LABORATORY DATA CONSULTANTS, INC.
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AECOM
1001 Bishop Street Suite 1600
Honolulu, HI 96813
ATTN: Ms. Alethea Ramos
alethea.ramos@aecom.com

October 20, 2022

SUBJECT: Red Hill Oily Waste Disposal Facility, CTO 18F0176 - Data Validation

Dear Ms. Ramos,

Enclosed is the final validation report for the fractions listed below. These SDGs were received on July 13, 2022. Attachment 1 is a summary of the samples that were reviewed for the analysis.

LDC Project #54719:

SDG #	Fraction
580-111967-2, 580-115066-1, 580-115115-1, 580-115123-1, 580-115161-1, 580-115163-1, 580-115197-1	Metals, Wet Chemistry, Volatiles, Semivolatiles, Polynuclear Aromatic Hydrocarbons, Gasoline Range Organics, Polychlorinated Dioxins/Dibenzofurans, Methane

The data validation was performed under Stage 2B & 4 validation guidelines. The analysis was validated using the following documents and variances, as applicable to the method:

- Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021)
- U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019)
- DoD General Validation Guidelines (November 2019)
- U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020)
- U.S. Department of Defense (DoD) Data Validation Guidelines Module 2: Data Validation Procedure for Metals by ICP-OES (May 2020)
- U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021)
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998; IIIB, November 2004; update IV, February 2007; update V, July 2014; update VI, July 2018

Please feel free to contact us if you have any questions.

Sincerely,

Stella Cuenco
Operations Manager/Senior Chemist
scuenco@lab-data.com

251 pages-ADV

Attachment 1

90/10 2B/4 EDD

LDC# 54719 (AECOM - Honolulu, HI / Red Hill Oily Waste, CTO 18F0176)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260D)		SVOA (8270E)		PAHs (8270E -SIM)		(5) Metals (6010D)		GRO (8260/ LUFT)		Dioxins (8290A)		Methane (175)		Alk. (2320B)		Br,Cl,F SO_4 (300.0)		NO_3-N (300.0)		NO_3/ NO_2-N (353.2)		DOC (9060A)		TOC (9060A)					
Matrix:	Water/Soil			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	580-111967-2	07/13/22	08/03/22	-	-	-	-	-	-	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
B	580-115066-1	07/13/22	08/03/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	1	0	-	-	-	-	-	-				
C	580-115115-1	07/13/22	08/03/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	3	0	-	-	-	-	-	-				
D	580-115123-1	07/13/22	08/03/22	4	0	2	0	2	0	1	0	4	0	2	0	3	0	1	0	0	0	0	0	1	0	1	0	1	0				
D	580-115123-1	07/13/22	08/03/22	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0				
E	580-115161-1	07/13/22	08/03/22	6	0	3	0	3	0	3	0	6	0	3	0	6	0	3	0	-	-	-	-	3	0	3	0	3	0				
F	580-115163-1	07/13/22	08/03/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0	4	0	-	-	-	-	-	-				
G	580-115197-1	07/13/22	08/03/22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2	0	-	-	-	-	-	-				
Total	T/SC			11	0	6	0	6	0	6	0	11	0	6	0	10	0	5	0	11	0	11	0	5	0	5	0	5	0	0	0	0	98

Shaded cells indicate Level D validation (all other cells are Level C validation). These sample counts do not include MS/MSD, and DUPs

V:\LOGIN\AECOM\Red Hill\54719ST_Oily_Eurofins.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-111967-2

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU094	580-111967-1	Water	03/28/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 2: Data Validation Procedure for Metals by ICP-OES (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Calcium, Magnesium, Manganese, Potassium, and Sodium by Environmental Protection Agency (EPA) SW 846 Method 6010D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the method.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Calcium Magnesium Manganese Potassium Sodium	0.0840 ug/L 0.0788 ug/L 0.00440 ug/L 0.405 ug/L 0.211 ug/L	All samples in SDG 580-111967-1

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Serial Dilution

Serial dilution was not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Data Qualification Summary - SDG 580-111967-2

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Laboratory Blank Data Qualification Summary - SDG 580-111967-2

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Field Blank Data Qualification Summary - SDG 580-111967-2

No Sample Data Qualified in this SDG

LDC #: 54719A4b
SDG #: 580-111967-2
Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 9/27/22
Page: 1 of 1
Reviewer: ATV
2nd Reviewer: A

METHOD: Metals (EPA SW-846 Method 6010D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Instrument Calibration	A	
III.	ICP Interference Check Sample (ICS) Analysis	A	
IV.	Laboratory Blanks	SW	
V.	Field Blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	C.S
VII.	Duplicate sample analysis	N	
VIII.	Serial Dilution	N	
IX.	Laboratory control samples	A	LCS/LCSD
X.	Field Duplicates	N	
XI.	Target Analyte Quantitation	N	
XII.	Overall Assessment of Data	A	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank
SB=Source blank
OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU094	580-111967-1	Water	03/28/22
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 54719A4b

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: ATL

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, Fe, Pb, [✓ Mg], [✓ Mn], Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___

Comments: Mercury by CVAA if performed

LDC #: 54719A4b

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: all

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level									
Ca			0.0840	420									
Mg			0.0788	394									
Mn			0.00440	22									
K			0.405	2025									
Na			0.211	1055									

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115066-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115066-1	Water	06/20/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Bromide, Chloride, Fluoride, Nitrate as Nitrogen, and Sulfate by Environmental Protection Agency (EPA) Method 300.0

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published methods and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (methods blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Data Qualification Summary - SDG 580-115066-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115066-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115066-1

No Sample Data Qualified in this SDG

LDC #: 54719B6 **VALIDATION COMPLETENESS WORKSHEET** Date: 9/27/22
SDG #: 580-115066-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: ATV
2nd Reviewer:

METHOD: (Analyte) Bromide, Chloride, Fluoride, Nitrate-N, Sulfate (EPA Method 300.0),

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	C.S
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU115	580-115066-1	Water	06/20/22
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 54719B6

VALIDATION FINDINGS WORKSHEET

Sample Specific Analysis Reference

Page: 1 of 1

Reviewer: ATU

All circled methods are applicable to each sample.

Sample ID	Parameter
1	pH TDS [✓ Cl] [✓ F] [✓ $\overset{N}{NO_3}$] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115115-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115115-1	Water	06/21/22
HU128	580-115115-2	Water	06/21/22
HU133	580-115115-3	Water	06/21/22
HU133MS	580-115115-3MS	Water	06/21/22
HU133MSD	580-115115-3MSD	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Bromide, Chloride, Fluoride, Nitrate as Nitrogen, and Sulfate by Environmental Protection Agency (EPA) Method 300.0

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published methods and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (methods blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Data Qualification Summary - SDG 580-115115-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115115-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115115-1

No Sample Data Qualified in this SDG

LDC #: 54719C6 **VALIDATION COMPLETENESS WORKSHEET** Date: 9/27/22
SDG #: 580-115115-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: ATV
2nd Reviewer: [illegible]

METHOD: (Analyte) Bromide, Chloride, Fluoride, Nitrate-N, Sulfate (EPA Method 300.0),

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	(4,5)
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115115-1	Water	06/21/22
2	HU128	580-115115-2	Water	06/21/22
3	HU133	580-115115-3	Water	06/21/22
4	HU133MS	580-115115-3MS	Water	06/21/22
5	HU133MSD	580-115115-3MSD	Water	06/21/22
6				
7				
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10				
11				
12				
13				
14				
15				

Notes:

LDC #: 54719C6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: ATL

All circled methods are applicable to each sample.

Sample ID	Parameter
1,2,3	pH TDS [✓ Cl] [✓ F] [✓ $\overset{N}{NO_3}$] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
4,5	pH TDS [✓ Cl] [✓ F] [✓ $\overset{N}{NO_3}$] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Volatiles

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU114	580-115123-2	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU124	580-115123-4	Water	06/20/22
HU122	580-115123-5	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) and Tentatively Identified Compounds (TICs) by Environmental Protection Agency (EPA) SW 846 Method 8260D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/22/22	Bromomethane	22.4	All samples in SDG 580-115123-1	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/28/22 (12:36)	Bromomethane Chloroethane Acetone	69.4 31.3 42.2	HU123** HU124	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/28/22 (20:05)	Bromomethane	61.8	HU123** HU124	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analysis Date	Analyte TIC (RT in minutes)	Concentration	Associated Samples
MB 580-394756	06/23/22	1,2,4-Trichlorobenzene 1,2-Dibromo-3-chloropropane Ethylbenzene Hexachlorobutadiene Naphthalene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54) 1,3,5-Trichlorobenzene (14.65) 1,2,3-Trichlorobenzene (15.53)	0.211 ug/L 0.172 ug/L 0.0815 ug/L 0.113 ug/L 0.431 ug/L 0.212 ug/L 0.205 ug/L 0.205 ug/L 0.264 ug/L 0.154 ug/L 0.162 ug/L 0.0713 ug/L 0.226 ug/L	HU115 HU114 HU123**
MB 580-395245	06/28/22	1,2,4-Trichlorobenzene 1,2-Dibromo-3-chloropropane Dibromochloromethane Ethylbenzene Hexachlorobutadiene Styrene Xylenes, total o-Xylene (12.21) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54) 1,2,3-Trichlorobenzene (15.53)	0.214 ug/L 0.185 ug/L 0.0588 ug/L 0.0818 ug/L 0.109 ug/L 0.213 ug/L 0.204 ug/L 0.204 ug/L 0.153 ug/L 0.162 ug/L 0.253 ug/L	HU124 HU122
MB 580-395868	07/04/22	Naphthalene	0.359 ug/L	HU124 HU122

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte TIC (RT in minutes)	Reported Concentration	Modified Final Concentration
HU115	Ethylbenzene	0.077 ug/L	0.077J+ ug/L
	Styrene	0.21 ug/L	0.50U ug/L
	Isopropylbenzene (12.51)	0.26 ug/L	0.26U ug/L
HU114	Ethylbenzene	0.078 ug/L	0.078J+ ug/L
	Naphthalene	0.36 ug/L	0.50U ug/L
	Isopropylbenzene (12.51)	0.26 ug/L	0.26U ug/L
	1,3,5-Trimethylbenzene (12.99)	0.15 ug/L	0.15U ug/L
	p-Isopropyltoluene (13.54)	0.16 ug/L	0.16U ug/L
HU123**	1,2,4-Trichlorobenzene	0.31 ug/L	0.35U ug/L
	1,2-Dibromo-3-chloropropane	0.28 ug/L	1.0U ug/L
	Ethylbenzene	0.085 ug/L	0.085J+ ug/L
	Hexachlorobutadiene	0.26 ug/L	0.26J+ ug/L
	Naphthalene	0.56 ug/L	0.56J+ ug/L
	Styrene	0.22 ug/L	0.50U ug/L
	Xylenes, total	0.21 ug/L	0.35U ug/L
	o-Xylene (12.21)	0.21 ug/L	0.21U ug/L
	Isopropylbenzene (12.51)	0.27 ug/L	0.27U ug/L
	1,2,3-Trichlorobenzene (15.53)	0.47 ug/L	0.47U ug/L
HU124	1,2,4-Trichlorobenzene	0.18 ug/L	0.35U ug/L
	Dibromochloromethane	0.059 ug/L	0.15U ug/L
	Ethylbenzene	0.083 ug/L	0.083J+ ug/L
	Styrene	0.21 ug/L	0.50U ug/L
	Xylenes, total	0.21 ug/L	0.35U ug/L
	o-Xylene (12.21)	0.21 ug/L	0.21U ug/L
	1,3,5-Trimethylbenzen (12.99)	0.15 ug/L	0.15U ug/L
	p-Isopropyltoluene (13.54)	0.16 ug/L	0.16U ug/L
	Naphthalene	0.28 ug/L	0.50U ug/L
HU122	Ethylbenzene	0.079 ug/L	0.079J+ ug/L
	Xylenes, total	0.20 ug/L	0.35U ug/L
	o-Xylene (12.21)	0.20 ug/L	0.20U ug/L
	1,3,5-Trimethylbenzen (12.99)	0.15 ug/L	0.15U ug/L
	p-Isopropyltoluene (13.54)	0.16 ug/L	0.16U ug/L
	Naphthalene	0.27 ug/L	0.50U ug/L

VI. Field Blanks

Samples HU114 and HU122 were identified as trip blanks. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
HU114	06/20/22	Ethylbenzene	0.078 ug/L	HU115
		Naphthalene	0.36 ug/L	
HU122	06/20/22	Ethylbenzene	0.079 ug/L	HU123**
		Xylenes, total	0.20 ug/L	HU124
		Naphthalene	0.27 ug/L	

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
HU115	Ethylbenzene	0.077 ug/L	0.077J+ ug/L
HU123**	Ethylbenzene Xylenes, total Naphthalene	0.085 ug/L 0.21 ug/L 0.56 ug/L	0.085J+ ug/L 0.35U ug/L 0.56J+ ug/L
HU124	Ethylbenzene Xylenes, total Naphthalene	0.083 ug/L 0.21 ug/L 0.28 ug/L	0.083J+ ug/L 0.35U ug/L 0.50U ug/L

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
HU115MS/MSD (HU115)	Bromomethane	146 (53-141)	-	NA	-

Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	LCS %R (Limits)	LCSD %R (Limits)	Flag	A or P
LCS/LCSD 580-395868 (HU124 HU122)	Methylene chloride	125 (74-124)	-	NA	-

Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples HU123** and HU124 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)
	HU123**	HU124	
1,2,4-Trichlorobenzene	0.31	0.18	53 (≤50)
1,2-Dibromo-3-chloropropane	0.28	1.0U	112 (≤50)
1,2-Dichlorobenzene	0.053	0.15U	96 (≤50)
Ethylbenzene	0.085	0.083	2 (≤50)
Hexachlorobutadiene	0.26	0.15U	54 (≤50)
Naphthalene	0.56	0.28	67 (≤50)
Styrene	0.22	0.21	5 (≤50)
Xylenes, total	0.21	0.21	0 (≤50)
Dibromochloromethane	0.15U	0.059	87 (≤50)

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte and Tentatively Identified Compounds Quantitation

All target analyte quantitations met validation criteria.

All tentatively identified compound (TICs) quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
All samples in SDG 580-115123-1	All laboratory calibrated analytes reported as Tentatively Identified Compounds (TICs).	J (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to ICV %D, continuing calibration %D and ending CCV %D, and analytes reported as TICs, data were qualified as estimated in five samples.

Due to laboratory blank contamination, data were qualified as not detected or estimated in five samples.

Due to trip blank contamination, data were qualified as not detected or estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Data Qualification Summary - SDG 580-115123-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU115 HU114 HU123** HU124 HU122	Bromomethane	UJ (all non-detects)	A	Initial calibration verification (%D) (c)
HU123** HU124	Bromomethane Chloroethane Acetone	UJ (all non-detects) UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (c)
HU123** HU124	Bromomethane	UJ (all non-detects)	A	Continuing calibration (ending CCV %D) (c)
HU115 HU114 HU123** HU124 HU122	All laboratory calibrated analytes reported as Tentatively Identified Compounds (TICs).	J (all detects)	A	Target analyte quantitation (TICs) (v)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

Sample	Analyte TIC (RT in minutes)	Modified Final Concentration	A or P	Code
HU115	Ethylbenzene Styrene Isopropylbenzene (12.51)	0.077J+ ug/L 0.50U ug/L 0.26U ug/L	A	b
HU114	Ethylbenzene Naphthalene Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.078J+ ug/L 0.50U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L	A	b
HU123**	1,2,4-Trichlorobenzene 1,2-Dibromo-3-chloropropane Ethylbenzene Hexachlorobutadiene Naphthalene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,2,3-Trichlorobenzene (15.53)	0.35U ug/L 1.0U ug/L 0.085J+ ug/L 0.26J+ ug/L 0.56J+ ug/L 0.50U ug/L 0.35U ug/L 0.21U ug/L 0.27U ug/L 0.47U ug/L	A	b

Sample	Analyte TIC (RT in minutes)	Modified Final Concentration	A or P	Code
HU124	1,2,4-Trichlorobenzene Dibromochloromethane Ethylbenzene Styrene Xylenes, total o-Xylene (12.21) 1,3,5-Trimethylbenzen (12.99) p-Isopropyltoluene (13.54) Naphthalene	0.35U ug/L 0.15U ug/L 0.083J+ ug/L 0.50U ug/L 0.35U ug/L 0.21U ug/L 0.15U ug/L 0.16U ug/L 0.50U ug/L	A	b
HU122	Ethylbenzene Xylenes, total o-Xylene (12.21) 1,3,5-Trimethylbenzen (12.99) p-Isopropyltoluene (13.54) Naphthalene	0.079J+ ug/L 0.35U ug/L 0.20U ug/L 0.15U ug/L 0.16U ug/L 0.50U ug/L	A	b

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Field Blank Data Qualification Summary - SDG 580-115123-1

Sample	Analyte	Modified Final Concentration	A or P	Code
HU115	Ethylbenzene	0.077J+ ug/L	A	t
HU123**	Ethylbenzene Xylenes, total Naphthalene	0.085J+ ug/L 0.35U ug/L 0.56J+ ug/L	A	t
HU124	Ethylbenzene Xylenes, total Naphthalene	0.083J+ ug/L 0.35U ug/L 0.50U ug/L	A	t

LDC #: 54719D1a **VALIDATION COMPLETENESS WORKSHEET** Date: 6/19/22
SDG #: 580-115123-1 Stage 2B/4 Page: 1 of 2
Laboratory: Eurofins, Tacoma, WA Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D) + TICs

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/SW	%RSD ≤ 15, r^2 ICV ≤ 20
IV.	Continuing calibration ending	SW	CCV ≤ 20/50
V.	Laboratory Blanks	SW	
VI.	Field blanks	SW	TB = 2, 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	SW	D = 3, 4
XI.	Internal standards	A	
XII.	Target analyte quantitation / TIC	A SW	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Stage 4 validation

	Client ID		Lab ID	Matrix	Date
1	HU115		580-115123-1	Water	06/20/22
2	HU114	TB	580-115123-2	Water	06/20/22
3	HU123**	D	580-115123-3**	Water	06/20/22
4	HU124	3 D	580-115123-4	Water	06/20/22
5	HU122	3 TB	580-115123-5	Water	06/20/22
6	HU115MS		580-115123-1MS	Water	06/20/22
7	HU115MSD		580-115123-1MSD	Water	06/20/22
8					
9					

Notes:

1	MB 580-394752						
2	MB 580-395245						
3	MB 580-395869		BB, E, MMM				

LDC #: 54719D1a

VALIDATION FINDINGS CHECKLIST

Reviewer: FT

Method: Volatiles (EPA SW 846 Method 8260 D)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the BFB performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% ?		✓		
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) ≤ 50% in the ending CCV?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the Blanks validation findings worksheet.	✓			
VI. Field blanks				
Were field blanks were identified in this SDG?	✓			
Were target analytes detected in the field blanks?	✓			
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If the percent recovery (%R) for one or more surrogates was out of QC limits, was a reanalysis performed to confirm samples with %R outside of criteria?			✓	
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		

Validation Area	Yes	No	NA	Findings/Comments
IX. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per analytical batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target analytes detected in the field duplicates?	✓			
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?	✓			
Were target analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did analyte spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. 2-Propanol
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 54791a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was an initial calibration verification standard analyzed after each ICAL for each instrument?

Y (N) N/A Were all %D within the validation criteria of ≤20 %D? C

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0% / 30%)	Associated Samples	Qualifications
	6/22/22 2024	ICV-TAC113	B	22.4	All	J+/UJ/A NP

LDC #: 54719p1a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ?

C

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
P1	6/23/22 1325	CCV-580-39475	JJ				
			P1				
P2	6/28/22 1236	CCV-580-39524	B	69.4		3,4, MB 580-39524	J+/UJ/A all ND
			D	31.3			J+/UJ/A
			F	42.2			J+/UJ/A
	6/28/22 2005	CCV-closing	B	61.8		↓	J+/UJ/A

LDC #: 54719D/a

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a method blank associated with every sample in this SDG?

Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?

Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

(b)

Blank analysis date: 6/23/22

Conc. units: ug/L

Associated Samples: 1-3

Compound	Blank ID	Sample Identification								
	MB 330-394756		1	2	3					
KKK	0.211				0.31/0.35U					
MM	0.172				0.28/1.0U					
EE	0.0815		0.077J+	0.078J+	0.085J+					
LLL	0.113				0.26J+					
MMM	0.431			0.36/0.50U	0.56J+					
FF	0.212		0.21/0.50U		0.22/0.50U					
GG	0.205				0.21/0.35U					

Blank analysis date: ↓

Conc. units: ↓

Associated Samples: 1-3

Compound	Blank ID	Sample Identification								
	↓		1	2	3					
SSS	0.205 (12.21)				0.21 (12.21)					
VV	0.264 (12.51)		0.26 (12.51)	0.26 (12.51)	0.27 (12.51)					
1,3,5-Trimethylbenzene	0.154 (12.99)			0.15 (12.99)						
GGG	0.162 (13.54)			0.16 (13.54)						
1,3,5-Trichlorobenzene	0.0713 (14.65)									
NNN	0.226 (15.53)				0.47 (15.53)					

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 B)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

(b)

Blank analysis date: 6/28/22
Conc. units: ug/L
Associated Samples: 4, 5

Compound	Blank ID	Sample Identification								
	MB 580-395245	4		5						
~~NNN~~ KKK	0.214	0.18 | 0.35 U		-						
MM	0.185	-		-						
T	0.0588	0.059 | 0.15 U		-						
EE	0.0818	0.083 J+		0.079 J+						
LLL	0.109	-		-						
FF	0.213	0.21 | 0.50 U		-						
GG	0.204	0.21 | 0.35 U		0.20 | 0.35 U						

Blank analysis date:
Conc. units: ↓
Associated Samples: 4, 5

Compound	Blank ID	Sample Identification								
	↓		4		5					
SSS	0.204 (12.21)		0.21 (12.21)		0.20 (12.21)					
1,3,5-Trimethylbenzene	0.153 (12.99)		0.15 (12.99)		0.15 (12.99)					
GGG	0.162 (13.54)		0.16 (13.54)		0.16 (13.54)					
NNN	0.253 (15.53)		-		-					

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 54790a

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration? b
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

Blank analysis date: 7/4/22
Conc. units: ug/L
Associated Samples: 4, 5

Compound	Blank ID	Sample Identification								
	MB 580-395868	4		5						
MMM	0.359	0.28 | 0.50 U		0.27 | 0.50 U						

NO TIC

Blank analysis date:
Conc. units:
Associated Samples:

Compound	Blank ID	Sample Identification								

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 54790/a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?

