-009D	0.016	0.0060	mg/L	JB	EBD
Cobalt, Total	E 200.7	MKTF-38	2212303-010D	0.011	0.0060	mg/L	JB	EBD
Cobalt, Total	E 200.7	EB-12-6-22	2212303-001D	0.0050	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	EB-12-6-22	2212303-001F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	MKTF-46	2212303-002F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	MKTF-18R	2212303-003F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	PW-3	2212303-005F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	East LDU	2212303-006F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	West LDU	2212303-007F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	DUP-12-6-22	2212303-009F	ND	0.0050	mg/L	UJ	LR-LCS
Cyanide, Total	E335.4	MKTF-38	2212303-010F	ND	0.0050	mg/L	UJ	LR-LCS
Fluoranthene	SW8270C	MKTF-18R	2212303-003c	0.14	0.30	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluoranthene	SW8270C	West LDU	2212303-007c	0.14	0.30	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	MKTF-16	2212303-004a	3.2	5.0	µg/L	J	MDLRL
Mercury, Dissolved	E245.1	MKTF-46	2212303-002E	0.00013	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	MKTF-18R	2212303-003E	0.00013	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	PW-3	2212303-005E	0.00011	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	East LDU	2212303-006E	0.00014	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Dissolved	E245.1	MKTF-38	2212303-010E	0.00010	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	MKTF-46	2212303-002D	0.00017	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	PW-3	2212303-005D	0.00010	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	East LDU	2212303-006D	0.00013	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	West LDU	2212303-007D	0.00014	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	DUP-12-6-22	2212303-009D	0.00014	0.00020	mg/L	J	HR-LCS, MDLRL
Mercury, Total	E245.1	MKTF-38	2212303-010D	0.00012	0.00020	mg/L	J	HR-LCS, MDLRL
Methylene Chloride	SW8260B	East LDU	2212303-006a	2.9	3.0	µg/L	J	MDLRL
MTBE	SW8260B	MKTF-38	2212303-010a	0.91	1.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	MKTF-38	2212303-010a	0.85	3.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-18R	2212303-003E	0.0075	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-18R	2212303-003D	0.0084	0.010	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	MKTF-18R	2212303-003a	5.6	10	µg/L	J	MDLRL
Phenol	SW8270C	MKTF-18R	2212303-003c	19	20	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	West LDU	2212303-007a	0.64	1.0	µg/L	J	MDLRL
Pyrene	SW8270C	EB-12-6-22	2212303-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-46	2212303-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-18R	2212303-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	PW-3	2212303-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	East LDU	2212303-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	West LDU	2212303-007c	ND	1.0	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Pyrene	SW8270C	DUP-12-6-22	2212303-009c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-38	2212303-010c	ND	1.0	µg/L	UJ	ERPD-LCS
sec-Butylbenzene	SW8260B	West LDU	2212303-007a	0.70	1.0	µg/L	J	MDLRL
sec-Butylbenzene	SW8260B	MKTF-38	2212303-010a	0.98	1.0	µg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-46	2212303-002E	0.00069	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	East LDU	2212303-006E	0.00071	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	West LDU	2212303-007E	0.00048	0.0010	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP-12-6-22	2212303-009E	0.00060	0.0010	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-46	2212303-002E	0.0032	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-18R	2212303-003E	0.0014	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	PW-3	2212303-005E	0.0040	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP-12-6-22	2212303-009E	0.0030	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-38	2212303-010E	0.0035	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	MKTF-46	2212303-002D	0.0019	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	PW-3	2212303-005D	0.0033	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	DUP-12-6-22	2212303-009D	0.0022	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	MKTF-38	2212303-010D	0.0021	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-38	2212303-010C	0.43	0.064	mg/L	JB	MBD
TPH DRO	SW8015	DUP-12-6-22	2212303-009C	0.077	0.064	mg/L	U	MBD
TPH DRO	SW8015	EB-12-6-22	2212303-001C	0.037	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	MKTF-46	2212303-002C	0.051	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	PW-3	2212303-005C	0.019	0.064	mg/L	U	MBD, MDLRL
TPH GRO	SW8015	MKTF-16	2212303-004a	2.1	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	East LDU	2212303-006a	0.52	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	West LDU	2212303-007a	0.31	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-38	2212303-010a	0.29	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	MKTF-46	2212303-002a	0.033	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	DUP-12-6-22	2212303-009a	0.030	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-46	2212303-002E	0.0037	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	PW-3	2212303-005E	0.0038	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	East LDU	2212303-006E	0.0061	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	West LDU	2212303-007E	0.0051	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-12-6-22	2212303-009E	0.0034	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-38	2212303-010E	0.0038	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-46	2212303-002D	0.004	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-18R	2212303-003D	0.0037	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-12-6-22	2212303-009D	0.0044	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	West LDU	2212303-007a	0.88	1.5	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	PW-3	2212303-005E	0.065	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-38	2212303-010E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	MKTF-46	2212303-002E	0.0080	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	DUP-12-6-22	2212303-009E	0.0044	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-12-6-22	2212303-001E	0.0072	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-18R	2212303-003D	0.0066	0.010	mg/L	J	MDLRL

ATTACHMENT A

CoC Confirmation

02/16/2023

Brittany Nelson
Trihydro Corporation
1252 Commerce Drive
Laramie, WY 82070

Chain of Custody Confirmation

I, Brittany Nelson representing the Marathon Gallup site do confirm the following information inadvertently left off the chain-of-custody (CoC) provided with data set 2212303 or information was not reported accurately in accordance with the field records. In addition, I do confirm that all aqueous samples were provided to the laboratory in the proper, method-referenced, containers and were properly preserved (chemically and physically). The information identified in bold italics will be used to further clarify the CoC documentation.

The required analytical parameters for samples MKTF-38 and Trip Blank were not noted on the CoC.

To the best of my knowledge, the above information is correct.

Brittany J Nelson
Brittany Nelson

2-16-23
DATE

This confirmation is an amendment to the chain-of-custody accompanying the Marathon Gallup, Hall Environmental Analysis Laboratory data set 2212303.

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 12/07/2022
Date Validated: 02/01/2023	Sample End Date: 12/07/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E ▪ Per- and Polyfluorinated Alkyl Substances (PFAS) by Liquid Chromatography with Tandem Mass Spectrometry (LC-MS/MS) and Isotope Dilution (ID)	
Laboratory Project ID: 2212442	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee, and Enthalpy Analytical Laboratory of El Dorado Hills, California, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD and ongoing precision and recovery (OPR) samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD/OPR percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-7-22	2212442-001
OW-64	2212442-002
OW-12	2212442-003
OW-12A	2212442-004
OW-63	2212442-005
OW-57	2212442-006
DUP-12-7-22	2212442-007
FB-12-7-22	2212442-008
EB-OW-67	2212442-009
Trip Blank	2212442-010

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD/OPR (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ✓ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Data review and evaluation was performed following criteria set forth in Data Review and Validation Guidelines for Perfluoroalkyl Substances (PFASs) Analyzed Using EPA Method 537, document number EPA 910-R-18-001, November 2018.
- Data were reviewed and evaluated according to criteria set forth in the Department of Defense (DoD) / Department of Energy (DOE) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3, 2019.
- Data were reviewed and evaluated according to criteria set forth in Data Validation Guidelines Module 3: Data Validation Procedure for Per- and Polyfluoroalkyl Substances Analysis by QSM Table B-15, United States Department of Defense, Environmental Data Quality Workgroup, May 2020.

Tier II Data Validation Report Summary

- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 564 data points. The data completeness calculation does not include any submitted blank sample results. Six data points were rejected. The data completeness measure for this data package is calculated to be 98.94% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8270C and Method 8270C SIM: 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for samples OW-57 and OW-63.

Method 8015D DRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

2. Were the data free of data qualification flags and/or notes used by the laboratory? No
If no, define.

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – %RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? No

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. The laboratory noted that the shipping containers were sealed, and custody seals were present and intact on the shipping containers.

The correct parameters were not marked on the CoC for the trip blank sample that was received by the laboratory. The laboratory logged in the sample and performed the appropriate volatile analysis. Validation action was not required.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	DUP-12-7-22	VOCs	2
200.7	OW-63	Total and Dissolved Barium	5
200.7	OW-57	Dissolved Barium	5
200.8	Multiple Samples	Select Total and Dissolved Metals	5
8260B	OW-12A	Select VOCs	5
8260B	OW-12	Benzene	10
8015D	OW-12A, OW-57	TPH DRO and MRO	10
8015D	OW-12A, OW-63, OW-57	TPH GRO	50
8260B	OW-12A	Select VOCs	50
8260B	OW-63, OW-57	Select VOCs	50
200.7	OW-57	Total Barium	100
8260B	OW-63, OW-57	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between 0.4°C and 1.1°C as noted on the Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 5.5°C as noted on the CoC. Samples transferred to Enthalpy Analytical Laboratory were received in good condition with the cooler temperature outside the recommended range at 0.8°C as noted on the CoC and the Sample Login Checklist. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken and/or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of nanograms per liter (ng/L), micrograms per liter (µg/L), and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Total Cobalt**	**71980**	**0.0048 mg/L**
200.7	Dissolved Barium	B93514	0.0013 mg/L
8015D	**TPH DRO**	**71994**	**0.15 mg/L**
8015D	**TPH DRO**	**72049**	**0.080 mg/L**

Detections of TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of total cobalt and TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	71980	EB-12-7-22, OW-64
200.7	Dissolved Metals	B93514	Not Prepared
200.8	Total Metals	71980	Not Prepared
200.8	Dissolved Metals	A93335	EB-12-7-22
200.8	Dissolved Metals	A93438	Not Prepared
200.8	Dissolved Antimony	A93556	Not Prepared
245.1	Total and Dissolved Mercury	72128	OW-12
245.1	Total Mercury	72200	Not Prepared
504.1	EDB	72189	Not Prepared
PFAS Method	PFAs	B22L133	Not Prepared
4500CN E	Cyanide	WG1974296	EB-12-7-22
8015D	TPH DRO and MRO	71994	Not Prepared
8015D	TPH DRO and MRO	72049	Not Prepared
8015D	TPH GRO	R93213	Not Prepared
8260B	VOCs	R93331	Not Prepared
8260B	VOCs	R93377	Not Prepared
8260B	VOCs	R93479	Not Prepared
8270C SIM	SVOCs	71974	Not Prepared
8270C	SVOCs	71974	Not Prepared
8270C SIM	SVOCs	72036	Not Prepared
8270C	SVOCs	72036	Not Prepared
8270C SIM	SVOCs	R93333	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

VALIDATION CRITERIA CHECKLIST

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS and OPR samples analyzed was equal to at least 5% of the total number of samples.

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS, LCSD and OPR percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Cobalt**	**71980**	**57.1%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Antimony**	**71980**	**69.4%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Dissolved Selenium**	**A93335**	**214%**	**-----**	**70-130%**	**-----**	**-----**
8015D	**TPH DRO**	**72049**	**Acceptable**	**Acceptable**	**31.2-125%**	**22.7%**	**20%**
8270C	**Pyrene**	**71974**	**Acceptable**	**Acceptable**	**61-123%**	**12.3%**	**11.8%**
8270C	**Pyrene**	**72036**	**Acceptable**	**Acceptable**	**61-123%**	**17.9%**	**11.8%**
8270C SIM	**Naphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-78.3%**	**33.3%**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-79.6%**	**40.0%**	**31.4$**
8270C SIM	**2-Methylnaphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-78.6%**	**39.1%**	**30.5%**
8270C SIM	**Acenaphthene**	**72036**	**Acceptable**	**Acceptable**	**15-92%**	**37.8%**	**30.5%**
8270C SIM	**Fluorene**	**72036**	**Acceptable**	**Acceptable**	**15-96%**	**31.4%**	**25.1%**

Detections of total cobalt in the associated samples were qualified as J-, and non-detections of total cobalt and total antimony were qualified UJ due to evidence of potential low bias.

