LABORATORY DATA CONSULTANTS, INC.
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Northgate Environmental Management, Inc.
1100 Quail Street Ste. 102
Newport Beach, CA 92660
ATTN: Ms. Cindy Arnold

June 2, 2010

SUBJECT: Tronox LLC Facility,2010 PCS, Henderson, Nevada,
Data Validation

Dear Ms. Arnold,

Enclosed are the final validation reports for the fraction listed below. These SDGs were received on May 5, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23125:

SDG #	Fraction
G0D090441,G0D100462, G0D100464,G0D120488, G0D140435	Dioxins/Dibenzofurans

The data validation was performed under Stage 2B/4 guidelines. The analyses were validated using the following documents, as applicable to each method:

- Standard Operating Procedures (SOP) 40, Data Review/Validation, BRC 2009
- Quality Assurance Project Plan Tronox LLC Facility, Henderson Nevada, June 2009
- NDEP Guidance, May 2006
- USEPA, Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, June 2008

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

Sincerely,

Erlinda T. Rauto
Operations Manager/Senior Chemist

Attachment 1

EDD Stage 2B/4

LDC #23125 (Tronox LLC-Northgate, Henderson NV / Tronox PCS)

LDC	SDG#	DATE REC'D	(3) DATE DUE	Dioxins (8290)																																	
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	W	S	W	S
A	G0D090441	05/05/10	05/26/10	1	4																																
A	G0D090441	05/05/10	05/26/10	0	2																																
B	G0D100462	05/05/10	05/26/10	0	4																																
B	G0D100462	05/05/10	05/26/10	0	2																																
C	G0D100464	05/05/10	05/26/10	0	1																																
D	G0D120488	05/05/10	05/26/10	1	0																																
E	G0D140435	05/05/10	05/26/10	0	2																																
E	G0D140435	05/05/10	05/26/10	0	1																																
Total	T/LR			2	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18

Shaded cells indicate Stage 4 validation (all other cells are Stage 2B validation). These sample counts do not include MS/MSD, and DUPs

Tronox PCS
Data Validation Reports
LDC# 23125

Dioxins/Dibenzofurans

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 7, 2010

LDC Report Date: May 25, 2010

Matrix: Soil/Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D090441

Sample Identification

SSAJ8-02-1BPC**
SSAJ8-02-1BPC-FD
SSAK8-01-1BPC**
SSAK8-01-1BPC-FD
SA84-5BPC
SA84-6BPC
FB-04072010-RZD
SSAJ8-02-1BPCMS
SSAJ8-02-1BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 8 soil samples and one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily 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 less than or equal to 25% .

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

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

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
4/20/10	^{13}C-1,2,3,4,7,8-HxCDF	30.5	SA84-5BPC	1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	P

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0103408MB	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.040 pg/g 0.13 pg/g 0.71 pg/g 0.033 pg/g 0.048 pg/g 0.033 pg/g 0.13 pg/g 0.068 pg/g 0.32 pg/g	SA84-5BPC SA84-6BPC
0102261MB	4/12/10	OCDD OCDF	0.67 pg/g 0.46 pg/g	SSAJ8-02-1BPC** SSAJ8-02-1BPC-FD SSAK8-01-1BPC** SSAK8-01-1BPC-FD
0103245MB	4/13/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF	2.3 pg/L 4.1 pg/L 0.90 pg/L	All water samples in SDG G0D090441

Sample concentrations were compared to concentrations detected in the method blanks as required by the QAPP. No sample data was qualified with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
FB-04072010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF	2.2 pg/L 8.3 pg/L 1.3 pg/L	2.2U pg/L 8.3U pg/L 1.3U pg/L

Sample FB-04072010-RZD was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All soil samples in SDG G0D090441

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MSD percent recoveries (%R) were not within QC limits for some compounds, the MS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAJ8-02-1BPC**	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	30 (40-135) 27 (40-135) 13 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P
SSAJ8-02-1BPC-FD	^{13}C-OCDD	31 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK8-01-1BPC**	^{13}C-OCDD	23 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAK8-01-1BPC-FD	^{13}C-OCDD	25 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SA84-6BPC	^{13}C-OCDD	38 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SA84-5BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	P
SA84-6BPC	2,3,7,8-TCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D090441	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D090441	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

Samples SSAJ8-02-1BPC** and SSAJ8-02-1BPC-FD and samples SSAK8-01-1BPC** and SSAK8-01-1BPC-FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAJ8-02-1BPC**	SSAJ8-02-1BPC-FD				
2,3,7,8-TCDD	0.51U	0.17	-	0.34 (≤0.51)	-	-
1,2,3,4,7,8-HxCDD	0.40	0.28	-	0.12 (≤2.5)	-	-
1,2,3,6,7,8-HxCDD	1.1	0.84	-	0.26 (≤2.5)	-	-
1,2,3,7,8,9-HxCDD	0.53	0.52	-	0.01 (≤2.5)	-	-
1,2,3,4,6,7,8-HpCDD	3.8	2.7	-	1.1 (≤2.5)	-	-
OCDD	12	18	-	6 (≤5.1)	J (all detects)	A
2,3,7,8-TCDF	3.5	2.3	-	1.2 (≤0.51)	J (all detects)	A
1,2,3,7,8-PeCDF	7.9	4.0	-	3.9 (≤2.5)	J (all detects)	A
2,3,4,7,8-PeCDF	4.4	2.0	-	2.4 (≤2.5)	-	-
1,2,3,4,7,8-HxCDF	15	7.8	-	7.2 (≤2.5)	J (all detects)	A

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAJ8-02-1BPC**	SSAJ8-02-1BPC-FD				
1,2,3,6,7,8-HxCDF	12	6.0	-	6 (≤2.5)	J (all detects)	A
2,3,4,6,7,8-HxCDF	3.4	1.4	-	2 (≤2.5)	-	-
1,2,3,7,8,9-HxCDF	2.2	1.1	-	1.1 (≤2.5)	-	-
1,2,3,4,6,7,8-HpCDF	51	26	65 (≤50)	-	J (all detects)	A
1,2,3,4,7,8,9-HpCDF	23	8.7	-	14.3 (≤2.5)	J (all detects)	A
OCDF	170	75	78 (≤50)	-	J (all detects)	A

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK8-01-1BPC**	SSAK8-01-1BPC-FD				
1,2,3,6,7,8-HxCDD	0.76	0.71	-	0.05 (≤3.0)	-	-
1,2,3,7,8,9-HxCDD	0.50	3.0U	-	2.5 (≤3.0)	-	-
1,2,3,4,6,7,8-HpCDD	2.0	2.2	-	0.2 (≤3.0)	-	-
OCDD	7.2	13	-	5.8 (≤5.9)	-	-
2,3,7,8-TCDF	1.9	1.8	-	0.1 (≤0.59)	-	-
1,2,3,7,8-PeCDF	3.8	3.9	-	0.1 (≤3.0)	-	-
2,3,4,7,8-PeCDF	2.0	1.9	-	0.1 (≤3.0)	-	-
1,2,3,4,7,8-HxCDF	7.8	5.0	-	2.8 (≤3.0)	-	-
1,2,3,6,7,8-HxCDF	5.3	5.5	-	0.2 (≤3.0)	-	-
2,3,4,6,7,8-HxCDF	1.7	0.90	-	0.8 (≤3.0)	-	-
1,2,3,7,8,9-HxCDF	0.81	1.1	-	0.29 (≤3.0)	-	-
1,2,3,4,6,7,8-HpCDF	21	18	15 (≤50)	-	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK8-01-1BPC**	SSAK8-01-1BPC-FD				
1,2,3,4,7,8,9-HpCDF	8.3	6.5	-	1.8 (≤3.0)	-	-
OCDF	75	44	52 (≤50)	-	J (all detects)	A

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D090441

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D090441	SA84-5BPC	1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	P	Routine calibration (%D) (c)
G0D090441	SSAJ8-02-1BPC**	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D090441	SSAJ8-02-1BPC-FD SSAK8-01-1BPC** SSAK8-01-1BPC-FD SA84-6BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D090441	SA84-5BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	P	Compound quantitation and CRQLs (e)
G0D090441	SA84-6BPC	2,3,7,8-TCDF OCDF	J (all detects) J (all detects)	P	Compound quantitation and CRQLs (e)
G0D090441	SSAJ8-02-1BPC** SSAJ8-02-1BPC-FD SSAK8-01-1BPC** SSAK8-01-1BPC-FD SA84-5BPC SA84-6BPC FB-04072010-RZD	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D090441	SSAJ8-02-1BPC** SSAJ8-02-1BPC-FD SSAK8-01-1BPC** SSAK8-01-1BPC-FD SA84-5BPC SA84-6BPC FB-04072010-RZD	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)
G0D090441	SSAJ8-02-1BPC** SSAJ8-02-1BPC-FD	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	A	Field duplicates (Difference) (fd)
G0D090441	SSAJ8-02-1BPC** SSAJ8-02-1BPC-FD	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	A	Field duplicates (RPD) (fd)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D090441	SSAK8-01-1BPC** SSAK8-01-1BPC-FD	OCDF	J (all detects)	A	Field duplicates (RPD) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D090441

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D090441	FB-04072010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF	2.2U pg/L 8.3U pg/L 1.3U pg/L	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D090441

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23125A21
SDG #: G0D090441
Laboratory: Test America

Date: 5/18/10
Page: 1 of 1
Reviewer: Q
2nd Reviewer: L

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

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.	Technical holding times	A	Sampling dates: 4/7/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	SW	
IV.	Routine calibration/ICV	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS/D
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SN	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	SW	D=1+2. 3+4
XV.	Field blanks	SW	FB = 7.