(f)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/20/22
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 1

Compound	Blank ID	Sample Identification								
	2		1							
EE	0.078		0.077J+							
MMM	0.36		-							

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/20/22
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 3, 4

Compound	Blank ID	Sample Identification								
	4 5		3	4						
EE	0.079		0.085J+	0.083J+						
GG	0.20		0.21/0.35U	0.21/0.35U						
MMM	0.77		0.56J+	0.28/0.50U						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

.LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET

Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT

METHOD : GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

[✓ Y] N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

[✓ Y] N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y [✓ N] N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	6 + 7	B	146 (53-141)	( )	( )	1 (e)	J+det/A ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

[✓ Y] N N/A Was a LCS required?

Y [✓ N] N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits? (1)

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS ID 580-395868	E	125 (74-124)	( )	( )	4,5 MB 580-395868	J+ det/P (ND)
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260D)

(Y) N N/A Were field duplicate pairs identified in this SDG?
(Y) N N/A Were target compounds detected in the field duplicate pairs?

Compound	Concentration (ug/L) 3	4	RPD (≤ 50 %)	QUAL
KKK	0.31	0.18	53	
MM	0.28	1.0U	112	
JJJ	0.053	0.15U	96	
EE	0.085	0.083	2	
LLL	0.26	0.15U	54	

Compound	Concentration (ug/L) 3	4	RPD (≤ 50 %)	QUAL
MMM	0.56	0.28	67	
FF	0.22	0.21	5	
GG	0.21	0.21	0	
T	0.15U	0.059	87	

Compound	Concentration ( )		RPD (≤ %)	QUAL

Compound	Concentration ( )		RPD (≤ %)	QUAL

LDC #: 54190K

VALIDATION FINDINGS WORKSHEET
Target Analyte and TIC

Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260D)

#	Date	Sample ID	Analyte	Finding	Qualifications
			All laboratory calibrated analytes reported as		Jdets/A (v)
			tentatively identified compounds (TIC)		

METHOD: GCMS 8260D

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 5ug/L std)	Recalculated (RRF 5ug/Lstd)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	6/22/2022	A	0.4917	0.4917	0.4786	0.4786	14.1	14.1
	TAC 113		CC	1.6414	1.6414	1.5432	1.5432	5.5	5.5
			JJJ	1.7421	1.7421	1.5218	1.5218	7.9	7.9

LDC #: 54719Q1a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 B)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where:
ave. RRF = initial calibration average RRF
A_x = Area of target analyte
C_x = Concentration of target analyte
RRF = continuing calibration RRF
A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV	6/23/22 1325	A	0.4786	0.4368	0.4368	8.7	8.7
			CC	1.5432	1.6333	1.6333	5.8	5.8
			JJJ	1.5218	1.521	1.521	0.0	0.0
2								
3								
4								

LDC #: 54719016

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Dibromofluoromethane	10.0	10.7	107	107	0
1,2-Dichloroethane-d4	↓	10.5	105	105	↓
Toluene-d8	↓	9.84	98	98	↓
Bromofluorobenzene	↓	9.95	99	99	↓

Comments: _____

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA Method 8260 D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the target analytes identified below using the following calculation:

% Recovery = 100 * (SSC - SC)/SA

Where: SSC = Spiked sample concentration; SA = Spike added; SC = Sample concentration

RPD = I MSC - MSC I * 2/(MSC + MSDC)

MSC = Matrix spike concentration; MSDC = Matrix spike duplicate concentration

MS/MSD sample: 6 + 7

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	-------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
1,1-Dichloroethene	5.0	5.0	ND	6.24	5.96	125	125	119	119	4	4
Trichloroethene	↓	↓	↓	5.30	5.41	106	106	108	108	2	2
Benzene	↓	↓	↓	5.58	5.64	112	112	113	113	1	1
Toluene	↓	↓	↓	5.54	5.75	111	111	115	115	4	4
Chlorobenzene	↓	↓	↓	5.35	5.45	108	108	109	109	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate (if applicable) were recalculated for the target analytes identified below using the following calculation:

% Recovery = 100 * SSC/SA

RPD = I LCSC - LCSDC I * 2/(LCSC + LCSDC)

Where: SSC = Spiked sample concentration
SA = Spike added
LCSC = Laboratory control sample concentration
LCSDC = Laboratory control sample duplicate concentration

LCS ID: lcs ID 580-394756

Compound	Spike Added (ug/L)		Spiked Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
1,1-Dichloroethene	5.0	5.0	5.29	5.23	106	106	105	105	1	1
Trichloroethene	↓	↓	5.05	4.92	101	101	98	98	3	3
Benzene			5.23	5.10	105	105	102	102	3	3
Toluene			5.24	5.14	105	105	103	103	2	2
Chlorobenzene			5.05	5.09	101	101	101	101	0	0

Comments: _____

LDC #: 54719D1a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

METHOD: GC/MS VOA (EPA SW 846 Method 8260D)

The concentration of the sample was calculated for the target analytes identified below using the following calculation:

$$\text{Concentration} = \frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$$

A_x = Area of the characteristic ion (EICP) for the target analyte to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

RRF = Relative response factor of the calibration standard.

V_o = Volume or weight of sample pruged in milliliters (ml) or grams (g).

Df = Dilution factor.

%S = Percent solids, applicable to soils and solid matrices only.

Example:

Sample I.D. #3, JJJ

$$\text{Conc.} = \frac{(6340)(10.0)}{(780913)(1.5218)}$$

$$= 0.0533 \text{ ug/L}$$

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	#3	JJJ	0.053	0.0533	-

LDC Report# 54719D2a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Semivolatiles

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU124	580-115123-4	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) and Tentatively Identified Compounds (TICs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/24/22	4-Chloroaniline 3,3'-Dichlorobenzidine	25.0 42.8	All samples in SDG 580-115123-1	UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Analyte	Concentration	Associated Samples
MB 580-394839	06/24/22	Diethylphthalate	0.189 ug/L	All samples in SDG 580-115123-1

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
HU115MS/MSD (HU115)	1,2,4-Trichlorobenzene	21 (≤20)	NA	-
	1,2-Dichlorobenzene	21 (≤20)		
	1,4-Dichlorobenzene	22 (≤20)		
	2,4,5-Trichlorophenol	23 (≤20)		
	2,4-Dimethylphenol	25 (≤20)		
	3,3'-Dichlorobenzidine	52 (≤20)		
	4-Chloroaniline	35 (≤20)		
	Hexachlorobutadiene	31 (≤20)		
	Nitrobenzene	22 (≤20)		
	Pentachlorophenol	22 (≤20)		

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits.

Relative percent differences (RPD) were within QC limits with the following exceptions:

LCS ID (Associated Samples)	Analyte	RPD (Limits)	Flag	A or P
LCS/LCSD 580-394839 (All samples in SDG 580-115123-1)	Pentachlorophenol	22 (≤20)	NA	-

X. Field Duplicates

Samples HU123** and HU124 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte and Tentatively Identified Compounds Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation.

All tentatively identified compound quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
All samples in SDG 580-115123-1	All tentatively identified compounds (TIC)	NJ (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

Due to TICs, data were qualified as presumptive and estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Data Qualification Summary - SDG 580-115123-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU115 HU123** HU124	4-Chloroaniline 3,3'-Dichlorobenzidine	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (c)
HU115 HU123** HU124	All tentatively identified compounds (TIC)	NJ (all detects)	A	Target analyte quantitation (TICs) (v)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D2a

SDG #: 580-115123-1

Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 8/19/22

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: GC/MS Semivolatiles (EPA SW-846 Method 8270E) and TIC

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	%RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration (ending)	SW	CCV ≤ 20/20
V.	Laboratory Blanks	SW	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	SW	
IX.	Laboratory control samples	SW	LCS ID
X.	Field duplicates	ND	D=2,3
XI.	Internal standards	A	
XII.	Target analyte quantitation / TIC	SW	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; ND = No compounds detected; D = Duplicate; SB=Source blank
N = Not provided/applicable; R = Rinsate; TB = Trip blank; OTHER:
SW = See worksheet; FB = Field blank; EB = Equipment blank

** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	HU115	580-115123-1	Water	06/20/22
2	HU123** D	580-115123-3**	Water	06/20/22
3	HU124 D	580-115123-4	Water	06/20/22
4	HU115MS	580-115123-1MS	Water	06/20/22
5	HU115MSD	580-115123-1MSD	Water	06/20/22
6				
7				
8				
9				

Notes:

	MB 580-394889						

LDC #: 54719D2a

VALIDATION FINDINGS CHECKLIST

Method: Semivolatiles (EPA SW 846 Method 8270C)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥ 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) ≤ 50% for closing calibration verification?		✓		
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the blanks validation findings worksheet.	✓			
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target analytes detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R ?				
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
IX. Laboratory control samples				
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?		✓		
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target analytes detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o"-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU.. 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW.. 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2. Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2. Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. 1,1'-Biphenyl	G1. 2-Acetylaminofluorene	I2. Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

(Y) N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20%D and ≥0.05 RRF ? (c)

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	6/24/22	CCV	T	25.0		All	J-/UJ/A ND
	2210		BBB	42.8		↓	↓

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a method blank analyzed for each matrix?
Y N N/A Was a method blank analyzed for each concentration preparation level?
Y N N/A Was a method blank associated with every sample?
Y N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 6/24/22 **Blank analysis date:** 6/24/22
Conc. units: ug/L Associated Samples: All (NO)

Compound	Blank ID								
	MB 580-34839								
LL	0.189								

Blank extraction date: _____ **Blank analysis date:** _____
Conc. units: _____ Associated Samples: _____

Compound	Blank ID								

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 C)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits? (c)

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	4,5	R	( )	( )	21 (20)	All	J det /A all NP
		F	( )	( )	21 ( )		
		E	( )	( )	22		
		Z	( )	( )	23 ( )		
		θ	( )	( )	25 ( )		
		BBP	( )	( )	52 ( )		
		T	( )	( )	35 ( )		
		U	( )	( )	31 ( )		
		L	( )	( )	22 ( )		
		TT	( )	( )	22 ( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

[✓ Y] N N/A Was a LCS required?

Y [✓ N] N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	lcsD 580-394839	TT	( )	( )	22 (20)	All (w)	Jdets/P ND
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: _54719D2a

Validation Findings Worksheet
Initial Calibration Calculation Verification

Method: 8270E

Calibration Date	Instrument/Column	Compound	Standard	(Y) Response	(X) Conc.	(X^2) Conc.
5/27/2022	GCMS	BBB	1	0.007	0.2	0.04
	TACO51		2	0.098	0.4	0.16
			3	0.297	1	1
			4	0.675	2	4
			5	1.383	4	16
			6	3.546	10	100
			7	6.510	20	400
			8	15.308	40	1600
			9	40.520	100	10000
			10	74.720	200	40000

Regression Output	**Calculated**		***Reported***	
Constant	c	-0.4630	c	-7.7350
Std Err of Y Est				
R Squared		0.9992441		0.9980000
Degrees of Freedom				
	a	b	a	b
X Coefficient(s)	4.22775E-01	-2.2920E-04	3.84200E-01	0.0000E+00
Std Err of Coef.				
Correlation Coefficient		0.999622		
Coefficient of Determination (r^2)		0.999244		

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

METHOD: GCMS 8270E

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 500 std)	Recalculated (RRF500 std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	5/27/2022	A	1.0619	1.0619	1.0091	1.0091	10.9	10.9
	TACO51		U	0.1627	0.1627	0.1661	0.1661	8.7	8.7
			LL	1.3406	1.3406	1.3324	1.3324	11.6	11.6
			SS	0.2798	0.2798	0.2585	0.2585	12.8	12.8
			BBB	see curve					

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)
The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
A_x = Area of target analyte
C_x = Concentration of target analyte
RRF = continuing calibration RRF
A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV	2210	A (1st IS)	1.0091	0.8746	0.8746	13.3	13.3
			" (2nd IS)	0.1661	0.1477	0.1477	11.1	11.1
			LL (3rd IS)	1.3324	1.227	1.227	7.9	7.9
			SS (4th IS)	0.2585	0.2402	0.2402	7.1	7.1
			BBB (5th IS)					
			(6th IS)					
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270C)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: 3

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5	1000.0	730.0	73	73	0
2-Fluorobiphenyl		881.6	88	88	
Terphenyl-d14		999.3	100	100	
Phenol-d5		303.1	30	30	
2-Fluorophenol		501.5	50	50	
2,4,6-Tribromophenol		851.9	85	85	

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 D)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the target analytes identified below using the following calculation:

$$SSC = \frac{(A_x)(C_{IS})(F_v)(D_f)}{(A_{IS})(RRF)(V_s \text{ or } W_s)(\%S/100)}$$

%Recovery = (SSC/SA)*100

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Where: A_x= Area of the target analyte
A_{IS} = Area for the specific internal standard
C_{IS} = Concentration of internal standard
Fv =Final volume of extract
Df= Dilution factor
RRF= Average relative response factor of the target analyte
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid
SSC = Spiked sample concentration
SA= Spike added
MS= Matrix spike
MSD= Matrix spike duplicate

MS/MSD samples: 4 + 5

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol	1.91	1.91	ND	0.636	0.553	33	33	29	29	14	14
N-Nitroso-di-n-propylamine											
4-Chloro-3-methylphenol											
Acenaphthene											
Pentachlorophenol	3.81	3.82	ND	1.95	2.42	51	51	63	63	22	22
Pyrene											

LDC #: 94719D2a

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

$$SSC = \frac{(A_x)(C_{IS})(Fv)(Df)}{(A_{IS})(RRF)(Vs \text{ or } Ws)(\%S/100)}$$

%Recovery = (SSC/SA)*100

RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where: A_x= Area of the target analyte
A_{IS}= Area for the specific internal standard
C_{IS} = Concentration of internal standard
Fv =Final volume of extract
Df= Dilution factor
RRF= Average relative response factor of the target analyte
Ws= Initial weight of the sample
%S= Percent Solid
SSC = Spiked sample concentration
LCS = Laboratory control sample
LCSD = Laboratory control sample duplicate
Vs= Initial volume of the sample

LCS/LCSD samples: LCS ID 580-394839

Compound	Spike Added (ug/L)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol	2.0		0.799	0.773	40	40	39	39	3	3
N-Nitroso-di-n-propylamine										
4-Chloro-3-methylphenol										
Acenaphthene										
Pentachlorophenol	4.0		1.62	2.02	41	41	51	51	22	22
Pyrene										

LDC #: 54719D2a

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x	=	Area of the characteristic ion (EICP) for the target analyte to be measured
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard
I_s	=	Amount of internal standard added in nanograms (ng)
V_o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
V_i	=	Volume of extract injected in microliters (ul)
V_t	=	Volume of the concentrated extract in microliters (ul)
Df	=	Dilution Factor.
%S	=	Percent solids, applicable to soil and solid matrices only.
2.0	=	Factor of 2 to account for GPC cleanup 2/1000

Example:

Sample I.D. LCS 580-394839 A

$$\text{Conc.} = \frac{(109476)\ \overset{FT}{(4000.0)}\ (100)(2)}{(27169)\ (1.0091)\ (1000)}$$

$$= 0.7986\ ug/L$$

#	Sample ID	Target Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	LCS	A	0.799	0.7986	

LDC Report# 54719D2b

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Polynuclear Aromatic Hydrocarbons

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU124	580-115123-4	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

Instrument performance check was performed at the required frequency.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples in the full scan analysis as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples HU123** and HU124 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D2b

SDG #: 580-115123-1

Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 8/19/22

Page: 1 of 1

Reviewer: D

2nd Reviewer: R

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW-846 Method 8270E-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A /A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A /A	0/0 RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration | ending	A	CCV ≤ 20|50
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	ND	D = 2, 3
XI.	Internal standards	A	
XII.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Stage 4 validation

	Client ID		Lab ID	Matrix	Date
1	HU115		580-115123-1	Water	06/20/22
2	HU123**	D	580-115123-3**	Water	06/20/22
3	HU124	D	580-115123-4	Water	06/20/22
4	HU115MS		580-115123-1MS	Water	06/20/22
5	HU115MSD		580-115123-1MSD	Water	06/20/22
6					
7					
8					
9					

Notes:

	MB 580-394839						

LDC #: 54719026

VALIDATION FINDINGS CHECKLIST

Reviewer: FT

Method: Semivolatiles (EPA SW 846 Method 8270 E)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
II. GC/MS Instrument performance check				
Were the DFTPP performance results reviewed and found to be within the specified criteria?	✓			
Were all samples analyzed within the 12 hour clock criteria?	✓			
IIIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 15% and relative response factors (RRF) within method criteria?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of > 0.990?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
IV. Continuing calibration				
Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?	✓			
Were all percent differences (%D) ≤ 20% and relative response factors (RRF) within method criteria? Were all percent differences (%D) ≤ 50% for closing calibration verification?	✓			
V. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed at least once every 12 hours for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks? If yes, please see the blanks validation findings worksheet.		✓		
VI. Field blanks				
Were field blanks were identified in this SDG?		✓		
Were target analytes detected in the field blanks?			✓	
VII. Surrogate spikes				
Were all surrogate percent recovery (%R) within QC limits?	✓			
If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any percent recoveries (%R) was less than 10%, was a reanalysis performed to confirm %R ?			✓	
VIII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			

Validation Area	Yes	No	NA	Findings/Comments
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
IX. Laboratory control samples				
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
X. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target analytes detected in the field duplicates?		✓		
XI. Internal standards				
Were internal standard area counts within -50% to +100% of the associated calibration standard?	✓			
Were retention times within ± 30 seconds of the associated calibration standard?	✓			
XII. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the target analyte?	✓			
Were compound quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XIII. Target analyte identification				
Were relative retention times (RRT's) within ± 0.06 RRT units of the standard?	✓			
Did compound spectra meet specified EPA "Functional Guidelines" criteria?	✓			
Were chromatogram peaks verified and accounted for?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XIV. System performance				
System performance was found to be acceptable.	✓			
XV. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o"-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU.. 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW.. 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2. Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2. Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. 1,1'-Biphenyl	G1. 2-Acetylaminofluorene	I2. Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC #: _54719D2b_____ **Validation Findings Worksheet** **Page:__1__ of __1__**

Initial Calibration Calculation Verification **FT**

Method: 8270E SIM

Calibration Date	Instrument/Column	Compound	Standard	(Y) Response	(X) Conc.	(X^2) Conc.
3/24/2022	SEA101	DDD	1	0.016	0.01	0.0001
			2	0.034	0.02	0.0004
			3	0.068	0.05	0.0025
			4	0.151	0.1	0.01
			5	0.311	0.2	0.04
			6	0.750	0.5	0.25
			7	1.533	1	1
			8	2.995	2	4
			9	6.952	5	25
			10	13.807	10	100
			11	27.760	20	400
			12	65.375	50	2500
			13	118.050	100	10000

Regression Output	**Calculated**		***Reported***	
Constant	c	0.0037	c	0.2105
Std Err of Y Est				
R Squared		0.9999906		0.9970000
Degrees of Freedom				
	a	b	a	b
X Coefficient(s)	1.43267E+00	-2.5210E-03	1.47230E+00	-3.1000E-05
Std Err of Coef.				
Correlation Coefficient		0.999995		
Coefficient of Determination (r^2)		0.999991		

LDC #:54719D2b

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: ____FT___

METHOD: GCMS 8270E SIM

The calibration factors (RRFF), average RRFF, and relative standard deviation (%RSD) were recalculated for compounds identified below using the following calculations:

RRF = (Ax)(Cis)/(Ais)(Cx)
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

Where:

Ax = Area of compound
Cx = Concentration of compound
S = Standard deviation of the RRFs
X = Mean of the RRFs
Ais = Area of associated internal standard
Cis = Concentration of internal Standard

#	Standard ID	Calibration Date	Compound	Reported (RRF 200ug/Lstd)	Recalculated (RRF200ug/L std)	Reported AverageRRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
	ICAL	3/24/2022	S	1.0542	1.0542	1.0388	1.0388	6.0	6.0
	SEA101		GG	1.3018	1.3018	1.2744	1.2744	3.0	3.0
			UU	1.2134	1.2134	1.1719	1.1719	6.2	6.2
			DDD	see curve					
			III	1.1332	1.1332	1.0795	1.0795	10.9	10.9

LDC #: 54719 D2b

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 C)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
A_x = Area of target analyte
C_x = Concentration of target analyte
RRF = continuing calibration RRF
A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Target Analyte (Internal Standard)	Average RRF (Initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV SEA101	3/24/22	S (1st IS)	1.0384	1.027	1.027	1.1	1.1
			GG (2nd IS)	1.2744	1.312	1.312	2.9	2.9
			UU (3rd IS)	1.179	1.111	1.111	5.2	5.7
			DDD (Q) (4th IS)	500	501	501	0.1	0.1
			III (5th IS)	1.0795	1.078	1.078	0.1	0.1
			(6th IS)					
2			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					
3			(1st IS)					
			(2nd IS)					
			(3rd IS)					
			(4th IS)					
			(5th IS)					
			(6th IS)					