The detection of dissolved selenium in sample OW-12A was qualified as J+ due to evidence of potential high bias. Non-detections of dissolved selenium in the associated samples did not require qualification.

The analytes with LCS/LCSD RPD values that were above the QC limit were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate/extracted internal standard (EIS) recoveries were within QC limits, with the following exceptions.

Method	Surrogate/ EIS	Sample	Surrogate Recovery	QC Limits
8015D	**BFB**	**OW-64**	**184%**	**70-130%**
8015D	**BFB**	**OW-12A**	**143%**	**70-130%**
8270C	**2-Fluorophenol**	**OW-12A**	**0%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-12A**	**0%**	**15-67%**
8015D	**BFB**	**DUP-12-7-22**	**188%**	**70-130%**
537	**$^{13}C_3$ PFBA**	**OW-63**	**35.9%**	**50-150%**
537	**$^{13}C_8$ PFOSA**	**OW-63**	**42.2%**	**50-150%**
537	**$^{13}C_8$ PFOSA**	**EB-OW-67**	**30.2%**	**50-150%**

VALIDATION CRITERIA CHECKLIST

TPH GRO was detected in the Method 8015D analyses of samples OW-64, OW-12A, and DUP-12-7-22, and these results were assigned J+ qualifiers due to evidence of potential high bias.

Since Method 8270C and 8270C SIM surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

Since at least 2 of 3 surrogates were recovered below 10%, the associated analytes that were not detected in the acid fraction of sample OW-12A were qualified as R to indicate rejected (not usable) data based on evidence of extreme low bias. The analyte 2,4-dimethylphenol was detected in sample OW-12A, and this result was qualified as J- due to evidence of potential low bias.

PFBA and PFOSA associated with EIS $^{13}C_3$ PFBA and $^{13}C_8$ PFOSA recoveries between 20% and 50% were qualified as J+ for detections and UJ for non-detections due to the non-conforming EIS recoveries.

The TPH DRO and TPH MRO results for samples OW-12A and OW-57 were not qualified based on the surrogate non-conformances in the Method 8015D analyses since the applied dilution of 10 times resulted in surrogate concentrations below routinely calibrated levels, and those results were deemed unreliable and possibly inaccurate.

Qualification of sample data was not required based on surrogate/EIS non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-7-22, and two equipment blank samples, EB-12-7-22 and EB-OW-67, were collected as part of this sample set.

19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples? No

Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exceptions.

Blank Sample ID	Method	Analyte	Concentration
EB-12-7-22	**200.7**	**Dissolved Zinc**	**0.0065 mg/L**
EB-12-7-22	**245.1**	**Total Mercury**	**0.000095 mg/L**
EB-12-7-22	8015D	TPH DRO	0.035 mg/L

Detections of dissolved zinc and total mercury in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of dissolved zinc and total mercury in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples did not require qualification.

The TPH DRO results for the samples in batches 71994 and 72049 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.

20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of field duplicates collected was equal to at least 10% of the number of samples.

Sample DUP-12-7-22 was collected as a field duplicate of sample OW-64.

VALIDATION CRITERIA CHECKLIST

21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)? Yes

Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples.

22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits? N/A

Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1974296 from a sample not associated with this data set and sample OW-12A.

The RPD for the laboratory duplicate prepared from a project sample could not be calculated because both measurements were reported as not detected.

The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-12A	Antimony	ND	0.0010
OW-57	Antimony	ND	0.0023
OW-64	Arsenic	0.0022	0.0025
OW-12	Arsenic	0.0015	0.0018
OW-12	Barium	0.019	0.020
OW-12	Lead	ND	0.000071
OW-12A	Nickel	ND	0.0055
OW-12A	Selenium	0.0016	0.0020
OW-12A	Silver	ND	0.0020
OW-57	Silver	ND	0.0016
OW-12	Vanadium	0.012	0.013
EB-12-7-22	Zinc	ND	0.0065
OW-12	Zinc	ND	0.011
OW-12A	Zinc	0.0056	0.0080
OW-63	Zinc	ND	0.0093
DUP-12-7-22	Zinc	ND	0.016

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-64 Field Duplicate Sample ID: DUP-12-7-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	0.29 mg/L	0.30 mg/L	3.4%
Barium, Total	E 200.7	0.30 mg/L	0.31 mg/L	3.3%
Vanadium, Dissolved	E 200.7	0.0048 mg/L	0.0052 mg/L	8.0% +/-RL
Vanadium, Total	E 200.7	0.0058 mg/L	0.0056 mg/L	3.5% +/-RL
Zinc, Dissolved	E 200.7	ND (0.010 mg/L)	0.016 mg/L	DL
Arsenic, Dissolved	E200.8	0.0025 mg/L	0.0019 mg/L	27.3%
Arsenic, Total	E200.8	0.0022 mg/L	0.0022 mg/L	0.0%
Lead, Dissolved	E200.8	0.000087 mg/L	0.000060 mg/L	36.7% +/-RL
Lead, Total	E200.8	0.00036 mg/L	0.00032 mg/L	11.8% +/-RL
Selenium, Total	E200.8	0.0010 mg/L	ND (0.0010 mg/L)	DL
TPH DRO	SW8015	0.54 mg/L	0.50 mg/L	7.7%
TPH GRO	SW8015	0.47 mg/L	0.46 mg/L	2.2%
1,2,4-Trimethylbenzene	SW8260B	33 µg/L	33 µg/L	0.0%
1,3,5-Trimethylbenzene	SW8260B	1.7 µg/L	1.7 µg/L	0.0% +/-RL
Benzene	SW8260B	5.0 µg/L	4.9 µg/L	2.0%
Ethylbenzene	SW8260B	20 µg/L	20 µg/L	0.0%
Isopropylbenzene	SW8260B	5.1 µg/L	5.3 µg/L	3.8%
n-Propylbenzene	SW8260B	2.4 µg/L	2.3 µg/L	4.3%
p-Isopropyltoluene	SW8260B	0.95 µg/L	1.0 µg/L	5.1% +/-RL
sec-Butylbenzene	SW8260B	1.8 µg/L	2.0 µg/L	10.5% +/-RL
Xylenes, Total	SW8260B	2.7 µg/L	2.4 µg/L	11.8% +/-RL
1-Methylnaphthalene	SW8270C	0.76 µg/L	0.92 µg/L	19.0%
2-Methylnaphthalene	SW8270C	0.16 µg/L	ND (0.30 µg/L)	DL
Acenaphthene	SW8270C	ND (0.30 µg/L)	0.18 µg/L	DL
Anthracene	SW8270C	0.20 µg/L	0.20 µg/L	0.0% +/-RL
Fluoranthene	SW8270C	0.48 µg/L	0.58 µg/L	18.9% +/-RL
Fluorene	SW8270C	0.22 µg/L	0.28 µg/L	24.0% +/-RL
Naphthalene	SW8270C	0.94 µg/L	1.2 µg/L	24.3%
Phenanthrene	SW8270C	0.44 µg/L	0.52 µg/L	16.7% +/-RL
Pyrene	SW8270C	0.34 µg/L	0.46 µg/L	30.0% +/-RL