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

Validated Samples: ** level IV

1	SSAJ8-02-1BPC ** S	11		21	010226 1MB	31	
2	SSAJ8-02-1BPC-FD	12		22	010340 8MB	32	
3	SSAK8-01-1BPC **	13		23	010324 5MB	33	
4	SSAK8-01-1BPC-FD	14		24		34	
5	SA84-5BPC	15		25		35	
6	SA84-6BPC	16		26		36	
7	FB-04072010-RZD W	17		27		37	
8	SSAJ8-02-1BPCMS S	18		28		38	
9	SSAJ8-02-1BPCMSD	19		29		39	
10		20		30		40	

Notes: _____

LDC #: 23125A2/
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Page: 1 of 2
Reviewer: Q
2nd Reviewer: W

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
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?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?		✓		
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
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.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 23425A21
SDG #: 22C0Un

VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: [illegible]
2nd Reviewer: [illegible]

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?		✓		
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	✓			
X. 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?	✓			
XI. Compound quantitation/CRQLs				
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. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target compounds were detected in the field blanks.	✓			

LDC #: 23135A1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 6

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

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

Y N N/A Was a routine calibration was performed at the beginning and end of each 12 hour period?

Y N N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?

Y N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (c)
	4/20/10	19AP10ADS.40	13C-K	30.5		5	J+ dets/ND (K-N)

	PCDDs	Selected ions (m/z)	Ion Abundance Ratio		PCDFs	Selected ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89		Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78		Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43		Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59		Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51		Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20		Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02		Octa-	M+2/M+4	0.76-1.02

LDC #: 23125A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: Q
2nd Reviewer: L

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?
Y N N/A Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/13/10 **Blank analysis date:** 4/20/10
Conc. units: pg/g **Associated samples:** 5-6 (>5x)

Compound	Blank ID	Sample Identification									
	0103408MB	5X	5 (10X)	6							
E	0.040	0.2	-	-							
F	0.13	0.65	-	-							
G	0.71	3.55	-	-							
H	0.033	0.165	-	-							
K	0.048	0.24	-	-							
L	0.033	0.165	-	-							
O	0.13	0.65	-	-							
P	0.068	0.34	-	-							
Q	0.32	1.6	-	-							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

VALIDATION FINDINGS WORKSHEET

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

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 #: 23125A1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: K

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

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank analyzed for each matrix?
Y N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/12/10 **Blank analysis date:** 4/24/10
Conc. units: pg/g Associated Samples: 1-4 (bl)

Compound	Blank ID	Sample Identification								
010326MB	010326MB	1	2	3	4					
F	0.67	(12)	(18)	(T2)	(13)					
A	0.46	(ITO)	(T5)	(T5)	(44)					

Blank extraction date: 4/13/10 **Blank analysis date:** 4/24/10
Conc. units: pg/L Associated Samples: ~~not 5,6,7~~ All H2O's (bl)

Compound	Blank ID	Sample Identification								
010324SMB	010324SMB	3	7							
F	2.3		2.2/U							
G	4.1		8.3/U							
O	0.90		1.3/U							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23125A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: All Soils (>5x)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	4.1	0.0205								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: [illegible]
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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

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?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		8/9	E	( )	74 (80-143)	( )	1	No Qual
			P	( )	158 (79-139)	( )		✓
				( )	( )	( )		(MS in)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23125A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 6 of 1
Reviewer: A
2nd Reviewer: L

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".
~~Y~~ N N/A Are all internal standard recoveries were within the 40-135% criteria?
Y N N/A Was the S/N ratio all internal standard peaks > 10?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (i)
		1	G	30 (40-135)	J/UJ/A (F-G, 0-R)
			H	27 ( )	
			I	13 ( )	
				( )	
		2	J	31 ( )	(F, R)
				( )	
		3	J	23 ( )	
				( )	
		4	J	25 ( )	
				( )	
		6	J	38 ( )	
				( )	
		5(MS)	I	24 ( )	No qual
				( )	
		9(MSD)	G	35 ( )	
			H	36 ( )	
			G	29 ( )	
			F	36 ( )	
			G	20 ( )	
			H	19 ( )	
			I	11 ( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		G.	^{13}C-1,2,3,4,6,7,8-HpCDF	
B.	^{13}C-2,3,7,8-TCDD		H.	^{13}C-1,2,3,4,6,7,8-HpCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		I.	^{13}C-OCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		K.	^{13}C-1,2,3,4-TCDD	
E.	^{13}C-1,2,3,4,7,8-HxCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
F.	^{13}C-1,2,3,6,7,8-HxCDD				

LDC #: 23125A2
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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

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 (cpds > calib range)	Associated Samples	Qualifications
		5	H. O. Q	5	J dets/P (e)
		6	H. Q	6	✓
		ml	2NPC results (Q flag)	ml	J (K) (K)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23125A21 **VALIDATION FINDINGS WORKSHEET** Page: 1 of 2
SDG#: See Cover **Field Duplicates** Reviewer: 9
2nd Reviewer: V

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

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (pg/g) 1	Concentration (pg/g) 2	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
A	0.51U	0.17		0.34	(≤0.51)	
C	0.40	0.28		0.12	(≤2.5)	
D	1.1	0.84		0.26	(≤2.5)	
E	0.53	0.52		0.01	(≤2.5)	
F	3.8	2.7		1.1	(≤2.5)	
G	12	18		6	(≤5.1)	Vdets/A (fd)
H	3.5	2.3		1.2	(≤0.51)	↓
I	7.9	4.0		3.9	(≤2.5)	↓
J	4.4	2.0		2.4	(≤2.5)	
K	15	7.8		7.2	(≤2.5)	Vdets/A (fd)
L	12	6.0		6	(≤2.5)	↓
M	3.4	1.4		2	(≤2.5)	
N	2.2	1.1		1.1	(≤2.5)	
O	51	26	65			Vdets/A (fd)
P	23	8.7		14.3	(≤2.5)	↓
Q	170	75	78			↓

Compound	Concentration (pg/g) 3	Concentration (pg/g) 4	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
D	0.76	0.71		0.05	(≤3.0)	
E	0.50	3.0U		2.5	(≤3.0)	
F	2.0	2.2		0.2	(≤3.0)	
G	7.2	13		5.8	(≤5.9)	
H	1.9	1.8		0.1	(≤0.59)	
I	3.8	3.9		0.1	(≤3.0)	
J	2.0	1.9		0.1	(≤3.0)	
K	7.8	5.0		2.8	(≤3.0)	

LDC#: 23125A21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: 9
2nd Reviewer: L

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

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (pg/g) 3	Concentration (pg/g) 4	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
L	5.3	5.5		0.2	(≤3.0)	
M	1.7	0.90		0.8	(≤3.0)	
N	0.81	1.1		0.29	(≤3.0)	
O	21	18	15			
P	8.3	6.5		1.8	(≤3.0)	
Q	75	44	52			Jdata/A (fd)

V:\FIELD DUPLICATES\23125A21.wpd

LDC #: 05159A-1
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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

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 = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (Initial)	Recalculated Average RRF (Initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	1CAL (105)	1/10/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.860	0.860	0.87	0.87	10.4	10.6
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.934	0.934	0.95	0.95	12.9	12.8
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.058	1.058	1.09	1.09	11.2	11.0
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	0.998	0.998	1.05	1.05	12.2	12.2
			OCDF (^{13}C-OCDD)	1.437	1.437	1.52	1.52	14.1	14.0
2	1CAL	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.29	1.20
			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 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 #: 23125A21
SDG #: Seconds

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Reviewer: Q
2nd Reviewer: [illegible]

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

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	24APIOIDS	4/24/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.860	0.83	0.83	3.9	4.0
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	0.934	0.91	0.91	2.2	2.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.058	1.00	1.00	5.2	5.1
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	0.998	1.11	1.11	11.0	11.0
			OCDF (^{13}C-OCDD)	1.437	1.48	1.48	3.1	3.1
2	26APIOASD	4/26/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	0.99	0.99	8.7	8.6
			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 #: 23125A7
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer:
2nd Reviewer: lc