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D26

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: GC/MS Semivolatiles (EPA SW 846 Method 8270 E)

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #2

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
~~Nitrobenzene-d5~~ W-d10	1000	698.7	70	70	0
2-Fluorobiphenyl YY-d10	↓	895.1	90	90	↓
Terphenyl-d14 TPH	↓	1006.8	101	101	↓
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					

Sample ID:

	Surrogate Spiked	Surrogate Found	Percent Recovery Reported	Percent Recovery Recalculated	Percent Difference
Nitrobenzene-d5					
2-Fluorobiphenyl					
Terphenyl-d14					
Phenol-d5					
2-Fluorophenol					
2,4,6-Tribromophenol					

LDC #: 54719D2b

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 C)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the target analytes identified below using the following calculation:

$$SSC = \frac{(A_x)(C_{IS})(F_v)(D_f)}{(A_{IS})(RRF)(V_s \text{ or } W_s)(\%S/100)}$$

%Recovery = (SSC/SA)*100

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Where: A_x= Area of the target analyte
A_{IS} = Area for the specific internal standard
C_{IS} = Concentration of internal standard
Fv =Final volume of extract
Df= Dilution factor
RRF= Average relative response factor of the target analyte
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid
SSC = Spiked sample concentration
SA= Spike added
MS= Matrix spike
MSD= Matrix spike duplicate

MS/MSD samples: 4 + 5

Compound	Spike Added (ug/L)		Sample Concentration (ug/L)	Spiked Sample Concentration (ug/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
Phenol											
N-Nitroso-di-n-propylamine											
4-Chloro-3-methylphenol											
Acenaphthene	1.91	1.91	ND	1.52	1.51	80	80	79	79	0	0
Pentachlorophenol											
Pyrene	1.91	1.91	ND	1.69	1.74	89	89	91	91	3	3

LDC #: 54719 p2b

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

$$SSC = \frac{(A_X)(C_{IS})(Fv)(Df)}{(A_{IS})(RRF)(Vs \text{ or } Ws)(\%S/100)}$$

%Recovery = (SSC/SA)*100

RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where: A_X= Area of the target analyte
A_{IS}= Area for the specific internal standard
C_{IS} = Concentration of internal standard
Fv =Final volume of extract
Df= Dilution factor
RRF= Average relative response factor of the target analyte
Ws= Initial weight of the sample
%S= Percent Solid
SSC = Spiked sample concentration
LCS = Laboratory control sample
LCSD = Laboratory control sample duplicate
Vs= Initial volume of the sample

LCS/LCSD samples: LCS 580-394839

Compound	Spike Added (ug/V)		Spike Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
Phenol										
N-Nitroso-di-n-propylamine										
4-Chloro-3-methylphenol										
Acenaphthene	2.00	2.00	1.69	1.77	84	84	88	88	4	4
Pentachlorophenol										
Pyrene	↓		1.88	1.95	94	94	98	98	4	4

LDC #: 54719D26

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

$$\text{Concentration} = \frac{(A_x)(I_s)(V_t)(DF)(2.0)}{(A_{is})(RRF)(V_o)(V_i)(\%S)}$$

A_x = Area of the characteristic ion (EICP) for the target analyte to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

V_i = Volume of extract injected in microliters (ul)

V_t = Volume of the concentrated extract in microliters (ul)

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

2.0 = Factor of 2 to account for GPC cleanup 2/1000

Example:

Sample I.D. ICS 580-394839 GG

$$\text{Conc.} = \frac{(564964)(1000)(2)}{(52539)(1.2744)(1000)}$$

$$= 1.6876 \text{ ug/L}$$

#	Sample ID	Target Analyte	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	ICS	GG	1.69	1.6876	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: October 11, 2022

Parameters: Metals

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22
HU115DUP	580-115123-1DUP	Water	06/20/22
HU123MS	580-115123-3MS	Water	06/20/22
HU123MSD	580-115123-3MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 2: Data Validation Procedure for Metals by ICP-OES (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Calcium, Magnesium, Manganese, Potassium, and Sodium by Environmental Protection Agency (EPA) SW 846 Method 6010D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the method.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Sodium	0.146 ug/L	All samples in SDG 580-115123-1

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Serial Dilution

Serial dilution analysis was performed on an associated project sample. Percent differences (%D) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Target Analyte Quantitation

All target analyte quantitation met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126
Metals - Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126
Metals - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126
Metals - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D4b

SDG #: 580-115123-1

Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

Date: 9/28/22

Page: 1 of 1

Reviewer: ATV

2nd Reviewer: AC

METHOD: Metals (EPA SW-846 Method 6010D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Instrument Calibration	A	
III.	ICP Interference Check Sample (ICS) Analysis	A	
IV.	Laboratory Blanks	SW	
V.	Field Blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	(3,4), (6,7)
VII.	Duplicate sample analysis	A	5
VIII.	Serial Dilution	A	
IX.	Laboratory control samples	A	LCS/LCSD
X.	Field Duplicates	N	
XI.	Target Analyte Quantitation	A	Not reviewed for Stage 2B validation.
XII	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	HU115	580-115123-1	Water	06/20/22
2	HU123**	580-115123-3**	Water	06/20/22
3	HU115MS	580-115123-1MS	Water	06/20/22
4	HU115MSD	580-115123-1MSD	Water	06/20/22
5	HU115DUP	580-115123-1DUP	Water	06/20/22
6	HU123MS	580-115123-3MS	Water	06/20/22
7	HU123MSD	580-115123-3MSD	Water	06/20/22
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)				
Validation Area	**Yes**	**No**	**NA**	**Comments**
I. Technical holding times				
Were all technical holding times met?	✓			
Were all water samples preserved to a pH of <2.	✓			
II. ICP-MS Tune				
Were mass resolutions within 0.1 amu for all isotopes in the tuning solution?			✓	
Were %RSDs of isoptoes in the tuning solution ≤5%?			✓	
III. Calibration				
Were all instruments calibrated daily?	✓			
Were the proper standards used?	✓			
Were all initial and continuing calibration verifications within the 90-110% (80-120% for mercury) QC limits?	✓			
Were the low level standard checks within 70-130%? 80-120%	✓			
Were all initial calibration correlation coefficients within limits as specifed by the method?	✓			
IV. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks?		✓		
Was there contamination in the initial and continuing calibration blanks?	✓			
V. Interference Check Sample				
Were the interference check samples performed daily?	✓			
Were the AB solution recoveries within 80-120%?	✓			
VI. Matrix Spike/Matrix Spike Duplicates/Laboratory Duplicates				
Were MS/MSD recoveries within the QC limits? (If the sample concentration exceeded the spike concentration by a factor of 4, no action was taken.)	✓			
Were the MS/MSD or laboratory duplicate relative percent differences (RPDs) within the QC limits?	✓			
VII. Laboratory Control Samples				
SDG?	✓			

Were the LCS recoveries and RPDs (if applicable) within QC limits?	✓			
METHOD: Trace Metals (EPA SW 846 Methods 6010/6020/7000)				
Validation Area	**Yes**	**No**	**NA**	**Comments**
VIII. Internal Standards				
Were all percent recoveries within the 30-120% (60-125% for EPA Method 200.8) QC limits?			✓	
If the recoveries were outside the limits, was a reanalysis performed?			✓	
IX. Serial Dilution				
Were all percent differences <10%?	✓			
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.		✓		
X. Target Analyte Quantitation				
Were all reporting limits adjusted to reflect sample dilutions?	✓			
Were all soil samples dry weight corrected?			✓	
XI. Overall Assessment of Data				
Was the overall assessment of the data found to be acceptable?	✓			
XII. Field Duplicates				
Were field duplicates identifed in this SDG?		✓		
Were target analytes detected in the field duplicates?			✓	
XIII. Field Blanks				
Were field blanks identified in this SDG?		✓		
Were target analytes detected in the field blanks?			✓	

LDC #: 54719D4b

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: ATL

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1,2	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, Fe, Pb, [✓ Mg], [✓ Mn], Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
QC		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
3->7	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, Fe, Pb, [✓ Mg], [✓ Mn], Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __

Analysis Method

ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, __ __

Comments: Mercury by CVAA if performed

LDC #: 54719D4b

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: all

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level									
Na			0.146	730									

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

LDC #: 54719D46

VALIDATION FINDINGS WORKSHEET
Initial and Continuing Calibration Calculation Verification

Reviewer: ATV

METHOD: Trace metals (EPA SW 846 Method 6010/6020/7000)

An initial and continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration (in ug/L) of each analyte measured in the analysis of the ICV or CCV solution
True = concentration (in ug/L) of each analyte in the ICV or CCV source

Standard ID	Type of Analysis	Element	Found (~~ug/L~~ mg/L)	True (~~ug/L~~ mg/L)	Recalculated %R	Reported %R	Acceptable (Y/N)
ICVL	ICP (Low Level calibration)	Mn	0.0200	0.0200	100	100	Y
	ICP/MS (Low Level calibration)						
ICV	ICP (Initial calibration)	Mg	39.31	40.000	98	98	Y
	ICP/MS (Initial calibration)						
	CVAA (Initial calibration)						
CCV	ICP (Continuing calibration) 6/27 @ 18:42	Na	95.97	100.000	96	96	Y
	ICP/MS (Continuing calibration)						
	CVAA (Continuing calibration)						

ICP-MS TUNE	Calculation	Mass	Actual (Mean Counts / Axis)	Required (Counts / Axis)	Recalculated %RSD	Acceptable (Y/N)
	Mass Axis			± 0.1 AMU	NA	
	%RSD			≤ 5% RSD		

Comments:

LDC #: 54719D46

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: ATL

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Percent recoveries (%R) for an ICP interference check sample, a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = Concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = Concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

An ICP serial dilution percent difference (%D) was recalculated using the following formula:

$\%D = \frac{|I-SDR|}{I} \times 100$ Where, I = Initial Sample Result (mg/L)
SDR = Serial Dilution Result (mg/L) (Instrument Reading x 5)

Sample ID	Type of Analysis	Element	Found / S / I (µg/L) (units)	True / D / SDR (µg/L) (units)	Recalculated %R / RPD / %D	Reported %R / RPD / %D	Acceptable (Y/N)
ICSAB	ICP interference check	Ca	488.1 mg/L	500.00 mg/L	98	98	Y
LCS	Laboratory control sample	Mn	969.8	1000.00	97	97	Y
6	Matrix spike	K	(SSR-SR) 21578	20000	108	108	Y
6|7	Duplicate	K	24850	24640	1	1	Y
1	Post digestion spike	Mg	20450	20000	102	102	Y
1	ICP serial dilution	Na	35620	35010	1.7	1.7	Y

Comments: _____

LDC #: 54719D46

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: ATV

METHOD: Trace Metals (EPA SW 846 Method 6010/6020/7000)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments and within the linear range of the ICP?
(Y) N N/A Are all detection limits below the CRDL?

Detected analyte results for Ca were recalculated and verified using the following equation:

Concentration = $\frac{(RD)(FV)(Dil)}{(In.\ Vol.)}$

Recalculation:

27.87 x 1000 = 27870

RD = Raw data concentration
FV = Final volume (ml)
In. Vol. = Initial volume (ml) or weight (G)
Dil = Dilution factor

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
	2	Ca	28000	27870	Y

Note: _____

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115DUP	580-115123-1DUP	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Bromide, Chloride, Fluoride, Nitrate as Nitrogen, and Sulfate by Environmental Protection Agency (EPA) Method 300.0
Dissolved Organic Carbon by EPA SW 846 Method 9060A
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Organic Carbon by EPA SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration of each method were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met for each method when applicable.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

All target analyte quantitation met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected or recommended for exclusion in this SDG.

Red Hill Bulk Storage Facility, CTO 18F0126
Wet Chemistry - Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Bulk Storage Facility, CTO 18F0126
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D6 **VALIDATION COMPLETENESS WORKSHEET** Date: 9/28/22
SDG #: 580-115123-1 Stage 2B/4 Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: ATV
2nd Reviewer: A

METHOD: (Analyte) Alkalinity (SM2320B), Bromide, Chloride, Fluoride, Nitrate-N, Sulfate (EPA Method 300.0), DOC (EPA SW-846 Method 9060A), Nitrate/Nitrite-N (EPA Method 353.2), TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	3
VII.	Duplicate sample analysis	A	4
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	A	Not reviewed for Stage 2B validation.
XI	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	HU115	580-115123-1	Water	06/20/22
2	HU123**	580-115123-3**	Water	06/20/22
3	HU115MS	580-115123-1MS	Water	06/20/22
4	HU115DUP	580-115123-1DUP	Water	06/20/22
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Notes:

METHOD: Inorganics				
Validation Area	**Yes**	**No**	**NA**	**Comments**
I. Technical holding times				
Were all technical holding times met?	✓			
II. Calibration				
Were all instruments calibrated at the required frequency?	✓			
Were the proper number of standards used?	✓			
Were all initial and continuing calibration verifications within the QC limits?	✓			
Were all initial calibration correlation coefficients within limits as specifed by the method?	✓			
Were balance checks performed as required?			✓	
III. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was there contamination in the method blanks?		✓		
Was there contamination in the initial and continuing calibration blanks?		✓		
IV. Matrix Spike/Matrix Spike Duplicates/Laboratory Duplicates				
Were MS/MSD recoveries within the QC limits? (If the sample concentration exceeded the spike concentration by a factor of 4, no action was taken.)	✓			
Were the MS/MSD or laboratory duplicate relative percent differences (RPDs) within the QC limits?	✓			
V. Laboratory Control Samples				
Was a LCS analyzed for each batch in the SDG?	✓			
Were the LCS recoveries and RPDs (if applicable) within QC limits?	✓			
X. Target Analyte Quantitation				
Were all reporting limits adjusted to reflect sample dilutions?	✓			
Were all soil samples dry weight corrected?			✓	
XI. Overall Assessment of Data				
Was the overall assessment of the data found to be acceptable?	✓			

METHOD: Inorganics				
Validation Area	**Yes**	**No**	**NA**	**Comments**
XII. Field Duplicates				
Were field duplicates identifed in this SDG?		✓		
Were target analytes detected in the field duplicates?			✓	
XIII. Field Blanks				
Were field blanks identified in this SDG?		✓		
Were target analytes detected in the field blanks?			✓	

LDC #: 54719D6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: ATL

All circled methods are applicable to each sample.

Sample ID	Parameter
1, 2	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN [✓ TOC] Cr6+ ClO_4 [✓ NO3/NO2-N] [✓ DOC]
2	pH TDS [✓ Cl] [✓ F] [✓ $\overset{N}{NO_3}$] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
3, 4	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ NO3/NO2-N]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 54719D6

Validation Findings Worksheet
Initial and Continuing Calibration Calculation Verification

Page: 1 of 1
Reviewer: ATL

Method: Inorganics, Method see cover

The correlation coefficient (r) for the calibration of NO_3/NO_2-N was recalculated. Calibration date: 6/29/22

An initial or continuing calibration verification percent recovery (%R) was recalculated for each type of analysis using the following formula:

$$\%R = \frac{\text{Found} \times 100}{\text{True}}$$

Where, Found = concentration of each analyte measured in the analysis of the ICV or CCV solution

True = concentration of each analyte in the ICV or CCV source

Type of analysis	Analyte	Standard	Conc. (mg/L)	Response	Recalculated r or r^2	Reported r or r^2	Acceptable (Y/N)
Initial calibration	NO_3/NO_2-N	s1	0	2450.4	*0.99687*	0.99687	Y
		s2	0.1	25240.9			
		s3	0.2	55346.4			
		s4	0.5	129173.5			
		s5	1	239578.5			
		s6	3	771103			
		s7	4	939960.9			
CCV (6/27 @ 16:14) Calibration verification	TOC	FOUND 24.238	TRUE 25.000		97	97	Y
CCV (6/22 @ 18:18) Calibration verification	SO_4^-	52.066	50.000		104	105	Y
CCV (6/27 @ 19:24) Calibration verification	DOC	24.489	25.000		98	98	Y

Comments: Refer to Calibration Verification findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D6

VALIDATION FINDINGS WORKSHEET
Level IV Recalculation Worksheet

Reviewer: ATL

METHOD: Inorganics, Method see cover

Percent recoveries (%R) for a laboratory control sample and a matrix spike sample were recalculated using the following formula:

$\%R = \frac{Found}{True} \times 100$ Where, Found = concentration of each analyte measured in the analysis of the sample. For the matrix spike calculation, Found = SSR (spiked sample result) - SR (sample result).
True = concentration of each analyte in the source.

A sample and duplicate relative percent difference (RPD) was recalculated using the following formula:

$RPD = \frac{|S-D|}{(S+D)/2} \times 100$ Where, S = Original sample concentration
D = Duplicate sample concentration

Sample ID	Type of Analysis	Element	µg/L Found / S (units)	µg/L True / D (units)	Recalculated %R / RPD	Reported %R / RPD	Acceptable (Y/N)
LCS	Laboratory control sample	Alkalinity	99330	100000	99	99	Y
3	Matrix spike sample	NO3/NO2-N	(SSR-SR) 960.281	1000	96	96	Y
4	Duplicate sample	NO3/NO2-N	258.495	275.217	6	6	Y

Comments: _____

LDC #: 54719DC

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: ATL

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Have results been reported and calculated correctly?
(Y) N N/A Are results within the calibrated range of the instruments?
(Y) N N/A Are all detection limits below the CRQL?

Compound (analyte) results for DOC reported with a positive detect were recalculated and verified using the following equation:

Concentration = Recalculation: #2

$$\frac{1.347 - 0.03494}{2.790} \times 1000 = 470.272$$

#	Sample ID	Analyte	Reported Concentration (µg/L)	Calculated Concentration (µg/L)	Acceptable (Y/N)
	2	NO3-N	200	210	Y
	2	NO3/NO2-N	190	189.614	Y
	2	TOC	400	396.437	Y
	2	Alkalinity	94000	94380	Y
	2	DOC	470	470.272	Y

Note:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Gasoline Range Organics

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU114	580-115123-2	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU124	580-115123-4	Water	06/20/22
HU122	580-115123-5	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260 and CADOHS LUFT Method

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples HU114 and HU122 were identified as trip blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the methods. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

Samples HU123** and HU124 were identified as field duplicates. No results were detected in any of the samples.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D7 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115123-1 Stage 2B/4 Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS Gasoline Range Organics (EPA SW-846 Method 8260/CADOHS LUFT Method)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	r² ICV ≤ 20
IV.	Continuing calibration pending	A	CCV ≤ 20/20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2, 5
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	A	
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	ND	D = 3, 4
XI.	Internal standards	A	
XII.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XIII.	Target analyte identification	A	Not reviewed for Stage 2B validation.
XIV.	System performance	A	Not reviewed for Stage 2B validation.
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

** Indicates sample underwent Stage 4 validation

	Client ID		Lab ID	Matrix	Date
1	HU115		580-115123-1	Water	06/20/22
2	HU114	TB	580-115123-2	Water	06/20/22
3	HU123**	D	580-115123-3**	Water	06/20/22
4	HU124	D	580-115123-4	Water	06/20/22
5	HU122	TB	580-115123-5	Water	06/20/22
6	HU115MS		580-115123-1MS	Water	06/20/22
7	HU115MSD		580-115123-1MSD	Water	06/20/22
8					
9					

Notes:

1	MB 580-394774						
2	MB 580-395649						

LDC #: 547197

VALIDATION FINDINGS CHECKLIST

Reviewer: FT

Method: ✓GC __HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?			✓	
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?	✓			
Were the RT windows properly established?	✓			
IIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
III. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
Were all the retention times within the acceptance windows?	✓			
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
V. Field Blanks				
Were field blanks identified in this SDG?	✓			
Were target analytes detected in the field blanks?		✓		
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?	✓			
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?	✓			
VIII. Laboratory control samples				
Was an LCS analyzed per analytical or extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?	✓			
Were target analytes detected in the field duplicates?		✓		
X. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Target analyte identification				
Were the retention times of reported detects within the RT windows?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

LDC #: 54719D7

Validation Findings Worksheet
Initial Calibration Calculation Verification

Reviewer: FT

Method: Method 8260/CADOHS LUFT Method

Calibration Date	Instrument/Column	Compound	Standard	(Y) Response	(X) Conc.	(X^2) Conc.
6/3/2022	TACO 36	GRO	1	17.850	5	25
		C6-C12	2	21.209	10	100
			3	37.293	25	625
			4	61.285	50	2500
			5	127.440	100	10000
			6	623.050	500	250000
			7	1260.300	1000	1000000
			8	1814.850	1500	2250000
			9	3977.740	2600	6760000

Regression Output	**Calculated**		***Reported***	
Constant	c	27.5942	c	122.9800
Std Err of Y Est				
R Squared		0.9982075		0.9930000
Degrees of Freedom				
	a	b	a	b
X Coefficient(s)	0.9394193302	0.0002193493	1.0311000000	0.0000181000
Std Err of Coef.				
Correlation Coefficient		0.999103		
Coefficient of Determination (r^2)		0.998207		

LDC #: 54719 D7

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC ✓ HPLC _____

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of target analyte
C = Concentration of target analyte

#	Standard ID	Calibration Date	Target Analyte	Average CF(Ical)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %D	Recalculated %D
1	CCV	7/1/22 1014	GRO C6 - C12	1.00	1.05	1.0468	4.7	4.7
2								
3								
4								

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D7

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: ✓ GC ___ HPLC

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
4-BFB		10.0	8.94	89	89	0

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 54719D7

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Reviewer: FT

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the matrix spike and matrix spike duplicate were recalculated for the target analytes identified below using the following calculation:

%Recovery = 100 * (SSC - SC)/SA

RPD =(({SSCMS - SSCMSD} * 2) / (SSCMS + SSCMSD))*100

Where SSC = Spiked sample concentration; SC = Sample concentration; SA = Spike added; MS = Matrix spike; MSD = Matrix spike duplicate

MS/MSD samples: 6 & 7

Compound	Spike Added (ug/L)		Sample Conc. (ug/L)	Spike Sample Concentration (ug/L)		Matrix spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	---	MS	MSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
GRO	1000	1000	NR	1060	1010	106	106	101	101	5	5

Comments: Refer to Matrix Spike/Matrix Spike Duplicates findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D7

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

%Recovery = 100 * (SSC/SA)
RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration
LCS = Laboratory Control Sample
SA = Spike added
LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: LCS 10 580-395648

Compound	Spike Added (ng/L)		Spike Sample Concentration (ng/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
GRO	1000	1000	1040	972	104	104	97	97	7	7

Comments: _____

LDC #: 54719D7

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: FT

METHOD: √ GC __ HPLC

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

Concentration= (A)(Fv)(Df) / (RF)(Vs or Ws)(%S/100)

A= Area or height of the target analyte to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the target analyte In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. LCS 580-395648 GRO C6-C12

Concentration = 1043.3 ug/L =

P768

C6 - C12

#	Sample ID	Target analyte	Reported Concentrations (ug/L)	Recalculated Results Concentrations (ug/L)	Qualifications
	LCS	GRO	1040	1043.3	
	25624380 (10) / 210291	= 1.0311 (X) + 0.0000181 (X^2) +		122.98	
		X = 104.3			

Comments: _____

SAMPCALCrev.wpd

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: October 12, 2022

Parameters: Polychlorinated Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU124	580-115123-4	Water	06/20/22
HU115MS	580-115123-1MS	Water	06/20/22
HU115MSD	580-115123-1MSD	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) SW 846 Method 8290A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was resolved with a valley of less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all analytes and labeled compounds.