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-EIS	The extracted internal standard (EIS) recovery was less than the lower acceptance limit.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,3,5-Trimethylbenzene	SW8260B	OW-12	2212442-003a	0.69	1.0	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	DUP-12-7-22	2212442-007a	1.7	2.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	OW-12A	2212442-004c	1.3	0.30	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-63	2212442-005c	41	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	OW-57	2212442-006c	58	5.0	µg/L	J	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP-12-7-22	2212442-007c	0.92	0.30	µg/L	J	ERPD-LCS
2,4,6-Trichlorophenol	SW8270C	OW-12A	2212442-004c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-12A	2212442-004c	7.2	10	µg/L	J-	LR-SUR, MDLRL
2,4-Dinitrophenol	SW8270C	OW-12A	2212442-004c	ND	20	µg/L	R	LR-SUR
2-Methylnaphthalene	SW8270C	OW-64	2212442-002c	0.16	0.30	µg/L	J	MDLRL
2-Methylnaphthalene	SW8270C	OW-12A	2212442-004c	0.68	0.30	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-63	2212442-005c	58	5.0.	µg/L	J	ERPD-LCS
2-Methylnaphthalene	SW8270C	OW-57	2212442-006c	37	50	µg/L	J	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Methylnaphthalene	SW8270C	DUP-12-7-22	2212442-007c	ND	0.300	µg/L	UJ	ERPD-LCS
2-Methylphenol	SW8270C	OW-12A	2212442-004c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-12A	2212442-004c	ND	10	µg/L	R	LR-SUR
Acenaphthene	SW8270C	OW-63	2212442-005C	0.74	0.30	µg/L	J	ERPD-LCS
Acenaphthene	SW8270C	OW-12A	2212442-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP-12-7-22	2212442-007c	0.18	0.30	µg/L	J	ERPD-LCS, MDLRL
Anthracene	SW8270C	OW-64	2212442-002c	0.20	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	OW-63	2212442-005C	0.18	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	OW-57	2212442-006C	0.22	0.30	µg/L	J	MDLRL
Anthracene	SW8270C	DUP-12-7-22	2212442-007c	0.20	0.30	µg/L	J	MDLRL
Antimony, Dissolved	E200.8	OW-57	2212442-006E	0.0023	0.0050	mg/L	J	MDLRL
Antimony, Total	E200.8	EB-12-7-22	2212442-001D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	OW-64	2212442-002D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	OW-12	2212442-003D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	OW-12A	2212442-004D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	OW-63	2212442-005D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	OW-57	2212442-006D	ND	0.0010	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	DUP-12-7-22	2212442-007D	ND	0.0010	mg/L	UJ	LR-LCS
Arsenic, Dissolved	E200.8	OW-57	2212442-006E	0.0020	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-12-7-22	2212442-007E	0.0019	0.0050	mg/L	J	MDLRL
Benzoic Acid	SW8270C	OW-12A	2212442-004c	ND	20	µg/L	R	LR-SUR
Cobalt, Total	E 200.7	OW-57	2212442-006D	0.058	0.0060	mg/L	J-	LR-LCS
Cobalt, Total	E 200.7	EB-12-7-22	2212442-001D	ND	0.0060	mg/L	UJ	LR-LCS
Cobalt, Total	E 200.7	OW-64	2212442-002D	ND	0.0060	mg/L	UJ	LR-LCS
Cobalt, Total	E 200.7	OW-12	2212442-003D	ND	0.0060	mg/L	UJ	LR-LCS
Cobalt, Total	E 200.7	DUP-12-7-22	2212442-007D	ND	0.0060	mg/L	UJ	LR-LCS
Cobalt, Total	E 200.7	OW-12A	2212442-004D	0.017	0.0060	mg/L	JB	MBD, LR-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Cobalt, Total	E 200.7	OW-63	2212442-005D	0.013	0.0060	mg/L	JB	MBD, LR-LCS
Fluoranthene	SW8270C	OW-57	2212442-006C	0.14	0.30	µg/L	J	MDLRL
Fluorene	SW8270C	OW-64	2212442-002c	0.22	0.30	µg/L	J	MDLRL
Fluorene	SW8270C	OW-63	2212442-005C	1.3	0.30	µg/L	J	ERPD-LCS
Fluorene	SW8270C	OW-12A	2212442-004c	0.12	0.30	µg/L	J	ERPD-LCS, MDLRL
Fluorene	SW8270C	DUP-12-7-22	2212442-007c	0.28	0.30	µg/L	J	ERPD-LCS, MDLRL
Lead, Dissolved	E200.8	OW-64	2212442-002E	0.000087	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-12	2212442-003E	0.000071	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	DUP-12-7-22	2212442-007E	0.00006	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	OW-64	2212442-002D	0.00036	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP-12-7-22	2212442-007D	0.00032	0.00050	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-12	2212442-003E	0.00013	0.00020	mg/L	J	MDLRL
Mercury, Dissolved	E245.1	OW-57	2212442-006E	0.00011	0.00020	mg/L	J	MDLRL
Mercury, Total	E245.1	OW-57	2212442-006D	0.00031	0.00020	mg/L	JB	EBD
Mercury, Total	E245.1	OW-12	2212442-003D	0.00013	0.00020	mg/L	U	EBD, MDLRL
Mercury, Total	E245.1	EB-12-7-22	2212442-001D	0.000095	0.00020	mg/L	J	MDLRL
Naphthalene	SW8270C	OW-12A	2212442-004c	3.4	0.30	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-63	2212442-005c	140	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	OW-57	2212442-006c	81	5.0	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	DUP-12-7-22	2212442-007c	1.2	0.30	µg/L	J	ERPD-LCS
Nickel, Dissolved	E 200.7	OW-12A	2212442-004E	0.0055	0.010	mg/L	J	MDLRL
n-Propylbenzene	SW8260B	OW-57	2212442-006a	41	50	µg/L	J	MDLRL
Perfluorobutanoic acid (PFBA)	EPA 537.1	OW-63	2212442-005G	140	2.03	ng/L	J+	LR-EIS
Perfluorooctane Sulfonamide (FOSA)	EPA 537.1	OW-63	2212442-005G	ND	2.03	ng/L	UJ	LR-EIS
Perfluorooctane Sulfonamide (FOSA)	EPA 537.1	EB-OW-67	2212442-009a	ND	1.94	ng/L	UJ	LR-EIS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Phenol	SW8270C	OW-12A	2212442-004c	ND	20	µg/L	R	LR-SUR
p-Isopropyltoluene	SW8260B	OW-64	2212442-002a	0.95	1.0	µg/L	J	MDLRL
p-Isopropyltoluene	SW8260B	DUP-12-7-22	2212442-007a	1.0	2.0	µg/L	J	MDLRL
Pyrene	SW8270C	EB-12-7-22	2212442-001c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-12	2212442-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-12A	2212442-004c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-63	2212442-005C	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	OW-64	2212442-002c	0.34	1.0	µg/L	J	ERPD-LCS, MDLRL
Pyrene	SW8270C	DUP-12-7-22	2212442-007c	0.46	1.0	µg/L	J	ERPD-LCS, MDLRL
Selenium, Dissolved	E200.8	OW-12A	2212442-004E	0.0020	0.0010	mg/L	J+	HR-LCS
Silver, Dissolved	E 200.7	OW-12A	2212442-004E	0.0020	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-57	2212442-006E	0.0016	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	OW-63	2212442-005a	42	50	µg/L	J	MDLRL
Toluene	SW8260B	OW-57	2212442-006a	27	50	µg/L	J	MDLRL
TPH DRO	SW8015	OW-64	2212442-002C	0.54	0.064	mg/L	JB	MBD
TPH DRO	SW8015	DUP-12-7-22	2212442-007C	0.50	0.064	mg/L	JB	ERPD-LCS, MBD
TPH DRO	SW8015	EB-12-7-22	2212442-001C	0.035	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-12	2212442-003C	0.022	0.064	mg/L	U	MBD, MDLRL
TPH DRO	SW8015	OW-63	2212442-005C	2.8	0.064	mg/L	J	ERPD-LCS
TPH DRO	SW8015	OW-57	2212442-006C	5.0	0.64	mg/L	J	ERPD-LCS
TPH GRO	SW8015	OW-64	2212442-002a	0.47	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	OW-12A	2212442-004a	14	2.5	mg/L	J+	HR-SUR
TPH GRO	SW8015	DUP-12-7-22	2212442-007a	0.46	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	OW-63	2212442-005C	ND	0.080	mg/L	UJ	ERPD-LCS
TPH ORO	SW8015	OW-57	2212442-006C	ND	0.80	mg/L	UJ	ERPD-LCS
TPH ORO	SW8015	DUP-12-7-22	2212442-007C	ND	0.080	mg/L	UJ	ERPD-LCS
Vanadium, Dissolved	E 200.7	OW-64	2212442-002E	0.0048	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Dissolved	E 200.7	OW-12	2212442-003E	0.013	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-57	2212442-006E	0.0030	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-12-7-22	2212442-007E	0.0052	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-64	2212442-002D	0.0058	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-12	2212442-003D	0.012	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-12-7-22	2212442-007D	0.0056	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	DUP-12-7-22	2212442-007a	2.4	3.0	µg/L	J	MDLRL
Zinc, Dissolved	E 200.7	OW-12	2212442-003E	0.011	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	DUP-12-7-22	2212442-007E	0.016	0.010	mg/L	JB	EBD
Zinc, Dissolved	E 200.7	OW-12A	2212442-004E	0.0080	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-63	2212442-005E	0.0093	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	OW-57	2212442-006E	0.0099	0.010	mg/L	U	EBD, MDLRL
Zinc, Dissolved	E 200.7	EB-12-7-22	2212442-001E	0.0065	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-12A	2212442-004D	0.0056	0.010	mg/L	J	MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 12/08/2022
Date Validated: 01/30/2023	Sample End Date: 12/08/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212630	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Charles Ballek, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Trip blanks
- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-8-22	2212630-001
MKTF-40	2212630-002
MKTF-31	2212630-003
MKTF-27	2212630-004
MKTF-28	2212630-005
MKTF-29	2212630-006
DUP 12-8-22	2212630-007
FB-12-8-22	2212630-008
Trip Blank	2212630-009

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ✓ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Fourteen data points were rejected. The data completeness measure for this data package is calculated to be 97.41% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 8015D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

J – Analyte detected below quantitation limits.

P1 – RPD value not applicable for sample concentrations less than 5 times the reporting limit.

R – % RPD outside of range.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	MKTF-31	Select VOCs	2
200.8	Multiple Samples	Select Total and Dissolved Metals	5
8270C	MKTF-31	1,4-Dioxane	10
8260B	MKTF-31	MTBE	20
200.8	MKTF-28	Dissolved Selenium	50

Dissolved selenium was not detected in sample MKTF-28 at a dilution of 50 times. The sample was analyzed for the remaining dissolved metals at no dilution and a dilution of 5. The laboratory did not specify the reason for reporting dissolved selenium from this dilution rather than analyses performed at lower dilutions with lower detection limits.

5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC? No

Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions.

The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.

VALIDATION CRITERIA CHECKLIST

6. Were samples received in good condition within method-specified requirements? No

Comments: Samples were received on ice, in good condition, and with the cooler temperatures both within and outside the recommended temperature range of 4°C ± 2°C at 1.5°C, 2.1°C, and 5.0°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature outside the recommended range at 0.6°C as noted on the CoC.

The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.

7. Were samples extracted/digested and analyzed within method-specified or technical holding times? Yes

Comments: The samples were extracted/digested and analyzed within method-specific holding times.

8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil. Yes

Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.

9. Did the laboratory provide any specific initial and/or continuing calibration results? No

Comments: Initial and continuing calibration data were not included as part of this data set.

10. If initial and/or continuing calibration results were provided, were the results within acceptable limits? N/A

Comments: Initial and continuing calibration data were not included as part of this data set.

11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	Total Cadmium	72026	0.016 mg/L
200.7	Dissolved Barium	B93514	0.0013 mg/L
200.8	Total Antimony	72026	0.00052 mg/L
200.8	Dissolved Antimony	D93335	0.00050 mg/L
8015D	**TPH DRO**	**72049**	**0.080 mg/L**

Detections of TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank results were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

VALIDATION CRITERIA CHECKLIST

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72026	EB-12-8-22, MKTF-40
200.7	Dissolved Metals	B93514	Not Prepared
200.7	Dissolved Metals	B93558	Not Prepared
200.8	Total Metals	72026	Not Prepared
200.8	Dissolved Metals	A93438	Not Prepared
200.8	Dissolved Metals	D93335	EB-12-8-22
245.1	Total and Dissolved Mercury	72201	DUP 12-8-22
504.1	EDB	72190	Not Prepared
4500CN E	Cyanide	WG1974296	Not Associated
8015D	TPH DRO and MRO	72049	Not Prepared
8015D	TPH GRO	A93392	MKTF-40
8260B	VOCs	R93394	Not Prepared
8270C SIM	SVOCs	72036	Not Prepared
8270C	SVOCs	72036	Not Prepared

Not Associated – The MS sample source was not associated with this project.

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? Yes

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits.

The percent recoveries and RPD values for MS/MSDs prepared from non-project samples were evaluated and considered but data were not qualified based on those results since matrix similarity to project samples could not be guaranteed.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits	LCS/LCSD RPD	RPD QC Limits
200.7	**Total Barium**	**72026**	**135%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Chromium**	**72026**	**142%**	**-----**	**70-130%**	**-----**	**-----**
200.7	**Total Zinc**	**72026**	**146%**	**-----**	**70-130%**	**-----**	**-----**
200.7	Total Cadmium	72026	484%	-----	70-130%	-----	-----
200.7	**Dissolved Chromium**	**B93558**	**65.3%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Antimony**	**72026**	**51.2%**	**-----**	**70-130%**	**-----**	**-----**
200.8	**Total Selenium**	**72026**	**135%**	**-----**	**70-130%**	**-----**	**-----**
245.1	Mercury	72201	131%	-----	70-130%	-----	-----
8015D	**TPH DRO**	**72049**	**Acceptable**	**Acceptable**	**31.2-125%**	**22.7%**	**20%**
8270C	**Pyrene**	**72036**	**Acceptable**	**Acceptable**	**61-123%**	**17.9%**	**11.8%**
8270C SIM	**Naphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-78.3%**	**33.3%**	**31.7%**
8270C SIM	**1-Methylnaphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-79.6%**	**40.0%**	**31.4%**
8270C SIM	**2-Methylnaphthalene**	**72036**	**Acceptable**	**Acceptable**	**15-78.6%**	**39.1%**	**30.5%**
8270C SIM	**Acenaphthene**	**72036**	**Acceptable**	**Acceptable**	**15-92%**	**37.8%**	**30.5%**
8270C SIM	**Fluorene**	**72036**	**Acceptable**	**Acceptable**	**15-96%**	**31.4%**	**25.1%**

Detections of the identified analytes with LCS recoveries above the QC limits were qualified as J+ in the associated samples due to evidence of potential high bias. Non-detection of these analytes in the associated samples did not require qualification.