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

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: 8/9

Compound	Spike Added (PS/g)		Sample Concentration (PS/g)	Spiked Sample Concentration (PS/g)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		Reported RPD	Recalculated RPD
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	----	----
2,3,7,8-TCDD	20.1	19.8	ND	21.3	21.9	106	106	111	111	2.9	2.8
1,2,3,7,8-PeCDD	101	99.0	↓	107	113	106	106	114	114	5.7	6.3
1,2,3,4,7,8-HxCDD	↓	↓	0.40	93.1	90.6	92	92	91	91	2.7	2.7
1,2,3,4,7,8,9-HpCDF	↓	↓	23	154	180	130	130	158	158	15	16
OCDF	201	198	170	375	436	103	102	136	134	15	15

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 #: 23125A21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

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METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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 = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 010226 1

Compound	Spike Added (~~PG~~/g)		Spiked Sample Concentration (~~PG~~/g)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	20.2	NA	101	101				
1,2,3,7,8-PeCDD	100	↓	106	↓	106	106				
1,2,3,4,7,8-HxCDD	↓	↓	91.9	↓	92	92				
1,2,3,4,7,8,9-HpCDF	↓	↓	91.7	↓	92	92				
OCDF	200	↓	193	↓	97	97				

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.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 23125A21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
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2nd reviewer: h

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

(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. 1 , Q :

Conc. = $\frac{(1045220)(4000)(\quad)}{(175979)(1.43)(10.36)(0.95)}$

= 167.4 pg/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 8, 2010

LDC Report Date: May 25, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D100462

Sample Identification

SSAK2-01-1BPC
SSAK3-02-1BPC
SSAK3-03-1BPC**
SSAK3-04-1BPC**
SSAK2-01-1BPC_FD
SSAK3-04-1BPC_FD
SSAK3-03-1BPCMS
SSAK3-03-1BPCMSD

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 8 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily 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 less than or equal to 25% .

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

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

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
4/20/10	^{13}C-1,2,3,4,7,8-HxCDF	30.5	SSAK2-01-1BPC	1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	P

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0103408MB	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.040 pg/g 0.13 pg/g 0.71 pg/g 0.033 pg/g 0.048 pg/g 0.033 pg/g 0.13 pg/g 0.068 pg/g 0.32 pg/g	SSAK2-01-1BPC SSAK3-02-1BPC SSAK3-03-1BPC** SSAK3-04-1BPC**
0112236MB	4/22/10	OCDD 1,2,3,4,6,7,8-HpCDF OCDF	0.85 pg/g 0.64 pg/g 1.3 pg/g	SSAK2-01-1BPC_FD SSAK3-04-1BPC_FD

Sample concentrations were compared to concentrations detected in the method blanks as required by the QAPP. No sample data was qualified with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
SSAK2-01-1BPC	1,2,3,7,8,9-HxCDD	0.19 pg/g	0.19U pg/g
SSAK3-02-1BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.12 pg/g 0.37 pg/g 1.4 pg/g	0.12U pg/g 0.37U pg/g 1.4U pg/g
SSAK3-03-1BPC**	OCDD	1.6 pg/g	1.6U pg/g
SSAK2-01-1BPC_FD	1,2,3,4,6,7,8-HpCDF	0.90 pg/g	0.90U pg/g

Sample FB-04072010-RZD (from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D100462

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Although the MS/MSD percent recoveries (%R) were not within QC limits for some compounds, the MSD or LCS percent recoveries (%R) were within QC limits and no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK2-01-1BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	30 (40-135) 34 (40-135) 14 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK3-04-1BPC**	^{13}C-OCDD	32 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAK2-01-1BPC_FD	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	28 (40-135) 26 (40-135) 9.6 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P
SSAK3-04-1BPC_FD	^{13}C-OCDD	31 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK3-04-1BPC**	1,2,3,4,6,7,8-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P
SSAK3-04-1BPC_FD	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D100462	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D100462	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

Samples SSAK2-01-1BPC and SSAK2-01-1BPC_FD and samples SSAK3-04-1BPC** and SSAK3-04-1BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK2-01-1BPC	SSAK2-01-1BPC_FD				
2,3,7,8-TCDD	0.53U	0.081	-	0.449 (≤0.53)	-	-
1,2,3,4,7,8-HxCDD	0.081	2.5U	-	2.419 (≤2.5)	-	-
1,2,3,6,7,8-HxCDD	0.17	2.5U	-	2.33 (≤2.5)	-	-
1,2,3,7,8,9-HxCDD	0.19	2.5U	-	2.31 (≤2.5)	-	-
1,2,3,4,6,7,8-HpCDD	2	2.5U	-	0.5 (≤2.5)	-	-
OCDD	49	5.1U	-	43.9 (≤5.1)	J (all detects) UJ (all non-detects)	A
2,3,7,8-TCDF	0.18	0.2	-	0.02 (≤0.53)	-	-
1,2,3,7,8-PeCDF	0.18	0.2	-	0.02 (≤2.5)	-	-
1,2,3,4,7,8-HxCDF	0.43	2.5U	-	2.07 (≤2.5)	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK2-01-1BPC	SSAK2-01-1BPC_FD				
1,2,3,6,7,8-HxCDF	0.26	2.5U	-	2.24 (≤2.5)	-	-
2,3,4,6,7,8-HxCDF	0.2	2.5U	-	2.3 (≤2.5)	-	-
1,2,3,7,8,9-HxCDF	0.11	2.5U	-	2.39 (≤2.5)	-	-
1,2,3,4,6,7,8-HpCDF	2.4	0.9	-	1.5 (≤2.5)	-	-
1,2,3,4,7,8,9-HpCDF	0.9	2.5U	-	1.6 (≤2.5)	-	-
OCDF	17	5.1U	-	11.9 (≤5.1)	J (all detects) UJ (all non-detects)	A

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK3-04-1BPC**	SSAK3-04-1BPC_FD				
2,3,7,8-TCDD	6.7	4.4	-	2.3 (≤2.7)	-	-
1,2,3,7,8-PeCDD	25	16	44 (≤50)	-	-	-
1,2,3,4,7,8-HxCDD	19	11	-	8 (≤2.7)	J (all detects)	A
1,2,3,6,7,8-HxCDD	41	26	45 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	37	24	43 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	140	92	41 (≤50)	-	-	-
OCDD	170	140	19 (≤50)	-	-	-
2,3,7,8-TCDF	160	110	37 (≤50)	-	-	-
1,2,3,7,8-PeCDF	320	200	46 (≤50)	-	-	-
2,3,4,7,8-PeCDF	160	98	48 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	610	420	37 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	310	200	43 (≤50)	-	-	-

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SSAK3-04-1BPC**	SSAK3-04-1BPC_FD				
2,3,4,6,7,8-HxCDF	78	52	40 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	68	42	47 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDF	1300	840	43 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	630	400	45 (≤50)	-	-	-
OCDF	4700	3000	44 (≤50)	-	-	-

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D100462

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D100462	SSAK2-01-1BPC	1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF	J+ (all detects) J+ (all detects) J+ (all detects) J+ (all detects)	P	Routine calibration (%D) (c)
G0D100462	SSAK2-01-1BPC SSAK2-01-1BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D100462	SSAK3-04-1BPC** SSAK3-04-1BPC_FD	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D100462	SSAK3-04-1BPC**	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	P	Compound quantitation and CRQLs (e)
G0D100462	SSAK3-04-1BPC_FD	OCDF	J (all detects)	P	Compound quantitation and CRQLs (e)
G0D100462	SSAK2-01-1BPC SSAK3-02-1BPC SSAK3-03-1BPC** SSAK3-04-1BPC** SSAK2-01-1BPC_FD SSAK3-04-1BPC_FD	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D100462	SSAK2-01-1BPC SSAK3-02-1BPC SSAK3-03-1BPC** SSAK3-04-1BPC** SSAK2-01-1BPC_FD SSAK3-04-1BPC_FD	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)
G0D100462	SSAK2-01-1BPC SSAK2-01-1BPC_FD	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Field duplicates (Difference) (fd)
G0D100462	SSAK3-04-1BPC** SSAK3-04-1BPC_FD	1,2,3,4,7,8-HxCDD	J (all detects)	A	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D100462

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D100462	SSAK2-01-1BPC	1,2,3,7,8,9-HxCDD	0.19U pg/g	A	bl
G0D100462	SSAK3-02-1BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.12U pg/g 0.37U pg/g 1.4U pg/g	A	bl
G0D100462	SSAK3-03-1BPC**	OCDD	1.6U pg/g	A	bl
G0D100462	SSAK2-01-1BPC_FD	1,2,3,4,6,7,8-HpCDF	0.90U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D100462

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23125B21
SDG #: G0D100462
Laboratory: Test America

Date: 5/18/10
Page: 1 of 1
Reviewer: A
2nd Reviewer: [illegible]

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

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.	Technical holding times	A	Sampling dates: 4/8/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW N	
XII.	System performance	A	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	SW	D = 1+5. 3 4+6 4+6
XV.	Field blanks	SW	FB-040T2010-RZD (G0D090441)

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

Validated Samples: ** Level IV MS soils

1	SSAK2-01-1BPC	11	01034.8MB	21		31	
2	SSAK3-02-1BPC	12	01122.36MB	22		32	
3	SSAK3-03-1BPC **	13		23		33	
4	SSAK3-04-1BPC **	14		24		34	
5	SSAK2-01-1BPC_FD	15		25		35	
6	SSAK3-04-1BPC_FD	16		26		36	
7	SSAK3-03-1BPCMS	17		27		37	
8	SSAK3-03-1BPCMSD	18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 23125B21
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 4
2nd Reviewer: W

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
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?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?		✓		
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
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.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 23125B2
SDG #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: V

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?		✓		
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	✓			
X. 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?	✓			
XI. Compound quantitation/CRQLs				
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. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.	✓			
Target compounds were detected in the field duplicates.	✓			
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target compounds were detected in the field blanks.	✓			

VALIDATION FINDINGS WORKSHEET

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

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 #: 23125B24
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer: [illegible]

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

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

Y (N) N/A Was a routine calibration was performed at the beginning and end of each 12 hour period?
Y (N) N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?
(Y) N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (c)
	4/20/10	19APIO4D5.to	13C-K	30.5		1	J+ dets/P(K-N)

	PCDDs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

	PCDFs	Selected Ions (m/z)	Ion Abundance Ratio
	Tetra-	M/M+2	0.65-0.89
	Penta-	M+2/M+4	1.32-1.78
	Hexa-	M+2/M+4	1.05-1.43
	Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
	Hepta-	M+2/M+4	0.88-1.20
	Octa-	M+2/M+4	0.76-1.02

LDC #: 23125B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: 9
2nd Reviewer: 1

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?
Y N N/A Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/13/10 **Blank analysis date:** 4/20/10
Conc. units: pg/g **Associated samples:** 1-4 (bl)

Compound	Blank ID	Sample Identification									
	0103408MB	5X	1	2	3		0x lws		> 5x		
E	0.040	0.2	0.19/U	0.12/U	-						
F	0.13	0.65	-	0.37/U	-						
G	0.71	3.55	-	1.4/U	1.6/U						
H	0.033	0.165	-	-	-						
K	0.048	0.24	-	-	-						
L	0.033	0.165	-	-	-						
O	0.13	0.65	-	-	-						
P	0.068	0.34	-	-	-						
Q	0.32	1.6	-	-	-						

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23125B2
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Blanks

Page: 1 of 1
Reviewer: A
2nd Reviewer: A

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

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank analyzed for each matrix?
Y N N/A Was the blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/22/10 **Blank analysis date:** 4/27/10
Conc. units: pg/g Associated Samples: 5-6, 160

Compound	Blank ID	Sample Identification								
	011236MB	5	6							
4	0.85		(140)							
0	0.64	0.90 U	(840)							
8	1.3		(3000)							

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

Compound	Blank ID	Sample Identification								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23125B21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: Q
2nd Reviewer: M

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

(Y) N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: All (>5x)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	4.1	0.0205								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: [illegible]
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

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

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?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		7/8	P	147 (79-139)	( )	( )	3	No Qual
			Q	164 (75-141)	160 (75-141)	( )		✓
				( )	( )	( )		(MSD or LCS w/)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23125B=1
SDG #: Recount

VALIDATION FINDINGS WORKSHEET
Internal Standards

Reviewer: 9
2nd Reviewer: V

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

Y (N) N/A Are all internal standard recoveries were within the 40-135% criteria?
Y N N/A Was the S/N ratio all internal standard peaks > 10?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (i)
		1	G	30 (40-135)	J (H-G, Q)
			H	34 ( )	
			I	14 ( )	
				( )	
		4	J	32 ( )	(G, Q)
				( )	
		5	G	28 ( )	
			H	26 ( )	
			I	9.6 ( )	
				( )	
		6	J	31 ( )	
				( )	
		T(MS)	J	22 (↓)	No Qual
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		G.	^{13}C-1,2,3,4,6,7,8-HpCDF	
B.	^{13}C-2,3,7,8-TCDD		H.	^{13}C-1,2,3,4,6,7,8-HpCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		I.	^{13}C-OCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		K.	^{13}C-1,2,3,4-TCDD	
E.	^{13}C-1,2,3,4,7,8-HxCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
F.	^{13}C-1,2,3,6,7,8-HxCDD				

LDC #: 03125B21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 6

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

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
		4	0. Q > calib range		J det, J+ (e)
			↓		↓
		6	Q		↓
		MI	2MPC results (Q flag)		J+ (K)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23125B21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: Q
2nd Reviewer: L

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

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (pg/g) 1	Concentration (pg/g) 5	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
A	0.53U	0.081		0.449	(≤0.53)	
C	0.081	2.5U		2.419	(≤2.5)	
D	0.17	2.5U		2.33	(≤2.5)	
E	0.19	2.5U		2.31	(≤2.5)	
F	2.0	2.5U		0.5	(≤2.5)	
G	49	5.1U		43.9	(≤5.1)	J/UJ/A (fd)
H	0.18	0.20		0.02	(≤0.53)	
I	0.18	0.20		0.02	(≤2.5)	
K	0.43	2.5U		2.07	(≤2.5)	
L	0.26	2.5U		2.24	(≤2.5)	
M	0.20	2.5U		2.3	(≤2.5)	
N	0.11	2.5U		2.39	(≤2.5)	
O	2.4	0.90		1.5	(≤2.5)	
P	0.90	2.5U		1.6	(≤2.5)	
Q	17	5.1U		11.9	(≤5.1)	J/UJ/A (fd)

Compound	Concentration (pg/g) 4	Concentration (pg/g) 6	(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
A	6.7	4.4		2.3	(≤2.7)	
B	25	16	44			
C	19	11		8	(≤2.7)	blnks/A (fd)
D	41	26	45			
E	37	24	43			
F	140	92	41			
G	170	140	19			
H	160	110	37			
I	320	200	46			

LDC#: 23125B21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: 9
2nd Reviewer: 1

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

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (pg/g)		(≤50) RPD	(pg/g) Difference	(pg/g) Limits	Qualifications (Parent Only)
	4	6				
J	160	98	48			
K	610	420	37			
L	310	200	43			
M	78	52	40			
N	68	42	47			
O	1300	840	43			
P	630	400	45			
Q	4700	3000	44			

V:\FIELD DUPLICATES\23125B21.wpd

LDC #: 21509A1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: a
2nd Reviewer: b

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

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 = $(A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
%RSD = 100 * (S/X)

A_x = Area of compound,
C_x = Concentration of compound,
S = Standard deviation of the RRFs,

A_{is} = Area of associated internal standard
C_{is} = Concentration of internal standard
X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL	4/12/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.945	0.98	0.98	4.44	4.33
	(4D5)		2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	1.021	1.04	1.04	3.03	2.97
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.114	1.19	1.19	5.33	5.25
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	1.11	1.11	3.60	3.75
			OCDF (^{13}C-OCDD)	1.445	1.445	1.51	1.51	5.85	5.89
2	ICAL	3/10/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.000	1.000	1.00	1.00	1.36	1.58
			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	ICAL	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.29	1.20
	(5D2)		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 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 #: 23135B21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: W

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

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	19AP10ES -20	4/19/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	1.00	1.00	6.1	6.1
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	1.02	1.02	0.2	0.2
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.19	1.19	6.8	6.8
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.07	1.07	0.1	0.1
			OCDF (^{13}C-OCDD)	1.445	1.51	1.51	4.8	4.8
2	20AP10SD2	4/20/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.000	1.05	1.05	4.8	4.8
			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)	1.088	1.13	1.13	3.4	3.4
			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 #: 23b5B2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates Results Verification

Page: 1 of 1
Reviewer: A
2nd Reviewer: [illegible]

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

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: 7/8

Compound	Spike Added (pg/g)		Sample Concentration (pg/g)	Spiked Sample Concentration (pg/g)		Matrix Spike Percent Recovery		Matrix Spike Duplicate Percent Recovery		Reported RPD	Recalculated RPD
	MS	MSD	------	MS	MSD	Reported	Recalc	Reported	Recalc	----	----
2,3,7,8-TCDD	20.6	20.1	ND	22.0	21.7	107	107	108	108	1.6	1.4
1,2,3,7,8-PeCDD	103	101	V	108	105	105	105	105	104	3.0	2.8
1,2,3,4,7,8-HxCDD	↓	↓	0.11	120	112	116	116	111	111	66	6.9
1,2,3,4,7,8,9-HpCDF	↓	↓	0.79	152	128	147	147	126	126	17	17
OCDF	206	201	7.2	346	330	164	164	160	160	4.7	4.7

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 #: 23195B2
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 2

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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 = | LCS - LCSD | * 2/(LCS + LCSD) LCS = Laboraotry control sample percent recovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0103408

Compound	Spike Added (pg/g)		Spiked Sample Concentration (pg/g)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	22.0	NA	110	110				
1,2,3,7,8-PeCDD	100		108		108	108				
1,2,3,4,7,8-HxCDD	↓	↓	116	↓	116	116				
1,2,3,4,7,8,9-HpCDF	↓	↓	118	↓	118	118				
OCDF	200	↓	225	↓	113	113				

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.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 23125B21
SDG #: Zeu Cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: a
2nd reviewer: b

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

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. 3 , F :

Conc. = $\frac{(470718)(2000)(\quad)}{(11653630)(1.072)(10.0)(0.965)}$

= 0.780 pg/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 8, 2010

LDC Report Date: May 25, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D100464

Sample Identification

RSAI2-12BPC
RSAI2-12BPCMS
RSAI2-12BPCMSD

Introduction

This data review covers 3 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily 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 less than or equal to 25% .

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks.

Sample FB-04072010-RZD (both from SDG G0D090441) was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04072010-RZD	4/7/10	1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.89 pg/L 1.5 pg/L 2.2 pg/L 8.3 pg/L 1.4 pg/L 1.6 pg/L 1.5 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D100464

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were not within the QC limits. Since the samples were diluted out, no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
RSAI2-12BPC	^{13}C-OCDD	24 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
RSAI2-12BPC	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D100464	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D100464	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D100464

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D100464	RSAI2-12BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D100464	RSAI2-12BPC	2,3,7,8-TCDF	J (all detects)	P	Compound quantitation and CRQLs (e)
G0D100464	RSAI2-12BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D100464	RSAI2-12BPC	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D100464

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D100464

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23125C21
SDG #: G0D100464
Laboratory: Test America

Date: 5/18/10
Page: 1 of 1
Reviewer: Q
2nd Reviewer: W

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

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.	Technical holding times	A	Sampling dates: 4/8/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	A	
V.	Blanks	A	
VI.	Matrix spike/Matrix spike duplicates	SW	
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB-040T2010-RZD (G0D090441)

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

Validated Samples:

1	RSAI2-12BPC 5	11	010536/MB	21		31	
2	RSAI2-12BPCMS	12		22		32	
3	RSAI2-12BPCMSD	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

VALIDATION FINDINGS WORKSHEET

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

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 #: 23125C21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: 1

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

(Y) N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/7/10
Field blank type: (circle one) (Field Blank) / Rinsate / Other: _____ Associated Samples: All (5X)

Compound	Blank ID	Sample Identification								
	FB-04072010-RZD	5X								
C	0.89	0.00445								
E	1.5	0.0075								
F	2.2	0.011								
G	8.3	0.0415								
K	1.4	0.007								
L	1.6	0.008								
M	1.5	0.0075								
N	1.6	0.008								
O	1.3	0.0065								
P	1.4	0.007								
Q	4.1	0.0205								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

Matrix Spike/Matrix Spike Duplicates

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

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?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		2/3	%R out for most of cpds			( )	1	No Qual
			and RPD out for one cpd			( )		(20x)
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

LDC #: 23125C1
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 4
2nd Reviewer: 1

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

Y N N/A Are all internal standard recoveries were within the 40-135% criteria?
Y N N/A Was the S/N ratio all internal standard peaks > 10?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (I)
		1	F	24 (40-135)	J/NA/P (F. Q)
				( )	
				( )	
		2(MS)	E	22 ( )	No Cmal
			H	32 ( )	
			I	15 ( )	
				( )	
		3(MSD)	E	22 ( )	
			H	26 ( )	
			I	9.8 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		G.	^{13}C-1,2,3,4,6,7,8-HpCDF	
B.	^{13}C-2,3,7,8-TCDD		H.	^{13}C-1,2,3,4,6,7,8-HpCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		I.	^{13}C-OCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		K.	^{13}C-1,2,3,4-TCDD	
E.	^{13}C-1,2,3,4,7,8-HxCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
F.	^{13}C-1,2,3,6,7,8-HxCDD				

LDC #: 23105C2/
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 1

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

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
		1	H > calib range	1	J detects/A (e)
		all	2NPe result (all Hag)		J K (E)

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 6, 2010

LDC Report Date: May 25, 2010

Matrix: Water

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D120488

Sample Identification

FB04062010-RZB

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily 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 less than or equal to 25% .

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

All of the routine calibration percent differences (%D) between the initial calibration RRF and the routine calibration RRF were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Affected Compound	Flag	A or P
4/22/10	^{13}C-1,2,3,4,6,7,8-HpCDD	30.1	All samples in SDG G0D120488	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	P

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0105215MB	4/15/10	1,2,3,7,8-PeCDD	0.72 pg/L	All samples in SDG G0D120488
		1,2,3,4,7,8-HxCDD	0.74 pg/L	
		1,2,3,6,7,8-HxCDD	0.89 pg/L	
		1,2,3,7,8,9-HxCDD	1.3 pg/L	
		1,2,3,4,6,7,8-HpCDD	2.2 pg/L	
		OCDD	6.2 pg/L	
		2,3,7,8-TCDF	2.1 pg/L	
		2,3,4,7,8-PeCDF	0.91 pg/L	
		1,2,3,4,7,8-HxCDF	1.4 pg/L	
		1,2,3,6,7,8-HxCDF	0.85 pg/L	
		2,3,4,6,7,8-HxCDF	1.2 pg/L	
		1,2,3,7,8,9-HxCDF	1.3 pg/L	
		1,2,3,4,6,7,8-HpCDF	1.4 pg/L	
		1,2,3,4,7,8,9-HpCDF	1.7 pg/L	
		OCDF	3.5 pg/L	

Sample concentrations were compared to concentrations detected in the method blanks as required by the QAPP. No sample data was qualified with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
FB04062010-RZB	1,2,3,7,8,9-HxCDD	0.68 pg/L	0.68U pg/L
	1,2,3,4,6,7,8-HpCDD	2.5 pg/L	2.5U pg/L
	OCDD	6.2 pg/L	6.2U pg/L
	2,3,7,8-TCDF	2.7 pg/L	2.7U pg/L
	1,2,3,4,7,8-HxCDF	1.4 pg/L	1.4U pg/L
	1,2,3,6,7,8-HxCDF	0.82 pg/L	0.82U pg/L
	1,2,3,7,8,9-HxCDF	0.94 pg/L	0.94U pg/L
	1,2,3,4,6,7,8-HpCDF	1.8 pg/L	1.8U pg/L
	1,2,3,4,7,8,9-HpCDF	1.2 pg/L	1.2U pg/L
	OCDF	4.4 pg/L	4.4U pg/L

Sample FB04062010-RZB was identified as a field blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD	0.68 pg/L	No associated samples in this SDG
		1,2,3,4,6,7,8-HpCDD	2.5 pg/L	
		OCDD	6.2 pg/L	
		2,3,7,8-TCDF	2.7 pg/L	
		1,2,3,4,7,8-HxCDF	1.4 pg/L	
		1,2,3,6,7,8-HxCDF	0.82 pg/L	
		1,2,3,7,8,9-HxCDF	0.94 pg/L	
		1,2,3,4,6,7,8-HpCDF	1.8 pg/L	
		1,2,3,4,7,8,9-HpCDF	1.2 pg/L	
		OCDF	4.4 pg/L	

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 (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
All samples in SDG G0D120488	2,3,7,8-TCDF	2nd column confirmation was not performed for this compound.	This compound must be confirmed on the 2nd column per the method.	None	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D120488	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D120488	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not reviewed for this SDG.

XII. System Performance

Raw data were not reviewed for this SDG.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D120488

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D120488	FB04062010-RZB	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	P	Routine calibration (%D) (c)
G0D120488	FB04062010-RZB	2,3,7,8-TCDF	None	P	Compound quantitation and CRQLs (o)
G0D120488	FB04062010-RZB	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D120488	FB04062010-RZB	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D120488

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D120488	FB04062010-RZB	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68U pg/L 2.5U pg/L 6.2U pg/L 2.7U pg/L 1.4U pg/L 0.82U pg/L 0.94U pg/L 1.8U pg/L 1.2U pg/L 4.4U pg/L	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D120488

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B

LDC #: 23125D21
SDG #: G0D120488
Laboratory: Test America

Date: 5/18/10
Page: 1 of 1
Reviewer: T
2nd Reviewer: TN

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

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.	Technical holding times	A	Sampling dates: 4/6/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	SW	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	N	client specified
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB = 1

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

Validated Samples:

1	FB04062010-RZB W	11	010521SM13	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

VALIDATION FINDINGS WORKSHEET

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

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 #: 23125D2J
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Routine Calibration

Page: 1 of 1
Reviewer: A
2nd Reviewer: L

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

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

Y N N/A Was a routine calibration was performed at the beginning and end of each 12 hour period?

Y N N/A Were all percent differences (%D) of RRFs ≤ 20% for unlabeled compounds and ≤ 30% for labeled?

Y N N/A Did all routine calibration standards meet the Ion Abundance Ratio criteria?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications (C)
	4/22/10	21APIOB1DS_9	13-F	30.1		All + Blk	J+ detects/P (F)

PCDDs	Selected ions (m/z)	Ion Abundance Ratio
Tetra-	M/M+2	0.65-0.89
Penta-	M+2/M+4	1.32-1.78
Hexa-	M+2/M+4	1.05-1.43
Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
Hepta-	M+2/M+4	0.88-1.20
Octa-	M+2/M+4	0.76-1.02

PCDFs	Selected ions (m/z)	Ion Abundance Ratio
Tetra-	M/M+2	0.65-0.89
Penta-	M+2/M+4	1.32-1.78
Hexa-	M+2/M+4	1.05-1.43
Hexa-^{13}C-HxCDF (IS) only	M/M+2	0.43-0.59
Hepta-^{13}C-HpCDF (IS) only	M/M+2	0.37-0.51
Hepta-	M+2/M+4	0.88-1.20
Octa-	M+2/M+4	0.76-1.02

LDC #: 23125D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: [signature]
2nd Reviewer: [signature]

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?
Y N N/A Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/15/10 **Blank analysis date:** 4/22/10
Conc. units: pg/L **Associated samples:** All (bl)

Compound	Blank ID	Sample Identification									
	0105215MB	5X		1							
B	0.72	3.6									
C	0.74	3.7									
D	0.89	4.45									
E	1.3	6.5		0.68/U							
F	2.2	11		2.5/U							
G	6.2	31		6.2/U							
H	2.1	10.5		2.7/U							
J	0.91	4.55									
K	1.4	7		1.4/U							
L	0.85	4.25		0.82/U							
M	1.2	6									
N	1.3	6.5		0.94/U							
O	1.4	7		1.8/U							
P	1.7	8.5		1.2/U							
Q	3.5	17.5		4.4/U							

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23125D21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: L

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

Y/N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/6/10
Field blank type: (circle one) Field Blank / Rinsate / Other: _____ Associated Samples: ~~All~~ None

Compound	Blank ID	Sample Identification									
	FB04062010-RZB	5X									
E	0.68	0.0034									
F	2.5	0.0125									
G	6.2	0.031									
H	2.7	0.0135									
K	1.4	0.007									
L	0.82	0.0041									
N	0.94	0.0047									
O	1.8	0.009									
P	1.2	0.006									
Q	4.4	0.022									
CRQL											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 23125021
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: 9
2nd Reviewer: [signature]

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

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	EMPC results (J flag)	All	VK (K)
		1	No 2,3,7,8-TCDF confirmation	1	NonD / A

Comments: See sample calculation verification worksheet for recalculations

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date: April 12, 2010

LDC Report Date: May 25, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B & 4

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D140435

Sample Identification

SSAN6-02-1BPC
SSAN6-02-2BPC
SA156-3BPC**

**Indicates sample underwent Stage 4 review

Introduction

This data review covers 3 soil samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

This review follows the Standard Operating Procedures (SOP) 40, Data Review/Validation (BRC 2009), the Quality Assurance Project Plan Tronox LLC Facility, Henderson, Nevada (June 2009), NDEP guidance (May 2006), and USEPA Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Dibenzofurans Data Review (September 2005).

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.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

Samples indicated by a double asterisk on the front cover underwent a Stage 4 review. A Stage 2B review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Stage 2B criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.

J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.

J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.

JK The analytical result is an estimated maximum possible concentration (EMPC).

X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.

J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.

J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.

J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily 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 less than or equal to 25% .

The exact mass of 380.9760 of PFK was verified. The static resolving power was at least 10,000 (10% valley definition) for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

III. Initial Calibration

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

Percent relative standard deviations (%RSD) were less than or equal to 20.0% for unlabeled compounds and less than or equal to 30.0% for labeled compounds.

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

The minimum S/N ratio for each target compound was greater than or equal to 2.5 and greater than or equal to 10 for each recovery and internal standard compound for samples on which Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

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

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

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polychlorinated dioxin/dibenzofuran contaminants were found in the method blanks with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0109260MB	4/19/10	1,2,3,4,6,7,8-HpCDD	0.14 pg/g	All samples in SDG G0D140435
		OCDD	0.59 pg/g	
		2,3,7,8-TCDF	0.28 pg/g	
		1,2,3,7,8-PeCDF	0.14 pg/g	
		1,2,3,4,7,8-HxCDF	0.24 pg/g	
		1,2,3,6,7,8-HxCDF	0.14 pg/g	
		1,2,3,7,8,9-HxCDF	0.086 pg/g	
		1,2,3,4,6,7,8-HpCDF	0.30 pg/g	
		1,2,3,4,7,8,9-HpCDF	0.13 pg/g	
		OCDF	0.63 pg/g	

Sample concentrations were compared to concentrations detected in the method blanks as required by the QAPP. No sample data was qualified with the following exceptions:

Sample	Compound	Reported Concentration	Modified Final Concentration
SA156-3BPC**	2,3,7,8-TCDF	0.51 pg/g	0.51U pg/g

Samples EB-04122010-RIG2-RZB and EB-04122010-RIG1-RZB (both from SDG G0D140534) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04122010-RIG2-RZB	4/12/10	1,2,3,4,7,8-HxCDD	0.31 pg/L	SA156-3BPC**
		1,2,3,6,7,8-HxCDD	0.35 pg/L	
		1,2,3,7,8,9-HxCDD	0.60 pg/L	
		1,2,3,4,6,7,8-HpCDD	1.8 pg/L	
		OCDD	4.0 pg/L	
		2,3,7,8-TCDF	4.8 pg/L	
		1,2,3,7,8-PeCDF	4.3 pg/L	
		2,3,4,7,8-PeCDF	2.2 pg/L	
		1,2,3,4,7,8-HxCDF	7.3 pg/L	
		1,2,3,6,7,8-HxCDF	4.6 pg/L	
		2,3,4,6,7,8-HxCDF	1.3 pg/L	
		1,2,3,7,8,9-HxCDF	0.85 pg/L	
		1,2,3,4,6,7,8-HpCDF	13 pg/L	
		1,2,3,4,7,8,9-HpCDF	5.6 pg/L	
		OCDF	26 pg/L	

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04122010-RIG1-RZB	4/12/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.57 pg/L 0.59 pg/L 0.82 pg/L 2.8 pg/L 10 pg/L 2.0 pg/L 1.2 pg/L 1.3 pg/L 1.7 pg/L 1.2 pg/L 1.1 pg/L 2.0 pg/L 0.95 pg/L 3.6 pg/L	SA156-3BPC**

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified.

Samples FB-04062010-RZB (from SDG G0D120488) and FB-04072010-RZC (from SDG G0D130519) were identified as field blanks. No polychlorinated dioxin/dibenzofuran contaminants were found in these blanks with the following exceptions:

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
FB-04062010-RZB	4/6/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.68 pg/L 2.5 pg/L 6.2 pg/L 2.7 pg/L 1.4 pg/L 0.82 pg/L 0.94 pg/L 1.8 pg/L 1.2 pg/L 4.4 pg/L	SA156-3BPC**
FB-04072010-RZC	4/8/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.77 pg/L 0.74 pg/L 0.82 pg/L 4.2 pg/L 37 pg/L 0.57 pg/L 0.96 pg/L 0.67 pg/L 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 2.1 pg/L 1.5 pg/L 6.7 pg/L	SSAN6-02-1BPC SSAN6-02-2BPC

Sample concentrations were compared to concentrations detected in the field blanks as required by the QAPP. No sample data was qualified.

VI. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were not within QC limits. Since there were no associated samples, no data were qualified.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

All internal standard recoveries were within QC limits with the following exceptions:

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAN6-02-1BPC	^{13}C-OCDD	21 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P
SSAN6-02-2BPC	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-OCDD	37 (40-135) 35 (40-135)	OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P
SA156-3BPC**	^{13}C-1,2,3,4,6,7,8-HpCDF ^{13}C-1,2,3,4,6,7,8-HpCDD ^{13}C-OCDD	30 (40-135) 30 (40-135) 17 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P

X. Target Compound Identifications

All target compound identifications were within validation criteria for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XI. Project Quantitation Limit

All compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAN6-02-1BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P
SSAN6-02-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D140435	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D140435	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XII. System Performance

The system performance was acceptable for samples on which a Stage 4 review was performed. Raw data were not evaluated for the samples reviewed by Stage 2B criteria.

XIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIV. Field Duplicates

Samples SA156-3BPC** and SA156-3BPC_FD (from SDG G0D140543) were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

Compound	Concentration (pg/g)		RPD (Limits)	Difference (Limits)	Flags	A or P
	SA156-3BPC**	SA156-3BPC_FD				
2,3,7,8-TCDD	0.15	0.54U	-	0.39 (≤0.54)	-	-
1,2,3,7,8-PeCDD	0.56	2.7U	-	2.17 (≤2.7)	-	-
1,2,3,4,7,8-HxCDD	0.84	2.7U	-	1.86 (≤2.7)	-	-
1,2,3,6,7,8-HxCDD	0.68	2.7U	-	2.02 (≤2.7)	-	-
1,2,3,7,8,9-HxCDD	0.81	2.7U	-	1.89 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDD	1.4	2.7U	-	1.3 (≤2.7)	-	-
OCDD	5.6	5.4U	-	0.2 (≤5.4)	-	-
2,3,7,8-TCDF	0.51	0.16	-	0.35 (≤0.54)	-	-
1,2,3,7,8-PeCDF	1.7	2.7U	-	1 (≤2.7)	-	-
1,2,3,4,7,8-HxCDF	4.1	2.7U	-	1.4 (≤2.7)	-	-
1,2,3,6,7,8-HxCDF	3.3	2.7U	-	0.6 (≤2.7)	-	-
2,3,4,6,7,8-HxCDF	1.4	2.7U	-	1.3 (≤2.7)	-	-
1,2,3,7,8,9-HxCDF	1.7	2.7U	-	1 (≤2.7)	-	-
1,2,3,4,6,7,8-HpCDF	10	1.2	-	8.8 (≤2.7)	J (all detects)	A
1,2,3,4,7,8,9-HpCDF	5.1	2.7U	-	2.4 (≤2.7)	-	-
OCDF	25	5.4	-	19.6 (≤5.4)	J (all detects)	A

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D140435

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D140435	SSAN6-02-1BPC	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D140435	SSAN6-02-2BPC	OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D140435	SA156-3BPC**	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D140435	SSAN6-02-1BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Compound quantitation and CRQLs (e)
G0D140435	SSAN6-02-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	P	Compound quantitation and CRQLs (e)
G0D140435	SSAN6-02-1BPC SSAN6-02-2BPC SA156-3BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D140435	SSAN6-02-1BPC SSAN6-02-2BPC SA156-3BPC**	All compounds reported as EMPC	JK (all detects)	A	Project Quantitation Limit (k)
G0D140435	SA156-3BPC**	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	A	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D140435

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D140435	SA156-3BPC**	2,3,7,8-TCDF	0.51U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D140435

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada
Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D140435

No Sample Data Qualified in this SDG

Tronox Northgate Henderson
VALIDATION COMPLETENESS WORKSHEET
Stage 2B/4

LDC #: 23125E21
SDG #: G0D140435
Laboratory: Test America

Date: 5/18/10
Page: 1 of 1
Reviewer: K
2nd Reviewer: L

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

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.	Technical holding times	A	Sampling dates: 4/12/10
II.	HRGC/HRMS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Routine calibration/ICV	A	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	SW	No spl ass'd - No Gen'l
VII.	Laboratory control samples	A	LCS
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	SW	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	SW	D=3+SA156-3BPC-FD(G0D140543, (G0D120488)
XV.	Field blanks	SW	FB-062010-R2B, FB-040710-R2C(G0D130519, EB-042210-R1G2-R2B, EB-042210-R1G1-R2B (G0D140534)

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

Validated Samples: **Level IV

1	SSAN6-02-1BPC	11	0109260MB	21		31	
2	SSAN6-02-2BPC	12		22		32	
3	SA156-3BPC **	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

LDC #: 23125E21
SDG #: See cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: V

Method: Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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?	✓			
III. Initial calibration				
Was the initial calibration performed at 5 concentration levels?	✓			
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
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?	✓			
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?	✓			
Were all percent differences (%D) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?	✓			
Did all routine calibration standards meet the Ion Abundance Ratio criteria?	✓			
V. Blanks				
Was a method blank associated with every sample in this SDG?	✓			
Was a method blank performed for each matrix and concentration?	✓			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet?	✓			
VI. Matrix spike/Matrix spike duplicates				
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.	✓			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?		✓		
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	✓			
Was an LCS analyzed per extraction batch?	✓			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?	✓			

LDC #: 23152z1
SDG #: See Cover

VALIDATION FINDINGS CHECKLIST

Reviewer: 9
2nd Reviewer: V

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		✓		
Were the performance evaluation (PE) samples within the acceptance limits?			✓	
IX. Internal standards				
Were internal standard recoveries within the 40-135% criteria?		✓		
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	✓			
X. 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?	✓			
XI. Compound quantitation/CRQLs				
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. System performance				
System performance was found to be acceptable.	✓			
XIII. Overall assessment of data				
Overall assessment of data was found to be acceptable.	✓			
XIV. Field duplicates				
Field duplicate pairs were identified in this SDG.		✓		
Target compounds were detected in the field duplicates.			✓	
XV. Field blanks				
Field blanks were identified in this SDG.	✓			
Target compounds were detected in the field blanks.	✓			

VALIDATION FINDINGS WORKSHEET

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

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 #: 23125E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Blanks

Reviewer: CF
2nd Reviewer: [illegible]

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Y N N/A Were all samples associated with a method blank?
Y N N/A Was a method blank performed for each matrix and whenever a sample extraction was performed?
Y N N/A Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/19/10 **Blank analysis date:** 4/25/10
Conc. units: pg/g **Associated samples:** All (bl)

Compound	Blank ID	Sample Identification									
	0109260MB	5X	3		afts > 5X						
F	0.14	0.7	-								
G	0.59	2.95	-								
H	0.28	1.4	0.51/U								
I	0.14	0.7	-								
K	0.24	1.2	-								
L	0.14	0.7	-								
N	0.086	0.43	-								
O	0.30	1.5	-								
P	0.13	0.65	-								
Q	0.63	3.15	-								

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
All contaminants within five times the method blank concentration were qualified as not detected, "U".

LDC #: 23125 22
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: A
2nd Reviewer: W

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/8/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 1-2

Compound	Blank ID	Sample Identification								
	FB-04072010-RZC	5X								
C	0.77	0.00385								
D	0.74	0.0037								
E	0.82	0.0041								
F	4.2	0.021								
G	37	0.185								
H	0.57	0.00285								
I	0.96	0.0048								
J	0.67	0.00335								
K	1.1	0.0055								
L	0.96	0.0048								
M	1.0	0.005								
N	1.0	0.005								
O	2.1	0.0105								
P	1.5	0.0075								
Q	6.7	0.0335								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 23125E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Page: 1 of 1
Reviewer: 9
2nd Reviewer: LW

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/6/10
Field blank type: (circle one) Field Blank / Rinsate / Other: Associated Samples: 3 (>5X)

Compound	Blank ID	Sample Identification								
	FB04062010-RZB	5X								
E	0.68	0.0034								
F	2.5	0.0125								
G	6.2	0.031								
H	2.7	0.0135								
K	1.4	0.007								
L	0.82	0.0041								
N	0.94	0.0047								
O	1.8	0.009								
P	1.2	0.006								
Q	4.4	0.022								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 23125E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer:

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/12/10
Field blank type: (circle one) Field Blank / Rinsate / Other: EB Associated Samples:

Compound	Blank ID	Sample Identification								
	FB-04122010-RIG2-RZB	5X								
C	0.31	0.00155								
D	0.35	0.00175								
E	0.60	0.003								
F	1.8	0.009								
G	4.0	0.02								
H	4.8	0.024								
I	4.3	0.0215								
J	2.2	0.011								
K	7.3	0.0365								
L	4.6	0.023								
M	1.3	0.0065								
N	0.85	0.00425								
O	13	0.065								
P	5.6	0.028								
Q	26	0.13								
CRQL										

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected,

LDC #: 23125E21
SDG #: See Cover

VALIDATION FINDINGS WORKSHEET
Field Blanks

Reviewer: 9
2nd Reviewer: L

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

Y N N/A Were field blanks identified in this SDG?
Blank units: pg/L **Associated sample units:** pg/g
Sampling date: 4/12/10
Field blank type: (circle one) Field Blank / Rinsate / Other: FB Associated Samples: 3 (>5X)

Compound	Blank ID	Sample Identification									
	FB-04122010-RIG1-RZB	5X									
C	0.57	0.00285									
D	0.59	0.00295									
E	0.82	0.0041									
F	2.8	0.014									
G	10	0.05									
H	2.0	0.01									
I	1.2	0.006									
J	1.3	0.0065									
K	1.7	0.0085									
L	1.2	0.006									
M	1.1	0.0055									
O	2.0	0.01									
P	0.95	0.00475									
Q	3.6	0.018									
CRQL											

CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

LDC #: 23125E21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Internal Standards

Page: 1 of 1
Reviewer: 9
2nd Reviewer: 6

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

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

Y (N) N/A Are all internal standard recoveries were within the 40-135% criteria?

Y (N) N/A Was the S/N ratio all internal standard peaks ≥ 10?

#	Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications (1)
		1	I	21 (40-135)	J (all A (4.0)
				( )	
				( )	
		2	G	37 ( )	(4.0-Q)
			I	35 ( )	
				( )	
		3	G	30 ( )	
			H	30 ( )	
			I	17 ( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	
				( )	

	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
A.	^{13}C-2,3,7,8-TCDF		G.	^{13}C-1,2,3,4,6,7,8-HpCDF	
B.	^{13}C-2,3,7,8-TCDD		H.	^{13}C-1,2,3,4,6,7,8-HpCDD	
C.	^{13}C-1,2,3,7,8-PeCDF		I.	^{13}C-OCDD	
D.	^{13}C-1,2,3,7,8-PeCDD		K.	^{13}C-1,2,3,4-TCDD	
E.	^{13}C-1,2,3,4,7,8-HxCDF		L.	^{13}C-1,2,3,7,8,9-HxCDD	
F.	^{13}C-1,2,3,6,7,8-HxCDD				

LDC #: 23125Z2/
SDG #: Secouer

VALIDATION FINDINGS WORKSHEET
Compound Quantitation and Reported CRQLs

Page: 1 of 1
Reviewer: Q
2nd Reviewer: L

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

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	cpds > calib range Finding	Associated Samples	Qualifications
		1	H.I.K.L.O.P.Q	1	~~det~~ / P (e)
		2	~~H~~ F.H.I.J.K.L	2	↓
			M.N.O.P.Q		
		M	ZMPC results (& flags)		J+ (E)

Comments: See sample calculation verification worksheet for recalculations

LDC#:23125E21
SDG#: See Cover

VALIDATION FINDINGS WORKSHEET
Field Duplicates

Reviewer: 4
2nd Reviewer: L

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

Y N NA Were field duplicate pairs identified in this SDG?
Y N NA Were target analytes detected in the field duplicate pairs?

Compound	Concentration (pg/g)		(≤50)	(pg/g)	(pg/g)	Qualifications
	3	SA156-3BPC_FD	RPD	Difference	Limits	(Parent Only)
A	0.15	0.54U		0.39	(≤0.54)	
B	0.56	2.7U		2.14	(≤2.7)	
C	0.84	2.7U		1.86	(≤2.7)	
D	0.68	2.7U		2.02	(≤2.7)	
E	0.81	2.7U		1.89	(≤2.7)	
F	1.4	2.7U		1.3	(≤2.7)	
G	5.6	5.4U		0.2	(≤5.4)	
H	0.51	0.16		0.35	(≤0.54)	
I	1.7	2.7U		1	(≤2.7)	
K	4.1	2.7U		1.4	(≤2.7)	
L	3.3	2.7U		0.6	(≤2.7)	
M	1.4	2.7U		1.3	(≤2.7)	
N	1.7	2.7U		1	(≤2.7)	
O	10	1.2		8.8	(≤2.7)	Vdets/A (fd)
P	5.1	2.7U		2.4	(≤2.7)	
Q	25	5.4		19.6	(≤5.4)	Vdets/A (fd)

LDC #: 21053C4
SDG #: see cover

VALIDATION FINDINGS WORKSHEET
Initial Calibration Calculation Verification

Page: 1 of 1
Reviewer: a
2nd Reviewer: h

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

The Relative Response Factor (RRF), average RRF, and percent relative standard deviation (%RSD) were recalculated for the compounds identified below using the following calculations:

$RRF = (A_x)(C_{is})/(A_{is})(C_x)$
average RRF = sum of the RRFs/number of standards
$\%RSD = 100 * (S/X)$

A_x = Area of compound, A_{is} = Area of associated internal standard
C_x = Concentration of compound, C_{is} = Concentration of internal standard
S = Standard deviation of the RRFs, X = Mean of the RRFs

#	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Reported Average RRF (initial)	Recalculated Average RRF (initial)	Reported RRF (CS3 std)	Recalculated RRF (CS3 std)	Reported %RSD	Recalculated %RSD
1	ICAL (ADS)	4/12/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.945	0.98	0.98	4.44	4.33
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	1.021	1.04	1.04	3.03	2.97
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.114	1.19	1.19	5.33	5.25
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	1.11	1.11	3.60	3.75
			OCDF (^{13}C-OCDD)	1.445	1.445	1.51	1.51	5.85	5.89
2	ICAL	3/10/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.000	1.000	1.00	1.00	1.36	1.58
			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	ICAL (SD2)	4/21/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.088	1.10	1.10	1.29	1.20
			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 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 #: 23125221
SDG #: 2ERCOUR

VALIDATION FINDINGS WORKSHEET
Routine Calibration Results Verification

Page: 1 of 1
Reviewer: R
2nd Reviewer: L

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

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	2HAP104051	4/27/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.97	0.97	3.1	3.1
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	0.94	0.94	7.5	7.5
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.10	1.10	1.2	1.2
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.04	1.04	2.9	2.9
			OCDF (^{13}C-OCDD)	1.445	1.42	1.42	2.0	2.0
2	2HAP104051	4/24/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	0.945	0.90	0.90	4.3	4.3
			2,3,7,8-TCDD (^{13}C-2,3,7,8-TCDD)	1.021	0.96	0.96	6.3	6.3
			1,2,3,6,7,8-HxCDD (^{13}C-1,2,3,6,7,8-HxCDD)	1.114	1.08	1.08	3.1	3.1
			1,2,3,4,6,7,8-HpCDD (^{13}C-1,2,4,6,7,8,-HpCDD)	1.072	1.03	1.03	3.9	3.9
			OCDF (^{13}C-OCDD)	1.445	1.36	1.36	5.9	5.8
3	2HAP105D2	4/28/10	2,3,7,8-TCDF (^{13}C-2,3,7,8-TCDF)	1.088	1.09	1.09	0.3	0.4
			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 #: 23125E21
SDG #: Recover

VALIDATION FINDINGS WORKSHEET
Laboratory Control Sample Results Verification

Reviewer: a
2nd Reviewer: [illegible]

METHOD: GC/MS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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: 010926O

Compound	Spike Added (pg/g)		Spiked Sample Concentration (pg/g)		LCS Percent Recovery		LCSD Percent Recovery		LCS/LCSD RPD	
	LCS	LCSD	LCS	LCSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	20.0	NA	19.8	NA	99	99				
1,2,3,7,8-PeCDD	100		102		102	102				
1,2,3,4,7,8-HxCDD	↓		108		108	108				
1,2,3,4,7,8,9-HpCDF	↓		104		104	104				
OCDF	200	↓	202	↓	101	101				

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.

Descriptor	Accurate mass[a]	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass[a]	Ion ID	Elemental Composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF	4	407.7818	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10$	TCDF		409.7788	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)		417.8250	M	$^{13}C_{12}H^{35}Cl_7O$	HpCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)		419.8220	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO$	HpCDF
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD		423.7767	M+2	$C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}C10_2$	TCDD		425.7737	M+4	$C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)		435.8169	M+2	$^{13}C_{12}H^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)		437.8140	M+4	$^{13}C_{12}H^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE		479.7165	M+4	$C_{12}H^{35}Cl_7{}^{37}Cl_2O$	NCDPE
	[354.9792]	LOCK	C_9F_{13}	PFK		[430.9728]	LOCK	C_9F_{17}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF	5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF		443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}C10$	PeCDF (S)		457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)		459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD		469.7780	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD		471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)		513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)		[422.9278]	LOCK	$C_{10}F_{17}$	PFK
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE					
	[354.9792]	LOCK	C_9F_{13}	PFK					
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF					
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF					
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)					
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)					
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD					
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD					
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)					
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (S)					
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE					
	[430.9728]	LOCK	C_9F_{17}	PFK					

(a) The following nuclidic masses were used:

H = 1.007825	O = 15.994915
C = 12.000000	^{35}Cl = 34.968853
^{13}C = 13.003355	^{37}Cl = 36.965903
F = 18.9984	

S = internal/recovery standard

LDC #: 23125E21
SDG #: See cover

VALIDATION FINDINGS WORKSHEET
Sample Calculation Verification

Page: 1 of 1
Reviewer: 9
2nd reviewer: 12

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

(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. 3 , 8 :

Conc. = $\frac{(157896)(4000)(\quad)}{(184240)(1.445)(10.03)(0.953)}$

= 24.8 pg/g

#	Sample ID	Compound	Reported Concentration ( )	Calculated Concentration ( )	Qualification

LDC #: 23125
SDG #: G0D090441, G0D100462, G0D100464, G0D120488, G0D140435

Reviewer: JE
2nd Reviewer: BC

Tronox Northgate Henderson Worksheet

EDD Area	Yes	No	NA	Findings/Comments
I. Completeness				
Is there an EDD for the associated Tronox validation report?	X			
II. EDD Qualifier Population				
Were all qualifiers from the validation report populated into the EDD?	X			
III. EDD Lab Anomalies				
Were EDD anomalies identified?	X			
If yes, were they corrected or documented for the client?	X			See EDD_discrepancy_ form_LDC23125_052510.doc
IV. EDD Delivery				
Was the final EDD sent to the client?	X			