The ion abundance ratios for all PCDDs/PCDFs were within method and validation criteria.

The minimum S/N ratio was greater than or equal to 2.5 for each analyte and greater than or equal to 10 for each labeled compound associated to samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes and less than or equal to 30.0% for labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 20.0% for all analytes and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

The minimum S/N ratio was greater than or equal to 10 for each analyte and labeled compound associated to samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Analyte	Concentration	Associated Samples
MB 410-270726	06/29/22	1,2,3,4,6,7,8-HpCDD	0.00000319 ug/L	All samples in SDG 580-115123-1
		1,2,3,4,6,7,8-HpCDF	0.000000668 ug/L	
		1,2,3,4,7,8-HxCDD	0.000000537 ug/L	
		1,2,3,4,7,8-HxCDF	0.000000587 ug/L	
		1,2,3,4,7,8,9-HpCDF	0.000000371 ug/L	
		1,2,3,6,7,8-HxCDD	0.000000571 ug/L	
		1,2,3,6,7,8-HxCDF	0.000000578 ug/L	
		1,2,3,7,8-PeCDD	0.000000319 ug/L	
		1,2,3,7,8-PeCDF	0.000000565 ug/L	
		1,2,3,7,8,9-HxCDD	0.000000478 ug/L	
		2,3,4,6,7,8-HxCDF	0.00000066 ug/L	
		2,3,4,7,8-PeCDF	0.000000453 ug/L	
		2,3,7,8-TCDD	0.0000000746 ug/L	
		2,3,7,8-TCDF	0.000000187 ug/L	
		OCDD	0.0000206 ug/L	
		OCDF	0.00000223 ug/L	
		Total HxCDD	0.0000159 ug/L	
		Total HxCDF	0.00000183 ug/L	
		Total HpCDD	0.00000319 ug/L	
		Total HpCDF	0.00000104 ug/L	
		Total PeCDD	0.000000319 ug/L	
		Total PeCDF	0.00000102 ug/L	
		Total TCDD	0.0000000746 ug/L	
		Total TCDF	0.000000187 ug/L	
		Total PCDD/PCDF	0.0000321 ug/L	
		Total PCDD	0.0000258 ug/L	
		Total PCDF	0.00000631 ug/L	

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
HU115	1,2,3,4,6,7,8-HpCDD	0.0000030 ug/L	0.0000030U ug/L
	1,2,3,4,6,7,8-HpCDF	0.0000013 ug/L	0.0000013U ug/L
	1,2,3,4,7,8-HxCDD	0.0000011 ug/L	0.0000011U ug/L
	1,2,3,4,7,8-HxCDF	0.0000013 ug/L	0.0000013U ug/L
	1,2,3,4,7,8,9-HpCDF	0.0000011 ug/L	0.0000011U ug/L
	1,2,3,6,7,8-HxCDD	0.00000019 ug/L	0.00000019U ug/L
	1,2,3,6,7,8-HxCDF	0.0000011 ug/L	0.0000011U ug/L
	1,2,3,7,8-PeCDD	0.00000051 ug/L	0.00000051U ug/L
	1,2,3,7,8-PeCDF	0.0000010 ug/L	0.0000010U ug/L
	1,2,3,7,8,9-HxCDD	0.0000014 ug/L	0.0000014U ug/L
	2,3,4,6,7,8-HxCDF	0.00000017 ug/L	0.00000017U ug/L
	2,3,4,7,8-PeCDF	0.0000013 ug/L	0.0000013U ug/L
	OCDD	0.000021 ug/L	0.000021U ug/L
	OCDF	0.0000040 ug/L	0.0000040U ug/L
	Total HxCDD	0.0000044 ug/L	0.0000044J ug/L
	Total HxCDF	0.0000052 ug/L	0.0000052J ug/L
	Total HpCDD	0.0000030 ug/L	0.0000030J ug/L
	Total HpCDF	0.0000024 ug/L	0.0000024J ug/L
	Total PeCDD	0.00000051 ug/L	0.00000051J ug/L
	Total PeCDF	0.0000023 ug/L	0.0000023J ug/L
	Total PCDD/PCDF	0.000044 ug/L	0.000044J ug/L
	Total PCDD	0.000029 ug/L	0.000029J ug/L
	Total PCDF	0.000014 ug/L	0.000014J ug/L
HU123**	1,2,3,4,6,7,8-HpCDD	0.0000028 ug/L	0.0000028U ug/L
	1,2,3,4,6,7,8-HpCDF	0.00000093 ug/L	0.00000093U ug/L
	1,2,3,4,7,8-HxCDD	0.00000056 ug/L	0.00000056U ug/L
	1,2,3,4,7,8-HxCDF	0.00000029 ug/L	0.00000029U ug/L
	1,2,3,4,7,8,9-HpCDF	0.00000040 ug/L	0.00000040U ug/L
	1,2,3,6,7,8-HxCDD	0.00000077 ug/L	0.00000077U ug/L
	1,2,3,6,7,8-HxCDF	0.00000058 ug/L	0.00000058U ug/L
	1,2,3,7,8-PeCDD	0.000001 ug/L	0.000001U ug/L
	1,2,3,7,8-PeCDF	0.00000089 ug/L	0.00000089U ug/L
	1,2,3,7,8,9-HxCDD	0.00000062 ug/L	0.00000062U ug/L
	2,3,4,6,7,8-HxCDF	0.00000057 ug/L	0.00000057U ug/L
	2,3,4,7,8-PeCDF	0.00000066 ug/L	0.00000066U ug/L
	2,3,7,8-TCDF	0.00000027 ug/L	0.00000027U ug/L
	OCDD	0.000020 ug/L	0.000020U ug/L
	OCDF	0.0000020 ug/L	0.0000020U ug/L
	Total HxCDD	0.0000020 ug/L	0.0000020J ug/L
	Total HxCDF	0.0000022 ug/L	0.0000022J ug/L
	Total HpCDD	0.0000028 ug/L	0.0000028J ug/L
	Total HpCDF	0.0000013 ug/L	0.0000013J ug/L
	Total PeCDD	0.0000010 ug/L	0.0000010J ug/L
	Total PeCDF	0.0000016 ug/L	0.0000016J ug/L
	Total TCDF	0.00000027 ug/L	0.00000027J ug/L
	Total PCDD/PCDF	0.000033 ug/L	0.000033J ug/L
	Total PCDD	0.000026 ug/L	0.000026J ug/L
	Total PCDF	0.0000074 ug/L	0.0000074J ug/L

Sample	Analyte	Reported Concentration	Modified Final Concentration
HU124	1,2,3,4,6,7,8-HpCDD	0.0000021 ug/L	0.0000021U ug/L
	1,2,3,4,6,7,8-HpCDF	0.0000014 ug/L	0.0000014U ug/L
	1,2,3,4,7,8-HxCDD	0.00000042 ug/L	0.00000042U ug/L
	1,2,3,4,7,8-HxCDF	0.00000070 ug/L	0.00000070U ug/L
	1,2,3,4,7,8,9-HpCDF	0.00000056 ug/L	0.00000056U ug/L
	1,2,3,6,7,8-HxCDD	0.00000062 ug/L	0.00000062U ug/L
	1,2,3,6,7,8-HxCDF	0.00000036 ug/L	0.00000036U ug/L
	1,2,3,7,8-PeCDD	0.00000097 ug/L	0.00000097U ug/L
	1,2,3,7,8-PeCDF	0.00000078 ug/L	0.00000078U ug/L
	1,2,3,7,8,9-HxCDD	0.00000080 ug/L	0.00000080U ug/L
	2,3,4,6,7,8-HxCDF	0.00000056 ug/L	0.00000056U ug/L
	2,3,4,7,8-PeCDF	0.00000067 ug/L	0.00000067U ug/L
	2,3,7,8-TCDF	0.00000015 ug/L	0.00000015U ug/L
	OCDD	0.000017 ug/L	0.000017U ug/L
	OCDF	0.0000029 ug/L	0.0000029U ug/L
	Total HxCDD	0.0000018 ug/L	0.0000018J ug/L
	Total HxCDF	0.0000024 ug/L	0.0000024J ug/L
	Total HpCDD	0.0000021 ug/L	0.0000021J ug/L
	Total HpCDF	0.0000020 ug/L	0.0000020J ug/L
	Total PeCDD	0.00000097 ug/L	0.00000097J ug/L
	Total PeCDF	0.0000015 ug/L	0.0000015J ug/L
	Total TCDF	0.00000015 ug/L	0.00000015J ug/L
	Total PCDD/PCDF	0.000031 ug/L	0.000031J ug/L
	Total PCDD	0.000022 ug/L	0.000022J ug/L
	Total PCDF	0.0000090 ug/L	0.0000090J ug/L

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	MS (%R) (Limits)	MSD (%R) (Limits)	Flag	A or P
HU115MS/MSD (HU115)	1,2,3,7,8-PeCDD	128 (76-121)	-	J+ (all detects)	A

Relative percent differences (RPD) were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

Samples HU123** and HU124 were identified as field duplicates. No results were detected in any of the samples with the following exceptions:

Analyte	Concentration (ug/L)		RPD (Limits)
	HU123**	HU124	
1,2,3,4,6,7,8-HpCDD	0.0000028	0.0000021	29 (≤50)
1,2,3,4,6,7,8-HpCDF	0.00000093	0.0000014	40 (≤50)
1,2,3,4,7,8-HxCDD	0.00000056	0.00000042	29 (≤50)
1,2,3,4,7,8-HxCDF	0.00000029	0.00000070	83 (≤50)
1,2,3,4,7,8,9-HpCDF	0.00000040	0.00000056	33 (≤50)
1,2,3,6,7,8-HxCDD	0.00000077	0.00000062	22 (≤50)
1,2,3,6,7,8-HxCDF	0.00000058	0.00000036	47 (≤50)
1,2,3,7,8-PeCDD	0.0000010	0.00000097	3 (≤50)
1,2,3,7,8-PeCDF	0.00000089	0.00000078	13 (≤50)
1,2,3,7,8,9-HxCDD	0.00000062	0.00000080	25 (≤50)
1,2,3,7,8,9-HxCDF	0.00000074	0.00000078	5 (≤50)
2,3,4,6,7,8-HxCDF	0.00000057	0.00000056	2 (≤50)
2,3,4,7,8-PeCDF	0.00000066	0.00000067	2 (≤50)
2,3,7,8-TCDF	0.00000027	0.00000015	57 (≤50)
OCDD	0.000020	0.000017	16 (≤50)
OCDF	0.0000020	0.0000029	37 (≤50)
Total HxCDD	0.0000020	0.0000018	11 (≤50)
Total HxCDF	0.0000022	0.0000024	9 (≤50)
Total HpCDD	0.0000028	0.0000021	29 (≤50)

Analyte	Concentration (ug/L)		RPD (Limits)
	HU123**	HU124	
Total HpCDF	0.0000013	0.0000020	42 (≤50)
Total PeCDD	0.0000010	0.00000097	3 (≤50)
Total PeCDF	0.0000016	0.0000015	6 (≤50)
Total TCDF	0.00000027	0.00000015	57 (≤50)
Total PCDD/PCDF	0.000033	0.000031	6 (≤50)
Total PCDD	0.000026	0.000022	17 (≤50)
Total PCDF	0.0000074	0.0000090	20 (≤50)

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target analytes were within QC limits.

XI. Target Analyte Quantitation

All target analyte quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
All samples in SDG 580-115123-1	Results flagged "I" by the laboratory as estimated maximum possible concentration (EMPC).	J (all detects)	A

For samples HU123** and HU124, 2,3,7,8-TCDF was not confirmed in the 2nd column since the 1st column result was less than the limit of quantitation.

Raw data were not reviewed for Stage 2B validation.

XII. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

The system performance was acceptable for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to MS/MSD %R and results reported by the laboratory as EMPC, data were qualified as estimated in three samples.

Due to laboratory blank contamination, data were qualified as not detected or estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 580-115123-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU115	1,2,3,7,8-PeCDD	J+ (all detects)	A	Matrix spike/Matrix spike duplicate (%R) (m)
HU115 HU123** HU124	Results flagged "I" by the laboratory as estimated maximum possible concentration (EMPC).	J (all detects)	A	Target analyte quantitation (EMPC) (k)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

Sample	Analyte	Modified Final Concentration	A or P	Code
HU115	1,2,3,4,6,7,8-HpCDD	0.0000030U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.0000013U ug/L		
	1,2,3,4,7,8-HxCDD	0.0000011U ug/L		
	1,2,3,4,7,8-HxCDF	0.0000013U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.0000011U ug/L		
	1,2,3,6,7,8-HxCDD	0.00000019U ug/L		
	1,2,3,6,7,8-HxCDF	0.0000011U ug/L		
	1,2,3,7,8-PeCDD	0.00000051U ug/L		
	1,2,3,7,8-PeCDF	0.0000010U ug/L		
	1,2,3,7,8,9-HxCDD	0.0000014U ug/L		
	2,3,4,6,7,8-HxCDF	0.00000017U ug/L		
	2,3,4,7,8-PeCDF	0.0000013U ug/L		
	OCDD	0.000021U ug/L		
	OCDF	0.0000040U ug/L		
	Total HxCDD	0.0000044J ug/L		
	Total HxCDF	0.0000052J ug/L		
	Total HpCDD	0.0000030J ug/L		
	Total HpCDF	0.0000024J ug/L		
	Total PeCDD	0.00000051J ug/L		
	Total PeCDF	0.0000023J ug/L		
	Total PCDD/PCDF	0.000044J ug/L		
	Total PCDD	0.000029J ug/L		
	Total PCDF	0.000014J ug/L		

Sample	Analyte	Modified Final Concentration	A or P	Code
HU123**	1,2,3,4,6,7,8-HpCDD	0.0000028U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.00000093U ug/L		
	1,2,3,4,7,8-HxCDD	0.00000056U ug/L		
	1,2,3,4,7,8-HxCDF	0.00000029U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.00000040U ug/L		
	1,2,3,6,7,8-HxCDD	0.00000077U ug/L		
	1,2,3,6,7,8-HxCDF	0.00000058U ug/L		
	1,2,3,7,8-PeCDD	0.000001U ug/L		
	1,2,3,7,8-PeCDF	0.00000089U ug/L		
	1,2,3,7,8,9-HxCDD	0.00000062U ug/L		
	2,3,4,6,7,8-HxCDF	0.00000057U ug/L		
	2,3,4,7,8-PeCDF	0.00000066U ug/L		
	2,3,7,8-TCDF	0.00000027U ug/L		
	OCDD	0.000020U ug/L		
	OCDF	0.0000020U ug/L		
	Total HxCDD	0.0000020J ug/L		
	Total HxCDF	0.0000022J ug/L		
	Total HpCDD	0.0000028J ug/L		
	Total HpCDF	0.0000013J ug/L		
	Total PeCDD	0.0000010J ug/L		
	Total PeCDF	0.0000016J ug/L		
	Total TCDF	0.00000027J ug/L		
	Total PCDD/PCDF	0.000033J ug/L		
	Total PCDD	0.000026J ug/L		
	Total PCDF	0.0000074J ug/L		
HU124	1,2,3,4,6,7,8-HpCDD	0.0000021U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.0000014U ug/L		
	1,2,3,4,7,8-HxCDD	0.00000042U ug/L		
	1,2,3,4,7,8-HxCDF	0.00000070U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.00000056U ug/L		
	1,2,3,6,7,8-HxCDD	0.00000062U ug/L		
	1,2,3,6,7,8-HxCDF	0.00000036U ug/L		
	1,2,3,7,8-PeCDD	0.00000097U ug/L		
	1,2,3,7,8-PeCDF	0.00000078U ug/L		
	1,2,3,7,8,9-HxCDD	0.00000080U ug/L		
	2,3,4,6,7,8-HxCDF	0.00000056U ug/L		
	2,3,4,7,8-PeCDF	0.00000067U ug/L		
	2,3,7,8-TCDF	0.00000015U ug/L		
	OCDD	0.000017U ug/L		
	OCDF	0.0000029U ug/L		
	Total HxCDD	0.0000018J ug/L		
	Total HxCDF	0.0000024J ug/L		
	Total HpCDD	0.0000021J ug/L		
	Total HpCDF	0.0000020J ug/L		
	Total PeCDD	0.00000097J ug/L		
	Total PeCDF	0.0000015J ug/L		
	Total TCDF	0.00000015J ug/L		
	Total PCDD/PCDF	0.000031J ug/L		
	Total PCDD	0.000022J ug/L		
	Total PCDF	0.0000090J ug/L		

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D21 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115123-1 Stage 2B/4 Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer:
2nd Reviewer: RC

METHOD: HRGC/HRMS Polychlorinated Dioxins/Dibenzofurans (EPA SW-846 Method 8290A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	%D RSD ≤ 20 ICV ≤ 20/30
IV.	Continuing calibration	A	CCV ≤ 20/30
V.	Laboratory Blanks	SW	
VI.	Field blanks	N	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	SW A	LCS 1P
IX.	Field duplicates	SW	D = 2, 3
X.	Labeled Compounds	A	
XI.	Target analyte quantitation	SW	Not reviewed for Stage 2B validation.
XII.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XIII.	System performance	A	Not reviewed for Stage 2B validation.
XIV.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

	Client ID		Lab ID	Matrix	Date
1	HU115		580-115123-1	Water	06/20/22
2	HU123**	D	580-115123-3**	Water	06/20/22
3	HU124	D	580-115123-4	Water	06/20/22
4	HU115MS		580-115123-1MS	Water	06/20/22
5	HU115MSD		580-115123-1MSD	Water	06/20/22
6					
7					
8					
9					
10					

Notes:

	MB 410-270726						

LDC #: 54719021

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: A

Method: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	✓			
Cooler temperature criteria was met.	✓			
II. GC/MS Instrument performance check				
Was PFK exact mass 380.9760 verified?	✓			
Were the retention time windows established for all homologues?	✓			
Was the chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomers ≤ 25% ?	✓			
Is the static resolving power at least 10,000 (10% valley definition)?	✓			
Was the mass resolution adequately check with PFK?	✓			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?	✓			
IIIa. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for all analytes and labeled compounds ?	✓			
Did all calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound ≥ 2.5 and for each recovery and internal standard ≥ 10?	✓			
IIIb. Initial Calibration Verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20% for unlabeled compounds and ≤30% for labeled compounds ?	✓			
IV. Continuing calibration				
Was a contiuning calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ≤ 20% for unlabeled compounds and ≤ 30% for labeled compounds ?	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
Was the signal to noise ratio for each target compound and for each recovery and internal standard ≥ 10?	✓			
V. Laboratory Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and whenever a sample extraction was performed?	✓			
Was there contamination in the method blanks?	✓			
VI. Field blanks				
Field blanks were identified in this SDG.		✓	✓	
Target compounds were detected in the field blanks.			✓	

LDC #: 54719021

VALIDATION FINDINGS CHECKLIST

Reviewer: FT
2nd Reviewer: AC

VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VIII. Laboratory control samples				
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			
IX. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
X. Labeled Compoubds				
Were internal standard recoveries within the 40-135% criteria?	✓			
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	✓			
XI. Compound quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?	✓			
Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XII. Target compound identification				
For 2,3,7,8 substituted congeners with associated labeled standards, were the retention times of the two quantitation peaks within -1 to 3 sec. of the RT of the labeled standard?	✓			
For 2,3,7,8 substituted congeners without associated labeled standards, were the relative retention times of the two quantitation peaks within 0.005 time units of the RRT measured in the routine calibration?	✓			
For non-2,3,7,8 substituted congeners, were the retention times of the two quantitation peaks within RT established in the performance check solution?	✓			
Did compound spectra contain all characteristic ions listed in the table attached?	✓			
Was the Ion Abundance Ratio for the two quantitation ions within criteria?	✓			
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5?	✓			
Does the maximum intensity of each specified characteristic ion coincide within ± 2 seconds (includes labeled standards)?	✓			
For PCDF identification, was any signal (S/N ≥ 2.5, at ± seconds RT) detected in the corresponding PCDPE channel?	✓			
Was an acceptable lock mass recorded and monitored?	✓			
XIII. System performance				
System performance was found to be acceptable.	✓			
XIV. Overall assessment of data	✓			
Overall assessment of data was found to be acceptable.				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:_____

LDC #: 54719D21

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y Were all samples associated with a method blank?
Y Was a method blank performed for each matrix and whenever a sample extraction was performed? (b)
Y Was the method blank contaminated?