Dissolved chromium and total antimony were not detected in the associated samples and the results were qualified as UJ due to evidence of potential low bias,
The results for analytes with LCS/LCSD RPD values that exceeded the QC limits were qualified as J for detections and UJ for non-detections for the associated samples due to evidence of poor precision.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**MKTF-29**	**1.92%**	**15-84.5%**
8270C	**Phenol-d_5**	**MKTF-29**	**9.84%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**MKTF-29**	**1.62%**	**15-108%**
8270C	**2-Fluorophenol**	**DUP 12-8-22**	**9.97%**	**15-84.5%**
8270C	**2,4,6-Tribromophenol**	**DUP 12-8-22**	**2.06%**	**15-108%**

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

The analytes in the acid fraction of samples MKTF-29 and DUP 12-8-22 were not detected. Since the recoveries for at least 2 of 3 surrogates in samples MKTF-29 and DUP 12-8-22 were less than 10%, these results were qualified as R to indicate rejected (not usable) data based on evidence of extreme low bias.

VALIDATION CRITERIA CHECKLIST	
Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.	
18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	Yes
Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One trip blank sample, Trip Blank, one field blank sample, FB-12-8-22, and one equipment blank sample, EB-12-8-22, were collected as part of this sample set.	
19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples?	No
Comments: Target analytes were not detected in the trip blank, field blank, and equipment blank samples with the following exception. TPH DRO was detected in the Method 8015D analysis of equipment blank sample EB-12-8-22 at 0.045 mg/L. The TPH DRO results in Method 8015D batch 72049 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	Yes
Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP 12-8-22 was collected as a field duplicate of sample MKTF-40.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	No
Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions. **RPD values for dissolved barium and total cyanide exceeded the data validation limit of 30% at 30.8% and 34.9%, respectively. The dissolved barium and total cyanide results for samples MKTF-40 and DUP-12-8-22 were assigned J qualifiers due to evidence of poor precision.**	
22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits?	N/A
Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1974296 from samples not associated with this data set. The RPD values for the laboratory duplicate samples prepared from non-project samples were evaluated and considered, but data were not qualified based on these results since matrix similarity to project samples could not be guaranteed.	

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? Yes

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
MKTF-40	Arsenic	ND	0.0010
MKTF-28	Arsenic	0.0034	0.055
MKTF-27	Selenium	ND	0.0031
MKTF-29	Selenium	ND	0.0027
DUP 12-8-22	Selenium	ND	0.0026
MKTF-31	Silver	ND	0.0016
MKTF-28	Silver	ND	0.0020
MKTF-40	Zinc	0.0051	0.011

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: MKTF-40 Field Duplicate Sample ID: DUP-12-8-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	**E 200.7**	**0.045 mg/L**	**0.033 mg/L**	**30.8%**
Barium, Total	E 200.7	0.10 mg/L	0.098 mg/L	2.0%
Beryllium, Total	E 200.7	0.0010 mg/L	ND (0.0020 mg/L)	DL
Chromium, Total	E 200.7	0.0034 mg/L	ND (0.0060 mg/L)	DL
Nickel, Dissolved	E 200.7	0.0096 mg/L	0.0078 mg/L	20.7% +/-RL
Nickel, Total	E 200.7	0.011 mg/L	0.012 mg/L	8.7% +/-RL
Silver, Dissolved	E 200.7	0.0070 mg/L	0.0031 mg/L	77.2% +/-RL
Silver, Total	E 200.7	0.0082 mg/L	0.0083 mg/L	1.2% +/-RL
Vanadium, Dissolved	E 200.7	0.0097 mg/L	0.0075 mg/L	25.6% +/-RL
Vanadium, Total	E 200.7	0.016 mg/L	0.015 mg/L	6.5% +/-RL
Zinc, Dissolved	E 200.7	0.011 mg/L	ND (0.010 mg/L)	DL
Zinc, Total	E 200.7	0.0051 mg/L	ND (0.010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0010 mg/L	0.00069 mg/L	36.7% +/-RL
Arsenic, Total	E200.8	ND (0.0050 mg/L)	0.0014 mg/L	DL
Lead, Total	E200.8	0.0019 mg/L	0.0018 mg/L	5.4% +/-RL
Selenium, Dissolved	E200.8	ND (0.0050 mg/L)	0.0026 mg/L	DL
Selenium, Total	E200.8	0.0052 mg/L	ND (0.0050 mg/L)	DL
Cyanide, Total	**E335.4**	**0.0115 mg/L**	**0.00808 mg/L**	**34.9%**
TPH DRO	SW8015D	0.067 mg/L	0.044 mg/L	41.4% +/-RL
1,1-Dichloroethane	SW8260B	1.0 µg/L	1.0 µg/L	0.0% +/-RL
1,4-Dioxane	SW8270C	12 µg/L	11 µg/L	8.7%

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

RPD values for dissolved barium and total cyanide exceeded the data validation limit of 30% at 30.8% and 34.9%, respectively, which was evidence of poor precision. The dissolved barium and total cyanide results were qualified as J for samples MKTF-40 and DUP-12-8-22.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
ERPD-FD	High field duplicate RPD.
ERPD-LCS	The LCS/LCSD RPD exceeded the upper acceptable limit indicating poor precision.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,1-Dichloroethane	SW8260B	MKTF-29	2212630-006a	0.76	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	MKTF-28	2212630-005c	0.66	1.0	µg/L	J	MDLRL
1-Methylnaphthalene	SW8270C	EB-12-8-22	2212630-001c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-40	2212630-002c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-27	2212630-004c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-28	2212630-005c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-29	2212630-006c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	DUP 12-8-22	2212630-007c	ND	0.30	µg/L	UJ	ERPD-LCS
1-Methylnaphthalene	SW8270C	MKTF-31	2212630-003c	0.16	0.30	µg/L	J	ERPD-LCS, MDLRL
2,4,6-Trichlorophenol	SW8270C	MKTF-29	2212630-006c	ND	10	µg/L	R	LR-SUR
2,4,6-Trichlorophenol	SW8270C	DUP 12-8-22	2212630-007c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	MKTF-29	2212630-006c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	DUP 12-8-22	2212630-007c	ND	10	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	MKTF-29	2212630-006c	ND	20	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	DUP 12-8-22	2212630-007c	ND	20	µg/L	R	LR-SUR

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
2-Methylnaphthalene	SW8270C	EB-12-8-22	2212630-001c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-40	2212630-002c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-27	2212630-004c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-28	2212630-005c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-29	2212630-006c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	DUP 12-8-22	2212630-007c	ND	0.30	µg/L	UJ	ERPD-LCS
2-Methylnaphthalene	SW8270C	MKTF-31	2212630-003c	0.22	0.30	µg/L	J	ERPD-LCS, MDLRL
2-Methylphenol	SW8270C	MKTF-29	2212630-006c	ND	10	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	DUP 12-8-22	2212630-007c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	MKTF-29	2212630-006c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	DUP 12-8-22	2212630-007c	ND	10	µg/L	R	LR-SUR
Acenaphthene	SW8270C	EB-12-8-22	2212630-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-40	2212630-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-31	2212630-003c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-27	2212630-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-28	2212630-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	MKTF-29	2212630-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Acenaphthene	SW8270C	DUP 12-8-22	2212630-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Antimony, Total	E200.8	EB-12-8-22	2212630-001D	ND	0.001	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	MKTF-40	2212630-002D	ND	0.005	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	MKTF-31	2212630-003D	ND	0.001	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	MKTF-27	2212630-004D	ND	0.005	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	MKTF-28	2212630-005D	ND	0.001	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	MKTF-29	2212630-006D	ND	0.001	mg/L	UJ	LR-LCS
Antimony, Total	E200.8	DUP 12-8-22	2212630-007D	ND	0.005	mg/L	UJ	LR-LCS
Arsenic, Dissolved	E200.8	MKTF-40	2212630-002E	0.0010	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	MKTF-31	2212630-003E	0.00068	0.0010	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Arsenic, Dissolved	E200.8	DUP 12-8-22	2212630-007E	0.00069	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	MKTF-29	2212630-006D	0.0013	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	DUP 12-8-22	2212630-007D	0.0014	0.0050	mg/L	J	MDLRL
Barium, Dissolved	E 200.7	MKTF-40	2212630-002E	0.045	0.0020	mg/L	J	ERPD-FD
Barium, Dissolved	E 200.7	DUP 12-8-22	2212630-007E	0.033	0.0020	mg/L	J	ERPD-FD
Barium, Total	E 200.7	MKTF-40	2212630-002D	0.10	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-31	2212630-003D	0.73	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-27	2212630-004D	0.087	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-28	2212630-005D	0.19	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	MKTF-29	2212630-006D	0.31	0.0030	mg/L	J+	HR-LCS
Barium, Total	E 200.7	DUP 12-8-22	2212630-007D	0.098	0.0030	mg/L	J+	HR-LCS
Benzene	SW8260B	MKTF-29	2212630-006a	0.59	1.0	µg/L	J	MDLRL
Benzoic Acid	SW8270C	MKTF-29	2212630-006c	ND	20	µg/L	R	LR-SUR
Benzoic Acid	SW8270C	DUP 12-8-22	2212630-007c	ND	20	µg/L	R	LR-SUR
Beryllium, Total	E 200.7	MKTF-40	2212630-002D	0.0010	0.0020	mg/L	J	MDLRL
Beryllium, Total	E 200.7	MKTF-28	2212630-005D	0.00089	0.0020	mg/L	J	MDLRL
Chromium, Dissolved	E 200.7	MKTF-29	2212630-006E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	DUP 12-8-22	2212630-007E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Total	E 200.7	MKTF-31	2212630-003D	0.030	0.0060	mg/L	J+	HR-LCS
Chromium, Total	E 200.7	MKTF-40	2212630-002D	0.0034	0.0060	mg/L	J+	HR-LCS, MDLRL
Chromium, Total	E 200.7	MKTF-28	2212630-005D	0.0028	0.0060	mg/L	J+	HR-LCS, MDLRL
Cobalt, Total	E 200.7	MKTF-28	2212630-005D	0.0038	0.0060	mg/L	J	MDLRL
Cyanide, Total	E335.4	MKTF-40	2212630-002F	0.0115	0.0050	mg/L	J	ERPD-FD
Cyanide, Total	E335.4	DUP 12-8-22	2212630-007F	0.00808	0.0050	mg/L	J	ERPD-FD
Fluorene	SW8270C	EB-12-8-22	2212630-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-40	2212630-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-31	2212630-003c	ND	0.30	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Fluorene	SW8270C	MKTF-27	2212630-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-28	2212630-005c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	MKTF-29	2212630-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Fluorene	SW8270C	DUP 12-8-22	2212630-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Lead, Dissolved	E200.8	MKTF-31	2212630-003E	0.000093	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-28	2212630-005E	0.00018	0.00050	mg/L	J	MDLRL
Lead, Dissolved	E200.8	MKTF-29	2212630-006E	0.000073	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-40	2212630-002D	0.0019	0.00250	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-27	2212630-004D	0.0011	0.00250	mg/L	J	MDLRL
Lead, Total	E200.8	MKTF-29	2212630-006D	0.00046	0.00050	mg/L	J	MDLRL
Lead, Total	E200.8	DUP 12-8-22	2212630-007D	0.0018	0.0025	mg/L	J	MDLRL
Naphthalene	SW8270C	MKTF-31	2212630-003c	0.52	0.30	µg/L	J	ERPD-LCS
Naphthalene	SW8270C	EB-12-8-22	2212630-001c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-40	2212630-002c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-27	2212630-004c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-29	2212630-006c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	DUP 12-8-22	2212630-007c	ND	0.30	µg/L	UJ	ERPD-LCS
Naphthalene	SW8270C	MKTF-28	2212630-005c	0.24	0.30	µg/L	J	ERPD-LCS, MDLRL
Nickel, Dissolved	E 200.7	MKTF-40	2212630-002E	0.0096	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-31	2212630-003E	0.0046	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	MKTF-28	2212630-005E	0.0062	0.010	mg/L	J	MDLRL
Nickel, Dissolved	E 200.7	DUP 12-8-22	2212630-007E	0.0078	0.010	mg/L	J	MDLRL
Nickel, Total	E 200.7	MKTF-28	2212630-005D	0.0089	0.010	mg/L	J	MDLRL
Phenol	SW8270C	MKTF-29	2212630-006c	ND	20	µg/L	R	LR-SUR
Phenol	SW8270C	DUP 12-8-22	2212630-007c	ND	20	µg/L	R	LR-SUR
Pyrene	SW8270C	EB-12-8-22	2212630-001c	ND	1.0	µg/L	UJ	ERPD-LCS

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Pyrene	SW8270C	MKTF-40	2212630-002c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-31	2212630-003c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-27	2212630-004c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-28	2212630-005c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	MKTF-29	2212630-006c	ND	1.0	µg/L	UJ	ERPD-LCS
Pyrene	SW8270C	DUP 12-8-22	2212630-007c	ND	1.0	µg/L	UJ	ERPD-LCS
Selenium, Dissolved	E200.8	MKTF-27	2212630-004E	0.0031	0.0050	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	MKTF-29	2212630-006E	0.0027	0.0050	mg/L	J	MDLRL
Selenium, Dissolved	E200.8	DUP 12-8-22	2212630-007E	0.0026	0.0050	mg/L	J	MDLRL
Selenium, Total	E200.8	MKTF-40	2212630-002D	0.0052	0.0050	mg/L	J+	HR-LCS
Selenium, Total	E200.8	MKTF-31	2212630-003D	0.0067	0.0010	mg/L	J+	HR-LCS
Selenium, Total	E200.8	MKTF-28	2212630-005D	0.0063	0.0010	mg/L	J+	HR-LCS
Silver, Dissolved	E 200.7	MKTF-31	2212630-003E	0.0016	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-27	2212630-004E	0.0031	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-28	2212630-005E	0.0020	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	MKTF-29	2212630-006E	0.0044	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	DUP 12-8-22	2212630-007E	0.0031	0.0050	mg/L	J	MDLRL
TPH DRO	SW8015	MKTF-31	2212630-003C	0.23	0.064	mg/L	JB	ERPD-LCS, MBD
TPH DRO	SW8015	MKTF-27	2212630-004C	0.17	0.064	mg/L	JB	ERPD-LCS, MBD
TPH DRO	SW8015	MKTF-28	2212630-005C	0.20	0.064	mg/L	JB	ERPD-LCS, MBD
TPH DRO	SW8015	MKTF-29	2212630-006C	0.31	0.064	mg/L	JB	ERPD-LCS, MBD
TPH DRO	SW8015	EB-12-8-22	2212630-001C	0.045	0.064	mg/L	U	ERPD-LCS, MBD
TPH DRO	SW8015	MKTF-40	2212630-002C	0.067	0.064	mg/L	U	ERPD-LCS, MBD
TPH DRO	SW8015	DUP 12-8-22	2212630-007C	0.044	0.064	mg/L	U	ERPD-LCS, MBD, MDLRL
TPH GRO	SW8015	MKTF-27	2212630-004a	0.034	0.050	mg/L	J	MDLRL
TPH GRO	SW8015	MKTF-29	2212630-006a	0.023	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-40	2212630-002E	0.0097	0.050	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Vanadium, Dissolved	E 200.7	MKTF-31	2212630-003E	0.0039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-27	2212630-004E	0.0039	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-28	2212630-005E	0.0055	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	MKTF-29	2212630-006E	0.0056	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP 12-8-22	2212630-007E	0.0075	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-40	2212630-002D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-27	2212630-004D	0.0063	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-28	2212630-005D	0.016	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	MKTF-29	2212630-006D	0.0078	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP 12-8-22	2212630-007D	0.015	0.050	mg/L	J	MDLRL
Zinc, Dissolved	E 200.7	MKTF-31	2212630-003E	0.0048	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	MKTF-31	2212630-003D	0.047	0.010	mg/L	J+	HR-LCS
Zinc, Total	E 200.7	MKTF-28	2212630-005D	0.020	0.010	mg/L	J+	HR-LCS
Zinc, Total	E 200.7	MKTF-29	2212630-006D	0.010	0.010	mg/L	J+	HR-LCS
Zinc, Total	E 200.7	MKTF-40	2212630-002D	0.0051	0.010	mg/L	J+	HR-LCS, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-080-002 Task: 0006	Sample Start Date: 12/14/2022
Date Validated: 01/31/2023	Sample End Date: 12/14/2022
Parameters Included: ▪ Volatile Organic Compounds (VOC) by Environmental Protection Agency (EPA) Test Methods for Evaluating Solid Waste (SW-846) Method 8260B ▪ 1,2-Dibromoethane (EDB) by EPA Method 504.1 ▪ Semivolatile Organic Compounds (SVOC) by SW-846 Method 8270C and Method 8270C with Selected Ion Monitoring (SIM) ▪ Total Petroleum Hydrocarbons (TPH) Gasoline Range Organics (GRO) by SW-846 Method 8015D ▪ TPH Diesel Range Organics (DRO) and Motor Oil Range Organics (MRO) by SW-846 Method 8015D Modified ▪ Total and Dissolved Metals by EPA Method 200.7 and Method 200.8 ▪ Total and Dissolved Mercury by EPA Method 245.1 ▪ Cyanide by Standard Methods for the Examination of Water and Wastewater (SM) Method 4500 CN E	
Laboratory Project ID: 2212913	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, with additional data from Pace Analytical National of Mount Juliet, Tennessee evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Precision, accuracy, method compliance, and completeness of this data package were assessed during this data review. Precision was determined by evaluating the calculated relative percent difference (RPD) values from:

- Field duplicate pairs
- Laboratory duplicate pairs
- Matrix spike (MS) and matrix spike duplicate (MSD) pairs
- Laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) pairs

Laboratory accuracy was established by reviewing the demonstrated percent recoveries (%R) of the following items to verify that data are not biased.

- MS/MSD samples
- LCS/LCSD samples
- Organic system monitoring compounds (surrogates)

Tier II Data Validation Report Summary

Field accuracy was established by collecting and analyzing the following samples to monitor for possible ambient or cross contamination during sampling and transportation.

- Field blanks
- Equipment blanks

Method compliance was established by reviewing sample integrity, holding times, detection limits, surrogate recoveries, laboratory blanks, initial and continuing calibrations (where applicable), and the LCS/LCSD percent recoveries against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
EB-12-14-22	2212913-001
OW-58	2212913-002
OW-70	2212913-003
NAPI-2	2212913-004
NAPI-3	2212913-005
KA-3	2212913-006
FB-12-14-22	2212913-007
DUP-12-14-22	2212913-008

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ✓ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ⊗ Laboratory Blanks (Items 11 and 12)
- ✓ MS/MSD (Items 13 and 14)
- ⊗ LCS/LCSD (Items 15 and 16)
- ⊗ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ⊗ Field and Equipment Blanks (Items 18 and 19)
- ⊗ Field Duplicates (Items 20 and 21)
- ✓ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Data for inorganic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Inorganic Superfund Methods Data Review, document number EPA-540-R-20-006, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Inorganic Data Review, document number EPA 540-R-04-004, October 2004.
- Review of field duplicates was conducted according to the USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration
J+	The result is an estimated concentration, but may be biased high
J-	The result is an estimated concentration, but may be biased low
UJ	Estimated reporting limit
U	Evaluated to be undetected at the reporting limit
JB	Estimated concentration due to blank contamination
R	Rejected, data not usable

Data Completeness

The analyses were performed as requested on the CoC records. The associated samples were received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 540 data points. The data completeness calculation does not include any submitted blank sample results. Seven data points were rejected. The data completeness measure for this data package is calculated to be 98.70% and is acceptable.

VALIDATION CRITERIA CHECKLIST

1. Was the report free of non-conformances identified by the laboratory? No

Comments: The laboratory noted the following analytical non-conformances related to this data set.

Method 80156D DRO/MRO: The method blank had a low-level detection for DRO. Samples with detections are flagged with a "B".

Methods 8270C and 8270C SIM: 1-Methylnaphthalene, 2-methylnaphthalene, and naphthalene were reported by EPA Method 8270 instead of EPA Method 8270 SIM because of their elevated concentrations for samples OW-58 and DUP-12-14-22.

1-Methylnaphthalene was reported by EPA Method 8270 instead of EPA Method 8270 SIM because of its elevated concentration for sample NAPI-2.

2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define. No

Comments: The laboratory used the following data qualification flags with this data set.

B – Analyte detected in the associated method blank.

D – Sample diluted due to matrix.

J – Analyte detected below quantitation limits.

J6 – The sample matrix interfered with the ability to make any accurate determination; spike value is low.

S – % Recovery outside of range due to dilution or matrix interference.

* – Value exceeds maximum contaminant level.

3. Were sample CoC forms and custody procedures complete? Yes

Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the samples were transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.

4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable? Yes

Comments: The detection limits appeared to be acceptable. The following dilutions were applied.

Method	Sample(s)	Analyte(s)	Dilution Factor
8260B	NAPI-2	Select VOCs	2
200.7	Multiple Samples	Total and/or Dissolved Barium	5
200.8	Multiple Samples	Dissolved Metals	5
8015D	OW-58, DUP-12-14-22	TPH DRO and MRO	5
200.7	OW-58, DUP-12-14-22	Total and/or Dissolved Barium	10
8015D	NAPI-2	TPH GRO	10
8260B	NAPI-2	Benzene, Ethylbenzene	20
8015D	OW-58, DUP-12-14-22	TPH GRO	50
8260B	OW-58, DUP-12-14-22	Select VOCs	50
8260B	OW-58, DUP-12-14-22	Benzene	500

VALIDATION CRITERIA CHECKLIST	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	No
Comments: The reported analytical methods were in compliance with the CoC, and the laboratory reported the requested constituents in accordance with the CoC, with the following exceptions. The CoC requested total and dissolved metals using only Method 200.7; however, the laboratory analyzed the samples using both Method 200.7 and Method 200.8. This substituted analytical method, Method 200.8, met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement. The CoC requested cyanide using Method 335.4; however, the laboratory analyzed the samples using Method 4500 CN E. This substituted analytical method met similar sensitivity, accuracy, and precision goals and, therefore, was an acceptable replacement.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: Samples were received on ice, in good condition, and with the cooler temperatures outside the recommended temperature range of 4°C ± 2°C between -3.5°C and 0.7°C as noted on the CoC and Sample Log-in Check List. Samples transferred to Pace National were received in good condition with the cooler temperature within the recommended range at 4.6°C as noted on the CoC. The cooler temperatures below 2.0°C were judged as acceptable since the laboratory did not report the sample containers as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	Yes
Comments: The samples were extracted/digested and analyzed within method-specific holding times.	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The results were reported in concentration units of micrograms per liter (µg/L) and milligrams per liter (mg/L), which were acceptable for the sample matrix and the analyses requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	Yes
Comments: The total number of laboratory blank samples prepared was equal to at least 5% of the total number of samples.	