Blank extraction date: 6/29/22 **Blank analysis date:** 6/29/22 **Associated samples:** All
Conc. units: ug/L

Compound	Blank ID	Sample Identification								
	MB 410 -270726	5x	1	2	3					
F	0.00000319	0.000015950	0.0000030U	0.0000028U	0.0000021U					
O	0.000000668	0.000003340	0.0000013U	0.00000093U	0.0000014U					
C	0.000000537	0.000002685	0.0000011U	0.00000056U	0.00000042U					
K	0.000000587	0.000002935	0.0000013U	0.00000029U	0.00000070U					
P	0.000000371	0.000001855	0.0000011U	0.00000040U	0.00000056U					
D	0.000000571	0.000002855	0.00000019U	0.00000077U	0.00000062U					
L	0.000000578	0.000002890	0.0000011U	0.00000058U	0.00000036U					
B	0.000000319	0.000001595	0.00000051U	0.0000010U	0.00000097U					
I	0.000000565	0.000002825	0.0000010U	0.00000089U	0.00000078U					
E	0.000000478	0.000002390	0.0000014U	0.00000062U	0.00000080U					
M	0.00000066	0.000003300	0.00000017U	0.00000057U	0.00000056U					
J	0.000000453	0.000002265	0.0000013U	0.00000066U	0.00000067U					
A	0.0000000746	0.000000373	-	-	-					
H	0.000000187	0.000000935	-	0.00000027U	0.00000015U					
G	0.0000206	0.000103000	0.000021U	0.000020U	0.000017U					
Q	0.00000223	0.000011150	0.0000040U	0.0000020U	0.0000029U					
T	0.00000159	0.000007950	0.0000044J	0.0000020J	0.0000018J					
X	0.00000183	0.000009150	0.0000052J	0.0000022J	0.0000024J					
U	0.00000319	0.000015950	0.0000030J	0.0000028J	0.0000021J					
Y	0.00000104	0.000005200	0.0000024J	0.0000013J	0.0000020J					

S	0.000000319	0.000001595	0.00000051J	0.0000010J	0.00000097J					
W	0.00000102	0.000005100	0.0000023J	0.0000016J	0.0000015J					
R	0.0000000746	0.000000373	-	-	-					
V	0.000000187	0.000000935	-	0.00000027J	0.00000015J					
Total PCDD/PCDF	0.0000321	0.000160500	0.000044J	0.000033J	0.000031J					
Total PCDD	0.0000258	0.000129000	0.000029J	0.000026J	0.000022J					
Total PCDF	0.00000631	0.000031550	0.000014J	0.0000074J	0.0000090J					

CIRCLED 0.00000079RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within0.00000089 five times the method blank concentration were qualified as not detected, "U".

LDC # 54719D21

LDC #: 54719D1

VALIDATION FINDINGS WORKSHEET

Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1

Reviewer: FT

METHOD: ~~GC/MS BNA (EPA SW 846 Method 8270~~) HRGC/HRMS 8290A

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

[✓ Y] N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

[✓ Y] N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y [✓ N] N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits? (e)

#	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	4,5	B	128 (76-12))	( )	( )	1	J+ dw/A Det
			( )	( )	( )		
			( )	( )			
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC#:_54719D21

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Page:_1__of__1_
Reviewer:__FT____

METHOD: 8290A

Compound	Concentration (ug/L)		(≤50)
	2	3	RPD
F	0.0000028	0.0000021	29
O	0.00000093	0.0000014	40
C	0.00000056	0.00000042	29
K	0.00000029	0.00000070	83
P	0.00000040	0.00000056	33
D	0.00000077	0.00000062	22
L	0.00000058	0.00000036	47
B	0.0000010	0.00000097	3
I	0.00000089	0.00000078	13
E	0.00000062	0.00000080	25
N	0.00000074	0.00000078	5
M	0.00000057	0.00000056	2
J	0.00000066	0.00000067	2
H	0.00000027	0.00000015	57
G	0.000020	0.000017	16
Q	0.0000020	0.0000029	37
T	0.0000020	0.0000018	11
X	0.0000022	0.0000024	9
U	0.0000028	0.0000021	29
Y	0.0000013	0.0000020	42
S	0.0000010	0.00000097	3
W	0.0000016	0.0000015	6
V	0.00000027	0.00000015	57
Total PCDD/PCDF	0.000033	0.000031	6
Total PCDD	0.000026	0.000022	17
Total PCDF	0.0000074	0.0000090	20
			??

V:\FIELD DUPLICATES\Field Duplicates\FD_Organics\2022\54719D21 AECOM Red Hill oily.wpd

LDC #: 54719D21

VALIDATION FINDINGS WORKSHEET
Target Analyte Quantitation and Reported CRQLs

Reviewer: FT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound?
Y N N/A Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

#	Date	Sample ID	Finding	Associated Samples	Qualifications
		All	Results qualified "I" by the laboratory as EMPC		Jdt (K)
		2, 3	H- NO 2nd column confirmation was performed. Results < LOQ		text

Comments: See sample calculation verification worksheet for recalculations

LDC #: 54719D21

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Reviewer: FT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$ — A_x = Area of Compound — A_{is} = Area of associated internal standard

average RRF = sum of the RRFs/number of standards — C_x = Concentration of compound, — C_{is} = Concentration of internal standard

%RSD = 100 * (S/X) — S= Standard deviation of the RRFs, — X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (IS)	Reported RRF (10/50/100 std)	Recalculated RRF (10/50/100 std)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported %RSD	Recalculated %RSD
1	ICAL DF18471	1/6/2022	2,3,7,8-TCDF	1.0576	1.0576	1.1309	1.1309	15.1	15.1
			2,3,7,8-TCDD	1.0589	1.0589	1.1359	1.1359	16.7	16.7
			1,2,3,6,7,8-HxCDD	1.0166	1.0166	1.0526	1.0526	5.1	5.1
			1,2,3,4,6,7,8-HpCDD	1.0509	1.0509	1.0671	1.0671	8.3	8.3
			OCDF	0.9190	0.9190	0.9320	0.9320	4.0	4.0

LDC #: 54719021

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the compounds identified below using the following calculation:

% Difference = 100 * (ave. RRF - RRF)/ave. RRF
$RRF = (A_x)(C_{is})/(A_{is})(C_x)$

Where: ave. RRF = initial calibration average RRF
RRF = continuing calibration RRF
A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Reported RRF (CC)	Recalculated RRF (CC)	Reported %D	Recalculated %D
1	CCV	6/29/22	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.1309	1.015	1.015	~~8.9~~ 10.2	10.2
	MB, 2, 3	1516	2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.1359	1.104	1.104	2.8	2.8
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.0526	1.011	1.011	3.9	3.9
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.0671	1.045	1.045	2.0	2.0
			OCDF (^{13}C-~~OCDD~~) OCDF	0.9320	0.9166	0.9166	1.7	1.7
2			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					
3			2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)					
			OCDF (^{13}C-OCDD)					

Comments: Refer to Routine Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D21

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the matrix spike and matrix spike duplicate were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * (SSR - SR)/SA Where: SSR = Spiked sample result, SR = Sample result
SA = Spike added

RPD = I MSR - MSDR I * 2/(MSR + MSDR) MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples: 4 + 5

Compound	Spike Added (ng/L)		Sample Concentration (ng/L)	Spiked Sample Concentration (ng/L)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		MS/MSD RPD	
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
2,3,7,8-TCDD	0.000190	0.00191	ND	0.000206	0.000195	108	108	102	102	5	5
1,2,3,7,8-PeCDD	0.000952		0.0000051	0.00122	0.00116	128	128	121	121	5	5
1,2,3,4,7,8-HxCDD	0.000952		0.0000011	0.00107	0.00109	112	128 112	114	114	2	2
1,2,3,4,7,8,9-HpCDF	0.000952		0.0000011	0.00100	0.00104	105	105	108	108	4	4
OCDF	0.00190		0.0000040	0.00206	0.00208	108	108	109	109	1	1

Comments: Refer to Matrix Spike/Matrix Spike Duplicate findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D21

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: FT

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy control sample and laboratory control sample duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA Where: SSC = Spiked sample concentration
SA = Spike added

RPD = I LCS - LCSD I * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: LCS 10 410-270726

Compound	Spike Added (ng/L)		Spiked Sample Concentration (ng/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalc
2,3,7,8-TCDD	0.00200	0.00200	0.00217	0.00215	108	108	108	108	1	1
1,2,3,7,8-PeCDD	0.00100	0.00100	0.00120	0.00121	120	120	121	121	1	1
1,2,3,4,7,8-HxCDD	0.00100	0.00100	0.00111	0.00107	111	111	107	107	3	3
1,2,3,4,7,8,9-HpCDF	0.00100	0.00100	0.00108	0.00103	108	108	103	103	4	4
OCDF	0.00200	0.00200	0.00222	0.00220	111	111	110	110	1	1

Comments: Refer to Laboratory Control Sample findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719021

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Reviewer: PT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

(Y) N N/A Were all reported results recalculated and verified for all level IV samples?
Y N N/A Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concentration = $\frac{(A_x)(I_s)(DF)}{(A_{is})(RRF)(V_o)(\%S)}$

A_x = Area of the characteristic ion (EICP) for the compound to be measured

A_{is} = Area of the characteristic ion (EICP) for the specific internal standard

I_s = Amount of internal standard added in nanograms (ng)

V_o = Volume or weight of sample extract in milliliters (ml) or grams (g).

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

%S = Percent solids, applicable to soil and solid matrices only.

Example:

Sample I.D. # 2, OCDF:

Conc. = $\frac{(1029)(20)(200)(1/1000)}{(2095206)(0.9320)(1048.2)}$

= 0.00000020111 ug/L

#	Sample ID	Compound	Reported Concentration (ug/L)	Calculated Concentration (ug/L)	Qualification
	# 2	OCDF	0.00000020	0.00000020111	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Methane

Validation Level: Stage 2B & 4

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115123-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU115	580-115123-1	Water	06/20/22
HU114	580-115123-2	Water	06/20/22
HU123**	580-115123-3**	Water	06/20/22
HU122	580-115123-5	Water	06/20/22

**Indicates sample underwent Stage 4 validation

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Methane by Method RSK-175

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results. Samples appended with a double asterisk on the cover page were subjected to Stage 4 data validation, which is comprised of the QC summary forms as well as the raw data, to confirm sample quantitation and identification.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

Retention time windows were established as required by the method for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

Retention times in the calibration standards were within the established retention time windows for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples HU114 and HU122 were identified as trip blanks. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Target Analyte Quantitation

All target analyte quantitations met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

X. Target Analyte Identification

All target analyte identifications met validation criteria for samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

Manual integrations were reviewed and were considered acceptable. The laboratory provided before and after integration printouts.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Laboratory Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Field Blank Data Qualification Summary - SDG 580-115123-1

No Sample Data Qualified in this SDG

LDC #: 54719D51 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115123-1 Stage 2B/4 Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: R
2nd Reviewer: R

METHOD: GC Methane (Method RSK-175)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	Initial calibration/ICV	A/A	%D RSD/ICV ≤20
III.	Continuing calibration	A	CCV ≤20/20
IV.	Laboratory Blanks	A	
V.	Field blanks	ND	TB = 2, 4
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	
VIII.	Laboratory control samples	A	LCS 1D
IX.	Field duplicates	N	
X.	Target analyte quantitation	A	Not reviewed for Stage 2B validation.
XI.	Target analyte identification	A	Not reviewed for Stage 2B validation. MI
XII	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank
** Indicates sample underwent Stage 4 validation

	Client ID	Lab ID	Matrix	Date
1	HU115	580-115123-1	Water	06/20/22
2	HU114 TB	580-115123-2	Water	06/20/22
3	HU123**	580-115123-3**	Water	06/20/22
4	HU122 TB	580-115123-5	Water	06/20/22
5				
6				
7				
8				
9				
10				
11				
12				

Notes:

	MB 410-269813						

LDC #: 54719D5)

VALIDATION FINDINGS CHECKLIST

Reviewer: FT

Method: ✓GC HPLC

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
Were all technical holding times met?	✓			
Was cooler temperature criteria met?	✓			
IIa. Initial calibration				
Did the laboratory perform a 5 point calibration prior to sample analysis?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20%?	✓			
Was a curve fit used for evaluation? If yes, did the initial calibration meet the curve fit acceptance criteria of ≥0.990?			✓	
Were the RT windows properly established?	✓			
IIb. Initial calibration verification				
Was an initial calibration verification standard analyzed after each initial calibration for each instrument?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
III. Continuing calibration				
Was a continuing calibration analyzed daily?	✓			
Were all percent differences (%D) ≤ 20%?	✓			
Were all the retention times within the acceptance windows?	✓			
IV. Laboratory Blanks				
Was a laboratory blank associated with every sample in this SDG?	✓			
Was a laboratory blank analyzed for each matrix and concentration?	✓			
Was there contamination in the laboratory blanks?		✓		
V. Field Blanks				
Were field blanks identified in this SDG?	✓			
Were target analytes detected in the field blanks?		✓		
VI. Surrogate spikes				
Were all surrogate percent recovery (%R) within the QC limits?	✓			
If the percent recovery (%R) of one or more surrogates was outside QC limits, was a reanalysis performed to confirm %R?			✓	
If any %R was less than 10 percent, was a reanalysis performed to confirm %R?			✓	
VII. Matrix spike/Matrix spike duplicates				
Were matrix spike (MS) and matrix spike duplicate (MSD) analyzed in this SDG?			✓	
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?			✓	
VIII. Laboratory control samples				
Was an LCS analyzed per analytical or extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

Validation Area	Yes	No	NA	Findings/Comments
IX. Field duplicates				
Were field duplicate pairs identified in this SDG?		✓		
Were target analytes detected in the field duplicates?			✓	
X. Target analyte quantitation				
Did the laboratory LOQs/RLs meet the QAPP LOQs/RLs?	✓			
Were analyte quantitation and RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	✓			
XI. Target analyte identification				
Were the retention times of reported detects within the RT windows?	✓			
Were manual integrations reviewed and found acceptable?	✓			
Did the laboratory provide before and after integration printouts?	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			

LDC #: 54719p51

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: FT
2nd Reviewer:

METHOD: GC ✓ HPLC ____

The calibration factors (CF) and relative standard deviation (%RSD) were recalculated using the following calculations:

CF = A/C
Average CF = sum of the CF/number of standards
%RSD = 100 * (S/X)

Where: A = Area of compound 4
C = Concentration of compound
S = Standard deviation of calibration factors
X = Mean of calibration factors

#	Standard ID	Calibration Date	Compound	Reported CF (99.0 std)	Recalculated CF (99.0 std)	Reported CF (initial)	Recalculated CF (intial)	Reported %RSD	Recalculated %RSD
1	ICAL	5/18/21	Methane	1899545	1899545	1893853.78	1893853.78	8.6	8.6
2									
3									
4									

Comments: Refer to Initial Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D5)

VALIDATION FINDINGS WORKSHEET
Continuing Calibration Results Verification

Reviewer: FT

METHOD: GC ✓ HPLC _____

The percent difference (%D) of the initial calibration average Calibration Factors (CF) and the continuing calibration CF were recalculated for the target analytes identified below using the following calculation:

% Difference = 100 * (ave. CF -CF)/ave.CF

Where: ave. CF = initial calibration average CF
CF = continuing calibration CF
A = Area of target analyte
C = Concentration of target analyte

#	Standard ID	Calibration Date	Target Analyte	Average CF(Ical)/ CCV Conc.	Reported CF/ Conc. CCV	Recalculated CF/ Conc. CCV	Reported %D	Recalculated %D
1	CCV MB, # 1	6/27/22 1514	Methane	59.9	54.4	54.4	9.2	9.2
2	CCV 2, 3, 5	6/27/22 1811 2043	↓	59.9	53.5	53.5	10.6	10.6
3								
4								

Comments: Refer to Continuing Calibration findings worksheet for list of qualifications and associated samples when reported results do not agree within 10.0% of the recalculated results.

LDC #: 54719D5)

VALIDATION FINDINGS WORKSHEET
Surrogate Results Verification

Reviewer: FT

METHOD: ✓ GC ___ HPLC

The percent recoveries (%R) of surrogates were recalculated for the compounds identified below using the following calculation:

% Recovery: SF/SS * 100

Where: SF = Surrogate Found
SS = Surrogate Spiked

Sample ID: #3

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	
Propene		19.9	15.4	77	77	0

Sample ID: _____

Surrogate	Column/Detector	Surrogate Spiked	Surrogate Found	Percent Recovery	Percent Recovery	Percent Difference
				Reported	Recalculated	

	Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound		Surrogate Compound
A	Chlorobenzene (CBZ)	G	Octacosane	M	Benzo(e)Pyrene	S	1-Chloro-3-Nitrobenzene	Y	Tetrachloro-m- xylene
B	4-Bromofluorobenzene (BFB)	H	Ortho-Terphenyl	N	Terphenyl-D14	T	3,4-Dinitrotoluene	Z	2-Bromonaphthalene
C`	a,a,a-Trifluorotoluene	I	Fluorobenzene (FBZ)	O	Decachlorobiphenyl (DCB)	U	Tripentyltin	AA	Chloro-octadecane
D	Bromochlorobenene	J	n-Triacontane	P	1-methylnaphthalene	V	Tri-n-propyltin	BB	2,4-Dichlorophenylacetic acid
E	1,4-Dichlorobutane	K	Hexacosane	Q	Dichlorophenyl Acetic Acid (DCAA)	W	Tributyl Phosphate	CC	2,5-Dibromotoluene
F	1,4-Difluorobenzene (DFB)	L	Bromobenzene	R	4-Nitrophenol	X	Triphenyl Phosphate		

LDC #: 54719D5)

VALIDATION FINDINGS WORKSHEET

Laboratory Control Sample/Laboratory Control Sample Duplicates Results Verification

Reviewer: FT

METHOD: ✓ GC __ HPLC

The percent recoveries (%R) and relative percent differences (RPD) of the laboratory control sample and laboratory control sample duplicate were recalculated for the target analytes identified below using the following calculation:

%Recovery = 100 * (SSC/SA)
RPD =(({SSCLCS - SSCLCSD} * 2) / (SSCLCS + SSCLCSD))*100

Where SSC = Spiked sample concentration
LCS = Laboratory Control Sample

SA = Spike added
LCSD = Laboratory Control Sample duplicate

LCS/LCSD samples: lcs ID - 410-269813

Compound	Spike Added (ug/V)		Spike Sample Concentration (ug/L)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc.	Reported	Recalc.	Reported	Recalc.
Methane	59.9	59.9	54.3	54.6	91	91	91	91	1	1

Comments: _____

LDC #: 54719D5J

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

METHOD: ✓ **GC** __ **HPLC**

The concentration of the sample was calculated for the target analyte identified below using the following calculation:

Concentration= $\frac{(A)(Fv)(Df)}{(RF)(Vs \text{ or } Ws)(\%S/100)}$

A= Area or height of the target analyte to be measured
Fv= Final Volume of extract
Df= Dilution Factor
RF= Average response factor of the target analyte In the initial calibration
Vs= Initial volume of the sample
Ws= Initial weight of the sample
%S= Percent Solid

Example:

Sample ID. LCS 410-269813 Methane

Concentration = $\frac{102753545}{1893853.78}$ =

= 54.256 ug/L

#	Sample ID	Target analyte	Reported Concentrations (ug/L)	Recalculated Results Concentrations (ug/L)	Qualifications
	LCS	Methane	54.3	54.256	

Comments: _____

LDC Report# 54719E1a

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: October 7, 2022

Parameters: Volatiles

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU140	580-115161-2	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU132	580-115161-4	Water	06/21/22
HU128	580-115161-5	Water	06/21/22
HU127	580-115161-6	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Volatile Organic Compounds (VOCs) and Tentatively Identified Compounds (TICs) by Environmental Protection Agency (EPA) SW 846 Method 8260D

All sample results were subjected to Level III data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 15.0% for all analytes

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/22/22	Bromomethane	22.4	All samples in SDG 580-115161-1	UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/26/22	Acetone Bromomethane	21.9 46.7	All samples in SDG 580-115161-1	UJ (all non-detects) UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/27/22	Bromomethane	105.1	All samples in SDG 580-115161-1	UJ (all non-detects)	A

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analysis Date	Analyte TIC (RT in minutes)	Concentration	Associated Samples
MB 580-39500	06/26/22	1,2,4-Trichlorobenzene	0.208 ug/L	All samples in SDG 580-115161-1
		Dibromochloromethane	0.0552 ug/L	
		Ethylbenzene	0.0818 ug/L	
		Hexachlorobutadiene	0.106 ug/L	
		Naphthalene	0.432 ug/L	
		Styrene	0.211 ug/L	
		Xylenes, total	0.205 ug/L	
		o-Xylene (12.21)	0.205 ug/L	
		Isopropylbenzene (12.51)	0.264 ug/L	
		1,3,5-Trimethylbenzene (12.99)	0.154 ug/L	
		p-Isopropyltoluene (13.54)	0.162 ug/L	
		1,3,5-Trichlorobenzene (14.65)	0.0175 ug/L	
		1,2,3-Trichlorobenzene (15.53)	0.230 ug/L	