VALIDATION CRITERIA CHECKLIST

12. Were target analytes reported as not detected in the laboratory blanks? No

Comments: Target analytes were reported as not detected in the laboratory blanks, with the following exceptions.

Method	Analyte	Batch	Concentration
200.7	**Dissolved Antimony**	**D93335**	**0.00050 mg/L**
8015D	**TPH DRO**	**72199**	**0.097 mg/L**

Detections of dissolved antimony and TPH DRO in the associated samples that were less than the blank results and/or less than the applicable reporting limits were assigned U qualifiers. Detections of TPH DRO in the associated samples that were greater than the reporting limits but less than or equal to 10 times the blank result were assigned JB qualifiers. Non-detections of the identified analytes in the associated samples and detections that were above the reporting limit and greater than ten times the blank concentration did not require qualification.

13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of matrix spike samples prepared was equal to at least 5% of the total number of samples, although MS samples were not prepared/reported for all analyses and/or batches. The matrix spike sample source for each analytical batch in this sample set has been indicated below.

Method	Analytes	Batch	MS Sample Source
200.7	Total Metals	72141	Not Prepared
200.7	Dissolved Metals	C93558	Not Prepared
200.8	Total Metals	72141	Not Prepared
200.8	Dissolved Metals	D93335	EB-12-14-22
245.1	Total and Dissolved Mercury	72202	DUP-12-14-22
504.1	EDB	72230	Not Prepared
4500CN E	Cyanide	WG1976252	OW-58
8015D	TPH DRO and MRO	72199	Not Prepared
8015D	TPH GRO	R93515	Not Prepared
8260B	VOCs	R93479	Not Prepared
8260B	Benzene	R93506	Not Prepared
8270C SIM	SVOCs	72138	Not Prepared
8270C	SVOCs	72138	Not Prepared

Not Prepared – Matrix spikes were not prepared/reported for this batch.

14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits? No

Comments: The percent recoveries and RPDs for MS/MSDs prepared from project samples were within data validation and laboratory QC limits, with the following exception.

The MS recovery for cyanide in Method 4500CN E batch WG1976252 was outside the laboratory QC limits of 90.0-110% at 89.9%. However, the recovery was within data validation limits of 75-125%. Validation action was not required.

15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method? Yes

Comments: The total number of LCS samples analyzed was equal to at least 5% of the total number of samples.

VALIDATION CRITERIA CHECKLIST

16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits? No

Comments: The LCS and LCSD percent recoveries and LCS/LCSD RPDs were within data validation and laboratory QC limits, with the following exceptions.

Method	Analyte	Batch	LCS Recovery	LCSD Recovery	LCS/LCSD QC Limits
200.7	**Total Zinc**	**72141**	**69.7%**	**-----**	**70-130%**
200.7	**Dissolved Nickel**	**C93558**	**137%**	**-----**	**70-130%**
200.7	**Dissolved Chromium**	**C93558**	**50.7%**	**-----**	**70-130%**

Total zinc and dissolved chromium results in the associated samples were assigned J- qualifiers if detected and UJ if not detected due to evidence of potential low bias.

Detections of dissolved nickel in the associated samples were qualified as J+ due to evidence of potential high bias. Non-detections of dissolved nickel in the associated samples did not require qualification.

17. Were surrogate recoveries within laboratory QC limits? No

Comments: Surrogate recoveries were within laboratory QC limits, with the following exceptions.

Method	Surrogate	Sample	Surrogate Recovery	QC Limits
8270C	**2-Fluorophenol**	**OW-58**	**0%**	**15-84.5%**
8270C	**Phenol-d_5**	**OW-58**	**0%**	**15-67%**
8270C	**2,4,6-Tribromophenol**	**OW-58**	**1.94%**	**15-108%**
8015D	**BFB**	**OW-70**	**235%**	**70-130%**
8015D	**BFB**	**NAPI-3**	**147%**	**70-130%**

TPH GRO was detected in the Method 8015D analyses for samples OW-70 and NAPI-3, and these results were assigned J+ qualifiers to indicate a potential high bias.

Since Method 8270C surrogate associations were not available from the laboratory, qualification was assigned to all of the target analytes in a given fraction (acid or base/neutral) when two or more surrogates from the same fraction (acid or base/neutral) were outside the acceptance range.

The analytes in the acid fraction of sample OW-58 were not detected. Since the recoveries of the surrogates in sample OW-58 were less than 10%, the results for the associated acid fraction analytes were assigned R qualifiers to indicate rejected (not usable) data based on evidence of extreme low bias.

Qualification of sample data was not required based on surrogate non-conformances in QC samples as the environmental samples were evaluated based on their specific surrogate recoveries.

18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit? Yes

Comments: The number of trip, field, and equipment blanks collected was equal to at least 10% of the number of samples. One field blank sample, FB-12-14-22, and one equipment blank sample, EB-12-14-22, were collected as part of this sample set.

VALIDATION CRITERIA CHECKLIST	
19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples?	No
Comments: Target analytes were not detected in the field blank and equipment blank samples, with the following exceptions. **Total beryllium was detected in the Method 200.7 analysis of equipment blank sample EB-12-14-22 at a concentration of 0.0008 mg/L. Total beryllium was detected in samples NAPI-2 and OW-70 at concentrations less than the blank level and/or the laboratory reporting limits, and the results were assigned U qualifiers.** Non-detections of this analyte in the associated samples did not require qualification. TPH DRO was detected in the Method 8015D analysis of equipment blank sample EB-12-14-22 at 0.025 mg/L. The TPH DRO results in Method 8015D batch 72199 were previously qualified due to a laboratory blank detection; therefore, additional qualification due to the equipment blank contamination was not required.	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	Yes
Comments: The number of field duplicates collected was equal to at least 10% of the number of samples. Sample DUP-12-14-22 was collected as a field duplicate of sample OW-58.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	No
Comments: As indicated in the Field Duplicate Summary Table at the end of this report, field duplicate RPD values were within data validation QC limits of 0-30% for water samples, with the following exceptions. **The RPD values for toluene, total xylenes, and naphthalene exceeded the data validation limit of 30% at 38.3%, 44.1%, and 31.0%, respectively. The toluene, total xylenes, and naphthalene results for samples OW-58 and DUP-12-14-22 were assigned J qualifiers due to evidence of poor precision** **An RPD value could not be calculated for phenol for the field duplicate pair OW-58 and DUP-12-14-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, phenol was qualified as J and UJ for the duplicate and parent samples, respectively.**	
22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits?	Yes
Comments: Laboratory duplicates were prepared for the analysis of cyanide in batch WG1976252 from a sample not associated with this data set and sample NAPI-2. The RPD for the laboratory duplicate prepared from a project sample was within laboratory acceptance limits. The RPD value for the laboratory duplicate sample prepared from a non-project sample was evaluated and considered, but data were not qualified based on this result since matrix similarity to project samples could not be guaranteed.	

VALIDATION CRITERIA CHECKLIST

23. Were the following data relationships realistic?

- Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)? N/A

Comments: Target analytes were not reported by more than one method.

- Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results? No

Comments: The following table contains the exceptions in which the dissolved metals results exceeded the total metals results.

Sample ID	Analyte	Total Result (mg/L)	Dissolved Result (mg/L)
OW-58	Antimony	0.00053	0.0027
KA-3	Arsenic	0.00062	0.00064
DUP-12-14-22	Arsenic	0.0028	0.0032
OW-58	Lead	ND	0.00034
KA-3	Zinc	0.0046	0.0098

The EPA has not provided guidance or requirements for the evaluation, validation, and qualification of dissolved metals results that exceed the corresponding total metals results. Therefore, qualification of results was not performed based on these data.

FIELD DUPLICATE SUMMARY

Client Sample ID: OW-58 Field Duplicate Sample ID: DUP-12-14-22				
Analyte	**Method**	**Laboratory Result**	**Duplicate Result**	**Relative Percent Difference (RPD)**
Barium, Dissolved	E 200.7	4.7 mg/L	4.8 mg/L	2.1%
Barium, Total	E 200.7	4.9 mg/L	5.3 mg/L	7.8%
Nickel, Dissolved	E 200.7	0.045 mg/L	0.045 mg/L	0.0%
Nickel, Total	E 200.7	0.048 mg/L	0.048 mg/L	0.0%
Silver, Dissolved	E 200.7	0.0017 mg/L	ND (0.0050 mg/L)	DL
Silver, Total	E 200.7	0.0020 mg/L	0.0020 mg/L	0.0% +/-RL
Vanadium, Dissolved	E 200.7	0.0032 mg/L	0.0033 mg/L	3.1% +/-RL
Vanadium, Total	E 200.7	0.0048 mg/L	0.0050 mg/L	4.1% +/-RL
Antimony, Dissolved	E200.8	0.0027 mg/L	ND (0.0050 mg/L)	DL
Antimony, Total	E200.8	0.00053 mg/L	ND (0.0010 mg/L)	DL
Arsenic, Dissolved	E200.8	0.0025 mg/L	0.0032 mg/L	24.6% +/-RL
Arsenic, Total	E200.8	0.0027 mg/L	0.0028 mg/L	3.6%
Lead, Dissolved	E200.8	0.00034 mg/L	ND (0.0025 mg/L)	DL
TPH DRO	SW8015	5.8 mg/L	7.7 mg/L	28.1%
TPH GRO	SW8015	70 mg/L	68 mg/L	2.9%
1,2,4-Trimethylbenzene	SW8260B	ND (50 µg/L)	47 µg/L	DL
1,3,5-Trimethylbenzene	SW8260B	ND (50 µg/L)	23 µg/L	DL
Benzene	SW8260B	31,000 µg/L	30,000 µg/L	3.3%
Ethylbenzene	SW8260B	1,400 µg/L	1,400 µg/L	0.0%
Isopropylbenzene	SW8260B	33 µg/L	34 µg/L	3.0% +/-RL
MTBE	SW8260B	1,200 µg/L	1,100 µg/L	8.7%
n-Propylbenzene	SW8260B	110 µg/L	110 µg/L	0.0%
Toluene	**SW8260B**	**190 µg/L**	**280 µg/L**	**38.3%**
Xylenes, Total	**SW8260B**	**230 µg/L**	**360 µg/L**	**44.1%**
1,4-Dioxane	SW8270C	0.84 µg/L	0.94 µg/L	11.2% +/-RL
1-Methylnaphthalene	SW8270C	38 µg/L	49 µg/L	25.3%
2-Methylnaphthalene	SW8270C	42 µg/L	55 µg/L	26.8%
Acenaphthene	SW8270C	1.8 µg/L	2.0 µg/L	10.5%
Anthracene	SW8270C	0.36 µg/L	0.32 µg/L	11.8% +/-RL
Fluoranthene	SW8270C	0.22 µg/L	0.18 µg/L	20.0% +/-RL
Fluorene	SW8270C	3.0 µg/L	2.9 µg/L	3.4%
Naphthalene	**SW8270C**	**71 µg/L**	**97 µg/L**	**31.0%**
Phenanthrene	SW8270C	3.5 µg/L	2.9 µg/L	18.8%
Phenol	**SW8270C**	**ND (20 µg/L)**	**50 µg/L**	**DL**

Field duplicate RPD control limits are not to exceed 30% for water as established by USEPA Region I - New England Environmental Data Review Supplement for Region 1 Data Review Elements and Superfund Specific Guidance/Procedures, EQADR-Supplement2, September 2020.

DL – Indicates that the analyte was detected in one of the duplicate samples and was undetected in the other sample, and therefore an RPD could not be calculated. Data were not qualified since the detection was within two times the reporting limit. Non-detected results are indicated above with the applicable reporting limit as ND (RL).

+/-RL – Indicates that the detections in both of the samples were within two times the reporting limit. Qualification of data was not required.

The RPD values for toluene, total xylenes, and naphthalene exceeded the data validation limit of 30% at 38.3%, 44.1%. and 31.0%, respectively, which was evidence of poor precision. The toluene, total xylenes, and naphthalene results were qualified as J for samples OW-58 and DUP-12-14-22.

An RPD value could not be calculated for phenol for the field duplicate pair OW-58 and DUP-12-14-22 since the analyte was detected in the duplicate sample and was undetected in the parent sample. As the detection in the duplicate sample was greater than two times the reporting limit, phenol was qualified as J and UJ for the duplicate and parent samples, respectively.

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
EBD	Equipment blank detection
ERPD-FD	High field duplicate RPD.
HR-LCS	The LCS and/or LCSD percent recovery was greater than the upper acceptable limit indicating a possible high bias.
HR-SUR	The surrogate percent recovery was greater than the upper acceptable limit indicating a possible high bias.
LR-LCS	The LCS and/or LCSD percent recovery was less than the lower acceptable limit indicating a possible low bias.
LR-SUR	The surrogate percent recovery was less than the lower acceptable limit indicating a possible low bias.
MBD	Method blank detection
MDLRL	Flagged by the laboratory: The result was greater than the MDL but less than the RL.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
1,2,4-Trimethylbenzene	SW8260B	NAPI-2	2212913-004a	1.4	2.0	µg/L	J	MDLRL
1,2,4-Trimethylbenzene	SW8260B	DUP-12-14-22	2212913-008a	47	50	µg/L	J	MDLRL
1,3,5-Trimethylbenzene	SW8260B	DUP-12-14-22	2212913-008a	23	50	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-58	2212913-002C	0.84	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	OW-70	2212913-003c	0.36	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	NAPI-3	2212913-005c	0.42	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	KA-3	2212913-006c	0.42	1.0	µg/L	J	MDLRL
1,4-Dioxane	SW8270C	DUP-12-14-22	2212913-008C	0.94	1.0	µg/L	J	MDLRL
2,4,6-Trichlorophenol	SW8270C	OW-58	2212913-002c	ND	10	µg/L	R	LR-SUR
2,4-Dimethylphenol	SW8270C	OW-58	2212913-002c	ND	10	µg/L	R	LR-SUR
2,4-Dinitrophenol	SW8270C	OW-58	2212913-002c	ND	20	µg/L	R	LR-SUR
2-Methylphenol	SW8270C	OW-58	2212913-002c	ND	10	µg/L	R	LR-SUR
3,4-Methylphenol	SW8270C	OW-58	2212913-002c	ND	10	µg/L	R	LR-SUR
Anthracene	SW8270C	NAPI-2	2212913-004C	0.20	0.30	µg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Antimony, Dissolved	E200.8	OW-58	2212913-002E	0.0027	0.0050	mg/L	U	MBD, MDLRL
Antimony, Total	E200.8	OW-58	2212913-002D	0.00053	0.0010	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-58	2212913-002E	0.0025	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	OW-70	2212913-003E	0.0015	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	NAPI-2	2212913-004E	0.0015	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	NAPI-3	2212913-005E	0.0021	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	KA-3	2212913-006E	0.00064	0.0050	mg/L	J	MDLRL
Arsenic, Dissolved	E200.8	DUP-12-14-22	2212913-008E	0.0032	0.0050	mg/L	J	MDLRL
Arsenic, Total	E200.8	KA-3	2212913-006D	0.00062	0.0010	mg/L	J	MDLRL
Benzoic Acid	SW8270C	OW-58	2212913-002c	ND	20	µg/L	R	LR-SUR
Beryllium, Total	E 200.7	OW-70	2212913-003D	0.0013	0.0020	mg/L	U	EBD, MDLRL
Beryllium, Total	E 200.7	NAPI-2	2212913-004D	0.0006	0.0020	mg/L	U	EBD, MDLRL
Beryllium, Total	E 200.7	EB-12-14-22	2212913-001D	0.0008	0.0020	mg/L	J	MDLRL
Chromium, Dissolved	E 200.7	EB-12-14-22	2212913-001E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	OW-58	2212913-002E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	OW-70	2212913-003E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	NAPI-2	2212913-004E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	NAPI-3	2212913-005E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	KA-3	2212913-006E	ND	0.0060	mg/L	UJ	LR-LCS
Chromium, Dissolved	E 200.7	DUP-12-14-22	2212913-008E	ND	0.0060	mg/L	UJ	LR-LCS
Cobalt, Dissolved	E 200.7	OW-70	2212913-003E	0.0056	0.0060	mg/L	J	MDLRL
Fluoranthene	SW8270C	OW-58	2212913-002C	0.22	0.30	µg/L	J	MDLRL
Fluoranthene	SW8270C	DUP-12-14-22	2212913-008C	0.18	0.30	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	OW-58	2212913-002a	33	50	µg/L	J	MDLRL
Isopropylbenzene	SW8260B	DUP-12-14-22	2212913-008a	34	50	µg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-58	2212913-002E	0.00034	0.0025	mg/L	J	MDLRL
Lead, Dissolved	E200.8	OW-70	2212913-003E	0.00031	0.0025	mg/L	J	MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Lead, Total	E200.8	NAPI-3	2212913-005D	0.00043	0.0005	mg/L	J	MDLRL
Naphthalene	SW8270C	OW-58	2212913-002c	71	5.0	µg/L	J	ERPD-FD
Naphthalene	SW8270C	DUP-12-14-22	2212913-008c	97	5.0	µg/L	J	ERPD-FD
n-Butylbenzene	SW8260B	OW-70	2212913-003a	0.45	3.0	µg/L	J	MDLRL
n-Butylbenzene	SW8260B	NAPI-2	2212913-004a	1.5	6.0	µg/L	J	MDLRL
Nickel, Dissolved	E 200.7	OW-58	2212913-002E	0.045	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	OW-70	2212913-003E	0.037	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	NAPI-2	2212913-004E	0.094	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	NAPI-3	2212913-005E	0.019	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	KA-3	2212913-006E	0.019	0.010	mg/L	J+	HR-LCS
Nickel, Dissolved	E 200.7	DUP-12-14-22	2212913-008E	0.045	0.010	mg/L	J+	HR-LCS
n-Propylbenzene	SW8260B	NAPI-3	2212913-005a	0.83	1.0	µg/L	J	MDLRL
Phenol	SW8270C	DUP-12-14-22	2212913-008c	50	20	µg/L	J	ERPD-FD
Phenol	SW8270C	OW-58	2212913-002c	ND	20	µg/L	R	ERPD-FD, LR-SUR
sec-Butylbenzene	SW8260B	NAPI-3	2212913-005a	0.93	1.0	µg/L	J	MDLRL
Silver, Dissolved	E 200.7	OW-58	2212913-002E	0.0017	0.0050	mg/L	J	MDLRL
Silver, Dissolved	E 200.7	NAPI-3	2212913-005E	0.0015	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	OW-58	2212913-002D	0.0020	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	NAPI-3	2212913-005D	0.0021	0.0050	mg/L	J	MDLRL
Silver, Total	E 200.7	DUP-12-14-22	2212913-008D	0.0020	0.0050	mg/L	J	MDLRL
Toluene	SW8260B	OW-58	2212913-002a	190	50	µg/L	J	ERPD-FD
Toluene	SW8260B	DUP-12-14-22	2212913-008a	280	50	µg/L	J	ERPD-FD
Toluene	SW8260B	NAPI-2	2212913-004a	1.1	2.0	µg/L	J	MDLRL
TPH DRO	SW8015	OW-70	2212913-003C	0.95	0.064	mg/L	JB	MBD
TPH DRO	SW8015	NAPI-3	2212913-005C	0.79	0.064	mg/L	JB	MBD
TPH DRO	SW8015	KA-3	2212913-006C	0.57	0.064	mg/L	JB	MBD
TPH DRO	SW8015	EB-12-14-22	2212913-001C	0.025	0.064	mg/L	U	MBD, MDLRL

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
TPH GRO	SW8015	OW-70	2212913-003a	0.20	0.050	mg/L	J+	HR-SUR
TPH GRO	SW8015	NAPI-3	2212913-005a	0.20	0.050	mg/L	J+	HR-SUR
TPH ORO	SW8015	NAPI-3	2212913-005C	0.070	0.080	mg/L	J	MDLRL
TPH ORO	SW8015	KA-3	2212913-006C	0.078	0.080	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-58	2212913-002E	0.0032	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	OW-70	2212913-003E	0.0018	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	NAPI-2	2212913-004E	0.0026	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	KA-3	2212913-006E	0.017	0.050	mg/L	J	MDLRL
Vanadium, Dissolved	E 200.7	DUP-12-14-22	2212913-008E	0.0033	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-58	2212913-002D	0.0048	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	OW-70	2212913-003D	0.021	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPI-2	2212913-004D	0.0076	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	NAPI-3	2212913-005D	0.0038	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	KA-3	2212913-006D	0.023	0.050	mg/L	J	MDLRL
Vanadium, Total	E 200.7	DUP-12-14-22	2212913-008D	0.0050	0.050	mg/L	J	MDLRL
Xylenes, Total	SW8260B	OW-58	2212913-002a	230	75	µg/L	J	ERPD-FD
Xylenes, Total	SW8260B	DUP-12-14-22	2212913-008a	360	75	µg/L	J	ERPD-FD
Zinc, Dissolved	E 200.7	KA-3	2212913-006E	0.0098	0.010	mg/L	J	MDLRL
Zinc, Total	E 200.7	OW-70	2212913-003D	0.014	0.010	mg/L	J-	LR-LCS
Zinc, Total	E 200.7	EB-12-14-22	2212913-001D	ND	0.010	mg/L	UJ	LR-LCS
Zinc, Total	E 200.7	OW-58	2212913-002D	ND	0.010	mg/L	UJ	LR-LCS
Zinc, Total	E 200.7	NAPI-3	2212913-005D	ND	0.010	mg/L	UJ	LR-LCS
Zinc, Total	E 200.7	DUP-12-14-22	2212913-008D	ND	0.010	mg/L	UJ	LR-LCS
Zinc, Total	E 200.7	NAPI-2	2212913-004D	0.0073	0.010	mg/L	J-	LR-LCS, MDLRL
Zinc, Total	E 200.7	KA-3	2212913-006D	0.0046	0.010	mg/L	J-	LR-LCS, MDLRL

Tier II Data Validation Report Summary

Client: Marathon Oil	Laboratory: Hall Environmental Analysis Laboratory
Project Name: Western Refining Southwest, Quarterly GW	Sample Matrix: Groundwater
Project Number: 697-082-003 Task: 0002	Sample Start Date: 01/12/2023
Date Validated: 02/15/2023	Sample End Date: 01/12/2023
Parameters Included: ▪ E. Coli by Standard Methods for the Examination of Water and Wastewater (SM) Method 9223B	
Laboratory Project ID: 2301520	
Data Validator: Daran O'Hollearn, Lead Project Scientist	
Reviewer: Mike Phillips, Senior Chemist	

DATA EVALUATION CRITERIA SUMMARY

A Tier II Data Validation was performed by Trihydro Corporation's Chemical Data Evaluation Services Group on the analytical data report packages generated by Hall Environmental Analysis Laboratory of Albuquerque, New Mexico, evaluating samples from the Marathon Oil site, located in Gallup, New Mexico.

Method compliance was established by reviewing sample integrity, holding times, detection limits, and initial and continuing calibrations (where applicable), against method-specific requirements.

Completeness was evaluated by determining the overall ratio of the number of samples and analyses planned versus the number of samples with valid analyses. Determination of completeness included a review of the chain-of-custody (CoC), laboratory analytical methods, and other laboratory and field documents associated with this analytical data set.

SAMPLE NUMBERS TABLE

Client Sample ID	Laboratory Sample Number
STP-1 to EP-2	2301520-001

Due to limitations of the Project Direct database, the E. Coli result of >24196 most probable number (MPN) per 100 milliliters could not be reported in the database.

Tier II Data Validation Report Summary

The laboratory data were reviewed to evaluate compliance with the methods and the quality of the reported data. Assessment of CoC completeness is included in Item 3 of the Data Validation Checklist. A check mark (✓) indicates that the referenced validation criteria were deemed acceptable, whereas a crossed circle (⊗) indicates validation criteria for which the data have been qualified by the data validator. An empty circle (○) indicates that the specified criterion does not apply to the reviewed data. Details are noted in the tables below.

Validation Criteria

- ✓ Data Completeness
- ✓ CoC Documentation (Item 3)
- ⊗ Holding Times and Preservation (Items 6 and 7)
- ○ Initial and Continuing Calibrations (Items 9 and 10)
- ○ Laboratory Blanks (Items 11 and 12)
- ○ Matrix Spikes (MS) and Matrix Spike Duplicates (MSD) (Items 13 and 14)
- ○ Laboratory Control Spikes (LCS) and Laboratory Control Spike Duplicates (LCSD) (Items 15 and 16)
- ○ System Monitoring Compounds (i.e., Surrogates) (Item 17)
- ○ Field, Equipment, and Trip Blanks (Items 18 and 19)
- ○ Field Duplicates (Items 20 and 21)
- ○ Laboratory Duplicates (Item 22)

Guidance References

Chemical data validation was conducted in accordance with the United States Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) National Functional Guidelines for the analyses listed below, or by the appropriate method if not covered in the National Functional Guidelines.

- Data for organic analyses were evaluated according to validation criteria set forth in the USEPA CLP National Functional Guidelines for Organic Superfund Methods Data Review, document number EPA-540-R-20-005, November 2020 with additional reference to the USEPA CLP National Functional Guidelines for Organic Data Review, document number EPA 540/R-99/008, October 1999.
- Trihydro Data Validation Variance Documentation, April 2022.

Tier II Data Validation Report Summary

OVERALL DATA PACKAGE ASSESSMENT

Based on a data validation review, the data are acceptable as delivered. Data qualified by the laboratory are discussed in Item 2 of the Validation Criteria Checklist.

The purpose of validating data and assigning qualifiers is to assist in proper data interpretation. Data that are not qualified meet the site data quality objectives. If values are assigned qualifiers other than an R (rejected, data not usable), the data may be used for site evaluation; however, consideration should be given to the reasons for qualification when interpreting sample concentrations. Data points that are assigned an R qualifier should not be used for site evaluation purposes.

If applicable, text was identified in **bold font** in the Validation Criteria Checklist to indicate that further action and/or qualification of the data were required. Data may have been qualified with J data flags by the laboratory if the result was greater than or equal to the method detection limit (MDL) but less than the reporting limit (RL). These laboratory-applied J flags were preserved, if present, and included in the Data Qualification Summary table at the end of this report. If applicable, data validation qualifiers were added for the items noted with crossed circles in the Validation Criteria section above. Please see the Data Qualification Summary table at the end of this report for a complete list of samples and analytes qualified.

If data would be qualified with more than one flag, one qualifier was assigned based on the severity; however, all reasons for qualification were retained. Data that would be qualified with both J+ and J- flags were evaluated based on validation criteria and assigned the appropriate flag. The hierarchy of qualifiers from the most to least severe is as follows:

- R > JB/U > NJ > J+/J- > J/UJ

Data qualifiers used during this validation are included in the following table.

Qualifier	Definition
J	Estimated concentration

Data Completeness

The analysis was performed as requested on the CoC records. The associated sample was received by the laboratory and analyzed properly unless otherwise noted in the Criteria Checklist below. The complete data package consisted of 1 data point. The data point was not rejected. The data completeness measure for this data package is calculated to be 100% and is acceptable.

VALIDATION CRITERIA CHECKLIST	
1. Was the report free of non-conformances identified by the laboratory?	Yes
Comments: The laboratory did not report non-conformances related to the analytical data for this sample set.	
2. Were the data free of data qualification flags and/or notes used by the laboratory? If no, define.	No
Comments: The laboratory used the following data qualification flag with this data set. H – Holding times for preparation or analysis exceeded.	
3. Were sample CoC forms and custody procedures complete?	Yes
Comments: The CoC records from field to laboratory were complete, and custody was maintained as evidenced by field and laboratory personnel signatures, dates, and times of receipt. Custody seals were not present because the sample was transferred to a laboratory field courier service for transport from the field to the laboratory, and custody was maintained at all times.	
4. Were detection limits in accordance with the quality assurance project plan (QAPP), permit, or method, or indicated as acceptable?	Yes
Comments: The detection limits appeared to be acceptable. The following dilution was applied. Method 9223B: Sample STP-1 to EP-2 was diluted by a factor of 10 times for the analysis of E Coli.	
5. Were the reported analytical methods and constituents in compliance with the QAPP, permit, or CoC?	Yes
Comments: The reported analytical method was in compliance with the CoC, and the laboratory reported the requested constituent in accordance with the CoC.	
6. Were samples received in good condition within method-specified requirements?	No
Comments: The sample was received on ice, in good condition, and with the cooler temperature outside the recommended temperature range of 4°C ± 2°C at 0.9°C as noted on the CoC and Sample Log-in Check List. The cooler temperature below 2.0°C was judged as acceptable since the laboratory did not report the sample container as broken or frozen.	
7. Were samples extracted/digested and analyzed within method-specified or technical holding times?	No
Comments: The sample was not analyzed within method-specific holding times. Method 9223B: **Sample STP-1 to EP-2 was analyzed for E. Coli outside the defined holding time of 24 hours to 48 hours by approximately 2 days. E. Coli was detected in sample STP-1 to EP-2, and this result was assigned a J qualifier based on the holding time exceedance.**	
8. Were reported units appropriate for the sample matrix/matrices and analytical method(s)? Specify if wet or dry units were used for soil.	Yes
Comments: The result was reported in concentration units of most probable number per 100 milliliters (MPN/ 100mL), which was acceptable for the sample matrix and the analysis requested.	
9. Did the laboratory provide any specific initial and/or continuing calibration results?	No
Comments: Initial and continuing calibration data were not included as part of this data set.	
10. If initial and/or continuing calibration results were provided, were the results within acceptable limits?	N/A
Comments: Initial and continuing calibration data were not included as part of this data set.	

VALIDATION CRITERIA CHECKLIST	
11. Was the total number of laboratory blank samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	No
Comments: The total number of laboratory blank samples prepared was not equal to at least 5% of the total number of samples.	
12. Were target analytes reported as not detected in the laboratory blanks?	N/A
Comments: Laboratory blanks were not reported for this data set.	
13. Was the total number of MS samples prepared equal to at least 5% of the total number of samples or analyzed as required by the method?	No
Comments: The total number of matrix spike samples prepared was not equal to at least 5% of the total number of samples. Matrix spikes were not prepared for the analyses in this data set.	
14. For MS/MSDs prepared from project samples, were percent recoveries and RPDs within data validation or laboratory quality control (QC) limits?	N/A
Comments: MS/MSD samples were not prepared using project samples as the sample source.	
15. Was the total number of LCSs analyzed equal to at least 5% of the total number of samples or analyzed as required by the method?	No
Comments: The total number of LCS analyzed was not equal to at least 5% of the total number of samples. LCS were not reported in this data set.	
16. Were LCS/LCSD percent recoveries and LCS/LCSD RPDs within data validation or laboratory QC limits?	N/A
Comments: LCS and LCSDs were not analyzed as part of this sample set.	
17. Were surrogate recoveries within laboratory QC limits?	N/A
Comments: Surrogates were not required for the analysis included in this data set.	
18. Were the number of trip blank, field blank, and/or equipment blank samples collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
19. Were target analytes reported as not detected in the trip blank, field blank, and/or equipment blank samples?	N/A
Comments: Trip, field, and equipment blank samples were not collected for this sample set.	
20. Was the number of field duplicates collected equal to at least 10% of the total number of samples or as required by the project guidelines, QAPP, SAP, or permit?	No
Comments: Field duplicates were not collected as part of this sample set.	
21. Were field duplicate RPD values within data validation QC limits (soil 0-50%, water 0-30%, or air 0-25%)?	N/A
Comments: Field duplicates were not collected as part of this sample set.	
22. For laboratory duplicates prepared from project samples, were RPDs within data validation or laboratory QC limits?	N/A
Comments: Laboratory duplicate samples were not prepared for this sample set.	

VALIDATION CRITERIA CHECKLIST	
23. Were the following data relationships realistic?	
• Target analytes were reported by more than one method (e.g., 8260/8270, EPH/8270)?	N/A
Comments: Target analytes were not reported by more than one method.	
• Both total and dissolved metals analyses were performed, and the total metals results were greater than or equal to the dissolved metals results?	N/A
Comments: Total and dissolved metals analyses were not performed for this data set.	

DATA QUALIFICATION SUMMARY

Abbreviation	Reason
HT-AN	Sample was analyzed outside of the method holding time.

Analyte	Method	Field Sample ID	Lab Sample ID	Result	Limit	Units	Reviewer Qualifier	DV Flag Reasons
Coliform, E-Coli	EPA 9223	STP-1 to EP-2	2301520-001A	>24196	10	MPN/100ml	J	HT-AN

District I
1625 N. French Dr., Hobbs, NM 88240
Phone:(575) 393-6161 Fax:(575) 393-0720
District II
811 S. First St., Artesia, NM 88210
Phone:(575) 748-1283 Fax:(575) 748-9720
District III
1000 Rio Brazos Rd., Aztec, NM 87410
Phone:(505) 334-6178 Fax:(505) 334-6170
District IV
1220 S. St Francis Dr., Santa Fe, NM 87505
Phone:(505) 476-3470 Fax:(505) 476-3462

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Action 209620

CONDITIONS

Operator: Western Refining Southwest LLC 539 South Main Street Findlay, OH 45840	OGRID: 267595
	Action Number: 209620
	Action Type: [UF-DP] Discharge Permit (DISCHARGE PERMIT)

CONDITIONS

Created By	Condition	Condition Date
scwells	Accepted for Records Retention Purposes. Appendices were too big to upload as one file so split up here.	4/21/2023