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte TIC (RT in minutes)	Reported Concentration	Modified Final Concentration
HU141	Ethylbenzene	0.078 ug/L	0.078J+ ug/L
	Styrene	0.21 ug/L	0.50U ug/L
	Xylenes, total	0.20 ug/L	0.35U ug/L
	o-Xylene (12.21)	0.20 ug/L	0.20U ug/L
	1,3,5-Trimethylbenzene (12.99)	0.15 ug/L	0.15U ug/L
	p-Isopropyltoluene (13.54)	0.15 ug/L	0.15U ug/L
HU140	Ethylbenzene	0.079 ug/L	0.079J+ ug/L
	Naphthalene	0.37 ug/L	0.50U ug/L
	Styrene	0.21 ug/L	0.50U ug/L
	Isopropylbenzene (12.51)	0.26 ug/L	0.26U ug/L
	1,3,5-Trimethylbenzene (12.99)	0.15 ug/L	0.15U ug/L
	p-Isopropyltoluene (13.54)	0.16 ug/L	0.16U ug/L

Sample	Analyte TIC (RT in minutes)	Reported Concentration	Modified Final Concentration
HU133	Ethylbenzene Styrene 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.077 ug/L 0.21 ug/L 0.15 ug/L 0.15 ug/L	0.077J+ ug/L 0.50U ug/L 0.15U ug/L 0.15U ug/L
HU132	Ethylbenzene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.077 ug/L 0.21 ug/L 0.20 ug/L 0.20 ug/L 0.26 ug/L 0.15 ug/L 0.16 ug/L	0.077J+ ug/L 0.50U ug/L 0.35U ug/L 0.20U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L
HU128	Ethylbenzene Naphthalene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.088 ug/L 0.41 ug/L 0.25 ug/L 0.25 ug/L 0.26 ug/L 0.16 ug/L 0.15 ug/L	0.088J+ ug/L 0.50U ug/L 0.35U ug/L 0.25U ug/L 0.26U ug/L 0.16U ug/L 0.15U ug/L
HU127	Ethylbenzene Naphthalene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.078 ug/L 0.36 ug/L 0.21 ug/L 0.20 ug/L 0.20 ug/L 0.26 ug/L 0.15 ug/L 0.16 ug/L	0.078J+ ug/L 0.50U ug/L 0.50U ug/L 0.35U ug/L 0.20U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L

VI. Field Blanks

Samples HU140, HU132, and HU127 were identified as trip blanks. No contaminants were found with the following exceptions:

Blank ID	Collection Date	Analyte	Concentration	Associated Samples
HU140	06/21/22	Ethylbenzene Naphthalene Styrene	0.079 ug/L 0.37 ug/L 0.21 ug/L	HU141
HU132	06/21/22	Ethylbenzene Styrene Xylenes, total	0.077 ug/L 0.21 ug/L 0.20 ug/L	HU133
HU127	06/21/22	Ethylbenzene Naphthalene Styrene Xylenes, total	0.078 ug/L 0.36 ug/L 0.21 ug/L 0.20 ug/L	HU128

Sample concentrations were compared to concentrations detected in the field blanks. The sample concentrations were either not detected or were significantly greater (>10X for common contaminants, >5X for other contaminants) than the concentrations found in the associated field blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
HU141	Ethylbenzene Styrene	0.078 ug/L 0.21 ug/L	0.078J+ ug/L 0.50U ug/L
HU133	Ethylbenzene Styrene	0.077 ug/L 0.21 ug/L	0.077J+ ug/L 0.50U ug/L
HU128	Ethylbenzene Naphthalene Xylenes, total	0.088 ug/L 0.41 ug/L 025 ug/L	0.088J+ ug/L 0.50U ug/L 0.35U ug/L

VII. Surrogates

Surrogates were added to all samples as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte and Tentatively Identified Compounds Quantitation

All target analyte quantitations met validation criteria.

All tentatively identified compound (TICs) quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
All samples in SDG 580-115161-1	All laboratory calibrated analytes reported as Tentatively Identified Compounds (TICs).	J (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to ICV %D, continuing calibration %D and ending CCV %D, and analytes reported as TICs, data were qualified as estimated in six samples.

Due to laboratory blank contamination, data were qualified as not detected or estimated in six samples.

Due to trip blank contamination, data were qualified as not detected or estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU141 HU140 HU133 HU132 HU128 HU127	Bromomethane	UJ (all non-detects)	A	Initial calibration verification (%D) (c)
HU141 HU140 HU133 HU132 HU128 HU127	Acetone Bromomethane	UJ (all non-detects) UJ (all non-detects)	A	Continuing calibration (%D) (c)
HU141 HU140 HU133 HU132 HU128 HU127	Bromomethane	UJ (all non-detects)	A	Continuing calibration (ending CCV %D) (c)
HU141 HU140 HU133 HU132 HU128 HU127	All laboratory calibrated analytes reported as Tentatively Identified Compounds (TICs).	J (all detects)	A	Target analyte quantitation (TICs) (v)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

Sample	Analyte TIC (RT in minutes)	Modified Final Concentration	A or P	Code
HU141	Ethylbenzene Styrene Xylenes, total o-Xylene (12.21) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.078J+ ug/L 0.50U ug/L 0.35U ug/L 0.20U ug/L 0.15U ug/L 0.15U ug/L	A	b
HU140	Ethylbenzene Naphthalene Styrene Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.079J+ ug/L 0.50U ug/L 0.50U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L	A	b
HU133	Ethylbenzene Styrene 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.077J+ ug/L 0.50U ug/L 0.15U ug/L 0.15U ug/L	A	b

Sample	Analyte TIC (RT in minutes)	Modified Final Concentration	A or P	Code
HU132	Ethylbenzene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.077J+ ug/L 0.50U ug/L 0.35U ug/L 0.20U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L	A	b
HU128	Ethylbenzene Naphthalene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.088J+ ug/L 0.50U ug/L 0.35U ug/L 0.25U ug/L 0.26U ug/L 0.16U ug/L 0.15U ug/L	A	b
HU127	Ethylbenzene Naphthalene Styrene Xylenes, total o-Xylene (12.21) Isopropylbenzene (12.51) 1,3,5-Trimethylbenzene (12.99) p-Isopropyltoluene (13.54)	0.078J+ ug/L 0.50U ug/L 0.50U ug/L 0.35U ug/L 0.20U ug/L 0.26U ug/L 0.15U ug/L 0.16U ug/L	A	b

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Volatiles - Field Blank Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Modified Final Concentration	A or P	Code
HU141	Ethylbenzene Styrene	0.078J+ ug/L 0.50U ug/L	A	t
HU133	Ethylbenzene Styrene	0.077J+ ug/L 0.50U ug/L	A	t
HU128	Ethylbenzene Naphthalene Xylenes, total	0.088J+ ug/L 0.50U ug/L 0.35U ug/L	A	t

LDC #: 54719E1a **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115161-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: F
2nd Reviewer: A

METHOD: GC/MS Volatiles (EPA SW-846 Method 8260D)
+ TICs

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A SW	%RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration / ending	SW	CCV ≤ 20/50
V.	Laboratory Blanks	SW	
VI.	Field blanks	SW	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	A	LCS/D
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Target analyte quantitation / TIC	SW	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1+	HU141	580-115161-1	Water	06/21/22
2+	HU140 TB	580-115161-2	Water	06/21/22
3	HU133	580-115161-3	Water	06/21/22
4	HU132 TB	580-115161-4	Water	06/21/22
5	HU128	580-115161-5	Water	06/21/22
6	HU127 TB	580-115161-6	Water	06/21/22
7				
8				
9				

Notes:

	MB 580-395002						

ICV TAC 113 in 54719D1a

TARGET COMPOUND WORKSHEET

METHOD: VOA

A. Chloromethane	AA. Tetrachloroethene	AAA. 1,3,5-Trimethylbenzene	AAAA. Ethyl tert-butyl ether	A1. 1,3-Butadiene
B. Bromomethane	BB. 1,1,2,2-Tetrachloroethane	BBB. 4-Chlorotoluene	BBBB. tert-Amyl methyl ether	B1. Hexane
C. Vinyl choride	CC. Toluene	CCC. tert-Butylbenzene	CCCC. 1-Chlorohexane	C1. Heptane
D. Chloroethane	DD. Chlorobenzene	DDD. 1,2,4-Trimethylbenzene	DDDD. Isopropyl alcohol	D1. Propylene
E. Methylene chloride	EE. Ethylbenzene	EEE. sec-Butylbenzene	EEEE. Acetonitrile	E1. Freon 11
F. Acetone	FF. Styrene	FFF. 1,3-Dichlorobenzene	FFFF. Acrolein	F1. Freon 12
G. Carbon disulfide	GG. Xylenes, total	GGG. p-Isopropyltoluene	GGGG. Acrylonitrile	G1. Freon 113
H. 1,1-Dichloroethene	HH. Vinyl acetate	HHH. 1,4-Dichlorobenzene	HHHH. 1,4-Dioxane	H1. Freon 114
I. 1,1-Dichloroethane	II. 2-Chloroethylvinyl ether	III. n-Butylbenzene	IIII. Isobutyl alcohol	I1. 2-Nitropropane
J. 1,2-Dichloroethene, total	JJ. Dichlorodifluoromethane	JJJ. 1,2-Dichlorobenzene	JJJJ. Methacrylonitrile	J1. Dimethyl disulfide
K. Chloroform	KK. Trichlorofluoromethane	KKK. 1,2,4-Trichlorobenzene	KKKK. Propionitrile	K1. 2,3-Dimethyl pentane
L. 1,2-Dichloroethane	LL. Methyl-tert-butyl ether	LLL. Hexachlorobutadiene	LLLL. Ethyl ether	L1. 2,4-Dimethyl pentane
M. 2-Butanone	MM. 1,2-Dibromo-3-chloropropane	MMM. Naphthalene	MMMM. Benzyl chloride	M1. 3,3-Dimethyl pentane
N. 1,1,1-Trichloroethane	NN. Methyl ethyl ketone	NNN. 1,2,3-Trichlorobenzene	NNNN. Iodomethane	N1. 2-Methylpentane
O. Carbon tetrachloride	OO. 2,2-Dichloropropane	OOO. 1,3,5-Trichlorobenzene	OOOO.1,1-Difluoroethane	O1. 3-Methylpentane
P. Bromodichloromethane	PP. Bromochloromethane	PPP. trans-1,2-Dichloroethene	PPPP. Tetrahydrofuran	P1. 3-Ethylpentane
Q. 1,2-Dichloropropane	QQ. 1,1-Dichloropropene	QQQ. cis-1,2-Dichloroethene	QQQQ. Methyl acetate	Q1. 2,2-Dimethylpentane
R. cis-1,3-Dichloropropene	RR. Dibromomethane	RRR. m,p-Xylenes	RRRR. Ethyl acetate	R1. 2,2,3- Trimethylbutane
S. Trichloroethene	SS. 1,3-Dichloropropane	SSS. o-Xylene	SSSS. Cyclohexane	S1. 2,2,4-Trimethylpentane
T. Dibromochloromethane	TT. 1,2-Dibromoethane	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	TTTT. Methyl cyclohexane	T1. 2-Methylhexane
U. 1,1,2-Trichloroethane	UU. 1,1,1,2-Tetrachloroethane	UUU. 1,2-Dichlorotetrafluoroethane	UUUU. Allyl chloride	U1. Nonanal
V. Benzene	VV. Isopropylbenzene	VVV. 4-Ethyltoluene	VVVV. Methyl methacrylate	V1. 2-Methylnaphthalene
W. trans-1,3-Dichloropropene	WW. Bromobenzene	WWW. Ethanol	WWWW. Ethyl methacrylate	W1. Methanol
X. Bromoform	XX. 1,2,3-Trichloropropane	XXX. Di-isopropyl ether	XXXX. cis-1,4-Dichloro-2-butene	X1. 1,2,3-Trimethylbenzene
Y. 4-Methyl-2-pentanone	YY. n-Propylbenzene	YYY. tert-Butanol	YYYY. trans-1,4-Dichloro-2-butene	Y1. 2-Propanol
Z. 2-Hexanone	ZZ. 2-Chlorotoluene	ZZZ. tert-Butyl alcohol	ZZZZ. Pentachloroethane	Z1.

LDC #: 54719E1a

VALIDATION FINDINGS WORKSHEET
Initial Calibration Verification

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y Was an initial calibration verification standard analyzed after each ICAL for each instrument?

N Were all %D within the validation criteria of ≤20 %D? (c)

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Associated Samples	Qualifications
	6/22/22	ICV	B	22.4	All	J+/UJ/A all ND

LDC #: 54719E1a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?

Y (N) N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20 %D and ≥0.05 RRF ? (c)

#	Date	Standard ID	Compound	Finding %D (Limit: <20.0%)	Finding RRF (Limit: >0.05)	Associated Samples	Qualifications
	6/26/22	CCV-TAC113	F	21.9		All	J+/UJ/A all ND
	2032		B	46.7		↓	J+/UJ/A ↓
	6/27/22	CCV-TAC113	B	105.1		↓	J+/UJ/A all ND
	0648	closing					

LDC #: 54719E1a

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
Y N N/A Was a method blank associated with every sample in this SDG?
Y N N/A Was a method blank analyzed at least once every 12 hours for each matrix and concentration?
Y N N/A Was there contamination in the method blanks? If yes, please see the qualifications below.

(b)

Blank analysis date: 6/26/22
Conc. units: ug/L
Associated Samples: All

Compound	Blank ID	Sample Identification								
	MB 580-39500	#		1	2	3	4	5	6	
KKK	0.208									
T	0.0552									
EE	0.0818			0.078 J+	0.079 J+	0.077 J+	0.077 J+	0.088 J+	0.078 J+	
LLL	0.106									
MMM	0.432				0.37/0.50U	-		0.41/0.50U	0.36/0.50U	
FF	0.211			0.21/0.50U	0.21/0.50U	0.21/0.50U	0.21/0.50U	-	0.21/0.50U	
GG	0.205			0.20/0.35U	-		0.20/0.35U	0.25/0.35U	0.20/0.35U	

Blank analysis date:
Conc. units:
Associated Samples:

Compound	Blank ID			Sample Identification						
				1	2	2	3	4	5	6
TICs SSS	0.205	(12.21)		0.20 (12.21)				0.20 (12.21)	0.25 (12.21)	0.20 (12.21)
VV	0.264	(12.51)				0.26 (12.51)		0.26 (12.51)	0.26 (12.51)	0.26 (12.51)
1,3,5-Trimethylbenzene	0.154	(12.99)		0.15 (12.99)	0.15 (12.99)	0.15 (12.99)	0.15 (12.99)	0.15 (12.99)	0.16 (12.99)	0.15 (12.99)
GGG	~~0.230~~ 0.162	(13.54)		0.15 (13.54)	0.15 (13.54)	0.16 (13.54)	0.15 (13.54)	0.16 (13.54)	0.15 (13.54)	0.16 (13.54)
1,3,5-Trichlorobenzene	~~0.115~~ 0.0175	(14.65)								
NNN	0.230	(15.53)								

All results were qualified using the criteria stated below except those circled.

Note: Common contaminants such as Methylene chloride, Acetone, 2-Butanone, Carbon disulfide and TICs that were detected in samples within ten times the associated method blank concentration were qualified as not detected, "U". Other contaminants within five times the method blank concentration were also qualified as not detected, "U".

LDC #: 54719E1a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 (17))
Y N N/A Were field blanks identified in this SDG?
Y N N/A Were target compounds detected in the field blanks?
(f)

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/21/22
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 1

Compound	Blank ID	Sample Identification								
	2		1							
EE	0.079		0.078 J+							
MMM	0.37									
FF	0.21		0.21/0.50M							

Blank units: ug/L **Associated sample units:** ug/L
Sampling date: 6/21/22
Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 3

Compound	Blank ID	Sample Identification								
	4		3							
EE	0.077		0.077 J+							
FF	0.21		0.21/0.50M							
GG	0.20									

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 54719E1a

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: FT

METHOD: GC/MS VOA (EPA SW 846 Method 8260 D)

(Y) N N/A Were field blanks identified in this SDG?

Y (N) N/A Were target compounds detected in the field blanks?

(f)

Blank units: ug/L **Associated sample units:** ug/L

Sampling date: 06/21/22

Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: TB Associated Samples: 5

Compound	Blank ID	Sample Identification								
	6		5							
EE	0.078		0.088 J+							
MMM	0.36		0.41 / 0.50 U							
FF	0.21		~~0.12 / 0.50 U~~							
GG	0.20		0.25 / 0.35 U							

Blank units: _____ **Associated sample units:** _____

Sampling date: _____

Field blank type: (circle one) Field Blank / Rinsate / Trip Blank / Other: _____ Associated Samples: _____

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Common contaminants such as Methylene chloride, Acetone, 2-Butanone and Carbon disulfide that were detected in samples within ten times the associated field blank concentration were qualified as not detected, "U". Other contaminants within five times the field blank concentration were also qualified as not detected, "U".

LDC #: 54719EQ

VALIDATION FINDINGS WORKSHEET
Target Analyte and TIC

Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260D)

#	Date	Sample ID	Analyte	Finding	Qualifications
			All laboratory calibrated analytes reported as		Jdets/A (v)
			tentatively identified compounds (TIC)		

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Semivolatiles

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU128	580-115161-5	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Semivolatile Organic Compounds (SVOCs) and Tentatively Identified Compounds (TICs) by Environmental Protection Agency (EPA) SW 846 Method 8270E

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A decafluorotriphenylphosphine (DFTPP) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, the percent relative standard deviations (%RSD) were less than or equal to 20.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes with the following exceptions:

Date	Analyte	%D	Associated Samples	Flag	A or P
06/30/22	2,4-Dinitrophenol	72.3	All samples in SDG 580-115161-1	UJ (all non-detects)	A

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte and Tentatively Identified Compounds Quantitation

All tentatively identified compound quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
HU128	All laboratory calibrated analytes reported as tentatively identified compounds (TIC).	J (all detects)	A
All samples in SDG 580-115161-1	All tentatively identified compounds (TIC).	NJ (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to continuing calibration %D, data were qualified as estimated in three samples.

Due to TICs, data were qualified as presumptive and estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU141 HU133 HU128	2,4-Dinitrophenol	UJ (all non-detects)	A	Continuing calibration (%D) (c)
HU128	All laboratory calibrated analytes reported as tentatively identified compounds (TIC).	J (all detects)	A	Target analyte quantitation (TICs) (v)
HU141 HU133 HU128	All tentatively identified compounds (TIC).	NJ (all detects)	A	Target analyte quantitation (TICs) (v)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Semivolatiles - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E2a

SDG #: 580-115161-1

Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

Date: 8/19/22

Page: 1 of 1

Reviewer: FT

2nd Reviewer: AC

METHOD: GC/MS Semivolatiles (EPA SW-846 Method 8270E) + TICs

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A / A	%RSD ≤ 20, r² ICV ≥ 20
IV.	Continuing calibration	SW	CCV ≤ 20/20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	SW	
VIII.	Matrix spike/Matrix spike duplicates	N	client
IX.	Laboratory control samples	SW	
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Target analyte quantitation / TIC	SW N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU133	580-115161-3	Water	06/21/22
3	HU128	580-115161-5	Water	06/21/22
4				
5				
6				
7				
8				
9				

Notes:

	MB 580-395166						

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS SVOA

A. Phenol	CC. Dimethylphthalate	EEE. Bis(2-ethylhexyl)phthalate	GGGG. C30-Hopane	I1. Methyl methanesulfonate
B. Bis (2-chloroethyl) ether	DD. Acenaphthylene	FFF. Di-n-octylphthalate	HHHH. 1-Methylphenanthrene	J1. Ethyl methanesulfonate
C. 2-Chlorophenol	EE. 2,6-Dinitrotoluene	GGG. Benzo(b)fluoranthene	IIII. 1,4-Dioxane	K1. o,o',o''-Triethylphosphorothioate
D. 1,3-Dichlorobenzene	FF. 3-Nitroaniline	HHH. Benzo(k)fluoranthene	JJJJ. Acetophenone	L1. n-Phenylene diamine
E. 1,4-Dichlorobenzene	GG. Acenaphthene	III. Benzo(a)pyrene	KKKK. Atrazine	M1. 1,4-Naphthoquinone
F. 1,2-Dichlorobenzene	HH. 2,4-Dinitrophenol	JJJ. Indeno(1,2,3-cd)pyrene	LLLL. Benzaldehyde	N1. N-Nitro-o-toluidine
G. 2-Methylphenol	II. 4-Nitrophenol	KKK. Dibenz(a,h)anthracene	MMMM. Caprolactam	O1. 1,3,5-Trinitrobenzene
H. 2,2'-Oxybis(1-chloropropane)	JJ. Dibenzofuran	LLL. Benzo(g,h,i)perylene	NNNN. 2,6-Dichlorophenol	P1. Pentachlorobenzene
I. 4-Methylphenol	KK. 2,4-Dinitrotoluene	MMM. Bis(2-Chloroisopropyl)ether	OOOO. 1,2-Diphenylhydrazine	Q1. 4-Aminobiphenyl
J. N-Nitroso-di-n-propylamine	LL. Diethylphthalate	NNN. Aniline	PPPP. 3-Methylphenol	R1. 2-Naphthylamine
K. Hexachloroethane	MM. 4-Chlorophenyl-phenyl ether	OOO. N-Nitrosodimethylamine	QQQQ. 3&4-Methylphenol	S1. Triphenylene
L. Nitrobenzene	NN. Fluorene	PPP. Benzoic Acid	RRRR. 4-Dimethyldibenzothiophene (4MDT)	T1. Octachlorostyrene
M. Isophorone	OO. 4-Nitroaniline	QQQ. Benzyl alcohol	SSSS. 2/3-Dimethyldibenzothiophene (4MDT)	U1. Famphur
N. 2-Nitrophenol	PP. 4,6-Dinitro-2-methylphenol	RRR. Pyridine	TTTT. 1-Methyldibenzothiophene (1MDT)	V1. 1,4-phenylenediamine
O. 2,4-Dimethylphenol	QQ. N-Nitrosodiphenylamine	SSS. Benzidine	UUUU.. 2,3,4,6-Tetrachlorophenol	W1. Methapyrilene
P. Bis(2-chloroethoxy)methane	RR. 4-Bromophenyl-phenylether	TTT. 1-Methylnaphthalene	VVVV. 1,2,4,5-Tetrachlorobenzene	X1. Pentachloroethane
Q. 2,4-Dichlorophenol	SS. Hexachlorobenzene	UUU.Benzo(b)thiophene	WWWW.. 2-Picoline	Y1. 3,3'-Dimethylbenzidine
R. 1,2,4-Trichlorobenzene	TT. Pentachlorophenol	VVV.Benzonaphthothiophene	XXXX. 3-Methylcholanthrene	Z1. o-Toluidine
S. Naphthalene	UU. Phenanthrene	WWW.Benzo(e)pyrene	YYYY. a,a-Dimethylphenethylamine	A2. 1-Naphthylamine
T. 4-Chloroaniline	VV. Anthracene	XXX. 2,6-Dimethylnaphthalene	ZZZZ. Hexachloropropene	B2. 4-Aminobiphenyl
U. Hexachlorobutadiene	WW. Carbazole	YYY. 2,3,5-Trimethylnaphthalene	A1. N-Nitrosodiethylamine	C2. 4-Nitroquinoline-1-oxide
V. 4-Chloro-3-methylphenol	XX. Di-n-butylphthalate	ZZZ. Perylene	B1. N-Nitrosodi-n-butylamine	D2. Hexachloropene
W. 2-Methylnaphthalene	YY. Fluoranthene	AAAA. Dibenzothiophene	C1. N-Nitrosomethylethylamine	E2. Bis (2-chloro-1-methylethyl) ether
X. Hexachlorocyclopentadiene	ZZ. Pyrene	BBBB. Benzo(a)fluoranthene	D1. N-Nitrosomorpholine	F2. Bifenthrin
Y. 2,4,6-Trichlorophenol	AAA. Butylbenzylphthalate	CCCC. Benzo(b)fluorene	E1. N-Nitrosopyrrolidine	G2. Cyfluthrin
Z. 2,4,5-Trichlorophenol	BBB. 3,3'-Dichlorobenzidine	DDDD. cis/trans-Decalin	F1. Phenacetin	H2. Cypermethrin
AA. 2-Chloronaphthalene	CCC. Benzo(a)anthracene	EEEE. 1,1'-Biphenyl	G1. 2-Acetylaminofluorene	I2. Permethrin (cis/trans)
BB. 2-Nitroaniline	DDD. Chrysene	FFFF. Retene	H1. Pronamide	J2. 5-Nitro-o-toluidine

LDC #: 54719E2a

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a continuing calibration standard analyzed at least once every 12 hours of sample analysis for each instrument?

(Y) N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤20%D and ≥0.05 RRF ?

(c)

#	Date	Standard ID	Compound	Finding %D (Limit: ≤20.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	6/30/22 1959	ccv	HH	72.3		All	J`/UJ/A ND

CONCAL.wpd

LDC #: 54719E2a

VALIDATION FINDINGS WORKSHEET
Surrogate Recovery

Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualification below for all questions answered "N". Not applicable questions are identified as "N/A".

Y (N) N/A Were percent recoveries (%R) for surrogates within QC limits?
Y N N/A If 2 or more base neutral or acid surrogates were outside QC limits, was a reanalysis performed to confirm %R?
Y N N/A If any %R was less than 10 percent, was a reanalysis performed to confirm %R?

#	Sample ID	Surrogate	%R (Limits)	Qualifications
	2	TPH	138 (50 - 134)	no qual
	3	↓	137 (↓)	↓
	MB 580-395166	↓	138 (↓)	↓

(NBZ) = Nitrobenzene - d5
(FBP) = 2-Fluorobiphenyl
(TPH) = Terphenyl - d14
(2FP) = 2-Fluorophenol
(TBP) = 2,4,6 -Tribromophenol
(2CP) = 2-Chlorophenol - d4

LDC #: 54719E2a

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of ___
Reviewer: FT

METHOD: GC/MS BNA (EPA SW 846 Method 8270 E)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

[✓ Y] N N/A Was a LCS required?

Y [✓ N] N/A Were the LCS/LCSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
	LCS ID	C	( )	119 (38-117)	( )	All (ℓ)	J+det/P all ND
	580-395166	BBB	142 (27-129)	142 (27-129)	( )	↓	↓
		T	( )	( )	23 (20)	↓ (w)	J det/P
			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		
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			( )	( )	( )		
			( )	( )	( )		
			( )	( )	( )		

LDC #: 53719E2A

VALIDATION FINDINGS WORKSHEET
Target Analyte and TIC

Reviewer: [illegible]

METHOD: GC/MS SVOA (EPA SW 846 Method 8270E)

#	Date	Sample ID	Analyte	Finding	Qualifications
		3	All laboratory calibrated analytes reported as		Jdets/A (v)
			tentatively identified compounds (TIC)		
		All	All tentatively identified compounds (TIC)		NJdets/A (v)

LDC Report# 54719E2b

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Polynuclear Aromatic Hydrocarbons

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU128	580-115161-5	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polynuclear Aromatic Hydrocarbons (PAHs) by Environmental Protection Agency (EPA) SW 846 Method 8270E in Selected Ion Monitoring (SIM) mode

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

Instrument performance check was performed at the required frequency.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

For analytes where average relative response factors (RRFs) were utilized, percent relative standard deviations (%RSD) were less than or equal to 15.0%.

In the case where the laboratory used a calibration curve to evaluate the analytes, all coefficients of determination (r^2) were greater than or equal to 0.990.

Average relative response factors (RRF) for all analytes were within validation criteria.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 50.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Surrogates

Surrogates were added to all samples in the full scan analysis as required by the method. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polynuclear Aromatic Hydrocarbons - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E2b

SDG #: 580-115161-1

Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET

Stage 2B

Date: 8/19/22

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW-846 Method 8270E-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/D	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A/D	%RSD ≤ 15, r² ICV ≤ 20
IV.	Continuing calibration	A	CCV ≤ 20/20
V.	Laboratory Blanks	A	
VI.	Field blanks	N	
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU133	580-115161-3	Water	06/21/22
3	HU128	580-115161-5	Water	06/21/22
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Notes:

	MB 580-395166						

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Metals

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU128	580-115161-5	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 2: Data Validation Procedure for Metals by ICP-OES (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Calcium, Magnesium, Manganese, Potassium, and Sodium by Environmental Protection Agency (EPA) SW 846 Method 6010D

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Instrument Calibration

Initial and continuing calibrations were performed as required by the method.

The initial calibration verification (ICV) and continuing calibration verification (CCV) standards were within QC limits.

III. ICP Interference Check Sample Analysis

The frequency of interference check sample (ICS) analysis was met. All criteria were within QC limits.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Analyte	Maximum Concentration	Associated Samples
ICB/CCB	Sodium Potassium	0.179 ug/L 0.4 ug/L	All samples in SDG 580-115161-1

Data qualification by the laboratory blanks was based on the maximum contaminant concentration in the laboratory blanks in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Serial Dilution

Serial dilution was not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XII. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Metals - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E4b
SDG #: 580-115161-1
Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 9/28/22
Page: 1 of 1
Reviewer: ATV
2nd Reviewer: [illegible]

METHOD: Metals (EPA SW-846 Method 6010D)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A / A	
II.	Instrument Calibration	A	
III.	ICP Interference Check Sample (ICS) Analysis	A	
IV.	Laboratory Blanks	SW	
V.	Field Blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	N	C,S
VII.	Duplicate sample analysis	N	
VIII.	Serial Dilution	N	
IX.	Laboratory control samples	A	LCS/LCSD
X.	Field Duplicates	N	
XI.	Target Analyte Quantitation	N	
XII.	Overall Assessment of Data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU133	580-115161-3	Water	06/21/22
3	HU128	580-115161-5	Water	06/21/22
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Notes:

LDC #: 54719E4b

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: ATL

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1,2,3	W	Al, Sb, As, Ba, Be, Cd, [✓ Ca], Cr, Co, Cu, Fe, Pb, [✓ Mg], [✓ Mn], Hg, Ni, [✓ K], Se, Ag, [✓ Na], Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___

Analysis Method

ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Sn, Ti, ___ ___

Comments: Mercury by CVAA if performed

LDC #: 54719E4b

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

METHOD: Trace metals (EPA SW 864 Method 6010B/6020/7000) Soil preparation factor applied: NA
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: all

Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (mg/L)	Maximum ICB/CCB[a] (mg/L)	Action Level									
Na			0.179	895									
K			0.4	2000									

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU128	580-115161-5	Water	06/21/22
HU141MS	580-115161-1MS	Water	06/21/22
HU141DUP	580-115161-1DUP	Water	06/21/22
HU133MS	580-115161-3MS	Water	06/21/22
HU133MSD	580-115161-3MSD	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Alkalinity by Standard Method 2320B
Dissolved Organic Carbon by Environmental Protection Agency (EPA) SW 846 Method 9060A
Nitrate/Nitrite as Nitrogen by EPA Method 353.2
Total Organic Carbon by EPA SW 846 Method 9060A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published methods and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (methods blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Analyte	%R (Limits)	Flag	A or P
HU141MS (HU141)	Nitrate/Nitrite as N	87 (90-110)	J- (all detects)	A

Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

Duplicate (DUP) sample analysis was performed on an associated project sample. Results were within QC limits.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected or recommended for exclusion in this SDG.

Due to MS/MSD %R, data were qualified as estimated in one sample.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Flag	A or P	Reason
HU141	Nitrate/Nitrite as N	J- (all detects)	A	Matrix spike/Matrix spike duplicate (%R) (q)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E6
SDG #: 580-115161-1
Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 9/28/22
Page: 1 of 1
Reviewer: ATL
2nd Reviewer: M

METHOD: (Analyte) Alkalinity (SM2320B), DOC (EPA SW-846 Method 9060A), Nitrate/Nitrite-N (EPA Method 353.2), TOC (EPA SW-846 Method 9060A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	SW	4, (6,7)
VII.	Duplicate sample analysis	A	5
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU133	580-115161-3	Water	06/21/22
3	HU128	580-115161-5	Water	06/21/22
4	HU141MS	580-115161-1MS	Water	06/21/22
5	HU141DUP	580-115161-1DUP	Water	06/21/22
6	HU133MS	580-115161-3MS	Water	06/21/22
7	HU133MSD	580-115161-3MSD	Water	06/21/22
8				
9				
10				
11				
12				
13				
14				

Notes: Lab provide ICAL on a wrong date for TOC
TOC ICAL run on instrument WC_SHIS 03/14/22 was reviewed from SDG # 580-115203-1.

LDC #: 54719E6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: ATL

All circled methods are applicable to each sample.

Sample ID	Parameter
1,2,3	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 [✓ Alk] CN NH_3 TKN [✓ TOC] Cr6+ ClO_4 [✓ NO_3/NO_2-N] [✓ DOC]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
4,5	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ NO_3/NO_2-N]
6,7	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN [✓ TOC] Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

LDC #: 54719E6

VALIDATION FINDINGS WORKSHEET
Matrix Spike Analysis

METHOD: Inorganics, Method See cover

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a matrix spike analyzed for each matrix in this SDG?

Y (N) N/A Were matrix spike percent recoveries (%R) within the control limits of ~~75-125~~ lab limits (85-115% for Method 300.0)? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.

LEVEL IV ONLY:

Y N (N/A) Were recalculated results acceptable? See Level IV Recalculation Worksheet for recalculations.

#	Date	Matrix Spike ID	Matrix	Analyte	%R	Associated Samples	Qualifications
		4	W	NO3/NO2-N	87 (90-110)	1	J-/UJ/A (detect) Code: q

Comments: _____

LDC Report# 54719E7

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Gasoline Range Organics

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU140	580-115161-2	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU132	580-115161-4	Water	06/21/22
HU128	580-115161-5	Water	06/21/22
HU127	580-115161-6	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 1: Data Validation Procedure for Organic Analysis by GC/MS (May 2020). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following methods:

Gasoline Range Organics by Environmental Protection Agency (EPA) SW 846 Method 8260 and CADOHS LUFT Method

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. GC/MS Instrument Performance Check

A bromofluorobenzene (BFB) tune was performed at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the methods.

A curve fit, based on the initial calibration, was established for quantitation. The coefficient of determination (r^2) was greater than or equal to 0.990.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

The percent differences (%D) were less than or equal to 20.0% for all analytes.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0% for all analytes.

All of the continuing calibration relative response factors (RRF) were within validation criteria.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the methods. No contaminants were found in the laboratory blanks.

VI. Field Blanks

Samples HU140, HU132, and HU127 were identified as trip blanks. No contaminants were found.

VII. Surrogates

Surrogates were added to all samples as required by the methods. All surrogate recoveries (%R) were within QC limits.

VIII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

IX. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the methods. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

X. Field Duplicates

No field duplicates were identified in this SDG.

XI. Internal Standards

All internal standard areas and retention times were within QC limits.

XII. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XIII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIV. System Performance

Raw data were not reviewed for Stage 2B validation.

XV. Overall Assessment of Data

The analysis was conducted within all specifications of the methods. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Gasoline Range Organics - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E7 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115161-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: EJ
2nd Reviewer: AC

METHOD: GC/MS Gasoline Range Organics (EPA SW-846 Method 8260/CADOHS LUFT Method)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A /A	
II.	GC/MS Instrument performance check	A	
III.	Initial calibration/ICV	A /A	r² ICV ≤ 20
IV.	Continuing calibration pending	A	CCV ≤ 20/20
V.	Laboratory Blanks	A	
VI.	Field blanks	ND	TB = 2, 4, 6
VII.	Surrogate spikes	A	
VIII.	Matrix spike/Matrix spike duplicates	N	
IX.	Laboratory control samples	A	LCS ID
X.	Field duplicates	N	
XI.	Internal standards	A	
XII.	Target analyte quantitation	N	
XIII.	Target analyte identification	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU140 TB	580-115161-2	Water	06/21/22
3	HU133	580-115161-3	Water	06/21/22
4	HU132 TB	580-115161-4	Water	06/21/22
5	HU128	580-115161-5	Water	06/21/22
6	HU127 TB	580-115161-6	Water	06/21/22
7				
8				
9				

Notes:

	MB 580-395957						

LDC Report# 54719E21

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: October 12, 2022

Parameters: Polychlorinated Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU128	580-115161-5	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Polychlorinated Dioxins/Dibenzofurans by Environmental Protection Agency (EPA) SW 846 Method 8290A

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required frequency.

Retention time windows were established for all homologues. The chromatographic resolution between 2,3,7,8-TCDD and peaks representing any other unlabeled TCDD isomer was resolved with a valley of less than or equal to 25%.

The static resolving power was at least 10,000 (10% valley definition).

III. Initial Calibration and Initial Calibration Verification

A five point initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0% for all analytes and labeled compounds.

The ion abundance ratios for all PCDDs/PCDFs were within method and validation criteria.

The minimum S/N ratio was greater than or equal to 2.5 for each analyte and greater than or equal to 10 for each labeled compound associated to samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0% for all analytes and less than or equal to 30.0% for labeled compounds.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 20.0% for all analytes and less than or equal to 30.0% for labeled compounds.

The ion abundance ratios for all PCDDs and PCDFs were within method and validation criteria.

The minimum S/N ratio was greater than or equal to 10 for each analyte and labeled compound associated to samples which underwent Stage 4 validation. Raw data were not reviewed for Stage 2B validation.

V. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks with the following exceptions:

Blank ID	Extraction Date	Analyte	Concentration	Associated Samples
MB 410-270726	06/29/22	1,2,3,4,6,7,8-HpCDD	0.00000319 ug/L	All samples in SDG 580-115161-1
		1,2,3,4,6,7,8-HpCDF	0.000000668 ug/L	
		1,2,3,4,7,8-HxCDD	0.000000537 ug/L	
		1,2,3,4,7,8-HxCDF	0.000000587 ug/L	
		1,2,3,4,7,8,9-HpCDF	0.000000371 ug/L	
		1,2,3,6,7,8-HxCDD	0.000000571 ug/L	
		1,2,3,6,7,8-HxCDF	0.000000578 ug/L	
		1,2,3,7,8-PeCDD	0.000000319 ug/L	
		1,2,3,7,8-PeCDF	0.000000565 ug/L	
		1,2,3,7,8,9-HxCDD	0.000000478 ug/L	
		2,3,4,6,7,8-HxCDF	0.00000066 ug/L	
		2,3,4,7,8-PeCDF	0.000000453 ug/L	
		2,3,7,8-TCDD	0.0000000746 ug/L	
		2,3,7,8-TCDF	0.000000187 ug/L	
		OCDD	0.0000206 ug/L	
		OCDF	0.00000223 ug/L	
		Total HxCDD	0.0000159 ug/L	
		Total HxCDF	0.00000183 ug/L	
		Total HpCDD	0.00000319 ug/L	
		Total HpCDF	0.00000104 ug/L	
		Total PeCDD	0.000000319 ug/L	
		Total PeCDF	0.00000102 ug/L	
		Total TCDD	0.0000000746 ug/L	
		Total TCDF	0.000000187 ug/L	
		Total PCDD/PCDF	0.0000321 ug/L	
		Total PCDD	0.0000258 ug/L	
		Total PCDF	0.00000631 ug/L	

Sample concentrations were compared to concentrations detected in the laboratory blanks. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated laboratory blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
HU141	1,2,3,4,6,7,8-HpCDD	0.0000012 ug/L	0.0000012U ug/L
	1,2,3,4,6,7,8-HpCDF	0.0000013 ug/L	0.0000013U ug/L
	1,2,3,4,7,8-HxCDD	0.00000081 ug/L	0.00000081U ug/L
	1,2,3,4,7,8-HxCDF	0.0000011 ug/L	0.0000011U ug/L
	1,2,3,4,7,8,9-HpCDF	0.0000050 ug/L	0.0000050U ug/L
	1,2,3,6,7,8-HxCDD	0.0000012 ug/L	0.0000012U ug/L
	1,2,3,6,7,8-HxCDF	0.00000037 ug/L	0.00000037U ug/L
	1,2,3,7,8-PeCDD	0.0000010 ug/L	0.0000010U ug/L
	1,2,3,7,8,9-HxCDD	0.00000095 ug/L	0.00000095U ug/L
	2,3,4,6,7,8-HxCDF	0.0000014 ug/L	0.0000014U ug/L
	OCDD	0.000020 ug/L	0.000020U ug/L
	OCDF	0.0000033 ug/L	0.0000033U ug/L
	Total HxCDD	0.0000030 ug/L	0.0000030J ug/L
	Total HxCDF	0.0000033 ug/L	0.0000033J ug/L
	Total HpCDD	0.0000012 ug/L	0.0000012J ug/L
	Total HpCDF	0.0000018 ug/L	0.0000018J ug/L
	Total PeCDD	0.000010 ug/L	0.000010J ug/L
	Total PCDD/PCDF	0.000033 ug/L	0.000033J ug/L
	Total PCDD	0.000025 ug/L	0.000025J ug/L
	Total PCDF	0.0000084 ug/L	0.0000084J ug/L
HU133	1,2,3,4,6,7,8-HpCDD	0.0000014 ug/L	0.0000014U ug/L
	1,2,3,4,6,7,8-HpCDF	0.0000012 ug/L	0.0000012U ug/L
	1,2,3,4,7,8-HxCDD	0.00000079 ug/L	0.00000079U ug/L
	1,2,3,4,7,8-HxCDF	0.00000089 ug/L	0.00000089U ug/L
	1,2,3,4,7,8,9-HpCDF	0.00000082 ug/L	0.00000082U ug/L
	1,2,3,6,7,8-HxCDD	0.00000070 ug/L	0.00000070U ug/L
	1,2,3,6,7,8-HxCDF	0.00000067 ug/L	0.00000067U ug/L
	1,2,3,7,8-PeCDD	0.00000059 ug/L	0.00000059U ug/L
	1,2,3,7,8-PeCDF	0.00000048 ug/L	0.00000048U ug/L
	1,2,3,7,8,9-HxCDD	0.00000062 ug/L	0.00000062U ug/L
	2,3,4,6,7,8-HxCDF	0.00000040 ug/L	0.00000040U ug/L
	2,3,4,7,8-PeCDF	0.00000060 ug/L	0.00000060U ug/L
	OCDD	0.000016 ug/L	0.000016U ug/L
	OCDF	0.0000024 ug/L	0.0000024U ug/L
	Total HxCDD	0.00000210 ug/L	0.00000210J ug/L
	Total HxCDF	0.0000027 ug/L	0.0000027J ug/L
	Total HpCDD	0.0000014 ug/L	0.0000014J ug/L
	Total HpCDF	0.00000020 ug/L	0.00000020J ug/L
	Total PeCDD	0.00000059 ug/L	0.00000059J ug/L
	Total PeCDF	0.0000011 ug/L	0.0000011J ug/L
	Total PCDD/PCDF	0.000028 ug/L	0.000028J ug/L
	Total PCDD	0.000020 ug/L	0.000020J ug/L
	Total PCDF	0.0000082 ug/L	0.0000082J ug/L
HU128	1,2,3,4,6,7,8-HpCDD	0.0000029 ug/L	0.0000029U ug/L
	1,2,3,4,6,7,8-HpCDF	0.00000065 ug/L	0.00000065U ug/L
	1,2,3,4,7,8-HxCDD	0.00000022 ug/L	0.00000022U ug/L
	1,2,3,4,7,8-HxCDF	0.00000046 ug/L	0.00000046U ug/L
	1,2,3,4,7,8,9-HpCDF	0.00000058 ug/L	0.00000058U ug/L
	1,2,3,6,7,8-HxCDD	0.00000062 ug/L	0.00000062U ug/L
	1,2,3,6,7,8-HxCDF	0.00000023 ug/L	0.00000023U ug/L
	1,2,3,7,8-PeCDF	0.00000039 ug/L	0.00000039U ug/L
	1,2,3,7,8,9-HxCDD	0.00000023 ug/L	0.00000023U ug/L
	2,3,4,6,7,8-HxCDF	0.00000057 ug/L	0.00000057U ug/L
	2,3,4,7,8-PeCDF	0.00000067 ug/L	0.00000067U ug/L
	OCDD	0.000021 ug/L	0.000021U ug/L
	OCDF	0.0000028 ug/L	0.0000028U ug/L
	Total HxCDD	0.0000011 ug/L	0.0000011J ug/L
	Total HxCDF	0.0000013 ug/L	0.0000013J ug/L
	Total HpCDD	0.0000029 ug/L	0.0000029J ug/L
	Total HpCDF	0.0000012 ug/L	0.0000012J ug/L
	Total PeCDF	0.0000011 ug/L	0.0000011J ug/L
	Total PCDD/PCDF	0.000031 ug/L	0.000031J ug/L
	Total PCDD	0.000025 ug/L	0.000025J ug/L
	Total PCDF	0.0000064 ug/L	0.0000064J ug/L

VI. Field Blanks

No field blanks were identified in this SDG.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Labeled Compounds

All percent recoveries (%R) for labeled compounds used to quantitate target analytes were within QC limits.

XI. Target Analyte Quantitation

All target analyte quantitations met validation criteria with the following exceptions:

Sample	Analyte	Flag	A or P
All samples in SDG 580-115161-1	Results flagged "I" by the laboratory as estimated maximum possible concentration (EMPC).	J (all detects)	A

Raw data were not reviewed for Stage 2B validation.

XII. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XIII. System Performance

Raw data were not reviewed for Stage 2B validation.

XIV. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Due to results reported by the laboratory as EMPC, data were qualified as estimated in three samples.

Due to laboratory blank contamination, data were qualified as not detected or estimated in three samples.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Flag	A or P	Reason (Code)
HU141 HU133 HU128	Results flagged "I" by the laboratory as estimated maximum possible concentration (EMPC).	J (all detects)	A	Target analyte quantitation (EMPC) (k)

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

Sample	Analyte	Modified Final Concentration	A or P	Code
HU141	1,2,3,4,6,7,8-HpCDD	0.0000012U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.0000013U ug/L		
	1,2,3,4,7,8-HxCDD	0.00000081U ug/L		
	1,2,3,4,7,8-HxCDF	0.0000011U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.0000050U ug/L		
	1,2,3,6,7,8-HxCDD	0.0000012U ug/L		
	1,2,3,6,7,8-HxCDF	0.00000037U ug/L		
	1,2,3,7,8-PeCDD	0.0000010U ug/L		
	1,2,3,7,8,9-HxCDD	0.00000095U ug/L		
	2,3,4,6,7,8-HxCDF	0.0000014U ug/L		
	OCDD	0.000020U ug/L		
	OCDF	0.0000033U ug/L		
	Total HxCDD	0.0000030J ug/L		
	Total HxCDF	0.0000033J ug/L		
	Total HpCDD	0.0000012J ug/L		
	Total HpCDF	0.0000018J ug/L		
	Total PeCDD	0.000010J ug/L		
	Total PCDD/PCDF	0.000033J ug/L		
	Total PCDD	0.000025J ug/L		
	Total PCDF	0.0000084J ug/L		
HU133	1,2,3,4,6,7,8-HpCDD	0.0000014U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.0000012U ug/L		
	1,2,3,4,7,8-HxCDD	0.00000079U ug/L		
	1,2,3,4,7,8-HxCDF	0.00000089U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.00000082U ug/L		
	1,2,3,6,7,8-HxCDD	0.00000070U ug/L		
	1,2,3,6,7,8-HxCDF	0.00000067U ug/L		
	1,2,3,7,8-PeCDD	0.00000059U ug/L		
	1,2,3,7,8-PeCDF	0.00000048U ug/L		
	1,2,3,7,8,9-HxCDD	0.00000062U ug/L		
	2,3,4,6,7,8-HxCDF	0.00000040U ug/L		
	2,3,4,7,8-PeCDF	0.00000060U ug/L		
	OCDD	0.000016U ug/L		
	OCDF	0.0000024U ug/L		
	Total HxCDD	0.00000210J ug/L		
	Total HxCDF	0.0000027J ug/L		
	Total HpCDD	0.0000014J ug/L		
	Total HpCDF	0.00000020J ug/L		
	Total PeCDD	0.00000059J ug/L		
	Total PeCDF	0.0000011J ug/L		
	Total PCDD/PCDF	0.000028J ug/L		
	Total PCDD	0.000020J ug/L		
	Total PCDF	0.0000082J ug/L		

Sample	Analyte	Modified Final Concentration	A or P	Code
HU128	1,2,3,4,6,7,8-HpCDD	0.0000029U ug/L	A	b
	1,2,3,4,6,7,8-HpCDF	0.00000065U ug/L		
	1,2,3,4,7,8-HxCDD	0.00000022U ug/L		
	1,2,3,4,7,8-HxCDF	0.00000046U ug/L		
	1,2,3,4,7,8,9-HpCDF	0.00000058U ug/L		
	1,2,3,6,7,8-HxCDD	0.00000062U ug/L		
	1,2,3,6,7,8-HxCDF	0.00000023U ug/L		
	1,2,3,7,8-PeCDF	0.00000039U ug/L		
	1,2,3,7,8,9-HxCDD	0.00000023U ug/L		
	2,3,4,6,7,8-HxCDF	0.00000057U ug/L		
	2,3,4,7,8-PeCDF	0.00000067U ug/L		
	OCDD	0.000021U ug/L		
	OCDF	0.0000028U ug/L		
	Total HxCDD	0.0000011J ug/L		
	Total HxCDF	0.0000013J ug/L		
	Total HpCDD	0.0000029J ug/L		
	Total HpCDF	0.0000012J ug/L		
	Total PeCDF	0.0000011J ug/L		
	Total PCDD/PCDF	0.000031J ug/L		
	Total PCDD	0.000025J ug/L		
	Total PCDF	0.0000064J ug/L		

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Polychlorinated Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E21 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22
SDG #: 580-115161-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Polychlorinated Dioxins/Dibenzofurans (EPA SW-846 Method 8290A)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration/ICV	A/A	%D RSD ≤20 ICV ≤ 20/30
IV.	Continuing calibration	A	CCV ≤20/30
V.	Laboratory Blanks	SW	
VI.	Field blanks	N	
VII.	Matrix spike/Matrix spike duplicates	N	CS
VIII.	Laboratory control samples	A	LCS ID
IX.	Field duplicates	N	
X.	Labeled Compounds	A	
XI.	Target analyte quantitation	SW	
XII.	Target analyte identification	N	
XIII.	System performance	N	
XIV.	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU133	580-115161-3	Water	06/21/22
3	HU128	580-115161-5	Water	06/21/22
4				
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9				
10				

Notes:

	MB 410-270726						

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)

A. 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	S. Total PeCDD	X. Total HxCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	Y. Total HpCDF

Notes:_____

LDC #: 54719E21

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: FT

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290A)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y Were all samples associated with a method blank?
Y Was a method blank performed for each matrix and whenever a sample extraction was performed? (b)
Y Was the method blank contaminated?

Blank extraction date: 6/29/22 **Blank analysis date:** 6/29/22 **Associated samples:** All
Conc. units: ug/L

Compound	Blank ID	Sample Identification								
	MB 410 -270726	5x	1	2	3					
F	0.00000319	0.000015950	0.0000012U	0.0000014U	0.0000029U					
O	0.000000668	0.000003340	0.0000013U	0.0000012U	0.00000065U					
C	0.000000537	0.000002685	0.00000081U	0.00000079U	0.00000022U					
K	0.000000587	0.000002935	0.0000011U	0.00000089U	0.00000046U					
P	0.000000371	0.000001855	0.00000050U	0.00000082U	0.00000058U					
D	0.000000571	0.000002855	0.0000012U	0.00000070U	0.00000062U					
L	0.000000578	0.000002890	0.00000037U	0.00000067U	0.00000023U					
B	0.000000319	0.000001595	0.0000010U	0.00000059U	-					
I	0.000000565	0.000002825	-	0.00000048U	0.00000039U					
E	0.000000478	0.000002390	0.00000095U	0.00000062U	0.00000023U					
M	0.00000066	0.000003300	0.0000014U	0.00000040U	0.00000057U					
J	0.000000453	0.000002265	-	0.00000060U	0.00000067U					
A	0.0000000746	0.000000373	-	-	-					
H	0.000000187	0.000000935	--	-	-					
G	0.0000206	0.000103000	0.000020U	0.000016U	0.000021U					
Q	0.00000223	0.000011150	0.0000033U	0.0000024U	0.0000028U					
T	0.00000159	0.000007950	0.0000030J	0.00000210J	0.0000011J					
X	0.00000183	0.000009150	0.0000033J	0.0000027J	0.0000013J					
U	0.00000319	0.000015950	0.0000012J	0.0000014J	0.0000029J					
Y	0.00000104	0.000005200	0.0000018J	0.0000020J	0.0000012J					

S	0.000000319	0.000001595	0.0000010J	0.00000059J	0					
W	0.00000102	0.000005100	-	0.0000011J	0.0000011J					
R	0.0000000746	0.000000373	-	-	-					
V	0.000000187	0.000000935	-	-	-					
Total PCDD/PCDF	0.0000321	0.000160500	0.000033J	0.000028J	0.000031J					
Total PCDD	0.0000258	0.000129000	0.000025J	0.000020J	0.000025J					
Total PCDF	0.00000631	0.000031550	0.0000084J	0.0000082J	0.0000064J					

CIRCLED 0.00000079RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within0.00000089 five times the method blank concentration were qualified as not detected, "U".

LDC # 54719E21

54719E21 MB 410-27026 AECOM Red Hill Oily

LDC #: 54719E2)

VALIDATION FINDINGS WORKSHEET
Target Analyte Quantitation and CRQLs

METHOD: ~~1613B~~ 8290A (F7)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were the correct internal standard (IS), quantitation ion and relative response factor (RRF) used to quantitate the compound?

Y N N/A Were compound quantitation and CRQLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?

#	Sample ID	Compound	Finding	Qualifications
	All	All results qualified "I" by the laboratory as EMPC		Jdw/A (K)

Comments: See sample calculation verification worksheet for recalculations

LDC Report# 54719E51

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: August 23, 2022

Parameters: Methane

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115161-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU141	580-115161-1	Water	06/21/22
HU140	580-115161-2	Water	06/21/22
HU133	580-115161-3	Water	06/21/22
HU132	580-115161-4	Water	06/21/22
HU128	580-115161-5	Water	06/21/22
HU127	580-115161-6	Water	06/21/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), the DoD General Validation Guidelines (November 2019), and the U.S. Department of Defense (DoD) Data Validation Guidelines Module 4: Data Validation Procedure for Organic Analysis by GC (March 2021). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Methane by Method RSK-175

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published method and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (method blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition and cooler temperatures upon receipt met validation criteria.

All technical holding time requirements were met.

II. Initial Calibration and Initial Calibration Verification

An initial calibration was performed as required by the method.

The percent relative standard deviations (%RSD) were less than or equal to 20.0%.

The percent differences (%D) of the initial calibration verification (ICV) standard were less than or equal to 20.0%.

III. Continuing Calibration

Continuing calibration was performed at required frequencies.

The percent differences (%D) were less than or equal to 20.0%.

The percent differences (%D) of the ending continuing calibration verifications (CCVs) were less than or equal to 20.0%.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

Samples HU140, HU132, and HU127 were identified as trip blanks. No contaminants were found.

VI. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VIII. Field Duplicates

No field duplicates were identified in this SDG.

IX. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

X. Target Analyte Identification

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Laboratory Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Methane - Field Blank Data Qualification Summary - SDG 580-115161-1

No Sample Data Qualified in this SDG

LDC #: 54719E51 **VALIDATION COMPLETENESS WORKSHEET** Date: 8/19/22

SDG #: 580-115161-1 Stage 2B Page: 1 of 1

Laboratory: Eurofins, Tacoma, WA Reviewer: EJ

2nd Reviewer: M

METHOD: GC Methane (Method RSK-175)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A A	
II.	Initial calibration/ICV	A A	%D RSD / ICV ≤ 20
III.	Continuing calibration	A	CCV ≤ 20/20
IV.	Laboratory Blanks	A	
V.	Field blanks	NP	TB = 2, 4, 6
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	CS
VIII.	Laboratory control samples	A	LCS/D
IX.	Field duplicates	N	
X.	Target analyte quantitation	N	
XI.	Target analyte identification	N	
XII	Overall assessment of data	A	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank; SB=Source blank; OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU141	580-115161-1	Water	06/21/22
2	HU140 TB	580-115161-2	Water	06/21/22
3	HU133	580-115161-3	Water	06/21/22
4	HU132 TB	580-115161-4	Water	06/21/22
5	HU128	580-115161-5	Water	06/21/22
6	HU127 TB	580-115161-6	Water	06/21/22
7				
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11				
12				

Notes:

	MB 410-270178						

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115163-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU110	580-115163-1	Water	06/22/22
HU135	580-115163-2	Water	06/22/22
HU126	580-115163-3	Water	06/22/22
HU119	580-115163-4	Water	06/22/22
HU126MS	580-115163-3MS	Water	06/22/22
HU126MSD	580-115163-3MSD	Water	06/22/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Bromide, Chloride, Fluoride, Nitrate as Nitrogen, and Sulfate by Environmental Protection Agency (EPA) Method 300.0

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published methods and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (methods blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Data Qualification Summary - SDG 580-115163-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115163-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115163-1

No Sample Data Qualified in this SDG

LDC #: 54719F6
SDG #: 580-115163-1
Laboratory: Eurofins, Tacoma, WA

VALIDATION COMPLETENESS WORKSHEET
Stage 2B

Date: 9/27/22
Page: 1 of 1
Reviewer: AT
2nd Reviewer: [illegible]

METHOD: (Analyte) Bromide, Chloride, Fluoride, Nitrate-N, Sulfate (EPA Method 300.0),

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	(5,6)
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI	Overall assessment of data	A	

Note: A = Acceptable
N = Not provided/applicable
SW = See worksheet
ND = No compounds detected
R = Rinsate
FB = Field blank
D = Duplicate
TB = Trip blank
EB = Equipment blank
SB=Source blank
OTHER:

	Client ID	Lab ID	Matrix	Date
1	HU110	580-115163-1	Water	06/22/22
2	HU135	580-115163-2	Water	06/22/22
3	HU126	580-115163-3	Water	06/22/22
4	HU119	580-115163-4	Water	06/22/22
5	HU126MS	580-115163-3MS	Water	06/22/22
6	HU126MSD	580-115163-3MSD	Water	06/22/22
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 54719F6

VALIDATION FINDINGS WORKSHEET

Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: ATL

All circled methods are applicable to each sample.

Sample ID	Parameter
1→4	pH TDS [✓ Cl] [✓ F] [✓ $\overset{N}{NO_3}$] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
5,6	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Red Hill Oily Waste Disposal Facility, CTO 18F0176

LDC Report Date: September 30, 2022

Parameters: Wet Chemistry

Validation Level: Stage 2B

Laboratory: Eurofins, Tacoma, WA

Sample Delivery Group (SDG): 580-115197-1

Sample Identification	Laboratory Sample Identification	Matrix	Collection Date
HU137	580-115197-1	Water	06/23/22
HU139	580-115197-2	Water	06/23/22
HU137MS	580-115197-1MS	Water	06/23/22
HU137MSD	580-115197-1MSD	Water	06/23/22

Introduction

This Data Validation Report (DVR) presents data validation findings and results for the associated samples listed on the cover page. Data validation was performed in accordance with the Final Site Assessment Work Plan, Red Hill Oily Waste Disposal Facility, Pearl Harbor HI FISC Site 22, Joint Base Pearl Harbor-Hickam, Oahu, Hawaii (February 2021), the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) for Environmental Laboratories, Version 5.3 (2019), and the DoD General Validation Guidelines (November 2019). Where specific guidance was not available, the data has been evaluated in a conservative manner consistent with industry standards using professional experience.

The analyses were performed by the following method:

Bromide, Chloride, Fluoride, Nitrate as Nitrogen, and Sulfate by Environmental Protection Agency (EPA) Method 300.0

All sample results were subjected to Stage 2B data validation, which comprises an evaluation of quality control (QC) summary results.

The following are definitions of the data qualifiers utilized during data validation:

J+ (Estimated, High Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying high bias, due to non-conformances discovered during data validation.

J- (Estimated, Low Bias): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated, displaying low bias, due to non-conformances discovered during data validation.

J (Estimated, Bias Indeterminate): The analyte was analyzed for and positively identified by the laboratory; however the reported concentration is estimated due to non-conformances discovered during data validation. Bias is indeterminate.

U (Non-detected): The analyte was analyzed for and positively identified by the laboratory; however the analyte should be considered non-detected due to the presence of contaminants detected in the associated blank(s).

UJ (Non-detected estimated): The analyte was not detected and the associated numerical value is approximate.

X (Exclusion of data recommended): The sample results (including non-detects) were affected by serious deficiencies in the ability to analyze the sample and to meet published methods and project quality control criteria. The presence or absence of the analyte cannot be substantiated by the data provided. Exclusion of the data is recommended.

NA (Not Applicable): The non-conformance discovered during data validation demonstrates a high bias, while the affected analyte in the associated sample(s) was reported as not detected by the laboratory and did not warrant the qualification of the data.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Qualification Code Reference

a ICP Serial Dilution %D was not within control limits.

b Presumed contamination from preparation (methods blank).

c Calibration %RSD, r, r^2, %D or %R was noncompliant.

d The analysis with this flag should not be used because another more technically sound analysis is available.

e MS/MSD or Duplicate RPD was high.

f Presumed contamination from FB or ER.

g ICP ICS results were unsatisfactory.

h Holding times were exceeded.

i Internal standard performance was unsatisfactory.

k Estimated Maximum Possible Concentration (HRGC/HRMS only)

l LCS/LCSD %R was not within control limits.

m Result exceeded the calibration range.

o Cooler temperature or temperature blank was noncompliant and/or sample custody problems.

p RPD between two columns was high (GC only).

q MS/MSD recovery was not within control limits.

s Surrogate recovery was not within control limits.

t Presumed contamination from trip blank.

v Unusual problems found with the data not defined elsewhere. Description of the problem can be found in the validation report.

w LCS/LCSD RPD was high.

y Chemical recovery was not within control limits (Radiochemistry only).

I. Sample Receipt and Technical Holding Times

All samples were received in good condition.

All technical holding time requirements were met.

II. Initial Calibration

All criteria for the initial calibration were met.

III. Continuing Calibration

Continuing calibration frequency and analysis criteria were met.

IV. Laboratory Blanks

Laboratory blanks were analyzed as required by the method. No contaminants were found in the laboratory blanks.

V. Field Blanks

No field blanks were identified in this SDG.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) sample analysis was performed on an associated project sample. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

VII. Duplicate Sample Analysis

The laboratory has indicated that there were no duplicate (DUP) analyses specified for the samples in this SDG, and therefore duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples

Laboratory control samples (LCS) and laboratory control samples duplicates (LCSD) were analyzed as required by the method. Percent recoveries (%R) were within QC limits. Relative percent differences (RPD) were within QC limits.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Target Analyte Quantitation

Raw data were not reviewed for Stage 2B validation.

XI. Overall Assessment of Data

The analysis was conducted within all specifications of the method. No results were rejected or recommended for exclusion in this SDG.

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Data Qualification Summary - SDG 580-115197-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG 580-115197-1

No Sample Data Qualified in this SDG

Red Hill Oily Waste Disposal Facility, CTO 18F0176
Wet Chemistry - Field Blank Data Qualification Summary - SDG 580-115197-1

No Sample Data Qualified in this SDG

LDC #: 54719G6 **VALIDATION COMPLETENESS WORKSHEET** Date: 9/27/22
SDG #: 580-115197-1 Stage 2B Page: 1 of 1
Laboratory: Eurofins, Tacoma, WA Reviewer: ATV
2nd Reviewer:

METHOD: (Analyte) Bromide, Chloride, Fluoride, Nitrate-N, Sulfate (EPA Method 300.0),

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Sample receipt/Technical holding times	A/A	
II	Initial calibration	A	
III.	Calibration verification	A	
IV	Laboratory Blanks	A	
V	Field blanks	N	
VI.	Matrix Spike/Matrix Spike Duplicates	A	(3,4)
VII.	Duplicate sample analysis	N	
VIII.	Laboratory control samples	A	LCS/LCSD
IX.	Field duplicates	N	
X.	Target Analyte Quantitation	N	
XI.	Overall assessment of data	A	

Note: A = Acceptable ND = No compounds detected D = Duplicate SB=Source blank
N = Not provided/applicable R = Rinsate TB = Trip blank OTHER:
SW = See worksheet FB = Field blank EB = Equipment blank

	Client ID	Lab ID	Matrix	Date
1	HU137	580-115197-1	Water	06/23/22
2	HU139	580-115197-2	Water	06/23/22
3	HU137MS	580-115197-1MS	Water	06/23/22
4	HU137MSD	580-115197-1MSD	Water	06/23/22
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Notes:

LDC #: 54719G6

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

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Reviewer: ATL

All circled methods are applicable to each sample.

Sample ID	Parameter
1,2	pH TDS [✓ Cl] [✓ F] [✓ N NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
QC	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
3,4	pH TDS [✓ Cl] [✓ F] [✓ N NO_3] NO_2 [✓ SO_4] O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4 [✓ Br^-]
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
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	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
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	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4
	pH TDS Cl F NO_3 NO_2 SO_4 O-PO_4 Alk CN NH_3 TKN TOC Cr6+ ClO_4

Comments: