

LABORATORY DATA CONSULTANTS, INC.

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Northgate Environmental Management, Inc.

June 15, 2010

1100 Quail Street Ste. 102 Newport Beach, CA 92660 ATTN: Ms. Cindy Arnold

SUBJECT: Tronox LLC Facility, 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 27, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23265:

SDG # Fraction

G0D080425, G0D130519, G0D150462 Dioxins/Dibenzofurans G0D150582, G0D150589, G0D160435 G0D160472, G0D170485, G0D170489 G0D170491, G0D170492, G0D200427 G0D200558, G0D240497, G0D270515 G0D270522, G0D270529, G0D270573 G0D270574, G0D280571, G0D280586 G0D300450, G0D300454

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
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

Erlinda T. Rauto

Operations Manager/Senior Chemist

Attachment 1

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LDC #: 23265

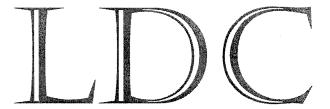
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Tronox Northgate Henderson Worksheet

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?			Х	See EDD_discrepancy_ form_LDC23265_061510.doc
IV. EDD Delivery			W. T	
Was the final EDD sent to the client?	X			

Tronox LLC Facility, PCS, Henderson, Nevada Data Validation Reports LDC #23265

Dioxins/Dibenzofurans



Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 6, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D080425

Sample Identification

SSA06-02-1BPC

SSA06-02-5BPC

RSAQ3-3BPC**

SA169-3BPC

RSAQ3-3BPC FD

SSAO6-02-1BPC FD

SSAJ8-01-3BPC**

SSA06-02-5BPCMS

SSA06-02-5BPCMSD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 9 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
4/22/10	¹³ C-1,2,3,4,6,7,8-HpCDD	30.1	RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD SSA06-02-5BPCMSD	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	Р
4/27/10	1,2,3,7,8,9-HxCDF	20.2	SSAJ8-01-3BPC**	1,2,3,7,8,9-HxCDF	J+ (all detects)	Р

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
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	SSAJ8-01-3BPC**
01 061 87MB	4/16/10	2,3,7,8-TCDD 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 1,2,3,4,6,7,8-HpCDF OCDF	0.036 pg/g 0.14 pg/g 0.45 pg/g 0.088 pg/g 0.040 pg/g 0.062 pg/g 0.054 pg/g 0.076 pg/g 0.15 pg/g	SSA06-02-1BPC SSA06-02-5BPC RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD SSAO6-02-1BPC_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
SSA06-02-1BPC	2,3,7,8-TCDD	0.082 pg/g	0.082U pg/g
	1,2,3,4,6,7,8-HpCDD	0.42 pg/g	0.42U pg/g
	OCDD	1.4 pg/g	1.4U pg/g

Sample	Compound	Reported Concentration	Modified Final Concentration
SSA06-02-5BPC	1,2,3,4,6,7,8-HpCDD	0.14 pg/g	0.14U pg/g
	OCDD	0.72 pg/g	0.72U pg/g
	2,3,7,8-TCDF	0.12 pg/g	0.12U pg/g
	1,2,3,7,8-PeCDF	0.12 pg/g	0.12U pg/g
	2,3,4,7,8-PeCDF	0.084 pg/g	0.084U pg/g
	1,2,3,4,7,8-HxCDF	0.093 pg/g	0.093U pg/g
	1,2,3,4,6,7,8-HpCDF	0.21 pg/g	0.21U pg/g
	OCDF	0.49 pg/g	0.49U pg/g
RSAQ3-3BPC**	2,3,7,8-TCDD	0.038 pg/g	0.038U pg/g
	1,2,3,4,6,7,8-HpCDD	0.23 pg/g	0.23U pg/g
	OCDD	0.61 pg/g	0.61U pg/g
	2,3,7,8-TCDF	0.24 pg/g	0.24U pg/g
	1,2,3,7,8-PeCDF	0.12 pg/g	0.12U pg/g
	2,3,4,7,8-PeCDF	0.13 pg/g	0.13U pg/g
	1,2,3,4,7,8-HxCDF	0.20 pg/g	0.20U pg/g
RSAQ3-3BPC_FD	1,2,3,4,6,7,8-HpCDD	0.43 pg/g	0.43U pg/g
	OCDD	1.1 pg/g	1.1U pg/g
SSAO6-02-1BPC_FD	1,2,3,4,6,7,8-HpCDD	0.30 pg/g	0.30U pg/g
	OCDD	0.62 pg/g	0.62U pg/g

Samples FB-04072010-RZD (from SDG G0D090441), FB04062010-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-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 1,2,3,4,6,7,8-HpCDF	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 1.4 pg/L 1.4 pg/L 4.1 pg/L	SSAJ8-01-3BPC**
FB04062010-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	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	RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
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 1,2,3,4,7,8-PaCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	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 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SSA06-02-1BPC SSA06-02-5BPC SSAO6-02-1BPC_FD

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) and MS/MSD relative percent differences (RPD) were not within QC limits for several compounds, the MS or MSD 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.

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
SA169-3BPC	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	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSA06-02-1BPC SSA06-02-5BPC RSAQ3-3BPC** RSAQ3-3BPC_FD	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 G0D080425	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D080425	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 SSA06-02-1BPC and SSAO6-02-1BPC_FD and samples RSAQ3-3BPC** and RSAQ3-3BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentra	ation (pg/g)				
Compound	SSA06-02-1BPC	SSAO6-02-1BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	0.082	1.0U	-	0.918 (≤1.0)	-	-
1,2,3,7,8-PeCDD	0.19	0.082	-	0.108 (≤5.2)	-	-
1,2,3,4,7,8-HxCDD	0.13	5.2U	<u>-</u>	5.07 (≤5.2)	-	-
1,2,3,6,7,8-HxCDD	0.17	0.14	-	0.03 (≤5.2)	-	-
1,2,3,7,8,9-HxCDD	0.19	0.11	-	0.08 (≤5.2)	•	-
1,2,3,4,6,7,8-HpCDD	0.42	0.30	-	0.12 (≤5.2)	-	-
OCDD	1.4	0.62	-	0.78 (≤10)	-	_
2,3,7,8-TCDF	0.91	0.76	-	0.15 (≤1.0)	-	-
1,2,3,7,8-PeCDF	0.62	1.0	-	0.38 (≤5.2)	-	-
2,3,4,7,8-PeCDF	0.39	0.47	<u>-</u>	0.08 (≤5.2)	-	-
1,2,3,4,7,8-HxCDF	0.92	1.6	-	0.68 (≤5.2)	-	_
1,2,3,6,7,8-HxCDF	0.49	0.85	-	0.36 (≤5.2)	-	-
2,3,4,6,7,8-HxCDF	0.16	0.27	-	0.11 (≤5.2)	-	-
1,2,3,7,8,9-HxCDF	0.19	0.16	-	0.03 (≤5.2)	-	-
1,2,3,4,6,7,8-HpCDF	1.2	2.0	-	0.8 (≤5.2)	-	-
1,2,3,4,7,8,9-HpCDF	0.83	1.1		0.27 (≤5.2)	-	-
OCDF	2.8	4.4	-	1.6 (≤10)	-	-

	Concentra	ation (pg/g)	DDD	Difference		
Compound	RSAQ3-3BPC**	RSAQ3-3BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	0.038	1.0U	-	0.962 (≤1.0)	-	-

	Concentra	ition (pg/g)				
Compound	RSAQ3-3BPC**	RSAQ3-3BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
1,2,3,4,7,8-HxCDD	0.066	5.2U	-	5.134 (≤5.2)	-	-
1,2,3,6,7,8-HxCDD	0.079	0.10	-	0.021 (≤5.2)	-	-
1,2,3,7,8,9-HxCDD	0.15	0.20	-	0.05 (≤5.2)	-	-
1,2,3,4,6,7,8-HpCDD	0.23	0.43	•	0.2 (≤5.2)	-	
OCDD	0.61	1.1	-	0.49 (≤10)	-	-
2,3,7,8-TCDF	0.24	0.64	-	0.4 (≤1.0)	-	-
1,2,3,7,8-PeCDF	0.12	5.2U	-	5.08 (≤5.2)	-	-
2,3,4,7,8-PeCDF	0.13	5.2U	-	5.07 (≤5.2)	-	•
1,2,3,4,7,8-HxCDF	0.20	0.79	-	0.59 (≤5.2)	-	-
1,2,3,6,7,8-HxCDF	0.11	0.38	<u>-</u> '	0.27 (≤5.2)	-	-
2,3,4,6,7,8-HxCDF	0.091	5.2U	-	5.109 (≤5.2)	-	-
1,2,3,7,8,9-HxCDF	0.12	0.33	-	0.21 (≤5.2)	-	-
1,2,3,4,6,7,8-HpCDF	0.39	1.2	-	0.81 (≤5.2)	-	-
1,2,3,4,7,8,9-HpCDF	0.20	0.63	-	0.43 (≤5.2)	-	-
OCDF	0.92	2.8	-	1.88 (≤10)	-	-

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D080425

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D080425	RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	Р	Routine calibration (%D) (c)
G0D080425	SSAJ8-01-3BPC**	1,2,3,7,8,9-HxCDF	J+ (all detects)	Р	Routine calibration (%D) (c)
G0D080425	SA169-3BPC	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	J (all detects)	Р	Project Quantitation Limit (e)
G0D080425	SSA06-02-1BPC SSA06-02-5BPC RSAQ3-3BPC** RSAQ3-3BPC_FD	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (o)
G0D080425	SSA06-02-1BPC SSA06-02-5BPC RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD SSA06-02-1BPC_FD SSAJ8-01-3BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D080425	SSA06-02-1BPC SSA06-02-5BPC RSAQ3-3BPC** SA169-3BPC RSAQ3-3BPC_FD SSAO6-02-1BPC_FD SSAJ8-01-3BPC**	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 G0D080425

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D080425	SSA06-02-1BPC	2,3,7,8-TCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.082U pg/g 0.42U pg/g 1.4U pg/g	А	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D080425	SSA06-02-5BPC	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 1,2,3,4,6,7,8-HpCDF OCDF	0.14U pg/g 0.72U pg/g 0.12U pg/g 0.12U pg/g 0.084U pg/g 0.093U pg/g 0.21U pg/g 0.49U pg/g	A	Ы
G0D080425	RSAQ3-3BPC**	2,3,7,8-TCDD 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	0.038U pg/g 0.23U pg/g 0.61U pg/g 0.24U pg/g 0.12U pg/g 0.13U pg/g 0.20U pg/g	A	bl
G0D080425	RSAQ3-3BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD	0.43U pg/g 1.1U pg/g	А	bl
G0D080425	SSAO6-02-1BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD	0.30U pg/g 0.62U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D080425

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

VALIDATION COMPLETENESS WORKSHEET LDC #: 23265A21 SDG #: G0D080425 Stage 2B/4 Laboratory: Test America

Reviewer: C 2nd Reviewer:

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
l.	Technical holding times	4	Sampling dates: 4/6/10
11.	HRGC/HRMS Instrument performance check	4	/ /
111.	Initial calibration	4	
IV.	Routine calibration/ICV	an	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	W	
VII.	Laboratory control samples	1	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
_X.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SN	
XII.	System performance	A	
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	W	D=1+6.3+5
XV.	Field blanks	W	FB-0407210-RZD (G0D090441)FB04062010-RZB (G0D120488) FB-04072010-RZC (G0D130519)

Note:

A = Acceptable

N = Not provided/applicable SW = See worksheet

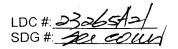
ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate TB = Trip blank EB = Equipment blank

Validated Samples: ** level IV

1	SSA06-02-1BPC	11	0/06187MB	21	31	
2	SSA06-02-5BPC C	12	0110455MX3	22	 32	
3	RSAQ3-3BPC ** B	13		23	 33	
4	SA169-3BPC	14		24	 34	
5	RSAQ3-3BPC_FD	15		25	35	
6	SSAO6-02-1BPC_FD c	16		26	36	
7 2	SSAJ8-01-3BPC ** D	17		27	37	
8	SSA06-02-5BPCMS	18		28	38	
9	SSA06-02-5BPCMSD	19		29	39	
10		20		30	40	

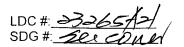
Notes:_	 	 	 		
F					



VALIDATION FINDINGS CHECKLIST

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?		<u></u>		
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) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?				
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?		_		
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 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?				



VALIDATION FINDINGS CHECKLIST

Page:_	<u>> of</u> ح
Reviewer:_	9_
2nd Reviewer:	9_

VIII. Regional Quality Assurance and Quality Control			<u></u>	
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?	-	/	<u> </u>	
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	/	<u> </u>		
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 \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?		1.10		
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.				7,10
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 2378-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	a. ocbF	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 12.3.6.7.8-HXCDD	1, 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 #Y

VALIDATION FINDINGS WORKSHEET

Routine Calibration

Page:

2nd Reviewer: Reviewer:

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". N-NA

Were all percent differences (%D) of RRFs \leq 20% for unlabeled compounds and \leq 30% for labeled? Was a routine calibration was performed at the beginning and end of each 12 hour period?

Did all routine calibration standards meet the Ion Abundance Ratio criteria?

AN NA

*	Date	Standard ID	Compound	(F	Finding %D 20	Finding ion Abundance Ratio	Associated Samples	Se	Qualifications (C)
	alfecta	21AP10B40S	5-18 13C-F		30.1		3-5.9	7	(+A+A (F)
		,	,						
	1/2/3	7777777							7 7 7 7 7
	1/2/10	2/14/104/12556	36 W	ð				1	1015 (K)
<u> </u>									
			,						
		PCDDs	Selected ions (m/z)	Ion Abundance Ratio	e Ratio	PCDFs	Selected ions (m/z)	(z/w) suc	Ion Abundance Ratio
	Tetra-		M/M+2	0.65-0.89	6	Tetra-	M/M+2	+2	0.65-0.89
	Penta-		M+2/M+4	1.32-1.78	60	Penta-	M+2/M+4	M+4	1.32-1.78
	Hexa-		M+2/M+4	1.05-1.43		Неха-	M+2/M+4	M+4	1.05-1.43
	Hexa-13C-HxCDF (IS) only	ODF (IS) only	M/M+2	0.43-0.59		Hexa- ¹³ C-HxCDF (IS) only	/ M/M+2	+2	0.43-0.59
	Hepta- ¹³ C-Hp	Hepta- ¹³ C-HpCDF (IS) only	M/M+2	0.37-0.51		Hepta-¹³C-HpCDF (IS) only	ly M/M+2	+2	0.37-0.51
	Hepta-		M+2/M+4	0.88-1.20		Hepta-	M+2/M+4	M+4	0.88-1.20
	Octa-		M+2/M+4	0.76-1.02	C.	Octa-	M+2/M+4	V+4	0.76-1.02

SDG # 2el Cour LDC #: 23265/2

VALIDATION FINDINGS WORKSHEET

Blanks

2nd Reviewer: Reviewer:

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

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

Were all samples associated with a method blank? N N/A

Was a method blank analyzed for each matrix?

Y/N N/A

Blank extraction date: 4/20/ N N/A

Associated Samples: Was the blank contaminated? If yes, please see qualification below. In date: 4/20/10 Blank analysis date: 4/26/19 Conc. units: 25/9

_						 	
	Sample Identification						
	Blank ID	SUSTAN	180	180	030		
	Compound		H	/	0		

Blank analysis date: Blank extraction date: Conc. units:

Associated Samples:

			-		
ıtion					
Sample Identification					
S					
Blank ID					
Compound	-				

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".

SDG #: See Cover LDC #: 23265A21

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 1 Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

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. N/N N/A

Associated samples: Blank analysis date: 4/21/10 Blank extraction date: 4/16/10 Conc. units: pg/g

											Ī	<u> </u>	<u> </u>	T	Ī	<u> </u>	Г	<u> </u>	Т
Sample Identification	9		0.30/U	0.62/U	•	ı		ı	•	1									
Sample	5		0.43/∪	1.1/U	-			ī	1	,					×				
	3	0.038/U	0.23/U	0.61/U	0.24/U	0.12/U	0.13/U	0.20/U	1	•					7				
	6		0.14/U	0.72/U	0.12/U	0.12/U	0.084/U	0.093/U	0.21/U	0.49/U					grand grand				
	1	0.082/U	0.42/U	1.4/U	1	1	1	-		-									
	5X	0.18	0.7	2.25	0.44	0.2	0.31	0.27	0.38	0.75									
Blank ID	0106187MB	0.036	0.14	0.45	0.088	0.040	0.062	0.054	0.076	0.15									
pun																			
Compound		A	Ľ.	9	I			×	0	Ø									

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 #: <u>23265A21</u> SDG #: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: of Reviewer: 2nd Reviewer: 2

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

Y N/A Were field blanks identified in this SDG?

nk units: pg/L Associated sample units:

Blank units: pg/L Sampling date: 4/7/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

er:______Associated Samples:_____

Compound	Blank ID			Sai	Sample Identification	tion		
	FB-04072010-RZD	5X						
O	0.89	0.00445						
Ш	1.5	0.0075						
L	2.2	0.011		- "				
O	8.3	0.0415						
¥	1.4	0.007						
7	1.6	0.008						
M	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
۵ـ	1.4	0.007						
Ö	4.1	0.0205						

CRQL								

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

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SDG #: See Cover LDC #: 23265A21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: of 2nd Reviewer: Reviewer:

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

Associated sample units: YN N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Sampling date: 4/6/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

3-5

Compound	Blank ID		Sa	Sample Identification	uo 		
	FR04062010-R7R	5X					
Ш	0.68	0.0034					
Ľ.	2.5	0.0125					
Ø	6.2	0.031					
Τ	2.7	0.0135					
×	1.4	0.007					
-1	0.82	0.0041					
Z	0.94	0.0047					
0	1.8	600.0					
a.	1.2	900.0					
Ø	4.4	0.022					
CROL							

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

SDG #: See Cover LDC #:23265A21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: 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

b/bd Associated sample units:_ Sampling date: 4/8/10

Associated Samples: Field blank type: (circle one Field Blank) Rinsate / Other:

Compound	Blank ID			Sar	Sample Identification	ıtion		
	FR-04072010-R7C	5X						
0	0.77	0.00385						
۵	0.74	0.0037						
Ш	0.82	0.0041						
Ľ.	4.2	0.021	-				AND CONTRACTOR OF THE CONTRACT	
9	37	0.185						
Ξ	0.57	0.00285						
	0.96	0.0048						
ſ	0.67	0.00335						
×	1.1	0.0055						
1	0.96	0.0048						
M	1.0	0.005						
Z	1.0	0.005						
0	2.1	0.0105	-					
۵	1.5	0.0075						
Ø	6.7	0.0335						
CRQL								

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

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rage:

2nd Reviewer: Reviewer:

SDG #: 261 COVE

Matrix Spike/Matrix Spike Duplicates

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

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

| 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.

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

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

	Date	di asm/sm	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
, ,		6/8	1	()	(***)	130 (5278)	И	10 Pr. 30
ŧ			4	()	(751-18) 121	49(532)		
,			7	()	()	- XXXX - XX		
			Σ	(()	48153C+		
1			. 2	()	()	(XXX) RS		
- 1			0	()	139(81-137)	()		
			4	()	651-62) (2)	()		
- 11			X		182(75-141)			>
1				()	()	()		(WS, & USD in
- 1				(.)	()	()		
- 1				()	()			
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- 1				()	()	()		
1				()	()	()		
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LDC #23265/2/ SDG #: Lec Con Ch

VALIDATION FINDINGS WORKSHEET

Internal Standards

Reviewer:_ Page:_

2nd Reviewer:

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

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

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

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	: 40-135%)	Qualifications
		91WS)	*		38	(3E/-OF)	No lenax
			+		28		1
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						()	
		Internal Standards	Check Standard Used		4	Internal Standards	Check Standard Used
Ą	13C-2,3,7,8-TCDF	JDF		Ö	¹³ C-1,2,3,4,6,7,8-HpCDF	т ТрСDF	
В	13C-2,3,7,8-TCDD	ממנ		Ŧ.	¹³ C-1,2,3,4,6,7,8-HpCDD	ЧрСDD	
ပ	¹³ C-1,2,3,7,8-PeCDF	PeCDF			13C-OCDD		
O.	¹³ C-1,2,3,7,8-PeCDD	PeCDD		ᅶ	¹³ C-1,2,3,4-TCDD		
ш	¹³ C-1,2,3,4,7,8-HxCDF	3-HxCDF		نـ	¹³ C-1,2,3,7,8,9-HxCDD	CDD	
ц	13C-1 2 3 6 7 8-HxCDD	HXCDD					

LDC #:333/5/

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	/pmg/	4	J455 (e)			(4.6)					
Associated Samples	thon 1-3		4								
Finding	No 3.3.7.8-TCOF Continue		H. K. L. O. P. 8	> call b lange		24 /1121/20 DUZ	•				
Sample ID	1-2,3,5		4			∌ II					
Date								0			
*											

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23265A21</u> SDG#:<u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: of Reviewer: 2nd Reviewer:

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

YN NA YN NA

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

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	1	6	RPD	Difference	Limits	(Parent Only)
Α	0.082	1.0U		0.918	(≤1.0)	
В	0.19	0.082		0.108	(≤5.2)	
C	0.13	5.2U		5.07	(<u><</u> 5.2)	
D	0.17	0.14		0.03	(<u><</u> 5.2)	
E	0.19	0.11		0.08	(<u><</u> 5.2)	
F	0.42	0.30		0.12	(≤5.2)	
G	1.4	0.62		0.78	(≤10)	
Н	0.91	0.76		0.15	(≤1.0)	
I	0.62	1.0		0.38	(≤5.2)	
J	0.39	0.47		0.08	(<u><</u> 5.2)	
κ	0.92	1.6		0.68	(≤5.2)	
L	0.49	0.85		0.36	(<u><</u> 5.2)	
М	0.16	0.27		0.11	(≤5.2)	
N	0.19	0.16		0.03	(<u><</u> 5.2)	
Ö	1.2	2.0		0.8	(<u><</u> 5.2)	
P	0.83	1.1		0.27	(≤5.2)	
Q	2.8	4.4		1.6	(<10)	

	Concentra	tion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	3	5	RPD	Difference	Limits	(Parent Only)
А	0.038	1.0U		0.962	(≤1.0)	
С	0.066	5.2U		5.134	(≤5.2)	
D	0.079	0.10		0.021	(≤5.2)	
E	0.15	0.20		0.05	(≤5.2)	
F	0.23	0.43		0.2	(≤5.2)	
G	0.61	1.1		0.49	(≤10)	
H	0.24	0.64		0.4	(≤1.0)	

LDC#: <u>23265A21</u> SDG#: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET <u>Field Duplicates</u>

Page: →of → Reviewer: ↓ 2nd Reviewer: ↓

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

YNNA

Were field duplicate pairs identified in this SDG?

Were target analytes detected in the field duplicate pairs?

	Concentra	ation (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	3	5	RPD	Difference	Limits	(Parent Only)
I	0.12	5.2U		5.08	(≤5.2)	
J	0.13	5.2U		5.07	(≤5.2)	
К	0.20	0.79		0.59	(≤5.2)	
L	0.11	0.38		0.27	(≤5.2)	
М	0.091	5.2U		5.109	(≤5.2)	
N	0.12	0.33		0.21	(≤5.2)	
0	0.39	1.2		0.81	(<u><</u> 5.2)	
Р	0.20	0.63		0.43	(≤5.2)	
Q	0.92	2.8		1.88	(≤10)	

V:\FIELD DUPLICATES\23265A21.wpd

SDG #: Sec COM

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

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

 A_{k} = Area of compound, A_{k} = C_{k} = Concentration of compound, C_{k} = S = Standard deviation of the RRFs, X = N

1, $A_a=Area$ of associated internal standard compound, $C_a=Concentration$ of internal standard of the RRFs, X=Mean of the RRFs

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (SS Std)	RRF (C\$3 std)	%RSD	%RSD
-	19th	0/0./1	2,3,7,8-TCDF (19C-2,3,7,8-TCDF)	0.860	0.860	0.87	1.00.0	4.01	901
	(105)		2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)	4560	0.934	0.96	0.95	100	8 61
		 r	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.058	1.058	00.1	601		011
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	8660	864.0	1.05	501	٤.٤/	12.2
			OCDF ("C-OCDD)	1.437	1.437	1.52	<5.1	141	140
7	1ste	4/2/1	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.088	1.10	0/:/	s si	SK.
		1/1/1	2,3,7,8-TCDD (¹⁵ C-2,3,7,8-TCDD)					,	. ,
		`	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	·					
			ocpf ("c-ocpp)						
ဗ	1str	1///	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	3460	0.945	86.0	860	4.44	A XX
	(405)	01/2/16	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.03/	1.02	1.04	1.04	202	1000
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.114	1.114	1.19	0 !!	7.33	1,7,7
\int			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	////	111	2,60	300
			OCDF ("C-OCDD)	1.1142	11111	1,2,	-		000

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.

, SDG #: 261 COM LDC #: 253/55/31

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

10 PM Page: 2nd Reviewer: Reviewer:

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 = $(A_a)(C_a)/(A_a)(C_s)$

ave. RRF = initial calibration average RRF Where:

RRF = continuing calibration RRF

 $A_{\rm k}$ = Area of associated internal standard $C_{\rm k}$ = Concentration of internal standard $A_x = Area of compound,$ $C_x = Concentration of compound,$

Ļ					Reported	Recalculated	Reported	Recalculated
	-	Calibration		Average RRF	RRF	RRF		
*	Standard ID	Date	Compound (Reference Internal Standard)	(initial)	(၁၁)	(၁၁)	%D	Q%
	21441415	4/1/77	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	0.945	701	1001	2.6	9.6
	\	21/11/2	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.02/	1.03	1.03	1:	7.7
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.114	1.36	97.1	13.5	13.5
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.072	60%	60.1	2.0	D. 0
			OCDF (3c-OCDD)	1.445	251 pio	1.50	3.9	39
8	21A PIOBUTS A/2411	A/2HID	2,3,7,8-TCDF (¹3C-2,3,7,8-TCDF)	2.945	501	601	8.7	1.8
	/	1/2/	2,3,7,8-TCDD (³ C-2,3,7,8-TCDD)	120.1	0.97	760	5.3	w. W
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.114	1.13	1.13	9.1	1.6
			1,2,3,4,6,7,8-HpCDD (°C-1,2,4,6,7,8,-HpCDD)	1.072	1.03	€01	3.5	8. S.
			OCDF (12C-OCDD)	1.445	1.43	1.43	1.7	1.7
က	3747104DE	4/8%	2,3,7,8-TCDF (³C-2,3,7,8-TCDF)	0.945	76.0	76.0	∞ `<	ab N'
		/ / 10	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.021	560	26.0	6.6	0
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)		601	601	4.0	4.8
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.072	1.03	601	40	4.0
			OCDF (1°C-OCDD)	1.446	134	1.24	6.0	6.9

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.

Routine Calibration Results Verification

* SDG *:

The percent difference (%D) of the initial calibration average Relative Response Factors (RRFs) and the continuing calibration RRFs were recalculated for the METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290) compounds identified below using the following calculation:

Where: ave. RRF = initial calibration average RRF RRF = corrinuing calibration RRF

% Difference = 100 * (ave, RRF - RRF)/ave, RRF RRF = $(A_u)(C_u)/(A_u)(C_v)$

nnr = continuing calloration hhr A_x = Area of compound, C_x = Concentration of compound, C

 $A_{\rm b} = Area$ of associated internal standard ound, $C_{\rm b} = Concentration$ of internal standard

L			i.					
					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	0%
_	JAD 10AIR	,	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.860	200	260	10	10
		01/20/4	4/26/10 2,3,7,8-TCDD (3C-2,3,7,8-TCDD)	0.934	0.93	0.93	10	10
		\	1,2,3,6,7,8-HxCDD (1°C-1,2,3,6,7,8-HxCDD)	1.058	1.18	1:15	8.8	0.00
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	8660	1.06	1.06	6.2	20
			OCDF (*c-OCDD)	1.437	7.5.1	7251/	7.7	7.0
7	37#PIDE 12 1 67/10	+ 67/10	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	1.088	1.04	to: -	1 N	NA
		2//1	2,3,7,8-TCDD (°C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (1°C-OCDD)					
က			2,3,7,8-TCDF (*0-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (1°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 (12C-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.



Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page:__ Reviewer:_

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

SSR = Spiked sample result, SR = Sample result SA = Spike added Where:

00) MS/MSD samples:

RPD = I MSR - MSDR I * 2/(MSR + MSDR)

MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

0

	Spike	Sample	Soiked Sample	Matrix Spike	Spike	Matrix Spike Duplicate	- Duplicate	Reported	Recalculated
Compound	Added	Concentration (+ 7/3)	Concentration (+)	Percent Recovery	tecovery	Percent Recovery	ecovery	RPD	RPD
1 m	MSD		MSM / MSD	Reported	Recaic	Reported	Recalc		9 8 9 2
2.3.7.8-TCDD	0	AN	10	86	\mathcal{E}	4	4	17	4 W
1.2.3.7.8-PeCDD	111 011		104 109	95	95	66	99	4.7	4.7
1.2.3.4.7.8-HxCDD			100 - 401	43	63	611	119	X	25
1.2.3.4.7.8.9-HpCDF		>	132 187	120	120	1,21	(50)	38	4
OCDF	20 20	049	28 40	727	n d	7 & l	(X)	80	NO
					-				
								-	

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.

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LDC#:23265/2/

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

Page: of Reviewer: 2nd Reviewer: 8

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:

Where: SSC = Spiked sample concentration SA = Spike added

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

ecovery LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0/06/87

	Ğ.	jke	Spiked S	ample	SOI	8	I CSD	D.	I CS/I CSD	CSD
Compound	B	Added	Concentration (475/9)	ration (9)	Percent Recovery	ecovery	Percent Recovery	эсоvегу	RPD	D
	1.03	I CSD	/ /	l CSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	000	¥	7 00	NX	(0)	101				
1,2,3,7,8-PeCDD	8		€0)	/ .	103	103	-			
1,2,3,4,7,8-HxCDD			0.96		96	96				
1,2,3,4,7,8,9-HpCDF		-	011		a11	110				
OCDF	000	->	204	<i>\</i>	<01	102	,			
					١	_				
						-		-		

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.

/te		-	· (C)				(S)	3)			Ī	<u> </u>		=		_									-					-		
Analyte	HpCDF	HpcDF	HPCDF (S)	HPCDF	HpCDD	HPCDD	Hpcpb (8	(s) даран (s)	NCDPE	д Ж		OCDF	OCDF	OCDD	OCDD	(s) agoo	(s) agoo	DCDPE	PFK										-			
position								Q																								
Elemental Composition	⁵ CI, ³⁷ CIO	C12H25C137C12O	0,50°	¹³ C ₁₂ H ³⁵ CI ₈ 37CIO	C ₁₂ H ³⁵ Cl ₆ 37ClO ₂	CI537CI2O2	18°C18,37C102	13C12H36CI537CI2O2	C ₁₂ H ³⁵ Cl ₂ 37Cl ₂ O			C ₁₂ %Cl ₇ 37ClO	0,3/CI ₂ O	1,37ClO ₂	C ₁₂ 35Cl ₈ 37Cl ₂ O ₂	Cl,37ClO ₂	Cl ₃ ,Cl ₂ O ₂	C ₁₂ 35Cl ₃ 37Cl ₂ O														
ЕІеш	S. T.	ις Ο	ည် သ	န် ဂ	ST.	C T	ည် ၂	13° 12° 1	C T	O F	_	ည်း သူ့	ပ္သ	ပ္ဆင္ဆ	ပ္ခ	13 25 28	- ဦ န	က လို့	о п													
Ol nol	M+2	M+4	Σ	M+2	M+2	M+4	M+2	M+4	A +	LOCK		M+2	Δ+ + 2	M+2	Σ + 4	M+2	M+4	M+4	LOCK													
lass ^(a)								-																								
Accurate Mass ^(a)	407.7818	409.7788	417.8250	419.8220	423.7767	425.7737	435.8169	437.8140	479.7165	430.9728]		441.7428	443.7399	457.7377	459.7348	469.7780	471.7750	513.6775	422.9278]													
		40	4	4	42	42	43	43	47	<u></u>		44	44	45	45	46	47	2	4		<u>-</u>	-										
Descriptor	4				_							ເດ 																				
Analyte		i L	F (S)	(S)	Δ	Ω	TCDD (S)	TCDD (S))PE			<u>ሖ</u> ;	٦. [Pecur (s)	PeCDF (S)	<u> </u>	Ö	PeCDD (S)	PeCDD (S)	PE			ፑ	Ŧ	HXCDF (S)	HXCDF (S)	<u>,</u>	٥	HXCDD (S)		(g)	(s) <u>-</u>
	TCDF	TCDF	TCDF (S)	TCDF (S)	<u> </u>	TCDD	ם	<u>10</u>	HXCDPE	퐀		Peop	recur TUS	2	P P	PecDD	PecDD	_ မ	Pe C	HPCDPE	푔		HXCDF	HXCDF	¥	¥ E	HXCDD	HXCDD	Ť		Ĭ	HXCDD (S)
mposition				_				_0							_			8	~~													_0
Elemental Composition	o ပြွ	C ₁₂ H ₄ 35Cl ₃ 37C10	o ပ်ပ္အ	***CI3**CIO	o င့်	C ₁₂ H ₄ **Cl ₃ **C10 ₂	13C12H, 35C1, O2	13C ₁₂ H ₄ 35Cl ₃ 37ClO ₂	C ₁₂ H ₄ **CI ₅ *7CIO			C ₁₂ H ₃ *Cl ₄ *ClO	ָבֶּילֶבֶּי בַּייָבֶּילָבָי בַּיִּבְיִינִי	C1,4/C10		C ₁₂ H ₃ **Cl ₄ **ClO ₂	C12H32C132C12O2	32C1 37C1O	13C ₁₂ H ₃ 3Cl ₃ 37Cl ₂ O ₂	Cl ₃ 7ClO	ر يا		CI,37CIO	C12H235C123C12O	O U	*CI,37CIO	C.H. 3CI-3CIO.	C,37C,0,	*Č[,37,Č[O,	•	SCI 3701.0	13C12H2 45C1477C12O2
Elen	L, H,	C. T.	Ξ, C, E,	L, T, T,	C12#,***C1,O2	ດ ∓້	Ť, Ť,	¹³ င်း H,	S,TZ	ကို		Ϋ́ Ϋ́	ے اور اور اور اور	בני ט'יני בייני	Σ Ω	C12H	S. T.		င်း ညီ	C12H38	ດ πີ້		C,T,	CLH	ئ بر	, H.	C T	, T.	- ξ. . Ξ.		13 T	13C12H2
On ID	Σ	M+2	Σ	M+2	Σ	M+2	≥	M+2	M+2	Z S S		M+2	M+4	M+2	Δ+4	M+2	¥+	M+2	M+4	M+2	LOCK LOCK		M+2	M+4	Σ	M+2	M+2	M+4	M+2		M+4	M+4
î.											-		-													-						
Accurate mass ⁽²⁾	16	87	19	8	8	36	89	38	22	792]		76	<u>ن</u> د	8 9	Q :	9 1	9	စ္ ်	<u></u>	4	, <u>9</u> 2]		80	80	စ္အ	0	9	2:	9		σ,	ου i
	303.9016	305.8987	315,9419	317.9389	319.8965	321.8936	331.9368	333,9338	375.8364	[354.9792]		339.8597	341.8567	351.9000	353.8970	355.8546	357.8516	367.8949	369.8919	409.7974	[354.9792]		373.8208	375.8178	383.8639	385.8610	389.8156	391.8127	401.8559		403.852	403.8529
Descriptor	1											7											က									

(a) The following nuclidic masses were used:

O = 15.994915 3 Cl = 34.968853 3 Cl = 36.965903

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

S = internal/recovery standard

LDC #: 33265 A > 1 SDG #: See COUN

only.

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	
Reviewer:	9
2nd reviewer:	a

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

K	N	N/A
$\langle \mathbf{y} \rangle$	N	N/A

Were all reported results recalculated and verified for all level IV samples?

Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Conce	ntration	$= \frac{(A_{\bullet})(I_{\bullet})(DF)}{(A_{\bullet})(RRF)(V_{\circ})(\%S)}$	Example:
A _×	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D:
A _{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (/10844) (2000) () (9577480) (/072) (/075) (938)
V _°	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	
RRF	=	Relative Response Factor (average) from the initial calibration	= 0.227 P3/g
Df	=	Dilution Factor.	/ 0
%S	=	Percent solids, applicable to soil and solid matrices	

#	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:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D130519

Sample Identification

FB-04072010-RZC EB-04072010-RZC

Introduction

This data review covers 2 water 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0123308MB	4/19/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 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-HyCDF 1,2,3,4,6,7,8-HpCDF	0.88 pg/L 1.6 pg/L 2.6 pg/L 0.94 pg/L 0.89 pg/L 0.50 pg/L 1.1 pg/L 0.93 pg/L 0.98 pg/L	All samples in SDG G0D130519

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-RZC	1,2,3,7,8,9-HxCDD	0.82 pg/L	0.82U pg/L
	1,2,3,4,6,7,8-HpCDD	4.2 pg/L	4.2U pg/L
	2,3,4,7,8-PeCDF	0.67 pg/L	0.67U pg/L
	1,2,3,4,7,8-HxCDF	1.1 pg/L	1.1U pg/L
	1,2,3,6,7,8-HxCDF	0.96 pg/L	0.96U pg/L
	2,3,4,6,7,8-HxCDF	1.0 pg/L	1.0U pg/L
	1,2,3,4,6,7,8-HpCDF	2.1 pg/L	2.1U pg/L
	1,2,3,4,6,7,8-HpCDF	1.5 pg/L	1.5U pg/L
EB-04072010-RZC	1,2,3,7,8,9-HxCDD	0.65 pg/L	0.65U pg/L
	1,2,3,4,6,7,8-HpCDD	5.5 pg/L	5.5U pg/L
	2,3,4,7,8-PeCDF	1.0 pg/L	1.0U pg/L
	1,2,3,4,7,8-HxCDF	1.8 pg/L	1.8U pg/L
	1,2,3,6,7,8-HxCDF	1.1 pg/L	1.1U pg/L
	2,3,4,6,7,8-HxCDF	0.97 pg/L	0.97U pg/L
	1,2,3,4,6,7,8-HpCDF	4.5 pg/L	4.5U pg/L
	1,2,3,4,6,7,8-HpCDF	1.1 pg/L	1.1U pg/L

Sample EB-04072010-RZC was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04072010-RZC	4/8/10	2,3,7,8-TCDD 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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.0 pg/L 0.69 pg/L 0.65 pg/L 5.5 pg/L 53 pg/L 2.6 pg/L 1.5 pg/L 1.0 pg/L 1.8 pg/L 1.1 pg/L 0.97 pg/L 4.5 pg/L 1.1 pg/L 1.2 pg/L	No associated samples in this SDG

Sample FB-04072010-RZC 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-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 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	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 1.1 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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 G0D130519	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	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D130519	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D130519	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D130519

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D130519	FB-04072010-RZC EB-04072010-RZC	2,3,7,8-TCDF	None	P	Project Quantitation Limit (o)
G0D130519	FB-04072010-RZC EB-04072010-RZC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D130519	FB-04072010-RZC EB-04072010-RZC	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 G0D130519

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D130519	FB-04072010-RZC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD 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 1,2,3,4,6,7,8-HpCDF	0.82U pg/L 4.2U pg/L 0.67U pg/L 1.1U pg/L 0.96U pg/L 1.0U pg/L 2.1U pg/L 1.5U pg/L	A	Ы
G0D130519	EB-04072010-RZC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD 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 1,2,3,4,6,7,8-HpCDF	0.65U pg/L 5.5U pg/L 1.0U pg/L 1.8U pg/L 1.1U pg/L 0.97U pg/L 4.5U pg/L 1.1U pg/L	A	ы

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D130519

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D130519

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23265C21 Stage 2B SDG #: G0D130519 Laboratory: Test America

Reviewer: Q 2nd Reviewer:

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
l.	Technical holding times	A	Sampling dates: 4/8/10
11.	HRGC/HRMS Instrument performance check	4	/ /
111.	Initial calibration	#	
IV.	Routine calibration/I	1	·
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	N	d'ent De fied
VII.	Laboratory control samples	A-	10a
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	1	
X	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	√W	All ZMPC - Ut(F)
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	W	B=1. 2B=2

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	FB-04071 0-R2C EB-04071 0-R2C W	11	0123308MB	21	31
2	2010-R2C EB-04071 0-R2C	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 Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

A 2 2 7 8 TOD				
	r. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1234780 UNCAE	
A 10378 DOCUM				U. Iotal HpCDD
00091-01:01:	6. OCDD	L. 1,2,3,6,7,8-HXCDF	3000	
100				V. lotal ICDF
C. 1,4,3,4,7,8-HXCDD	H. 2,3,7,8-TCDF	M. 2.3.4.6.7.8-HxCDF	100 H 100 H	
				W. Total PeCDF
D. 1,2,3,6,7,8-HxCDD	1.12378.PaCDE			
		LV. 1,2,5,7,8,8-TXCOF	S. Total PeCDD	X Total DVO DE
E. 12.3.7.8.9.H×CDD				A: Total TACOF
	0. 4,0,4,7,0-recor	O. 1,2,3,4,6,7,8-HpCDF	T Total HVCOD	
				Y. DOM HOUSE

Notes:

5C21	Cover
2326	See
DC#	# 9Q
⊐	S

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Y N N/A N/A

Was the method blank contaminated? If yes, please see qualification below. N/A

(bl)

A

Blank analysis date: 5/1/10 Blank extraction date: 4/19/10 Conc. units: pg/L

Sample Identification Associated samples: 0.65/U 0.97/U 5.5/U 1.0/U 1.8/∪ 1.1/0 1.1∕∪ 4.5/U 0.82/U 0.67/U 0.96/U 4.2/∪ 1.1 1.0/∪ 2.1/U 1.5/U 4.45 4.65 4.4 4.7 2.5 5.5 5 4.9 X ω 0123308MB Blank ID 0.88 0.89 0.94 0.50 1.6 2.6 0.93 0.98 7. Compound O O

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".

SDG #: See Cover LDC #: 23265C21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Page: Reviewer:

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

Associated sample units: (Y M N/A Were field blanks identified in this SDG?

Biank units: pg/L Sampling date: 4/8/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

b/bd

Compound	Blank ID			Sar	Sample Identification	ation		
	EB-04072010-RZC	5x						
۷	1.0	0.005						
۵	0.69	0.00345						
ш	0.65	0.00325						
Ľ	5.5	0.0275						
O	53	0.265						
T	2.6	0.013						
	1.5	0.0075						
ſ	1.0	0.005						
¥	1.8	0.009						
	7.	0.0055						
V	0.97	0.00485						
0	4.5	0.0225						
d .	7.7	0.0055						
Ø	12	90:0						
CROL								

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

SDG #: See Cover LDC #:23265C21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_

Page: Reviewer:

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

b/bd Associated sample units: | V N N/A Were field blanks identified in this SDG? | Blank units: pg/L | Associated sample units | Sampling date: 4/8/10 |

Field blank type: (circle one) Field Blank PRinsate / Other.

None Associated Samples:

Compound	Blank ID			Sar	Sample Identification	tion		
	FB-04072010-RZC	5X						
U	0.77	0.00385						
D	0.74	0.0037						
Ш	0.82	0.0041						
ц.	4.2	0.021						
g	37	0.185						
Τ	0.57	0.00285						
	0.96	0.0048						
٦	0.67	0.00335						
¥	1.1	0.0055						
	0.96	0.0048						
Σ	1.0	0.005						
Z	1.0	0.005						
0	2.1	0.0105						
۵	1.5	0.0075						
Ø	6.7	0.0335						
CRQL			-					

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

SDG #: Sectional LDC #: 2326227

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

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 MA

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	None			(K)						
Associated Samples	M			M	/					
Finding	No confirmation Um	2.3.7.8-700F		1 XII ZNP C (& + lag)						
Sample ID	// \$ -			W						
Date							0			
*										

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 13, 2010

LDC Report Date:

June 10, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D150462

Sample Identification

SSAI3-02-1BPC

SSAI3-03-1BPC

SSAK3-01-1BPC

SSAJ3-03-1BPC

SSAI2-01-1BPC**

SA207-12BPC

SSAI3-02-1BPCMS

SSAI3-02-1BPCMSD

^{**}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.
- P 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
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	SA207-12BPC
0109260MB	4/19/10	1,2,3,4,6,7,8-HpCDD 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 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	0.14 pg/g 0.59 pg/g 0.28 pg/g 0.14 pg/g 0.24 pg/g 0.14 pg/g 0.086 pg/g 0.30 pg/g 0.13 pg/g 0.63 pg/g	SSAI3-02-1 BPC SSAI3-03-1 BPC SSAK3-01-1 BPC SSAJ3-03-1 BPC SSAI2-01-1 BPC**

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
SSAI3-02-1 BPC	1,2,3,4,6,7,8-HpCDD	0.31 pg/g	0.31U pg/g
	OCDD	0.31 pg/g	0.31U pg/g
	2,3,7,8-TCDF	0.34 pg/g	0.34U pg/g
	1,2,3,7,8-PeCDF	0.53 pg/g	0.53U pg/g
SSAI3-03-1 BPC	1,2,3,4,6,7,8-HpCDD	0.47 pg/g	0.47U pg/g
	OCDD	2.8 pg/g	2.8U pg/g
	1,2,3,7,8,9-HxCDF	0.22 pg/g	0.22U pg/g
SSAJ3-03-1BPC	OCDD	0.87 pg/g	0.87U pg/g
	2,3,7,8-TCDF	1.1 pg/g	1.1U pg/g
	1,2,3,7,8,9-HxCDF	0.30 pg/g	0.30U pg/g

Sample EB-04132010-RIG3-RZD (from SDG G0D150582) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04132010-RIG3-RZD	4/13/10	1,2,3,6,7,8-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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.39 pg/L 1.3 pg/L 3.1 pg/L 2.8 pg/L 2.3 pg/L 1.4 pg/L 4.6 pg/L 2.7 pg/L 1.0 pg/L 0.48 pg/L 5.9 pg/L 2.3 pg/L 9.9 pg/L	SSAI3-02-1 BPC SSAI3-03-1 BPC SSAK3-01-1 BPC SSAJ3-03-1 BPC SSAI2-01-1 BPC**

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

Samples FB-04072010-RZD (from SDG G0D090441) 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-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 1,2,3,4,6,7,8-HpCDF	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 1.6 pg/L 1.4 pg/L 1.9 pg/L 1.4 pg/L 4.1 pg/L	SSAI3-02-1BPC SSAI3-03-1BPC SSAK3-01-1BPC SSAJ3-03-1BPC SSAI2-01-1BPC**
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 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 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 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SA207-12BPC

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 within QC limits.

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
SSAI3-03-1 BPC	¹³ C-OCDD	22 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAJ3-03-1BPC	¹³ C-OCDD	27 (40-135)	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
SSAK3-01-1BPC	1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150462	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150462	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 SSAl3-03-1BPC_FD (from SDG G0D150589) and SSAl3-03-1BPC and samples SSAl2-01-1BPC_FD (from SDG G0D150589) and SSAl2-01-1BPC were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentration (pg/g)		555		DDD D:#******		
Compound	SSAI3-03-1BPC_FD	SSAI3-03-1BPC	RPD (Limits)	Difference (Limits)	Flags	A or P	
1,2,3,7,8-PeCDD	0.12	2.5U	-	2.38 (≤2.5)	-	-	
1,2,3,4,7,8-HxCDD	0.090	0.061	-	0.029 (≤2.6)	-	-	
1,2,3,6,7,8-HxCDD	0.24	0.16	-	0.08 (≤2.6)	-	-	
1,2,3,7,8,9-HxCDD	0.24	0.17	-	0.07 (≤2.6)	-	-	
1,2,3,4,6,7,8-HpCDD	2.8	0.47	-	2.33 (≤2.6)	-	-	

	Concentral	tion (pg/g)	on (pg/g) RPD Difference			
Compound	SSAI3-03-1BPC_FD	SSAI3-03-1BPC	(Limits)	(Limits)	Flags	A or P
OCDD	59	2.8	•	56.2 (≤5.2)	J (all detects)	А
2,3,7,8-TCDF	0.80	0.49U	•	0.31 (≤0.49)	-	-
1,2,3,7,8-PeCDF	0.91	0.72	-	0.19 (≤2.6)	-	-
2,3,4,7,8-PeCDF	0.55	0.33	•	0.22 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	1.7	1.5	-	0.2 (≤2.6)	-	-
1,2,3,6,7,8-HxCDF	1.1	1.2	-	0.1 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	0.29	0.25	-	0.04 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.30	0.22	-	0.08 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	3.9	3.1	•	0.8 (≤2.6)	-	-
1,2,3,4,7,8,9-HpCDF	1.6	1.4	-	0.2 (≤2.6)	-	-
OCDF	16	12	-	4 (≤5.2)	-	-

	Concentral	DDD.		RPD Difference		
Compound	SSAI2-01-1BPC_FD	SSAI2-01-1BPC	(Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	0.10	0.13	-	0.03 (≤0.53)	-	-
1,2,3,7,8-PeCDD	0.23	0.18	-	0.05 (≤2.6)	-	-
1,2,3,4,7,8-HxCDD	0.26	0.24	-	0.02 (≤2.6)	-	-
1,2,3,6,7,8-HxCDD	3.3	2.9	-	0.4 (≤2.6)	-	-
1,2,3,7,8,9-HxCDD	1.3	0.85	_	0.45 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	22	21	5 (≤50)	-	-	-
OCDD	2.8	3.6	-	0.8 (≤5.3)	-	-

	Concentra	tion (pg/g)		Diff	DDD DW		
Compound	SSAI2-01-1BPC_FD	SSAI2-01-1BPC	RPD (Limits)	Difference (Limits)	Flags	A or P	
2,3,7,8-TCDF	1.4	2.3	-	0.9 (≤0.53)	-	-	
1,2,3,7,8-PeCDF	2.6	3.8	-	1.2 (≤2.6)	-	-	
2,3,4,7,8-PeCDF	1.5	1.7	-	0.2 (≤2.6)	-	-	
1,2,3,4,7,8-HxCDF	8.0	7.1	-	0.9 (≤2.6)	-	-	
1,2,3,6,7,8-HxCDF	4.9	5.7	-	0.8 (≤2.6)	-	-	
2,3,4,6,7,8-HxCDF	1.1	1.3	-	0.2 (≤2.6)	-	-	
1,2,3,7,8,9-HxCDF	0.85	0.61	-	0.24 (≤2.6)	-	-	
1,2,3,4,6,7,8-HpCDF	18	19	5 (≤50)	-	-	_	
1,2,3,4,7,8,9-HpCDF	7.3	9.0	-	1.7 (≤2.6)	-	-	
OCDF	48	60	22 (≤50)	-			

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D150462

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D150462	SSAI3-03-1 BPC SSAJ3-03-1 BPC	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	internal standards (%R) (i)
G0D150462	SSAK3-01-1BPC	1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D150462	SSAI3-02-1BPC SSAI3-03-1BPC SSAK3-01-1BPC SSAJ3-03-1BPC SSAI2-01-1BPC** SA207-12BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D150462	SSAI3-02-1BPC SSAI3-03-1BPC SSAK3-01-1BPC SSAJ3-03-1BPC SSAI2-01-1BPC** SA207-12BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)
G0D150462	SSAI3-03-1BPC	OCDD	J (all detects)	A	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D150462

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D150462	SSAI3-02-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF	0.31U pg/g 0.31U pg/g 0.34U pg/g 0.53U pg/g	A	bl
G0D150462	SSAI3-03-1BPC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8,9-HxCDF	0.47U pg/g 2.8U pg/g 0.22U pg/g	А	bi
G0D150462	SSAJ3-03-1BPC	OCDD 2,3,7,8-TCDF 1,2,3,7,8,9-HxCDF	0.87U pg/g 1.1U pg/g 0.30U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D150462

No Sample Data Qualified in this SDG

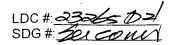
Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D150462

No Sample Data Qualified in this SDG

SDG	#: <u>23265D21</u> #: <u>G0D150462</u> ratory: <u>Test America</u>	VA		N COMP	LET		lenderson ESS WORKSHE	ET	Date: <u>48</u> Page: <u>/of</u> Reviewer: <u>9</u> 2nd Reviewer: <u>6</u>	10
MET	HOD: HRGC/HRMS Diox	ins/D	ibenzofuran	is (EPA SV	V 840	6 Me	thod 8290)		J .	
The s	samples listed below were	e revi	ewed for ea	ch of the fo	ollow	ina va	alidation areas. Valid	dation fin	dings are noted in attache	:d
valida	ation findings worksheets.					J			J	
					T		-	*****		7
	Validation	Area		\			1/5/	mments		1
1.	Technical holding times			73	Sam	oling d	ates: 4/15/10			-
11.	HRGC/HRMS Instrument pe	erforma	ance check	—				· .		-
111.	Initial calibration			*						-
IV.	Routine calibration/19V		- Alleria	#	ļ					4
<u>V.</u>	Blanks			W						-
VI.	Matrix spike/Matrix spike du	plicate	S	Q)	_					4
VII.	Laboratory control samples			7/	120	29	>			4
VIII	Regional quality assurance	and qu	ality control	N						4
IX.	Internal standards			W	ļ					4
Χ.	Target compound identificat	ions		\$	Not	review	ed for Stage 2B validatio	n.		
XI.	Compound quantitation and	CRQL	.s	W	Not	review	ed for Stage 2B validatio	n		4
XII.	System performance			A	Not	review	ed for Stage 2B validatio	n.		
XIII	Overall assessment of data			⋪						
XIV	Field duplicates			W	D=_	2+9	5X13-03-1BPC F	D 6+	SA12-01-7 FDC/G1D16	283
XV.	Field blanks			\overline{M}	FZ-	Otol	2010 - D27 (CADA	andal)	542-01-1506GDDG	DA.
				1 VVV	2B	-04	32010-2143- D = Duplicate	10441) R2D(6	FB-0407-010-RZ(G =0D16058=)	an po
Note:	A = Acceptable N = Not provided/applicable	!	ND = N R = Rin	o compound: sate	s dete	cted'	D = Duplidate TB = Trip blank	. • 1		
	SW = See worksheet		FB = Fi	eld blank			EB = Equipment	blank		
Valida	ted Samples: ** Indicates samp	ole und	derwent State	4 validation						
1	SSAI3-02-1BPC*** 17	11	010921	LONB		21		31		7
2	SSAI3-03-1BPC	12	0/0920	MB		22		32		1
3	SSAK3-01-1BPC	13				23		33		1
4	SSAJ3-03-1BPC	14				24		34		1
5	SSAI2-01-1BPC **	15				25		35		1
6		16			-	26		36		1
7	SSAI3-02-1BPCMS	17				27		37		1
			 							_11

10	20	30	40
Notes:			

SSAI3-02-1BPCMSD

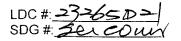


VALIDATION FINDINGS CHECKLIST

Page: /of / Reviewer: / 2nd Reviewer: /

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% ?			<u></u>	
Is the static resolving power at least 10,000 (10% valley definition)?	1		<u> </u>	
Was the mass resolution adequately check with PFK?	<u> </u>			
Was the presence of 1,2,8,9-TCDD and 1,3,4,6,8-PeCDF verified?			<u> </u>	
III. Initial calibration			<u> </u>	
Was the initial calibration performed at 5 concentration levels?		<u> </u>		
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?		-	<u> </u>	
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?			ا ا	
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?		<u> </u>		
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?				
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.		i		
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?				



VALIDATION FINDINGS CHECKLIST

Page:	Aof -
Reviewer:	
d Reviewer	1

VIII. Regional Quality Assurance and Quality Control	1		,	/
Were performance evaluation (PE) samples performed?	<u> </u>	_	<u> </u>	
Were the performance evaluation (PE) samples within the acceptance limits?				
IX. Internal standards			т	<u> </u>
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	-1			
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?	1			
Does the maximum intensity of each specified characteristic ion coincide within \pm 2 seconds (includes labeled standards)?				
For PCDF identification, was any signal (S/N \geq 2.5, at \pm 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	13			
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. ocpp	L. 1,2,3,6,7,8-HxCDF	a. 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	1. 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:

SDG # SECOUL LDC #: 33-45/2

VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

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". Were all samples associated with a method blank? Y/N N/A

Was the blank contaminated? If yes, please see qualification below. n date: チ/ンの のBlank analysis date: チ/ング の Was a method blank analyzed for each matrix? @Blank analysis date: € Blank extraction date: 4/20/ Y N N/A

Conc. units: 100

Associated Samples:

Sample Identification THE Z Blank ID γ m W Compound

tion				
Sample Identification				
S				
Blank ID				
Compound				

Associated Samples:

Blank analysis date:

Blank extraction date:

Conc. units:

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 #: 23265D21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Blanks

Page: Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Y N N/A N/A

Was the method blank contaminated? If yes, please see qualification below. Y/N N/A

Blank analysis date: 4/25/10 Blank extraction date: 4/19/10

Conc. units: pg/g

Associated samples:

Compound Blaink ID Sample Identification 0.142560MR 5X 1 2 4 Amble Identification 0.159 2.95 0.31/U 2.8/U 0.87/U -				10.													Ī
Blank ID												·					
Blank ID																	
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Blank ID																	
Blank ID	dentification																
Blank ID 5X 1 2 0.14 0.7 0.31/U 0.47/U 0.59 2.95 0.31/U 2.8/U 0.28 1.4 0.34/U - 0.24 1.2 - - 0.14 0.7 0.53/U - 0.086 0.43 0.22/U 0.30 1.5 - - 0.13 0.65 - - 0.63 3.15 - - 0.63 3.15 - - 0.63 3.15 - -	Sample I																T
Blank ID 5X 1 0.14 0.7 0.31/U 0.59 2.95 0.31/U 0.28 1.4 0.34/U 0.14 0.7 0.53/U 0.086 0.43 - 0.13 0.65 - 0.63 3.15 - 0.63 3.15 -		4	8	0.87/U	1.1/U	ı	•	ŧ	0.30/U	1							
Blank ID 5X 0.14 0.7 0.59 2.95 0.28 1.4 0.14 0.7 0.24 1.2 0.086 0.43 0.086 0.43 0.13 0.65 0.13 0.65 0.63 3.15 0.63 3.15		2	0.47/U	2.8/U		-	•	1	0.22/U	1	ı	1					
Blank ID			0.31/U	0.31/U	0.34/U	0.53/U	-	•		•	,						
		ΣX	0.7	2.95	1.4	0.7	1.2	0.7	0.43	1.5	0.65	3.15					
Compound	Blank ID	0109260MB	0.14	0.59	0.28	0.14	0.24	0.14	0.086	0:30	0.13	0.63					
Compo	pun																
	Сотро																

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".

SDG #: See Cover LDC #:23265D21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: / of_ 2nd Reviewer:_ Reviewer:

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

Associated sample units: Blank units: pg/L Associated sample units Sampling date: 4/13/10

Associated Samples: 1 Field blank type: (circle one) Field Blank / Rinsate / Other:

b/bd

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

SDG #: See Cover LDC #: 23265D21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: 2nd Reviewer:__ 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

Sampling date: 4/7/10

Associated sample units:_

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound				Sar	Sample Identification	ıtion		
	FB-04072010-RZD	5X						
ပ	0.89	0.00445						
Ш	1.5	0.0075						
Ш	2.2	0.011						
9	8.3	0.0415						
¥	1.4	0.007		·				
7	1.6	0.008						
V	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
C .	1.4	0.007						
Ö	4.1	0.0205					:	
CROL								

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

SDG #:See Cover LDC #:23265D21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page:__ 2nd Reviewer:

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

Associated sample units:_ W N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units
Sampling date: 4/8/10

b/bd

Field blank type: (circle one Field Blank) Rinsate / Other.

Associated Samples:

Compound	Blank ID			Sar	Sample Identification	ation		
	FB-04072010-RZC	5X						
O	0.77	0.00385						
D	0.74	0.0037						
ш	0.82	0.0041						
u .,	4.2	0.021						
9	37	0.185						
Ξ	0.57	0.00285						
	0.96	0.0048						
ſ	0.67	0.00335						
¥	1.1	0.0055						
1	0.96	0.0048						
M	1.0	0.005						
Z	1.0	0.005						
0	2.1	0.0105						
Q.	1.5	0.0075						
ø	6.7	0.0335						
CRQL								

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

LDC #: 3536502/ SDG #: 368 60008

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: Reviewer:_ 2nd Reviewer:_

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".

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

X N N/A

#	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	it: 40-135%)	Qualifications ()
		7	+		22	(40-135)	~ (F. A)
						()	
		4	+		27	(/)	
					/	()	
						()	
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		Internal Standards	Check Standard Used			Internal Standards	Check Standard Used
ď	13C-2,3,7,8-TCDF	J.F		ග්	¹³ C-1,2,3,4,6,7,8-HpCDF	-нрсоғ	
ю.	13C-2,3,7,8-TCDD	OC		Ή	¹³ C-1,2,3,4,6,7,8-HpCDD	-нрсрр	
ن ن	¹³ C-1,2,3,7,8-PeCDF	eCDF		-	13C-OCDD		
D.	¹³ C-1,2,3,7,8-PeCDD	есрр		곳	¹³ C-1,2,3,4-TCDD	0	
ш	¹³ C-1,2,3,4,7,8-HxCDF	HXCDF		نـ	¹³ C-1,2,3,7,8,9-HxCDD	xCDD	
Ц	13C-12367.8-HxCDD	-HxCDD					

LDC #: <u>232650</u>7 SDG #: *See COM*

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary). Y N N N N

Qualifications	14 (e)		1 × (+)							
Associated Samples	4)		M	,						
aple > calls 11415e	チ. / こ. 人.		ZADe Moults	(B)+lag)						
Sample ID	٤)		11\$							
Date			7				0			
*										

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23265D21</u> SDG#:<u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: of Pag

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

YN NA YN NA

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

	Concentrati	on (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	SSAI3-03-1BPC_FD	2	RPD	Difference	Limits	(Parent Only)
В	0.12	2.5U		2.38	(<u><</u> 2.5)	
С	0.090	0.061		0.029	(<u><</u> 2.6)	
D	0.24	0.16		0.08	(<2.6)	
Е	0.24	0.17		0.07	(≤2.6)	
F	2.8	0.47		2.33	(≤2.6)	_
G	59	2.8		56.2	(<u><</u> 5.2)	Idets A
Н	0.80	0.49U		0.31	(≤0.49)	
1	0.91	0.72		0.19	(≤2.6)	
J	0.55	0.33		0.22	(≤2.6)	
к	1.7	1.5		0.2	(<2.6)	
L	1.1	1.2		0.1	(≤2.6)	
М	0.29	0.25		0.04	(≤2.6)	
N	0.30	0.22		0.08	(≤2.6)	
0	3.9	3.1		0.8	(<2.6)	
Р.	1.6	1.4		0.2	(<2.6)	
Q	16	12		4	(<5.2)	

	Concentration	n (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	SSAI2-01-1BPC_FD	5	RPD	Difference	Limits	(Parent Only)
Α	0.10	0.13		0.03	(≤0.53)	
В	0.23	0.18		0.05	(≤2.6)	
С	0.26	0.24		0.02	(<u><</u> 2.6)	
D	3.3	2.9		0.4	(≤2.6)	
E	1.3	0.85		0.45	(≤2.6)	
F	22	21	5			
G	2.8	3.6		0.8	(≤5.3)	
Н	1.4	2.3		0.9	(≤0.53)	

SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: ≥of Reviewer: ① 2nd Reviewer:

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

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

	Concentrati	on (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	SSAI2-01-1BPC_FD	5	RPD	Difference	Limits	(Parent Only)
1	2.6	3.8		1.2	(≤2.6)	
J	1.5	1.7		0.2	(<u><</u> 2.6)	
К	8.0	7.1		0.9	(<2.6)	
L	4.9	5.7		0.8	(<2.6)	
М	1.1	1.3		0.2	(≤2.6)	
N	0.85	0.61		0.24	(<2.6)	
О	18	19	5			
Р	7.3	9.0		1.7	(≤2.6)	
Q	48	60	22			

V:\FIELD DUPLICATES\23265D21.wpd



Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: 2nd Reviewer: Reviewer:

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 = $(A_u)(C_u)/(A_u)(C_v)$ 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,

 $A_{\bf k}=Area$ of associated internal standard $G_{\bf k}=Concentration$ of internal standard X=Mean of the RRFs

L				Lonordo					
				Delinden	Recalculated	неропед	Hecalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF () A () Std)	RRF	%RSD	%RSD
	lett.	0.///-	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	0.98315	0.9831511.98315	10/8/2	1.0/872	460936	4 609
	(305)	146	2,3,7,8-TCDD (¹3C-2,3,7,8-TCDD)	1.05/05	701501	1.11325-	255///	7.439WD	7.4.40
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.08449	67780-1	1.09101	101601	765595	563/
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.03068	890801	1.0892	1.08562	44945	4495
			OCDF (19c-OCDD)	1.42582	1.4258>	157900	1.57900	8.93881	8030
2	ah	1/4/W	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	3480	245	0.0X	XPO	4.44	433
\prod	(405)		2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.001	150.1	40-	40.	303	100
$\underline{\mathbb{I}}$			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	71.1	4=:	0 -	61:1	533	5. 28
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.07	1072		1, 1	3 60	3.70
			OCDF ("C-OCDD)	145	1.445	:5	. 37	585	
6	1041	1/1/1	2,3,7,8-TCDF (¹3C-2,3,7,8-TCDF)	1.088	1.088	\ \mathref{A}.	1.10	401	1 x &
		01/10	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
		\	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF ("C-OCDD)						

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

LDC #: 3345272

VALIDATION FINDINGS WORKSHEET Routine Calibration Results Verification

Page: Of Reviewer: Stand Reviewer: R

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,)(C_b)/(A_b)(C_c)

Where: ave. RRF = initial calibration average RRF RRF = continuing calibration RRF

RRF = continuing calibration A_x = Area of compound,

 A_{κ} = Area of compound, A_{k} = Area of associated internal standard C_{κ} = Concentration of internal standard

					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	Q%	Q%
-	2 Apolation	11/20	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	5760	0.90	0,90	A. W.	4
		0/4/2	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.021	0.96	0.96	N. W	0.3
		` .	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	<i>†\\\</i>	1.08	80:1) W	<i>h</i>
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.072	1.03	1.03	8.0	2.0
			OCDF (3c-OCDD)	1.445	1.36	1.36	65	59
8	28 Aprotos	1/2/1	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	2,88315	1/2/60	1.5/2.0	1.1	1.7
	,	0,1/2/2	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	20/201	1.06595	1.06595	1.4	1.4
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	6 th 80.1	1.08867	1.09567	10	0.
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	890501	1.06354	75890-1	77.7	W. V.
			OCDF (1°C-OCDD)	1.4>585	1.43843	1.43843	0.0	60
က	545001/W10	, / ,	2,3,7,8-TCDF (¹³C-2,3,7,8-TCDF)	1.083	1.08	108	91	60
		01/1/5	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)					1
		\ \	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (4c-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 #: 33/502/ SDG #: 50,0000

%S

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Were all reported results recalculated and verified for all level IV samples?

Page:_	/of/
Reviewer:	9
2nd reviewer:	0

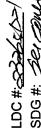
METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

Y/N	N/A	Were all recalculated results for detected ta	erget o
Cond	entration	$A = \frac{(A_{\bullet})(I_{\bullet})(DF)}{(A_{\bullet})(RRF)(V_{\circ})(\%S)}$	
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	
l _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	

Percent solids, applicable to soil and solid matrices

compounds agree within 10.0% of the reported results?
Example:
Sample I.D:
Conc. = (194970,69, (4000)((88596984 4.42582)40.84 16.954
(885969.84 4.42582) 40.84 18.954
= 59.7 pg/g
/ / /

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
					
ļ					
-					
				·	
					·



Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

Page: — Reviewer:___ 2nd Reviewer:

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

SSR = Spiked sample result, SR = Sample result SA = Spike added Where:

MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples: _

RPD = I MSR - MSDR I * 2/(MSR + MSDR)

	Sp	ike	Sample	Spiked Sample	Sample	Matrix	Matrix Spike	Matrix Spike Duplicate	Duplicate	Reported	Recalculated
Compound	A A	Added (Concentration (P3/4)	Concentration (+75/9)	ncentration 75/9)	Percent I	Percent Recovery	Percent Recovery	Recovery	RPD	RPD
	/ sw	MSD		MS	MSD	Reported	Recalc	Reported	Recalc	# 60 #	0 T T T T
2,3,7,8-TCDD	N	24.5	@N	23.5	580	701	701	911	116	61	6
1,2,3,7,8-PeCDD	51/	Se/	/	611	132	901	501	801	107	101	10
1,2,3,4,7,8-HxCDD	7	/	1	27.7	125	28	81	201	102	58	38
1,2,3,4,7,8,9-HpCDF	1	<i>,</i>	0.80	7781	147	8/1	811	611	611	18	4.2
OCDF	226	245	7.1	227	708	120	611	/~/	12/	7.6	9.3
							,				,

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.

V:\Validation Worksheets\Dioxin90\MSDCLC90.21

SDG #: SECCOUNTY

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy 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 = 1 LCS - LCSD 1 * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0/0 9260

	S	iko	Spiked S	amole	ICS	5	ICSD	D	I CS/I CSD	CSD
Compound	₩	Added (A)	Concentration (47/9)	tration (9)	Percent Recovery	ecovery	Percent Recovery	scovery	RPD	Q
	, so I	1 CSD	()	1 CSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	0.00	NA	19.8	NA	99	86				
1,2,3,7,8-PeCDD	001	-	~a/		102	(02				
1,2,3,4,7,8-HxCDD	/		801	/	108	108				
1,2,3,4,7,8,9-HpCDF	1		104		401	104				
OCDF	(Note)	\	200	\ \ -	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.

Analyte	HPCDF HPCDF HPCDF HPCDD HPCDD HPCDD HPCDD HPCDD HPCDD SS	000F 000D 000D 000D (3) 000D (3) D00PE PFK	
Elemental Composition	C, H ³⁵ Cl, 37ClO C, H ³⁵ Cl, 37ClO ₂ C, H ³⁵ Cl, 37Cl ₂ O C, H ³⁵ Cl, 37Cl ₂ O	C, 360, 37010 C, 260, 37010 C, 260, 37010, C, 260, 37010, 101, 260, 37010, 102, 260, 3701, 102, 3701, 0, 102, 3701, 0, 102, 3701, 0, 103, 3701, 0, 104, 3701, 0,	
Ol nol	XX XXXXXX XX XX XX XX X4 X X X X X X X X4 X X X X	M + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 + 4 +	
Accurate Mass ^(a)	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775	
Descriptor	4	Ŋ	
Analyte	TCDF TCDF (3) TCDP (3) TCDD TCDD TCDD (3) TCDD (3) TCDD (5)	Pecde Pecde Pecde (S) Pecde (S) Pecde Pecde (S) Pecde (S) Pecde (S)	HXCDF HXCDF (S) HXCDD HXCDD HXCDD HXCDD HXCDD (S) HXCDD (S) HXCDD (S) PFK
Elemental Composition	C ₁₂ H, ³⁵ Cl ₄ O C ₁₂ H, ³⁵ Cl ₄ O 13C ₁₂ H, ³⁵ Cl ₄ O	C ₁₂ H ₃ wCl ₃ TClO C ₁₂ H ₃ wCl ₃ TClO C ₁₂ H ₃ wCl ₃ TClO C ₁₂ H ₃ wCl ₃ TCl ₂ O C ₁₂ H ₃ wCl ₃ TClO ₂ C ₁₂ H ₃ wCl ₃ TClO ₂ G ₁₂ H ₃ wCl ₃ TClO ₂ C ₁₂ H ₃ wCl ₃ TClO C ₁₂ H ₃ wCl ₃ TClO C ₁₂ H ₃ wCl ₃ TClO	C ₁₂ H ₂ *Cl ₃ *ClO C ₁₂ H ₂ *Cl ₃ *ClO C ₁₂ H ₂ *Cl ₃ O (1 ₂ C ₁₄ *Cl ₃ *ClO (1 ₂ H ₂ *Cl ₃ *ClO (1 ₂ H ₂ *Cl ₃ *ClO ₂ (1 ₂ H ₂ *ClO ₃ *ClO ₂ (1 ₂ H ₂ *ClO ₃ *ClO ₂ (1 ₂ H ₂ *ClO ₃ *ClO
Ion ID	M M M M M M M M M M M M M M M M M M M	M+2 M+4 M+2 M+4 M+2 M+4 M+2 COCK	M + + 2 S W + + 4 S W W + + 4 S W W + 4 W W + 4 W W + 4 W W + 4 W W + 4 W W W W
Accurate mass ^(a)	303,9016 305,8987 315,9419 317,9389 321,8965 321,8936 331,9368 333,938 375,8364 [354,9792]	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 367.8949 409.7974 [354.9792]	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 445.7555 [430.9728]
Descriptor		N	တ

The following nuclidic masses were used:

©

H = 1.007825 C = 12.000000 $^{13}C = 13.003355$ F = 18.9984

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$

S = internal/recovery standard

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 13, 2010

LDC Report Date:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D150582

Sample Identification

EB-04132010-RIG3-RZD FB-04132010-RIG2-RZE

Introduction

This data review covers 2 water 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0111312MB	4/21/10	1,2,3,7,8-PeCDD 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 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 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.64 pg/L 0.83 pg/L 1.0 pg/L 1.3 pg/L 2.1 pg/L 6.6 pg/L 0.78 pg/L 0.79 pg/L 1.2 pg/L 1.2 pg/L 1.6 pg/L 1.6 pg/L 2.2 pg/L 1.6 pg/L 1.7 pg/L 3.5 pg/L	All samples in SDG G0D150582

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
EB-04132010-RIG3-RZD	1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 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 1,2,3,4,6,7,8-HpCDF	0.39 pg/L 1.3 pg/L 3.1 pg/L 2.3 pg/L 1.4 pg/L 4.6 pg/L 2.7 pg/L 1.0 pg/L 0.48 pg/L 5.9 pg/L 2.3 pg/L 9.9 pg/L	0.39U pg/L 1.3U pg/L 3.1U pg/L 2.3U pg/L 1.4U pg/L 4.6U pg/L 2.7U pg/L 1.0U pg/L 0.48U pg/L 5.9U pg/L 2.3U pg/L 9.9U pg/L
FB-04132010-RIG2-RZE	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 0.53 pg/L 0.97 pg/L	0.40U pg/L 0.65U pg/L 2.5U pg/L 0.66U pg/L 0.41U pg/L 0.53U pg/L 0.97U pg/L

Sample EB-04132010-RIG3-RZD was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04132010-RIG3-RZD	4/13/10	1,2,3,6,7,8-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 1,2,3,4,6,7,8-HpCDF	0.39 pg/L 1.3 pg/L 3.1 pg/L 2.8 pg/L 2.3 pg/L 1.4 pg/L 4.6 pg/L 2.7 pg/L 1.0 pg/L 0.48 pg/L 5.9 pg/L 2.3 pg/L	No associated samples in this SDG

Sample FB-04132010-RIG2-RZE 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-04132010-RIG2-RZE	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 0.53 pg/L 0.97 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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
EB-04132010-RIG3-RZD	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	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150582	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150582	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D150582

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D150582	EB-04132010-RIG3-RZD	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (o)
G0D150582	EB-04132010-RIG3-RZD FB-04132010-RIG2-RZE	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D150582	EB-04132010-RIG3-RZD FB-04132010-RIG2-RZE	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D150582

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D150582	EB-04132010-RIG3-RZD	1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 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 1,2,3,4,6,7,8-HpCDF	0.39U pg/L 1.3U pg/L 3.1U pg/L 2.3U pg/L 1.4U pg/L 4.6U pg/L 2.7U pg/L 1.0U pg/L 0.48U pg/L 5.9U pg/L 2.3U pg/L 9.9U pg/L	A	Ы
G0D150582	FB-04132010-RIG2-RZE	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40U pg/L 0.65U pg/L 2.5U pg/L 0.66U pg/L 0.41U pg/L 0.53U pg/L 0.97U pg/L	A	ы

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D150582

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D150582

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

DC #: 23265E21	VALIDATION COMPLETENESS WORKSHEET
SDG #: <u>G0D150582</u>	Stage 2B
_aboratory: <u>Test America</u>	
METUAD, HDAC/HDMC Dia	vina/Dibanyafurana /EDA SW/ 946 Mathad 9200)

Reviewer: C 2nd Reviewer:

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
1.	Technical holding times	A	Sampling dates: 4/13/10
II.	HRGC/HRMS Instrument performance check	\forall	,
111.	Initial calibration	4	
IV.	Routine calibration/I	A	
V	Blanks	M	
VI.	Matrix spike/Matrix spike duplicates	N	sieut Derfied
VII.	Laboratory control samples	\forall	100
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	1	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	5N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	m	23=1. FB=2.

N	ote:	- 1

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	EB-04132010-RIG3-RZD W	11	21	21	31	
2	FB-04132010-RIG2-RZE V	12	22	22	32	
3		13	23	23	33	
4		14	24	24	34	
5		15	25	25	35	
6		16	26	26	36	
7		17	27	27	37	
8		18	28	28	38	
9		19	29	9	39	
10		20	30	30	40	

Notes:			
	 · · · · · · · · · · · · · · · · · · ·		

VALIDATION FINDINGS WORKSHEET

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

		-									
		U. Total HpCDD		V. Total TCDF		H	W. Iotal Pecur		- X. Total HXCDF		Y Total Harrie
	100100170070	10.04H-8,6,7,4,6,5,1	2000	5000		R. Total TCDD		C C C C C C C C C C C C C C C C C C C	o. Total recou		T. Total HxCDD
	K. 1,2,3,4,7,8-HXCDF		L. 1,2,3,6,7,8-HxCDF			M. 4,5,4,6,7,8-HXCDF		N. 1,2,3,7,8,9-HxCDF			O. 1,4,3,4,6,7,8-HPCDF
	r. 1,2,3,4,6,7,8-HpCDD		6. OCDD		H. 2.3.7 8.TODE		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1. 1,4,3,7,8-PBCDF		J. 2.3.4.7.8-People	
A. 2.3.7 8.TCDD		B 12378-Becno	0000		0. 1,4,5,4,7,8-HXCDD		D. 123678.HVCDD		100 100 100 100 100 100 100 100 100 100	L. 1,2,3,7,8,4-HXCDD	

Notes:

LDC #: 23265E21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Blanks

Page: 1 of Reviewer: 2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/21/10

Blank analysis date: 5/1/10

Sample Identification All (bl) Associated samples: 0.65/U 0.40/U 0.53/U 0.66/U 0.41/∪ 0.97/∪ 2.5/U 0.39/U 0.48/U 1.3/U 3.1/∪ 4.6/U 2.3/U 1.4/U 1.0/0 5.9/U 2.7/U 2.3/U 0,6.6 4.15 10.5 3.95 17.5 3.2 3.9 6.5 8.5 Z S 33 ဖ 9 7 ω ω 0111312MB Blank ID 0.64 0.83 0.78 0.79 1.0 1.3 6.6 2.1 1.2 1.2 1.6 2.2 1.6 1.7 3.5 Compound Conc. units: pg/L Ω Ω

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".

SDG #: See Cover LDC #:23265E21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:

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

Associated sample units: Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other: Sampling date: 4/13/10

Compound	Blank ID			Sar	Sample Identification	ıtion		
	FB-04132010-RIG3-RZD	5X						
D	0.39	0.00195						
Ш	1.3	0.0065						
9	3.1	0.0155						
I	2.8	0.014						
	2.3	0.0115						
D	1.4	0.007						
×	4.6	0.023						
	2.7	0.0135						
Σ	1.0	0.005						
Z	0.48	0.0024						
0	5.9	0.0295					-	
Δ.	2.3	0.0115						
Ø	6.6	0.0495						
TOBO								

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

SDG #: See Cover LDC #:23265E21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Page: Reviewer:

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

Y N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L

Field blank type: (circle-one) Field Blank LRinsate / Other Sampling date: 4/13/10

Associated Samples:

\neg			1		_	_			 _	 _	_	_		_	
ation															
Sample Identification															
Š															
	2X		0.00325	0.0125	0.0033	0.00205	0.00265	0.00485							
Blank ID	EB-04132010-RIG2-RZE	0.40	0.65	2.5	0.66	0.41	0.53	0.97							
Compound													-		
		Ш	比	၅	쏘	Σ	0	ø							CROL

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

LDC #232/5227

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of /

Reviewer: 2nd Reviewer:

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".

N N N N

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1 (F)	() () () () () () () () () ()	4						
Associated Samples	m								
Finding	STINSIN SOME	No confirmation du	S. 2. 18-TCOF						
Sample ID	ad								
Date						0			
*	·								

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 13, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D150589

Sample Identification

SSAI3-03-1BPC FD

SSAI2-01-1BPC_FD

Introduction

This data review covers 2 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.

Raw data were not reviewed for this SDG. The review was 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 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 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 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.14 pg/g 0.59 pg/g 0.28 pg/g 0.14 pg/g 0.24 pg/g 0.14 pg/g 0.086 pg/g 0.30 pg/g 0.13 pg/g 0.63 pg/g	All samples in SDG G0D150589

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
SSAI3-03-1BPC_FD	2,3,7,8-TCDF 1,2,3,7,8,9-HxCDF	0.80 pg/g 0.30 pg/g	0.80U pg/g 0.30U pg/g
SSAI2-01-1BPC_FD	OCDD	2.8 pg/g	2.8U pg/g

Sample EB-04132010-RIG3-RZD (from SDG G0D150582) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04132010-RIG3-RZD	4/13/10	1,2,3,6,7,8-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 1,2,3,4,6,7,8-HpCDF	0.39 pg/L 1.3 pg/L 3.1 pg/L 2.8 pg/L 2.3 pg/L 1.4 pg/L 4.6 pg/L 2.7 pg/L 1.0 pg/L 0.48 pg/L 5.9 pg/L 2.3 pg/L 9.9 pg/L	All samples in SDG G0D150589

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

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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	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 1.6 pg/L 1.7 pg/L 1.9 pg/L 1.9 pg/L 1.1 pg/L	All samples in SDG G0D150589

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
SSAI3-03-1BPC_FD	¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-OCDD	38 (40-135) 28 (40-135) 25 (40-135) 10 (40-135)	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	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 compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150589	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D150589	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

Samples SSAI3-03-1BPC_FD and SSAI3-03-1BPC (from SDG G0D150462) and samples SSAI2-01-1BPC_FD and SSAI2-01-1BPC (from SDG G0D150462) were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentration (pg/g) RPD Difference		Concentrati		·		
Compound	SSAI3-03-1BPC_FD	SSAI3-03-1BPC	(Limits)	(Limits)	Flags	A or P	
1,2,3,7,8-PeCDD	0.12	2.5U	<u>-</u>	2.38 (≤2.5)	-	-	
1,2,3,4,7,8-HxCDD	0.09	0.061	-	0.029 (≤2.6)	-	-	

	Concentra	tion (pg/g)				
Compound	SSAI3-03-1BPC_FD	SSAI3-03-1BPC	RPD (Limits)	Difference (Limits)	Flags	A or P
1,2,3,6,7,8-HxCDD	0.24	0.16	_	0.08 (≤2.6)	-	_
1,2,3,7,8,9-HxCDD	0.24	0.17	-	0.07 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	2.8	0.47	_	2.33 (≤2.6)	. <u>-</u>	-
OCDD	59	2.8	_	56.2 (≤5.2)	J (all detects)	А
2,3,7,8-TCDF	0.80	0.49U	-	0.31 (≤0.49)	-	-
1,2,3,7,8-PeCDF	0.91	0.72	-	0.19 (≤2.6)	-	-
2,3,4,7,8-PeCDF	0.55	0.33	-	0.22 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	1.7	1.5	-	0.2 (≤2.6)		-
1,2,3,6,7,8-HxCDF	1.1	1.2	-	0.1 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	0.29	0.25	-	0.04 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.30	0.22	-	0.08 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	3.9	3.1	-	0.8 (≤2.6)	-	-
1,2,3,4,7,8,9-HpCDF	1.6	1.4	-	0.2 (≤2.6)	-	-
OCDF	16	12	•	4 (≤5.2)	-	-

	Concentrat	ion (pg/g)	-	D:#		
Compound	SSAI2-01-1BPC_FD	SSAI2-01-1BPC	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	0.10	0.13	-	0.03 (≤0.53)	-	-
1,2,3,7,8-PeCDD	0.23	0.18	-	0.05 (≤2.6)	-	-
1,2,3,4,7,8-HxCDD	0.26	0.24	-	0.02 (≤2.6)	-	-
1,2,3,6,7,8-HxCDD	3.3	2.9	-	0.4 (≤2.6)	-	-

	Concentrat	tion (pg/g)		Difference		
Compound	SSAI2-01-1BPC_FD	SSAI2-01-1BPC	RPD (Limits)	(Limits)	Flags	A or P
1,2,3,7,8,9-HxCDD	1.3	0.85	-	0.45 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	22	21	5 (≤50)	-	-	-
OCDD	2.8	3.6	-	0.8 (≤5.3)	-	-
2,3,7,8-TCDF	1.4	2.3	-	0,9 (≤0.53)	-	-
1,2,3,7,8-PeCDF	2.6	3.8	-	1.2 (≤2.6)	· •	-
2,3,4,7,8-PeCDF	1.5	1.7	-	0.2 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	8.0	7.1		0.9 (≤2.6)	-	-
1,2,3,6,7,8-HxCDF	4.9	5.7	-	0.8 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	1.1	1.3	-	0.2 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.85	0.61	-	0.24 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	18	19	5 (≤50)	-	-	_
1,2,3,4,7,8,9-HpCDF	7.3	9.0	-	1.7 (≤2.6)	-	-
OCDF	48	60	22 (≤50)	-		

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D150589

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D150589	SSAI3-03-1BPC_FD	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 1,2,3,4,6,7,8-HpCDF 0CDF	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D150589	SSAI3-03-1BPC_FD SSAI2-01-1BPC_FD	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D150589	SSAI3-03-1BPC_FD SSAI2-01-1BPC_FD	All compounds reported as EMPC	JK (all detects)	Α	Project Quantitation Limit (k)
G0D150589	SSAI3-03-1BPC_FD	OCDD	J (all detects)	Α	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D150589

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D150589	SSAI3-03-1BPC_FD	2,3,7,8-TCDF 1,2,3,7,8,9-HxCDF	0.80U pg/g 0.30U pg/g	А	bl
G0D150589	SSAI2-01-1BPC_FD	OCDD	2.8U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D150589

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D150589

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

_DC #:23265F21	VALIDATION COMPLETENESS WORKSHEET
SDG #: <u>G0D150589</u>	Stage 2B
_aboratory:_Test America	
	· (D)

Reviewer: 2nd Reviewer:

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
1.	Technical holding times	A	Sampling dates: 4/3/10
11.	HRGC/HRMS Instrument performance check	 	
111.	Initial calibration	1	
IV.	Routine calibration/I	1	
V.	Blanks	Tu	
VI.	Matrix spike/Matrix spike duplicates	w	No SP assid-No Cona
VII.	Laboratory control samples	1	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	KW	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	1	
XIV.	Field duplicates	W	D=1+55A13-03-1BPC, 2+55A12-01-1BPC(FOD)
XV.	Field blanks	SM/	D=1+55A13-03-1BPC, 2+55A12-01-1BPCGODI FB-04072010-RZD(GOD090441), ZB-04132010+19
ote:		No compound	(ED)15

N = Not provided/applicable SW = See worksheet

R = Rinsate

FB = Field blank

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAI3-03-1BPC_FD 9	11	0109260HB	21	31	
2	SSAI2-01-1BPC_FD	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 1234780-U205E	
000000000000000000000000000000000000000				O. Iotal HpCDD
COP-10: 1:5:2: .	e. oceb	L. 1,2,3,6,7,8-HxCDF	0.000	
000000000000000000000000000000000000000				V. Iotal ICDF
UUUXU-0',',4',5',5', 'O	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total Tonn	
1 0 0 0				W. Iotal Pecur
U. 1,4,3,6,7,8-HXCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	ממטים ביניד מ	
			O. Total recou	X. Iotal HXCDF
E. 1,2,3,7,8,9-HxCDD	J. 2,3,4,7,8-PeCDF	O. 1.2.3.4.6.7.8-HDCDE		
				100 I 100 V

Notes:

LDC #: 23265F21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

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 analysis date: 4/25/10 Blank extraction date: 4/19/10

Conc. units: pg/g

Sample Identification ₹ Associated samples: 2.8/∪ 0.80/U 0.30/U 2.95 0.65 0.43 3.15 4. 0.7 0.7 1.2 0.7 1.5 섫 0109260MB Blank ID 0.086 0.14 0.59 0.28 0.14 0.14 0.24 0.30 0.13 0.63 Compound

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".

SDG #: See Cover LDC #:23265F21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer: Page:

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

Associated sample units: |Y N N/A Were field blanks identified in this SDG?|
Blank units: pg/L Associated sample units|
Sampling date: 4/13/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

₹

Compound	Blank ID		5	Sar	mole Identifics	tification			
	FB-04132010-RIG3-RZD	5X							
D	0.39	0.00195							
L	1.3	0.0065							
တ	3.1	0.0155							
Τ	2.8	0.014							
	2.3	0.0115							
7	1.4	0.007					1		
¥	4.6	0.023							
7	2.7	0.0135							
Σ	1.0	0.005							
Z	0.48	0.0024							
0	5.9	0.0295						:	
Ω.	2.3	0.0115							
Ö	9.6	0.0495							
CRQL									

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

SDG #:See Cover LDC #: 23265F21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Page:_

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

VN N/A Were field blanks identified in this SDG?

Associated sample units:_ Blank units: pg/L

b/bd

Field blank type: (circle one) Field Blank) Rinsate / Other. Sampling date: 4/7/10

Sample Identification Associated Samples: 0.00445 0.0075 0.0415 0.0075 0.0065 0.0205 0.008 0.008 0.007 0.007 0.011 ž EB-04072010-RZD Blank ID 0.89 1.5 2.2 8.3 1.4 1.6 1.5 1.6 1.3 1.4 4.1 Compound G

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

LDC#:33265 SDG#: JOY

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:

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".

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%)	40-135%)	
			2) D M	(40-135)	1 as + (F-F K-8
\vdash			+ H) &<	(
T			74) _52		
			1,1		1 0 (()	
H)		
						(
\vdash						(-	
T						(
\vdash)	(
 							
\parallel						(
T						()	
\vdash)	(
)	(
1)	()	
 							
						()	
П							
П							
\dashv				-	_	(
		Internal Standards	Check Standard Used		Int	Internal Standards	Check Standard Used
Α̈́	13C-2,3,7,8-TCDF	:DF		G.	¹³ C-1,2,3,4,6,7,8-HpCDF	рСDF	
B.	¹³ C-2,3,7,8-TCDD	aa:		Ξ	¹³ C-1,2,3,4,6,7,8-HpCDD	рсор	
ن	¹³ C-1,2,3,7,8-PeCDF	ecdF			13C-OCDD		
<u>.</u>	¹³ C-1,2,3,7,8-PeCDD	Pecdo		ᅶ	¹³ C-1,2,3,4-TCDD		
ші	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		زر	¹³ C-1,2,3,7,8,9-HxCDD	000	
П	13C-123678-HxCDD	-HxCDD					

LDC #: 3365 500 SDG # 588 COLUM

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of A Reviewer:

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 X N/A

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1K/K)										-		
Quali	メフ												
				1				,					
mples	/						,				-		
Associated Samples	M												
Ą													
	Mrs.												
Finding	USU												
	SUPE	/							:				
	Z												
	/		-										
Sample ID	411												
						·							
Date									0				
*													

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23265F21</u> SDG#:<u>See Cover</u>

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page: of Reviewer: of 2nd Reviewer:

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

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

	Concentra	ation (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	1	SSAI3-03-1BPC	RPD	Difference	Limits	(Parent Only)
В	0.12	2.5U		2.38	(≤2.5)	
С	0.090	0.061		0.029	(<u><</u> 2.6)	
D	0.24	0.16		0.08	(≤2.6)	
E	0.24	0.17		0.07	(<2.6)	
F	2.8	0.47		2.33	(<u><</u> 2.6)	
G	59	2.8		56.2	(<u><</u> 5.2)	Jolets/A
Н	0.80	0.49U		0.31	(≤0.49)	7
I	0.91	0.72		0.19	(≤2.6)	
J	0.55	0.33		0.22	(<u><</u> 2.6)	
К	1.7	1.5		0.2	(≤2.6)	
L	1.1	1.2		0.1	(≤2.6)	
М	0.29	0.25		0.04	(≤2.6)	·
N	0.30	0.22		0.08	(≤2.6)	
0	3.9	3.1		0.8	(≤2.6)	
Р	1.6	1.4		0.2	(≤2.6)	
Q	16	12		4	(<u><</u> 5.2)	

	Concent	ration (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	2	SSAI2-01-1BPC	RPD	Difference	Limits	(Parent Only)
Α	0.10	0.13		0.03	(≤0.53)	
В	0.23	0.18		0.05	(≤2.6)	
С	0.26	0.24		0.02	(≤2.6)	
D	3.3	2.9		0.4	(<u><</u> 2.6)	
E	1.3	0.85		0.45	(≤2.6)	
F	22	21	5			
G	2.8	3.6		0.8	(≤5.3)	
Н	1.4	2.3		0.9	(≤0.53)	

(H)

LDC#: 23265F21 SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

Reviewer: 2nd Reviewer:

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

Y N NA Y N NA

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

	Concen	tration (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	2	SSAI2-01-1BPC	RPD	Difference	Limits	(Parent Only)
I	2.6	3.8		1.2	(≤2.6)	
J	1.5	1.7		0.2	(<u><</u> 2.6)	
к	8.0	7.1		0.9	(<u><</u> 2.6)	
L	4.9	5.7		0.8	(≤2.6)	
М	1.1	1.3		0.2	(<u><</u> 2.6)	
N :	0.85	0.61		0.24	(≤2.6)	
0	18	19	5			
Р	7.3	9.0		1.7	(<2.6)	
Q	48	60	22			

V:\FIELD DUPLICATES\23265F21.wpd

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 14 through April 15, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D160435

Sample Identification

SSAL4-01-1BPC

SSAL4-02-1BPC

SSAK5-01-1BPC

SSAO6-01-1BPC

SSAL2-01-1BPC

SSAL3-01-1BPC

SSAL3-02-1BPC

SSAK4-01-1BPC

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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0113286MB	4/23/10	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.75 pg/g 0.22 pg/g 0.25 pg/g 0.35 pg/g 0.50 pg/g 0.16 pg/g 0.75 pg/g	SSAL2-01-1BPC
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	SSAL4-01-1BPC SSAL4-02-1BPC SSAK5-01-1BPC SSAO6-01-1BPC SSAL3-01-1BPC SSAK4-01-1BPC
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	SSAL3-02-1BPC

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
SSAL2-01-1BPC	OCDD	3.4 pg/g	3.4U pg/g
SSAL3-01-1BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF	0.90 pg/g 1.0 pg/g	0.90U pg/g 1.0U pg/g

Samples EB-04142010-RIG1-RZC and EB-04142010-RIG2-RZC (both from SDG G0D160472) were identified as equipment 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-04142010-RIG1-RZC	4/14/10	1,2,3,4,6,7,8-HpCDD 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 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	1.2 pg/L 9.2 pg/L 0.50 pg/L 0.32 pg/L 0.69 pg/L 0.39 pg/L 0.28 pg/L 0.20 pg/L 0.79 pg/L 0.30 pg/L 1.8 pg/L	SSAO6-01-1BPC

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04142010-RIG2-RZC	4/14/10	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-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.29 pg/L 0.39 pg/L 0.77 pg/L 2.5 pg/L 3.3 pg/L 1.6 pg/L 0.73 pg/L 4.2 pg/L 2.2 pg/L 0.71 pg/L 0.43 pg/L 6.6 pg/L 1.9 pg/L 13 pg/L	SSAO6-01-1BPC

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

Samples FB-04072010-RZC (from SDG G0D130519) and FB-04072010-RZD (from SDG G0D090441) 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-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 0CDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF		SSAO6-01-1BPC
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 1,2,3,4,6,7,8-HpCDF	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 1.4 pg/L 1.4 pg/L 4.1 pg/L	SSAL4-01-1BPC SSAL4-02-1BPC SSAK5-01-1BPC SSAL2-01-1BPC SSAL3-01-1BPC SSAL3-02-1BPC SSAK4-01-1BPC

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
SSAL4-01-1BPC	¹³ C-OCDD	32 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAL4-02-1BPC	¹³ C-OCDD	24 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAO6-01-1BPC	¹³ C-OCDD	30 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAL2-01-1BPC	¹³ C-OCDD	22 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAL3-01-1BPC	¹³ C-OCDD	27 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р

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
SSAL4-02-1BPC	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	CDF calibration range. within calibration range.		J (all detects)	Р
SSAK5-01-1BPC	OCDD 2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р
SSAK4-01-1BPC	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	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects) J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D160435	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D160435	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

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 G0D160435

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D160435	SSAL4-01-1BPC SSAL4-02-1BPC SSAO6-01-1BPC SSAL2-01-1BPC SSAL3-01-1BPC	OCDD J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)		Р	Internal standards (%R) (i)
G0D160435	SSAL4-02-1BPC	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)		Р	Project Quantitation Limit (e)
G0D160435	SSAK5-01-1BPC	O1-1BPC OCDD J (all detects) 2,3,7,8-TCDF J (all detects)		Р	Project Quantitation Limit (e)
G0D160435	SSAK4-01-1BPC	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	J (all detects) J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D160435	SSAL4-01-1 BPC SSAL4-02-1 BPC SSAK5-01-1 BPC SSAO6-01-1 BPC SSAL2-01-1 BPC SSAL3-01-1 BPC SSAL3-02-1 BPC SSAK4-01-1 BPC	All compounds reported J (all detects) below the PQL.		A	Project Quantitation Limit (sp)
G0D160435	SSAL4-01-1BPC SSAL4-02-1BPC SSAK5-01-1BPC SSAO6-01-1BPC SSAL2-01-1BPC SSAL3-01-1BPC SSAL3-02-1BPC SSAK4-01-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D160435

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D160435	SSAL2-01-1BPC	OCDD	3.4U pg/g	А	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D160435	SSAL3-01-1BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF	0.90U pg/g 1.0U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D160435

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D160435

No Sample Data Qualified in this SDG

DC #:	23265G21	_ VA			thgate He	enderson SS WORKSH	łEET	Date: 4/8/
DG#	:G0D160435	_		S	tage 2B			Page: /of
abora	tory: Test America				Ü			Reviewer: 9
he sa	OD: HRGC/HRMS Diox mples listed below wer ion findings worksheets	e revi		,		•	alidation findinç	2nd Reviewer: () gs are noted in attache
	Validation	Area					Comments	
l.	Technical holding times			A	Sampling dat	es: 4/15/10	, 4/4/10)
II.	HRGC/HRMS Instrument p	erform	ance check	A				
111.	Initial calibration			4				
IV.	Routine calibration/IX			A				
V.	Blanks /			W			,	
VI.	Matrix spike/Matrix spike du	plicate	es	M	No SP	assid.	-No On	al
VII.	Laboratory control samples			4	10c	MANUFACTURE		
VIII.	Regional quality assurance	and q	uality control	N ,				
IX.	Internal standards	·	- Market and a second a second and a second	M				
Χ.	Target compound identifica	tions		N			A. AMBrehmann	
X [.	Compound quantitation and	CRQ	_S	Ź₩.				
XII.	System performance			N				
XIII.	Overall assessment of data			A				
XIV.	Field duplicates				75			
XV.	Field blanks			SM/	TB040720	10-RZD(40D0	90441), FB-1	42010-R142R20 4072010(40)1300
te:	A = Acceptable N = Not provided/applicabl SW = See worksheet	Э	R = Rin	o compound sate eld blank	s detected	D = Duplicate TB = Trip bla EB = Equipm	nk	FFC
	d Samples:							
- 1	SSAL4-01-1BPC	11	01104	554B	21		31	
S	SSAL4-02-1BPC	12	0/1042	SMB	22		32	
S	SSAK5-01-1BPC	13			23		33	
s	SSAO6-01-1BPC <	14			24		34	
	SSAL2-01-1BPC	15			25		35	

IVV	50.S.					
1	SSAL4-01-1BPC	11	011043543	21	31	
2	SSAL4-02-1BPC	12	0/104354B	22	32	
3	SSAK5-01-1BPC	13		23	33	
4	SSAO6-01-1BPC	c 14		24	34	
5	SSAL2-01-1BPC	15		25	35	
6	SSAL3-01-1BPC	16		26	36	
7 7	SSAL3-02-1BPC	17		27	37	
8	SSAK4-01-1BPC	18		28	38	
9		19		29	39	
10		20		30	40	

Notes:			

VALIDATION FINDINGS WORKSHEET

METHOD; HRGC/HRMS Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

K. 1,2,3,4,7,8-HXCDF		L. 1,2,3,6,7,8-HXCDF		M. 2.3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HxCDF		0, 1,2,3,4,6,7,8-HpCDF
F. 1,2,3,4,6,7,8-HpCDD K. 1,2,3,4,7,8		G. UCDD		H. 2,3,7,8-TCDF M. 2,3,4,6,7,8		1. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9		- 5.5,4,7,6-reCOr - 0. 1,2,3,4,6,7
A. 4.5,7,8-1 COD	B. 12.3.7.8-Pacon		0 1 0 2 4 4 0 12000	UUUXH-6,7,4,8,2,1	703670	DDXn-6, 1, 6, 6, 5, 1	E. 12.3.7.8 9.H×CDD	

Notes:

LDC#.326542 SDG #200 CON

VALIDATION FINDINGS WORKSHEET

Reviewer: 2nd Reviewer:_ Page:

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".

Were all samples associated with a method blank? N N/A

Was the blank contaminated? If yes, please see qualification below. Was a method blank analyzed for each matrix?

Associated Samples: Blank extraction date: チムシル Blank analysis date: 4分パリ Conc. units: アック

Sample Identification 4.6 0.5 g (v) 155.0 N 3 35 29 510 Blank ID Compound H

Blank analysis date: Blank extraction date:

Conc. units:

Associated Samples:

ntification				
Sample Identification				
-				
Blank ID				
Сотроина				

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".

SDG #: 200 COULD LDC#3335

VALIDATION FINDINGS WORKSHEET Blanks

Page: 2nd Reviewer: Reviewer:

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

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? M/N N/A Y/N N/A

Was the blank contaminated? If yes, please see qualification below. Y/N N/A

Associated Samples: Blank extraction date 15/2/10 Blank analysis date 12/2 Conc. units: ≱

Compound	Blank ID			Sar	Sample Identification	ion		
011	011 P455113	Ď						
-	150	0.90%						
	l €.0	Noil	-					
V	030	(42)			:			
	J							

es:
sis date:インズ(り Associated Sample
k extraction date:メタンの Blank analys c. units: アツタ

Compound	Blank ID	Sample Identification
011	6112354B	
\P	0,85	
-0	64	
	ح.	

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".

SDG #:See Cover LDC #: 23265G21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page:_ 2nd Reviewer:_

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

Associated sample units: YN N/A Were field blanks identified in this SDG?

Field blank type: (circle one) Field Blank / Rinsate / Other:

Blank units: pg/L / Sampling date: 4/14/10

Sample Identification 4 (>5X) Associated Samples: 0.00345 0.00395 0.00195 0.0025 0.0016 0.0014 0.0015 0.006 0.046 0.009 0.001 ž FB-04142010-RIG1-RZC Blank ID 0.69 7. 0.50 0.32 0.39 0.28 0.20 0.79 0.30 9.2 Compound O. Σ Z 0

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

CROL

SDG #: See Cover LDC #: 23265G21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Påge: Reviewer: 2nd Reviewer:

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

Y N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L / Sampling date: 4/14/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

4 (>5X)

Sample Identification 0.00145 0.00195 0.00385 0.0125 0.0165 ž EB-04142010-RIG2-RZC Blank ID 0.29 0.39 0.77 2.5 3.3 Compound G

ROL	CIRCLED RESULTS WERE NOT QUALIFIED. ALL RESULTS NOT CIRCLED WERE QUALIFIED BY THE FOLLOWING STATEMENT:
-----	--

0.00215

0.0095

0.065

0.033

9.9 1.9 13

0.00355

0.71

0.011 0.021

0.00365

0.73

4.2 2.2

0.008

1.6

Samples with compound concentrations within five times the associated field blank concentration are listed above, these sample results were qualified as not detected, "U".

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SDG #: See Cover LDC #:23265G21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:_

Page:

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

V N N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L Sampling date: 4/8/10

Field blank type: (circle one) Field Blank / Rinsate / Other.

4 (>5X) Associated Samples:

Compound	Blank ID		,	Sample Identification	ation		
	FB-04072010-RZC	5X					
O	0.77	0.00385					
D	0.74	0.0037					-
Ш	0.82	0.0041					
L	4.2	0.021					
9	37	0.185					
工	0.57	0.00285					
	0.96	0.0048					
,	0.67	0.00335					
¥	1.1	0.0055					
	0.96	0.0048					
×	1.0	0.005					
Z	1.0	0.005					
0	2.1	0.0105		-			
۵	1.5	0.0075					
Ø	6.7	0.0335					
CROL							

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

SDG #: See Cover LDC #: 23265G21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Reviewer: Page:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8230)

YN N/A Were field blanks identified in this SDG?

Associated sample units:_ Blank units: pg/L Sampling date: 4/7/10

1-3, 5-8 Associated Samples: Field blank type: (circle ofe) Field Blank / Ripsate / Other.

Compound	Blank ID			Sar	Sample Identification	ıtion		
	FB-04072010-RZD	5X						
	0.89	0.00445						
	1.5	0.0075						
	2.2	0.011						
	8.3	0.0415						
	1.4	0.007						
	1.6	0.008						
	1.5	0.0075		,				
	1.6	0.008						
	1.3	0.0065						
	1.4	0.007						
	4.1	0.0205						
CRQL								

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

SDG #: 26 COV LDC #:2326647

VALIDATION FINDINGS WORKSHEET

Internal Standards

Page:__

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". XXVIVA Are all internal standard recoveries were within the 40-135% criteria?

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

Was the S/N ratio all internal standard peaks > 10? X N N/A

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	135%)	Qualifications (
			Н	ω	32 (,	40-135) JW ((8
)			
		7	Н	89	324			
)			
		4	4	(//	8			
)			
		8	Н	7	7			
		1	H	227)	\	١ (
)			
)			
)		(
)			
)			
							(
)			
)			
)			
		Internal Standards			Interna	Internal Standards	Check Standard Used	
∢	13C-2,3,7,8-TCDF	ODF		ڻ ق	¹³ C-1,2,3,4,6,7,8-HpCDF	L		-
B.	13C-2,3,7,8-TCDD	ססכ		Ŧ.	¹³ C-1,2,3,4,6,7,8-HpCDD	Q		
ن	¹³ C-1,2,3,7,8-PeCDF	PeCDF			13C-OCDD			
D.	¹³ C-1,2,3,7,8-PeCDD	Ресоо		Υ.	¹³ C-1,2,3,4-TCDD			
ш	13C-1,2,3,4,7,8-HxCDF	8-HxCDF		نـ	¹³ C-1,2,3,7,8,9-HxCDD			
ш	13C-123678	E. 13C-123678-HxCDD						

SDG #: 26c COL LDC # 123/2/4

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:

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",

ANN X

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding can Se	Associated Samples	Qualifications (
		d	I. K. L. O. P. &	7	Lats 4 (e)
			_		
		ح)	4. H.	~	
		B	17 7 7 7 1	8	Johns 14 (2)
			0		
1] 	AL USUSTE	\mathcal{M}	(4) 47
	0				
					The second secon

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 14, 2010

LDC Report Date:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D160472

Sample Identification

EB-04142010-RIG1-RZC EB-04142010-RIG2-RZC

Introduction

This data review covers 2 water 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0111312MB	4/21/10	1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 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 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	0.64 pg/L 0.83 pg/L 1.0 pg/L 1.3 pg/L 2.1 pg/L 6.6 pg/L 0.78 pg/L 0.79 pg/L 1.2 pg/L 1.6 pg/L 1.6 pg/L 2.2 pg/L 1.6 pg/L 1.7 pg/L 3.5 pg/L	All samples in SDG G0D160472

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
EB-04142010-RIG1-RZC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.2 pg/L 9.2 pg/L 0.32 pg/L 0.69 pg/L 0.39 pg/L 0.28 pg/L 0.20 pg/L 0.79 pg/L 0.30 pg/L 1.8 pg/L	1.2U pg/L 9.2U pg/L 0.32U pg/L 0.69U pg/L 0.39U pg/L 0.28U pg/L 0.20U pg/L 0.79U pg/L 0.30U pg/L 1.8U pg/L
EB-04142010-RIG2-RZC	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 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 1,2,3,4,6,7,8-HpCDF	0.29 pg/L 0.39 pg/L 0.77 pg/L 2.5 pg/L 1.6 pg/L 0.73 pg/L 4.2 pg/L 2.2 pg/L 0.71 pg/L 0.43 pg/L 6.6 pg/L 1.9 pg/L 13 pg/L	0.29U pg/L 0.39U pg/L 0.77U pg/L 2.5U pg/L 1.6U pg/L 0.73U pg/L 4.2U pg/L 2.2U pg/L 0.71U pg/L 0.43U pg/L 6.6U pg/L 1.9U pg/L 1.9U pg/L

Samples EB-04142010-RIG1-RZC and EB-04142010-RIG2-RZC were identified as equipment 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-04142010-RIG1-RZC	4/14/10	1,2,3,4,6,7,8-HpCDD 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 2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.2 pg/L 9.2 pg/L 0.50 pg/L 0.32 pg/L 0.69 pg/L 0.39 pg/L 0.28 pg/L 0.20 pg/L 0.79 pg/L 0.30 pg/L 1.8 pg/L	No associated samples in this SDG
EB-04142010-RIG2-RZC	4/14/10	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 1,2,3,4,6,7,8-HpCDF	0.29 pg/L 0.39 pg/L 0.77 pg/L 2.5 pg/L 3.3 pg/L 1.6 pg/L 0.73 pg/L 4.2 pg/L 2.2 pg/L 0.71 pg/L 0.43 pg/L 6.6 pg/L 1.9 pg/L 13 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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 G0D160472	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	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D160472	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D160472	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D160472

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D160472	EB-04142010-RIG1-RZC EB-04142010-RIG2-RZC	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (o)
G0D160472	EB-04142010-RIG1-RZC EB-04142010-RIG2-RZC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D160472	EB-04142010-RIG1-RZC EB-04142010-RIG2-RZC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D160472

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D160472	EB-04142010-RIG1-RZC	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,7,8-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	1.2U pg/L 9.2U pg/L 0.32U pg/L 0.69U pg/L 0.39U pg/L 0.28U pg/L 0.20U pg/L 0.79U pg/L 0.30U pg/L 1.8U pg/L	A	ы
G0D160472	EB-04142010-RIG2-RZC	1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.29U pg/L 0.39U pg/L 0.77U pg/L 2.5U pg/L 1.6U pg/L 0.73U pg/L 4.2U pg/L 2.2U pg/L 0.71U pg/L 0.43U pg/L 6.6U pg/L 1.9U pg/L 13U pg/L	A	ы

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D160472

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

DC #: 23265H21	_ VALIDATION COMPLETENESS
SDG #: G0D160472	Stage 2B
aboratory: Test America	

Date: 68/10
Page: 101/
Reviewer: 2nd Reviewer: 1

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
1.	Technical holding times	A	Sampling dates: 4/14/10
11.	HRGC/HRMS Instrument performance check	4	, ,
- 111.	Initial calibration	1	
IV.	Routine calibration/Io	A	
V.	Blanks	\sqrt{M}	
VI.	Matrix spike/Matrix spike duplicates	N	cient Refiel
VII.	Laboratory control samples	A	100
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
Χ.	Target compound identifications	N	
×I.	Compound quantitation and CRQLs	SN	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	m	3-1.2

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	EB-04142010-RIG1-RZC W	11	0111312MB	21		31	
2	EB-04142010-RIG2-RZC	12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27	<u> </u>	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)

	U. Total HpCDD	/ Total TOOR	v, lotal LCDF		W. Iotal PecoF		A. Iotal HxCDF	Y. Total HpCDF
D 1 2 2 4 7 8 0 11 00 II	TOOGE-8,0,7,4,0,4,1	Q, OCDF		R. Total TCDD	0001 ::::::::::::::::::::::::::::::::::	10,40 to 10,000		T. Total HxCDD
K. 1,2,3,4,7,8-HxODF		L. 1,2,3,6,7,8-HXCDF		M. 2,3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HxCDF		O. 1,2,3,4,6,7,8-HpCDF
F. 1,2,3,4,6,7,8-HpCDD	9000	g. 0000	1000	n. 4,3,7,0-1 CUF		1. 1,2,3,7,8-PeCDF		J. 2.5,4,7,5-PeCDF
A. 2,3,7,8-1CDD	B. 1.2.3.7.8-Pecon		C. 1.2.3.4.7.8-HYCDD		12267843000	OOXH-6, ', ', ', ', ', ', ', '	E. 12.3.7.8 9.Hv.CDD	

Notes:

LDC #: 23265H21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Blanks

Page: 1 of 2nd Reviewer:__ Revièwer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

Rease 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?

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. √ N N/A

Associated samples: Blank analysis date: 5/1/10 Blank extraction date: 4/21/10 Conc. units: pg/L

Compound	Blank ID				Sample	Sample Identification			
	0111312MB	5X	1	2					
В	0.64	3.2	į						
2	0.83	4.15							
D	1.0	5		0.29/U					
3	1.3	6.5		0.39/U				-	
Ш	2.1	10.5	1.2/U	U/277/U					
9	6.6	33	9.2/U	2.5/U				:	
	0.78	3.9	0.32/U	1.6/U					
ر	0.79	3.95		0.73/U					
X	1.2	9	0/69.0	4.2/U					
7	1.2	9	0.39/U	2.2/U					
M	1.6	8	0.28/U	0.71/U					
Z	2.2	11	0.20/U	0.43/U					
0	1.6	8	U/62.0	6.6/U					
Ь	1.7	8.5	0.30/U	1.9/U					
Ö	3.5	17.5	1.8/U	13/0					

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".

SDG #:See Cover LDC #: 23265H21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: 2nd Reviewer:_ Reviewer:

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

Associated sample units: Y/N N/A Were field blanks identified in this SDG?
Blank units: pg/L Associated sample units

Sampling date: 4/14/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

None

Compound	Blank ID			Sar	Sample Identification	ation		
	EB-04142010-RIG1-R7C	5X						
Щ	1.2	0.006						
O	9.2	0.046						
I	0:50	0.0025						
	0.32	0.0016						
¥	69.0	0.00345						
7	0.39	0.00195				į		
Σ	0.28	0.0014						
Z	0.20	0.001						
0	0.79	0.00395						
ď	0.30	0.0015						
٥	1.8	0.009						
						-		
CROL								

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

LDC #: 23265H21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Page:

2nd Reviewer:

Field Blanks

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

Associated sample units: YN N/A Were field blanks identified in this SDG?

b/bd

Field blank type: (circle one) Field Blank / Rinsate / Other: Blank units: pg/L Sampling date: 4/14/10

None

Associated Samples:

Sample Identification 0.00195 0.00215 0.00145 0.00365 0.00385 0.0125 0.0165 0.00355 0.008 0.0095 0.033 0.065 0.021 0.011 2 EB-04142010-RIG2-RZC. Blank ID 0.29 0.39 0.77 0.73 0.43 1.6 2.5 3.3 4.2 0.71 2.2 6.6 6. 5 Compound O

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".

CRQL

LDC # 23-45-11 SDG # 2002

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

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",

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary). N N X

Qualifications	0 7 8	A		1 (K)						
Associated Samples										
Finding	No confinction to	3.3.7.8-7co≠		2000 usulta)					
Sample ID	ĄI			A.J.						
Date							0			
*										

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 15, 2010

LDC Report Date:

June 10, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D170485

Sample Identification

SSA06-03-1BPC **SA129-3BPC**

SA129-4BPC

SA175-5BPC

SA175-8BPC**

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 5 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.
- 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
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	SSAO6-03-1BPC SA129-3BPC SA129-4BPC
0113206MB	4/23/10	OCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.75 pg/g 0.22 pg/g 0.25 pg/g 0.35 pg/g 0.50 pg/g 0.16 pg/g 0.75 pg/g	SA175-5BPC SA175-8BPC**

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

Samples FB-04132010-RIG2-RZE (from SDG G0D150582) 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-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 1,2,3,4,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	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 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	SSAO6-03-1BPC
FB-04132010-RIG2-RZE	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 053 pg/L 0.97 pg/L	SA129-3BPC SA129-4BPC SA175-5BPC SA175-8BPC**

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
SSAO6-03-1BPC	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) 32 (40-135) 16 (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)	Р
SA129-3BPC	¹³ C-OCDD	35 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SA129-4BPC	¹³ C-OCDD	30 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SA175-5BPC	¹³ C-2,3,7,8-TCDF ¹³ C-1,2,3,7,8-PeCDF	36 (40-135) 163 (40-135)	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF	J (all detects) UJ (all non-detects)	Р
SA175-8BPC**	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	25 (40-135) 31 (40-135) 22 (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)	Р

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
SA129-3BPC	1,2,3,4,7,8-HxCDF 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)	Р
SA129-4BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 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) J (all detects)	Р
SA175-5BPC	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)	А
SA175-8BPC**	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 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)	A

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170485	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170485	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D170485

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D170485	SSAO6-03-1BPC SA175-8BPC**	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)	Р	Internal standards (%R) (i)
G0D170485	SA129-3BPC SA129-4BPC	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D170485	SA175-5BPC	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF	J (all detects) P UJ (all non-detects)		Internal standards (%R) (i)
G0D170485	SA129-3BPC	1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D170485	SA129-4BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D170485	SA175-5BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	А	Project Quantitation Limit (e)
G0D170485	SA175-8BPC**	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	А	Project Quantitation Limit (e)
G0D170485	SSAO6-03-1BPC SA129-3BPC SA129-4BPC SA175-5BPC SA175-8BPC**	All compounds reported below the PQL.	J (all detects) A		Project Quantitation Limit (sp)
G0D170485	SSAO6-03-1BPC SA129-3BPC SA129-4BPC SA175-5BPC SA175-8BPC**	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D170485

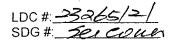
No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D170485

No Sample Data Qualified in this SDG

SDG Labor METI The s	#: 23265l21 #: G0D170485 ratory: Test America HOD: HRGC/HRMS Dioxi ramples listed below were ation findings worksheets.	ns/D	LIDATION	N COMP Sta s (EPA SW	LETEN age 2B v 846 M	NE 74 eth	nod 8290)	on find	Date: 49// Page: /of / Reviewer: 2nd Reviewer: v		
	Validation Area Comments										
1.	Technical holding times	Alca		A	Sampling	da	1/ /	GIIIS			
11.	HRGC/HRMS Instrument pe	rforms	ance check	Ä	Samping	ua	les. 4/13/10				
111.	Initial calibration		ince check	7							
IV.	Routine calibration/I	,		Ā			- TANA SANAHAN AND AND AND AND AND AND AND AND AND A				
V.	Blanks			W.							
VI.	Matrix spike/Matrix spike du	olicate	s	√W	·No =	 >t	1 assid - No 6		2		
VII.	Laboratory control samples			\triangleleft	10	S					
VIII.	Regional quality assurance a	and qu	ality control	N							
IX.	Internal standards			W							
X.	Target compound identificat	ions		A	Not reviewed for Stage 2B validation.						
XI.	Compound quantitation and	CRQL	.s	RW	Not reviewed for Stage 2B validation.						
XII.	System performance			A	Not reviewed for Stage 2B validation.						
XIII.	Overall assessment of data			★							
XIV.	Field duplicates			N							
XV.	Field blanks			W	13-041	13:	2010-RIGZ-RZE (E	FOL	150582}		
Note:	A = Acceptable N = Not provided/applicable SW = See worksheet ted Samples: ** Indicates samp		R = Rins FB = Fie	eld blank	3-64 detected	:07	(>010 (Go) 13€ D≩ Ouplicate TB = Trip blank EB = Equipment blan	k	9)		
1	SSAO6-03-1BPC	11	011045	SUB	21	T		31			
2	SA129-3BPC		011045	36M13	> 22	1		32			
3	SA129-4BPC	13			23			33			
4	SA175-5BPC	14			24			34			
5 /	SA175-8BPC ★ ★	15			25			35			
6		16			26			36			
7		17			27	\perp		37			
8		18			28	\downarrow		38			
9		19			29	\downarrow		39			
10		20			30	\perp		40			

Notes:	 		
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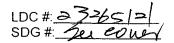


VALIDATION FINDINGS CHECKLIST

Page: / of Page: / Of Page: Q

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?	7			
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) \leq 20% for unlabeled standards and \leq 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		. Pir. Pir.		
Was a routine calibration performed at the beginning and end of each 12 hour period?	/			
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 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?				



VALIDATION FINDINGS CHECKLIST

Page: Of Of Office Page: Office

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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	1. 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:

SDG#: Les Cons LDC #: 23265/2/

VALIDATION FINDINGS WORKSHEET

Page:__ Reviewer:_ 2nd Reviewer:

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

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

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? N N/A N/A

Associated Samples: Was the blank contaminated? If yes, please see qualification below. Blank extraction date: 4/20/10 Blank analysis date: 4/20/10 Conc. units: 79/9

(XSX)

Sample Identification \ N \ Associated Samples: 4 - 5-Blank extraction gate. 183/19 Blank analysis date: 1 $_{\mathcal{O}}^{\mathcal{O}}$ Blank ID W 78 Compound 14

Conc. units:

Compound	Blank ID	Sample Identification
	7	
	0.75	
	0.22	
	125	
	0.35	
	0.50	
	0.16	
	520	

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".

SDG #: See Cover LDC #:23265121

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: 1 Reviewer:__ Page:

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

X N N/A Were field blanks identified in this SDG?

Associated sample units:

Blank units: pg/L Sampling date: 4/8/10

Associated Samples: 1 (>5X)	Sample Identification	
/ Other:		> 4
Field Blank Akinsate	Blank ID	CB 04072040 BZC
Field blank type: (circle one) Field Blank /kinsate / Other	Compound	ulium Parameter (1997) Parameter (1997)

Compound	Blank ID			San	Sample Identification	tion		
	FR-04072010-R7C	5X						
U	0.77	0.00385						
O	0.74	0.0037						
ш	0.82	0.0041						
L	4.2	0.021						
ග	37	0.185						
I	0.57	0.00285						
	0.96	0.0048						
7	0.67	0.00335						
¥	1.1	0.0055						
7	0.96	0.0048						
M	1.0	0.005						
Z	1.0	0.005						
0	2.1	0.0105						
Δ.	1.5	0.0075						
σ	6.7	0.0335						
CROL								

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

SDG #:See Cover LDC #:23265121

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_

Reviewer: Page:

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

(YA) N/A Were field blanks identified in this SDG?

b/bd

Associated Samples: Blank units: pg/L Associated sample units: pg Sampling date: 4/13/10 Field blank type: (circle one) Field Blank Rinsate / Other:

Compound	Blank ID			Sar	Sample Identification	ıtion		
	FR-04132010-RIG2-RZF	2X						
Ш	0.40	0.002						
Щ	0.65	0.00325					_	
9	2.5	0.0125						
¥	0.66	0.0033						
W	0.41	0.00205						
0	0.53	0.00265						
ø	0.97	0.00485						
CRQL								
					The second secon			

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

Fr. C 53.

LDC #: <u>252/5/</u>2/ SDG #: <u>261 GM</u>

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: // Reviewer: __ 2nd Reviewer:_

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 IN N/A

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Was the S/N ratio all internal standard peaks >	Į
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#	Date	Lab ID/Reference	Internal Standard	%	, % Recovery (Limit: 40-135%)	Qual	Qualifications (/)
		/	Þ	80	S (40-135)	JULA	(F-4.0-8)
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			/	91	(
					()		
		8	7	56	((4.4)
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		4	A	98)		(H-/)
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		Internal Standards	Check Standard Used		Internal Standards	້ວ	Check Standard Used
Ą	¹³ C-2,3,7,8-TCDF	.DF		ئ	¹³ C-1,2,3,4,6,7,8-HpCDF		
В.	13C-2,3,7,8-TCDD	OO:		H.	¹³ C-1,2,3,4,6,7,8-HpCDD		
Ö	¹³ C-1,2,3,7,8-PeCDF	PecoF		1. 13(¹³ C-OCDD		
Ö.	¹³ C-1,2,3,7,8-PeCDD	PeCDD		κ. 13 _C	¹³ C-1,2,3,4-TCDD		
ші	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		L. 13(¹³ C-1,2,3,7,8,9-HxCDD		
П	¹³ C-1.2.3.6.7.8-HxCDD	-HxCDD					

LDC #: 23265/5

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Gods > calib 1000 Se	Associated Samples	Qualifications
		ď	K.O. &	þ	yets (e)
		3	HK.0 &	4	
		4	0.0	+	Jak /4 (e)
		\$	7.J. K. L. O. P. &	S	-
			-		
	,	 	ZVDC WSIUTS	m	(F)

Comments: See sample calculation verification worksheet for recalculations

LDC #: 33065/7 SDG #: 264 COWN

VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

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 = $(A_u)(C_u)/(A_u)(C_v)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

 $A_x = Area of compound,$

 $A_{\bf k}=A {\rm rea}$ of associated internal standard J, $C_{\bf k}=Concentration$ of internal standard RFs, $X=M {\rm ean}$ of the RRFs

L									
		-		Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Callbration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (CSStd)	RRF	%BSD	%RSD
-	19th	0/0//	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.860	080	1X 0	180	707	
\perp	(105)	2/4//	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	4660	0 934	095		100	600
		1	1,2,3,6,7,8-HxCDD (¹⁴ C-1,2,3,6,7,8-HxCDD)	1.058	X50.	000	100	.1	06/1
\perp			1,2,3,4,8,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	8000	8660	1.05	501	4 4	1000
			OCDF (1°C-OCDD)	1.437	1.437	1.57	1.53	1	10.00
~	10th	4/2/100	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	8801	880.	0//	9//	así	(K)
			2,3,7,8-TCDD (13C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (1°C-1,2,4,6,7,8,-HpCDD)						
			OCDF (11C-OCDD)						
ო	istr	1 / / /	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	3460	-7hb 0	800	Qu's	1.11.1	25 /
	(405)	0/2/10	2,3,7,8-TCDD (4C-2,3,7,8-TCDD)	1001	107	401	000	400	4.07
			1,2,3,6,7,8-HxCDD (19C-1,2,3,6,7,8-HxCDD)	4/1.1	4///	1:10	0 /	25.7	The second
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.072	1.072			2000	1000
			OCDF ("C-OCDD)	1.11.45	11111			7 (1)	500

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 #: 23365/2 SDG #: 143,000

VALIDATION FINDINGS WORKSHEET Routine Calibration Results Verification

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 = $(A_{\lambda})(C_{\lambda})/(A_{\lambda})(C_{\lambda})$

Where: ave. RRF = initial calibration average RRF RFF = continuing calibration RRF

 A_x = Area of compound, A_k = Area of associated internal standard C_x = Concentration of compound, C_k = Concentration of internal standard

L					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	0%
_	294710175		2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	0.860	0.90	0.90	4	4
	/_	01/60/4	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)	0.934	760	0.97	25	W N
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.658	6/:/	61:1	/.5/	(.0.)
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	8660	1.01	1.0.1	1.6	1.0
			OCDF (*c-OCDD)	1.437	1.29	1.29	10.0	0.01
8	5THYLOFFE	' '	2,3,7,8-TCDF (*0-2,3,7,8-TCDF)	245	20.1	90.1	5.5	SS
	. / ,	01/2/5	2,3,7,8-TCDD ('³C-2,3,7,8-TCDD)	1.021	1.00	00.1	4.8	4.8
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.114	91.1	1.16	5.7	N. W.
			1,2,3,4,6,7,8-HpCDD (³ C-1,2,4,6,7,8,-HpCDD)	EL01,	801	1.08	0.1	0 1
			OCDF (1ºC-OCDD)	1.445	1.45	1.45	4.0	4.0
ဧ	104/105p		2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	1.038	16.0	16.0	0.91	16.1
		01/01/5	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)					
	·	\ \ \	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (3c-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 #: <u>232/5/2/</u> SDG #: <u>2er conn</u>

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

Reviewer: 2nd Reviewer: Page:_

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

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

LCS ID: 01/3286

I CS/I CSD	RPO	Reported Recalculated									
LCSD	Percent Recovery	Reported Recalc.									
80	Percent Recovery	Reported Recalc	116 116	116 116	107 107	126 126	120 120				
Cuited Cample	Concentration		23.2 NA	1 911	1 201	126	240				
71:20	Addeg	I CS I CSD	,	1 001			200 V				
	Compound		2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8,9-HpCDF	OCDF				

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.

HPCDF HPCDF HPCDF HPCDD HPCDD HPCDD HPCDD (S) HPCDD (S) NCDPE	000F 000D 000D 000D 000D (S) 000D (S) PFK	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 - ² C	
C12 H ³⁶ C1 ₃ 7 C1C C12 H ³⁶ C1 ₃ 7 C1C C12 H ³⁶ C1 ₃ 7 C1C C12 H ³⁶ C1 ₃ 7 C1C C17 C1C	C12 aC1, 37 C1O C12 aC1, 37 C1O C1O C1O	
M + 2 M + 2 M + 2 M + 2 M + 4 M + 4 LOCK	M+2 M+4 M+4 M+4 M+4 M+4	
118 88 88 65 67 69 69 65 728]	28 77 77 48 80 80 75 75	
407.78 409.77 417.82 419.82 423.77 425.77 437.81 479.71	441.74 443.73 457.73 459.73 469.77 471.77 513.67	
4	ю	
DF DF (S) DF (S) DD (D) DD (S) CDPE	CDF (S) CDF (S) CDF (S) CDD (S) CDD (S) CDD (S)	HXCDF HXCDF (S) HXCDF (S) HXCDD (S) HXCDD (S) HXCDD (S)
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0 5 0	00500	0 200
# # # # # # # # # # # # # # # # # # #	30,170,000,000,000,000,000,000,000,000,00	C ₁₂ H ₂ *Cl ₂ N°ClO C ₁₂ H ₂ *Cl ₃ N°Cl ₂ O 13C ₁₂ H ₂ *Cl ₃ O 13C ₁₂ H ₂ *Cl ₃ O 13C ₁₂ H ₂ *Cl ₃ N°ClO C ₁₂ H ₂ *Cl ₃ N°ClO C ₁₂ H ₂ *Cl ₃ N°ClO ₂ C ₁₂ H ₂ *Cl ₃ N°ClO ₂ 13C ₁₂ H ₂ *Cl ₃ N°ClO ₂ 13C ₁₂ H ₂ *Cl ₃ N°ClO ₂ 13C ₁₂ H ₂ *Cl ₃ N°ClO ₂
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303.9016 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9368 335.8364 [355.8364	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555
	0	ω ω ω ω ω ω ω 4 4 4
	M C ₁₂ H ₃ sCl ₁ O TCDF 4 407.7818 M+2 C ₁₂ H ₃ Cl ₃ OCl ₂ O M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O TCDF 409.7788 M+4 C ₁₂ H ₃ Cl ₃ OCl ₂ O M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O TCDF 417.825O M 13C ₁₂ H ₃ Cl ₃ OCl ₂ O M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O TCDF 419.8220 M+2 C ₁₂ H ₃ Cl ₃ OCl ₂ O M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O TCDD 423.7767 M+2 C ₁₂ H ₃ Cl ₃ OCl ₂ O M+2 C ₁₂ H ₃ sCl ₄ O ₂ O TCDD 425.7737 M+4 C ₁₂ H ₃ Cl ₃ Cl ₃ Cl ₂ O ₂ M+2 C ₁₂ H ₃ sCl ₄ O ₂ O TCDD 435.8169 M+4 C ₁₂ H ₃ Cl ₃ Cl ₃ Cl ₂ O ₂ M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O TCDD HXCDPE 479.7165 M+4 C ₁₂ H ₃ Cl ₃ Cl ₂ O ₂ O M+2 C ₁₂ H ₃ sCl ₃ OCl ₂ O HXCDPE FFK FFK C ₁₂ H ₃ Cl ₃ Cl ₂ O ₂ O	363.8916 M C ₁₂ H ₂ C ₁ C ₁ C TCDF 407.7818 M+2 C ₁₂ H ² C ₁ C ₂ C ₁ C H ₁ C ₂ C ₁ C H ₁ C ₂ C ₁ C TCDF (5) 417.8250 M+4 C ₁₂ H ² C ₁₂ C ₁ C H ₁ C ₁₂ C ₁ C H ₁ C ₁₂ C ₁₂ C H ₁ C ₁₂ C ₁₂ C TCDF (5) 417.8250 M+2 C ₁₂ H ² C ₁₂ C ₁₂ C H ₁ C

(a) The following nuclidic masses were used:

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$ LDC #: <u>2325/2/</u> SDG #: see couls

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:	_/of /
Reviewer:	4
2nd reviewer:	~

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

	/Y	N	N/A
-	Y	N	N/A
	$\overline{}$		

Were all reported results recalculated and verified for all level IV samples?

Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Conce	ntration	$= (A_{\downarrow})(I_{\downarrow})(DF)$ $(A_{\downarrow})(RRF)(V_{\downarrow})(\%S)$	Example:	
A _x	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D. <u> </u>	_:
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	, , , , 20	
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (12/23/00) (2000) ((15/66/96) (1.02/) (10.55)	100
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	,	-, -
RRF	=	Relative Response Factor (average) from the initial calibration	= 57.9 pg/g	,
Df	=	Dilution Factor.	O	
%S	=	Percent solids, applicable to soil and solid matrices only.		

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
				. 1	
			·		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 14, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D170489

Sample Identification

SSAP3-01-1BPC SA182-5BPC

Introduction

This data review covers 2 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	SSAP3-01-1BPC

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
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	SA182-5BPC

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

Samples EB04142010-RIG1-RZC and EB-04142010-RIG2-RZC (both from SDG G0D160472) were identified as equipment 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-04142010-RIG1-RZC	4/14/10	1,2,3,4,6,7,8-HpCDD 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 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	1.2 pg/L 9.2 pg/L 0.50 pg/L 0.32 pg/L 0.69 pg/L 0.39 pg/L 0.28 pg/L 0.20 pg/L 0.79 pg/L 0.30 pg/L 1.8 pg/L	All samples in SDG G0D170489
EB-04142010-RIG2-RZC	4/14/10	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-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.29 pg/L 0.39 pg/L 0.77 pg/L 2.5 pg/L 3.3 pg/L 1.6 pg/L 0.73 pg/L 4.2 pg/L 2.2 pg/L 0.71 pg/L 0.43 pg/L 6.6 pg/L 1.9 pg/L 1.9 pg/L	All samples in SDG G0D170489

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

Sample FB-04072010-RZC (from SDG G0D130519) 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-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 1,2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	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 1.1 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	All samples in SDG G0D170489

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.

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
SSAP3-01-1BPC	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)	Р
SA182-5BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170489	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170489	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D170489

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D170489	SSAP3-01-1BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D170489	SA182-5BPC	OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D170489	SSAP3-01-1BPC SA182-5BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D170489	SSAP3-01-1BPC SA182-5BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D170489

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D170489

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D170489

No Sample Data Qualified in this SDG

Tronox Northgate Henderson T

_DC #: 23265J21	VALIDATION COMPLETENESS WORKSHEE
SDG #:G0D170489	Stage 2B
_aboratory: <u>Test America</u>	
METHOD, HDCC/HDMC Dies	ing/Dihanzafurana (EDA SIM 846 Mathad 9200)

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	Reviewer:			
2nd	Reviewer:	(b	
			7	

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: 4/14/10
11.	HRGC/HRMS Instrument performance check	Å	/ /
Ш.	Initial calibration	ϕ	
IV.	Routine calibration/low	ϕ	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	w	No splassid- No Cenal
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
Χ	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	N	
XII.	System performance	N	
XIII.	Overall assessment of data	1	
XIV.	Field duplicates	N	
XV.	Field blanks	w	FB-04072010-REC(400130519)

Note: A = Acceptable

N = Not provided/applicable

SW = See worksheet

R = Rinsate FB = Field blank

ND = No compounds detected

D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAP3-01-1BPC 5	11	0110455MB	21	31	
2	SA182-5BPC	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 Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

1 A 2 2 4 C D				
0. 2:3;7;6:1	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	100110011	
			TOOGH-9,0,7,4,0,4,1	U. Total Hoodo
B. 1.2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	90000	
			, j	V. Total TCDF
C. 1,2,3,4,7,8-HxCDD	H. 2,3,7,8-TCDF	M. 2.3.4.6.7.8-HXCDE	4 do 0 H	
				W. Total PecDF
D. 1,2,3,6,7,8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1.2.3.7.8.9-H×CDF	(40) d 1772 F 0	
1 0 0 7			S. Total Pecino	X. Total HXCDF
E: 1,2,3,7,8,9-HXCDD	SCOF	O. 1,2,3,4,6,7,8-HpCDF	T Total Hychn	

Notes:

SDG #261 COUNT LDC #: 25-2/5 10-1

VALIDATION FINDINGS WORKSHEET

2nd Reviewer:_ Reviewer: Page:_

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".

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? Y N/A

Associated Samples: Blank extraction date: #20/pBlank analysis date: #26/pBlank analysis d

へ大切へ)

Sample Identification OKO ASIND M W 60 Blank ID Compound

Associated Samples: 0/ M المرضي Blank analysis date: 4 Blank extraction date: Conc. units:

					-		
no							
Sample Identification							
Sar							
	Ň						
Blank ID	MESE 10	1280	264	W			
7							
Compound		V	6	W W			

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".

SDG #:See Cover LDC #: 23265J21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: 2nd Reviewer: Reviewer:

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

Associated sample units: V N N/A Were field blanks identified in this SDG? Blank units: pg/L Sampling date: 4/14/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other.

All (>5X)

Compound	Blank ID			Sal	Sample Identification	ation		
	FB-04142010-RIG1-RZC	5X						
	1.2	900.0						
	9.2	0.046						
	0.50	0.0025						
	0.32	0.0016						
	0.69	0.00345						
	0.39	0.00195						
	0.28	0.0014						
	0.20	0.001						
	0.79	0.00395						
	0:30	0.0015						
	1.8	600.0						

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

SDG #: See Cover LDC #: 23265J21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Reviewer: 2nd Reviewer:

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

b/bd Associated sample units: | N N/A Were field blanks identified in this SDG? | Blank units: pg/L | Associated sample units | Sampling date: 4/14/10

All (>5X)

Field blank type: (circle one) Field Blank / Rinsate / Other:

Sample Identification Associated Samples: 0.00385 0.00215 0.00145 0.00195 0.0125 0.0165 0.00365 0.00355 0.0095 0.008 0.033 0.021 0.011 0.065 ž FB-04142010-RIG2-RZC Blank ID 0.29 0.39 0.77 0.73 0.71 0.43 2.5 3.3 1.6 4.2 2.2 9.9 6.1 5 Compound G Σ

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

CROL

SDG #: See Cover LDC #:23265J21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:

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

Y N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L Sampling date: 4/8/10

Field blank type: (circle one) Field Blank / Rinsate / Other.

Associated Samples:

Compound	Blank ID		Sam	Sample Identification		
	FB-04072010-RZC	2X				
O	0.77	0.00385				
D	0.74	0.0037				
Ш	0.82	0.0041				
Ŀ	4.2	0.021				
ඉ	37	0.185		-		
工	0.57	0.00285				
	0.96	0.0048				
7	0.67	0.00335				
¥	1.1	0.0055				
1	0.96	0.0048				
W	1.0	0.005				
Z	1.0	0.005			,,	
0	2.1	0.0105				
۵.	1.5	0.0075				
Ø	6.7	0.0335				
CRQL						

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

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Reviewer: ______

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? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
			20 calebrange		Letat (e)
		γ.	1	d	•
		(av	ZAPe results	ad	76/4)
			-		
	,				
İ					
l					

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 15, 2010

LDC Report Date:

June 10, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D170491

Sample Identification

SSAL5-04-1BPC SSAL4-03-1BPC SSAM4-01-1BPC**

**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
0110455MB	4/20/10	2,3,7,8-TCDF 1,2,3,7,8-PeCDF 1,2,3,4,6,7,8-HpCDF	0.31 pg/g 0.31 pg/g 0.30 pg/g	All samples in SDG G0D170491

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
SSAL4-03-1BPC	1,2,3,7,8-PeCDF	0.72 pg/g	0.72U pg/g
SSAM4-01-1BPC** (5X)	2,3,7,8-TCDF 1,2,3,7,8-PeCDF	2.9 pg/g 5.2 pg/g	2.9U pg/g 5.2U 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 1,2,3,4,6,7,8-HpCDF	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 1.6 pg/L 1.7 pg/L 1.9 pg/L 1.9 pg/L 1.1 pg/L	All samples in SDG G0D170491

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
SSAL5-04-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	31 (40-135) 35 (40-135) 23 (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)	Р
SSAL4-03-1BPC	¹³ C-OCDD	32 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р

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 compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170491	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170491	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D170491

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D170491	SSAL5-04-1BPC	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)	Р	Internal standards (%R) (i)
G0D170491	SSAL4-03-1BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D170491	SSAL5-04-1BPC SSAL4-03-1BPC SSAM4-01-1BPC**	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D170491	SSAL5-04-1BPC SSAL4-03-1BPC SSAM4-01-1BPC**	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D170491

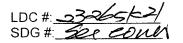
SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D170491	SSAL4-03-1BPC	1,2,3,7,8-PeCDF	0.72U pg/g	А	bl
G0D170491	SSAM4-01-1BPC** (5X)	2,3,7,8-TCDF 1,2,3,7,8-PeCDF	2.9U pg/g 5.2U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D170491

No Sample Data Qualified in this SDG

SDG#	:23265K21 #:G0D170491 atory:_Test America	VA 	Tro LIDATIO		_	ENE	SSV		SHEET		Date: 48/10 Page: /of / Reviewer: 9
	IOD: HRGC/HRMS Dioxi			•				•	Validatio	on fine	2nd Reviewer:
	tion findings worksheets.	TOVIC	ewed for ea	T or the R	T	ng va		iii aicas.	validatio	711 HIIC	are noted in attached
	Validation /	Area		 					Comm	ents	
<u> </u>	Technical holding times	<u></u>		A-	Samp	ling da	tes:	4/	15/ 1	0	
11.	HRGC/HRMS Instrument pe	rforma	ince check	★				/			
111.	Initial calibration			-							
IV.	Routine calibration/I			1	ļ						
V.	Blanks			W	-				7	p	
VI.	Matrix spike/Matrix spike dup	olicate	S	AV.	_ N	0 54	p/a	sud	- No G	Ova	<u> </u>
VII.	Laboratory control samples			7	120	19					
VIII.	Regional quality assurance a	and qu	ality control	N						·	
IX.	Internal standards			M							
Χ.	Target compound identificati			A	<u> </u>						
XI.	Compound quantitation and	CRQL	S	N	 						
XII.	System performance			A	<u> </u>						
XIII.	Overall assessment of data			<u> </u>	ļ						
XIV.	Field duplicates			N	<u> </u>						
XV.	Field blanks			1 m	FB	-04	0720	010-RZ	D(5	-0D	090441)
Note: Validate	A = Acceptable N = Not provided/applicable SW = See worksheet ed Samples:		R = Rin FB = Fi	o compound sate eld blank	s detec	oted		D = Duplic TB = Trip t EB = Equip	olank	ık	
1	SSAL5-04-1BPC	11	01104	55 M3		21	****	··		31	
2	SSAL4-03-1BPC	12	7,5			22				32	
3	SSAM4-01-1BPC **	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		- 3		40	

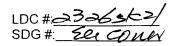
Notes:_



VALIDATION FINDINGS CHECKLIST

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 \leq 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) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?				
IV. Continuing calibration	y tid			
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 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?	1			
Was an LCS analyzed per extraction batch?				
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?				



VALIDATION FINDINGS CHECKLIST

Page: → of →
Reviewer: ←

2nd Reviewer: ←

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?	/		<u> </u>	
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 <u>+</u> 2 seconds (includes labeled standards)?				
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?				
XI. Compound quantitation/CRQLs			ı	
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			71. 	
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. ocpp	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	1. 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:

SDG #: 201 GOUL 1DC#:333/3/7/

VALIDATION FINDINGS WORKSHEET

Page:__ 2nd Reviewer: Reviewer:

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".

Were all samples associated with a method blank? A N A

Was a method blank analyzed for each matrix?

Was the blank contaminated? If yes, please see qualification below. In date: $\frac{260/2}{2}$ Blank analysis date: $\frac{232}{2}$ Blank extraction date: 460/

Sample Identification Associated Samples: 3 (BX ď OFIEN W Blank ID W 0.30 0 Conc. units: 379 Compound

Blank analysis date: Blank extraction date: Conc. units:

Associated Samples:

Compound	Blank ID		ÿ	Sample Identification	ion		

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".

SDG #:See Cover LDC #: 23265K21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Page:__ Reviewer:_

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

N/A Were field blanks identified in this SDG?

b/bd Associated sample units:_

Field blank type: (circle one) Field Blank) Rinsate / Other: Blank units: pg/L Sampling date: 4/7/10

(YXX)

Associated Samples:

Sample Identification 0.00445 0.0075 0.0415 0.0075 0.0065 0.008 0.011 0.007 0.008 0.007 ž FR-04072010-RZD Blank ID 0.89 1.6 8.3 4. .3 2.2 1.6 4. Compound മ

0.0205

4.

0

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

SDG #: 200 CL923 LDC#: 233656

VALIDATION FINDINGS WORKSHEET Internal Standards

2nd Reviewer: Reviewer:___ Page:

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".

Are all internal standard recoveries were within the 40-135% criteria?

Was the S/N ratio all internal standard peaks > 10? Y N N/A

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	. `	Qualifications (/)
\vdash			*		(40-1	1351	1/4/4 (F-6.0-8)
H			\mathcal{H}	111	35-	(
			/	J) ೯೪	(
\vdash				-)	(
П		B	+	33	1	V)	V (G. A
\vdash)	(
)	(
)	(
\vdash)	(
Т					•		
					Ú)	
T)	(
T						(
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)	(
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Γ)	(
Γ						î	
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П							
)	(
		Internal Standards	Check Standard Used		Internal Standards	ıdards	Check Standard Used
Α̈́	¹³ C-2,3,7,8-TCDF	DF		Ġ.	¹³ C-1,2,3,4,6,7,8-HpCDF		
В.	¹³ C-2,3,7,8-TCDD	OC:		İ	13C-1,2,3,4,6,7,8-HpCDD		
Ċ.	¹³ C-1,2,3,7,8-PeCDF	PecDF			13C-OCDD		
О.	¹³ C-1,2,3,7,8-PeCDD	eCDD		ᅶ	13C-1,2,3,4-TCDD		
Ë	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		نـ	¹³ C-1,2,3,7,8,9-HxCDD		
ц	13C-123678-HxCDD	-HxCDD					

LDC #: 33365/27 SDG #: 261 CONM

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
		//₽	ENDO USULAS	ast.	VF(K)
			/		
	0				

Comments: See sample calculation verification worksheet for recalculations

1DC #: 23265 (2)

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:

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 = $(A_{\nu}/(C_{\nu})/(A_{\nu})(C_{\nu})$ everage 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,

 $A_{\rm u}$ = Area of associated internal standard $C_{\rm u}$ = Concentration of internal standard X = Mean of the RRFs

L									
				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Average RRF (initial)	RRF (ASStd)	RRF	WRSD	%RSD
	19th	0/01/1	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.860	0.860	180	1.80	104	100
	(105)	1/4//	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)	4560	0.934	0.95	260	10 2	900
			1,2,3,6,7,8-HxCDD (19C-1,2,3,6,7,8-HxCDD)	1.058	1.05X	000	1001	- 1	06/1
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	8000	8660	1.05	501	4 6	10.0
			OCDF ("C-OCDD)	1.437	1.437	152	1.57	14	140
~	10/2	4/2/100	2.3,7,8-TCDF (*C-2,3,7,8-TCDF)	880.1	8801	011	0//	así	52
			2,3,7,8-TCDD ("C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (19C-1,2,4,6,7,8,-HpCDD)						
			ocpr (4c-ocpp)						
0	ate	1/-//	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	3460	-7hb 0	86.0	Xa s	441	7
	(405)	01/2/14	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.001	107	1.04	1001	200	131
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.114	4/1/	1:10	0 !	727	The second
\perp			1,2,3,4,6,7,8-HpCDD (*3C-1,2,4,6,7,8,-HpCDD)	1.072	1.072	1///		1000	1000
			OCDF ("C-OCDD)	1.442	1 1116	1,1,1		0 4	2001

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.



Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:

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 th€ compounds identified below using the following calculation:

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

ave. RRF = initial calibration average RRF RRF == continuing calibration RRF Where:

 $A_{\mathtt{k}} = \mathsf{Area} \ \mathsf{of} \ \mathsf{associated} \ \mathsf{internal} \ \mathsf{standard} \ \mathsf{C}_{\mathtt{k}} = \mathsf{Concentration} \ \mathsf{of} \ \mathsf{internal} \ \mathsf{standard} \ \mathsf{d}$ $A_x = Area of compound,$ $C_x = Concentration of compound,$

# Standard ID Date Compound (Reference Internal Standard) Average RF RRF L									
Standard ID Date Compound (Reference Internal Standard) Moverage RRF RRF						Reported	Recalculated	Reported	Recalculated
123.67.PTOF ("C-237.8-TCDF") 0.360 0.92 7.0	*		Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	G %
4/36/16 237,8-TCDD (*C-23,7,8-TCDD) 0.9344 0.93	<u>긔</u>	34P 10AIL	,,,,	, ,	0.860	280	0.92	10	01
1,23,6,7,844CDD (°C-1,24,6,7,8-HVCDD) 1,958 1,155 5,9 1,23,46,7,84HVCDD (°C-1,24,6,7,8-HVCDD) 1,457 1,54 1,54 1,23,46,7,84HVCDD (°C-1,24,6,7,8-HVCDD) 1,088 1,048 1,044 1,23,46,7,8-HVCDD) 1,23,46,7,84HVCDD (°C-1,24,6,7,8-HVCDD) 1,23,46,7,84HVCDD) 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD 1,23,46,7,84HVCDD (°C-1,24,6,7,8-HVCDD) 1,23,46,7,84HVCDD (°C-1,24,6,7,8-HVCDD (°C-1,24,6,7,8-HVCDD (°C-1,24,6,7,8-HVCDD (°C-1,24,6,7,8-HVCD (°C-1,24,6,7,8-HVCD (°C-1,24,6,7,8-HVCD (°C-1,24,6,7,8-HVCD (°C-1,24,6,7,8-HVCD (°C-1,24,6,7,			4/26/10	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	4560	0.93	0.93	10	10
1,23,4,67,8-HpCDD (*C-1,24,67,8-HpCDD) 0,4437 1,066 6,5				1,2,3,6,7,8-HxCDD ('3C-1,2,3,6,7,8-HxCDD)	8501	1.18	1.12	0.00	09
CODE (**C-OCDD)				1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	8660	1.06	1.00	62	7.0
23.7.8-TCDF ("C-23.7.8-TCDF) 1.08 1.04 1.04 1.06				OCDF (1c-OCDD)	1.437	75.1	725./	1	10
QSM/QASY 2.3.7.8-TCDD (*C-1,2.3.6.7.8-HxCDD) C.3.7.8-TCDD (*C-1,2.3.6.7.8-HxCDD) QAM/QASY 1,2.3.6.7.8-HxCDD (*C-1,2.4.6.7.8.HpCDD) 0.76 0.76 QAM/QASY 2.3.7.8-TCDF (*C-2,3.7.8-TCDF) 0.74 0.76 0.76 QAM/QASY 2.3.7.8-TCDF (*C-2,3.7.8-TCDF) 0.74 0.76 0.76 QAM/QASY 2.3.7.8-TCDF (*C-2,3.7.8-TCDF) 0.74 0.76 0.76 QAM/QASY 1.2.3.6.7.8-HxCDD (*C-1,2.3.6.7.8-HxCDD) 0.74 0.76 0.76 QCDF (*C-2,3.7.8-HyCDD) 0.74 0.76 0.76 0.76 1.2.3.6.7.8-HyCDD (*C-1,2.3.6.7.8-HpCDD) 0.74 0.76 0.76 1.2.3.6.7.8-HyCDD (*C-1,2.4.6.7.8HpCDD) 0.74 0.76 0.76	7		the state	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	40.	80/404	1500 H	180
1,23,6,7,8+kCDD (°C-1,23,6,7,8-hCDD)				2,3,7,8-TCDD (13C-2,3,7,8-TCDD)					
QLAM Months Section (**C-1,2.4,6,7,8-HpCDD) CODE (**C-2,3,7,8-TCDF) COME (**C-2,3,7,8-TCDF) CODE (**C-2,3,7,8-TCDF) CODE (**C-2,3,7,8-TCDD) CODE (**C-1,2,3,6,7,8-HpCDD) CODE (**C-1,2,4,6,7,8-HpCDD) CODE (**C-1,2,4,6,7,8-HpCDD) CODE (**C-0CDD)		OSN/JOHO	1/2/10	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
QAM/Inflight S (3,7,8-TCDF (*3-C-2,3,7,8-TCDF)) 0.745 0.96 0.96 1.23,6,7,8-HxCDD (*3-1,2,4,6,7,8-HpCDD) 0.045 0.96]	1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
Q4M Ylash description 2.3,7,8-TCDF (³C-2,3,7,8-TCDF) 0.745 0.96 0.96 0.76 0.96				OCDF (1°C-OCDD)					
2,3,7,8-TCDD (*C-2,3,7,8-TCDD)	က	a4M Ylar Abs	0/1/2	2,3,7,8-TCDF (*3C-2,3,7,8-TCDF)	5th:0	28.0	200	7.7	7.7
1.14 1.1 1.1 6.3 1.07 1.00 1.00 6.3 1.445 1.40 1.10 0.11		\] 2//2/	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)	1.021	196	1800		
1.072 1.00 1.00 6.3				1,2,3,6,7,8-HxCDD (1°C-1,2,3,6,7,8-HxCDD)	4/1/	/ / /		N C	0 N
1.45 1.40 1.100]			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1072	201	all	10/10/10/10	100
				OCDF (*c-OCDD)	1.445	1.40	1,77,	jo	

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 #: 232/25/3

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

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Page: Reviewer	
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2nd Reviewer:

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

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0110455

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

	So	ke	Spiked	sample	SUL	S	ICSD	d	I CS/I CSD	CSD
Compound	AA (g)	Added	Concentration (779)	tration	Percent Recovery	есочегу	Percent Recovery	ecovery	RPD	Q
	1.08	I CSD	SUL	usol	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2.3.7.8-TCDD	20.0	NA	1.61	NĂ	96	26				
1.2.3.7.8-PeCDD	001		103	,	801	103				
1.2.3.4.7.8-HXCDD			25.5		56	95				
1.2.3.4.7.8.9-HpCDF	1		4.18		18	8/				
OCDF	200		86/	<u></u>	66	66				
			\			,				
										-
										-
								·		
						-		-	·	

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.

303.9016 N-305.8987 N-315.9419 N-317.9389 N-319.8955 N-321.8936 N-333.9338 N-333.9338 N-335.8364 N-333.8597 N-339.8597 N-339.8597 N-339.8597 N-339.8597 N-339.8597 N-339.8597 N-339.8597 N-330.8987 N-339.8597 N-339.8597 N-330.8597 N-	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	C,Pt,*CI,O						
			TCDF	4	407.7818	M+2	C ₁₂ H ³⁵ CI ₈ 37CIO	HpCDF
2		C ₁₂ H, ³⁵ Cl ₃ 37C10	TCDF TCDE (8)		409.7788	¥	C ₁₂ H ²⁵ Cl ₂ 37Cl ₂ O	HPCDF
		13C, H. 3C, CO.	TCDF (S)		419,8220	M 42	12C, H ² C, H ² CO	HPCDF (3)
		C, H, SCI, O,	TCDD		423.7767	M+2	C, H ³⁵ Cl ₃ 7ClO ₂	НрСББ
2		C12H4**C13**C102	TCDD		425.7737	M+4	C ₁₂ H ³⁵ Cl ₅ 37Cl ₂ O ₂	Нрсрр
23		13C12H, 35C14O2	TCDD (S)		435.8169	M+2	13C ₁₂ H ³⁵ Cl ₈ 37ClO ₂	HpcDD (S)
ਕ .	M+2	13C ₁₂ H ₄ 35Cl ₃ 37ClO ₂	TCDD (S)		437.8140	A+4	13C ₁₂ H ³⁵ Cl ₅ 37Cl ₂ O ₂	HpCDD (S)
[2]	M+2	C ₁₂ H ₄ **Cl ₅ *7ClO	HXCDPE		479.7165	M+4	C,2H301,37Cl2O	NCDPE
	- Sc	ر ا ا	PFK	-	[430.9728]	LOCK	ريار 1-1-30	PFK
		C ₁₂ H ₃ 35Cl ₄ 37ClO	PeCDF	ιΩ	441.7428		C ₁₂ **Cl ₇ 37 ClO	OCDF
-		C ₁₂ H ₃ *Cl ₃ *Cl ₂ O	PecDF		443.7399		C ₁₂ *Cl ₈ *Cl ₂ O	OCDF
	M+2	13C12H3#C1_37C10	PeCDF (S)		457.7377	M+2	C ₁₂ **CI ₇ **CIO ₂	0000
	M+4	13C12H3#C137C12O	PeCDF (S)		459.7348	∆ +4	C ₁₂ *Cl ₈ *Cl ₂ O ₂	OCDD
	M+2	C ₁₂ H ₃ 35Cl ₄ 37ClO ₂	PeCDD		469.7780	M+2	13C1235CI,37CIO2	ocpp (s)
357.8516 M+	M+4	C ₁₂ H ₃ **Cl ₃ **Cl ₂ O ₂	PecDD		471.7750	M+4	13C1235C1837C12O2	OCDD (S)
367.8949 M+	M+2	13C1,H,36C1,37CIO,	PeCDD (S)		513.6775	M+4	C,3*Cl,*Cl,O	DCDPE
369.8919 M+	M+4	13C1,H,35C1,37C1,O,	PecDD (S)		[422.9278]	LOCK	O.F.	PFK
409.7974 M+	M+2	C, H, 36Cl, 37ClO	HPCDPE		•			
[354.9792] LO		, L. C.	PFK					
373.8208 M+	M+2	C,,H,**CI,**CIO	HXCDF					
		C,"H,"*C ,"7C ,O	HXCDF					
			HXCDF (S)					
385.8610 H	M+2	13C1,H,36C1,37C1O	HXCDF (S)					
389.8156 M+		C.H. aci acio	HXCDD					
		C;,H,**C[,**C],O,	HXCDD					
401.8559 A+	M+2	13Č1, H, 36Č1, 37Č1O,	HXCDD (S)					
		13C12H23C147C12O2	HXCDD (S)					
		C ₁₂ H ₂ ³⁵ Cl ₈ ³⁷ Cl ₂ O	OCDPE					
[430.9728] LOC	XXO	C,F ₁₇	PFK					

(a) The following nuclidic masses were used:

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

S = internal/recovery standard

LDC #: 336542/ SDG #: Sex count

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	/ 6f/
Reviewer:	9
2nd reviewer:	~_~

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

N		Ν	N/A
	Y/	N	N/A

Were all reported results recalculated and verified for all level IV samples?

Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Concent	ration	$= \frac{(A_x)(I_x)(DF)}{(A_{ix})(RRF)(V_o)(\%S)}$
A _×	=	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
l _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,	& :
Conc. = $\frac{(208468)}{(1194310)}$ (4)	1-000 \(\ \(\frac{1}{45}\)(10.05\)(0.93)
= 5/.6 P9/g	?

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
-			 		
1					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 16, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil/Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D170492

Sample Identification

EB-04152010-1-RZD SSAL8-01-1BPC SSAK8-02-1BPC

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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
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	All soil samples in SDG G0D170492

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0112250MB	4/22/10	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.1 pg/L 8.4 pg/L 0.92 pg/L 0.52 pg/L 0.50 pg/L 1.6 pg/L 1.0 pg/L 1.7 pg/L	All water samples in SDG G0D170492

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
EB-04152010-1-RZD	1,2,3,4,6,7,8-HpCDD	7.3 pg/L	7.3U pg/L
	1,2,3,4,7,8-HxCDF	1.3 pg/L	1.3U pg/L
	1,2,3,6,7,8-HxCDF	0.33 pg/L	0.33U pg/L
	1,2,3,4,6,7,8-HpCDF	2.2 pg/L	2.2U pg/L
	1,2,3,4,7,8,9-HpCDF	0.62 pg/L	0.62U pg/L
	OCDF	6.8 pg/L	6.8U pg/L

Samples EB-04152010-2-RZD (from SDG G0D200558) and EB-04152010-1-RZD were identified as equipment 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-04152010-2-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HxCDD 1,2,3,4,6,7,8-HpCDD 0CDD 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 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 0CDF	1.6 pg/L 2.9 pg/L 1.4 pg/L 2.6 pg/L 2.3 pg/L 9.8 pg/L 11 pg/L 45 pg/L 48 pg/L 29 pg/L 70 pg/L 56 pg/L 13 pg/L 7.6 pg/L 180 pg/L 58 pg/L 450 pg/L	All soil samples in SDG G0D170492

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04152010-1-RZD	4/16/10	2,3,7,8-TCDD 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 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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	0.34 pg/L 0.41 pg/L 0.41 pg/L 7.3 pg/L 60 pg/L 0.19 pg/L 0.39 pg/L 1.3 pg/L 0.33 pg/L 0.63 pg/L 2.2 pg/L 0.62 pg/L 6.8 pg/L	All soil samples in SDG G0D170492

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

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 1,2,3,4,6,7,8-HpCDF	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 G0D170492

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
SSAL8-01-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	33 (40-135) 37 (40-135) 22 (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

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
SSAK8-02-1BPC	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	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)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170492	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D170492	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D170492

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D170492	SSAL8-01-1BPC	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)	Р	Internal standards (%R) (i)
G0D170492	SSAK8-02-1BPC	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	J (all detects) J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D170492	EB-04152010-1-RZD SSAL8-01-1BPC SSAK8-02-1BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D170492	EB-04152010-1-RZD SSAL8-01-1BPC SSAK8-02-1BPC	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 G0D170492

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D170492	EB-04152010-1-RZD	1,2,3,4,6,7,8-HpCDD 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	7.3U pg/L 1.3U pg/L 0.33U pg/L 2.2U pg/L 0.62U pg/L 6.8U pg/L	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D170492

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D170492

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

VALIDATION COMPLETENESS WORKSHEET LDC #: 23265L21 Stage 2B SDG #: G0D170492_ Reviewer: Laboratory: Test America 2nd Reviewer: 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. Comments Validation Area Sampling dates: Technical holding times 11. HRGC/HRMS Instrument performance check 111. Initial calibration IV. Routine calibration/NV Blanks VI. Matrix spike/Matrix spike duplicates VII. Laboratory control samples VIII. Regional quality assurance and quality control IX. Internal standards X. Target compound identifications Ν XI. Compound quantitation and CRQLs Ν XII. System performance XIII. Overall assessment of data XIV. Field duplicates XV. Field blanks A = Acceptable ND = No compounds detected D = Duplicate Note: R = Rinsate TB = Trip blank N = Not provided/applicable SW = See worksheet FB = Field blank EB = Equipment blank Validated Samples: -*J- R2D* EB-04152010 R2D 22 32 2 12 SSAL8-01-1BPC 33 13 23 3 SSAK8-02-1BPC 14 24 34 4 5 15 25 35 16 26 36 6 37 17 27 38 28 8 18 19 29 39 9 20 30 40

Notes:

VALIDATION FINDINGS WORKSHEET

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

11000				
A. 2,3,7,8-1CDD	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-HnCDE	
B. 12.3.7.8-PACDD	2000			o. Total npc00
	g. 0000	L. 1,2,3,6,7,8-HxCDF	Q. 00DF	V Total TCDE
C 193478-EVODE	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
UDOXLI-0,1,1,0,2,1	H. 2,3,7,8-1 CDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	14/ H 15/ D 20 m
000000000000000000000000000000000000000				VV. I Otal Pecur
UUUXH-6,1,6,6,2,1	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HXCDF	CO Total etc.	
11 000			o: lotal raced	A. lotal HXCDF
E. 1,4,3,7,8,9-HXCUU	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T. Total HxCDD	180-11 1-1-1 A

Notes:

LDC #: 2326562/2018 SDG #: 261 CONCO

VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:_

Page:

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

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

Were all samples associated with a method blank?

Associated Samples: Y N N/A Was the blank contaminated? If yes, please see qualification below. Blank extraction date: 4シバのBlank analysis date エレンバック Conc. units: アカタ

Sample Identification 权 ONESAND X Blank ID Compound Ψ

Blank analysis date:_ Blank extraction 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 #: 23265L21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 1 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. N/N N/₩

All Waters (bl)

Associated samples:

Blank analysis date: 4/27/10 Blank extraction date: 4/22/10

Conc. units: pg/l

Sample Identification																
Sample I																
															-	
	,	7.3/U	s	1.3/U	0.33/U		2.2/U	0.62/U	6.8/U							
	5X	10.5	42	4.6	2.6	2.5	8	5	8.5							
Blank ID	0112250MB	2.1	8.4	0.92	0.52	0.50	1.6	1.0	1.7							
Compound														-		
Соп		ıι	g	쏘		Σ	0	Ь	ø							

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".

SDG #:See Cover LDC #: 23265L21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: 2nd Reviewer: Reviewer:_

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

Associated Samples: EB Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units: pg/
Sampling date: 4/16/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

All Soils

Compound	Blank ID	and the second second		3 -	Sample Identification	tion		
	FR-04152010-2-RZD	5X						
A	1.6	0.008						
а	2.9	0.0145						
U	1.4	0.007						
D	2.6	0.013						
Ш	2.3	0.0115						
щ	9.8	0.049						
9	- 11	0.055						
Ŧ	45	0.225						
	48	0.24						
, ,	29	0.145						
¥	70	0.35						3 A a a 44
7	56	0.28						
Σ	13	0.065						
Z	7.6	0.038						
0	180	6.0						
d	58	0.29						
Ö	450	2.25						
CBOI								

SDG #: See Cover LDC #: 23265L21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Page: Reviewer:

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

V/N N/A Were field blanks identified in this SDG?

Associated sample units:

Blank units: pg/L / Sampling date: 4/16/10

All Soils Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound Blank ID Symple Identification A 0.034 0.0017 C <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>							
60 0.39 0.39 0.39 0.39 0.63 0.62 0.62 0.62 0.63 0.62 0.63 0.65	Compound	Blank ID		Sample I	dentification		
0.34 0.41 0.41 7.3 60 60 0.39 1.3 0.63 2.2 2.2 0.63 0.63 0.63 6.8	Man and a second	FB-04152010-1-RZD	2X				
0.41 0.41 7.3 60 0.19 0.39 1.3 0.63 2.2 0.63 0.63 6.8	∢	0.34	0.0017				
0.41 60 60 0.39 1.3 0.63 0.63 0.63 0.63 6.8	D	0.41	0.00205				
7.3 60 0.19 0.39 1.3 0.63 0.62 6.8	В	0.41	0.00205				
60 0.19 0.39 0.63 0.63 0.62 6.8	ш	7.3	0.0365				
0.19 0.39 1.3 0.63 0.62 6.8	ග	90	0.3				
0.39 1.3 0.33 0.62 0.62 6.8	T	0.19	0.00095				
1.3 0.63 0.62 0.62 6.8		0.39	0.00195				
0.63 0.63 0.62 0.62 6.8	¥	1.3	0.0065				
0.63 2.2 0.62 6.8		0.33	0.00165				
0.62	Z	0.63	0.00315				
6.8	0	2.2	0.011				
8.8	۵	0.62	0.0031				
CRQL	σ	6.8	0.034				
CRQL							
CRQL							
CRQL							
CRQL							
	CRQL						

SDG #:See Cover LDC #: 23265L21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:__ Page: Reviewer:_

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

|V/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Sampling date: 4/7/10

Associated sample units:_

Field blank type: (circle oxe) Field Blank Rinsate / Other:	Field Blank)/ Rinsate	/ Other:	Associated Samples:	All Soils (><	(×5×
Compound	Blank ID		8	Sample Identification	
The second secon	FB-04072010-RZD	5X			
၁	0.89	0.00445			
Ш	1.5	0.0075			
Ц	2.2	0.011			
9	8.3	0.0415			
×	1.4	0.007			
7	1.6	0.008			
M	1.5	0.0075			
Z	1.6	0.008			
0	1.3	0.0065			
Q .	1.4	0.007			
Ø	4.1	0.0205			
CRQL					

LDC #: 252652-7 SDG #: 201 GONUN

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: _/ 2nd Reviewer:_ Reviewer:_

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".

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

YN N/A

*	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	it: 40-135%)	Qualifications ()
		6	5		33	(40-135)	JAN A (F-408
			<i>t</i>		37	()	
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		Internal Standards	Check Standard Used			Internal Standards	Check Standard Used
Ą	¹³ C-2,3,7,8-TCDF	DF		Ö	¹³ C-1,2,3,4,6,7,8-HpCDF	НрСDF	
B.	13C-2,3,7,8-TCDD	QQ		Τ̈́	¹³ C-1,2,3,4,6,7,8-HpCDD	НрСОО	
ပ	¹³ C-1,2,3,7,8-PeCDF	eCDF		-	13C-OCDD		
<u>0</u>	¹³ C-1,2,3,7,8-PeCDD	еСDD		ᅶ	13C-1,2,3,4-TCDD		
ш	¹³ C-1,2,3,4,7,8-HxCDF	-HxCDF		ز	13C-1,2,3,7,8,9-HxCDD	хсрр	
Ш	السا	-нхСDD					

LDC #: 25265 420 SDG #: 268 COW

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of A Reviewer: C 2nd Reviewer:

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? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

M Superior My Supe	*	Date	Sample ID	Finding	Associated Samples	Qualifications
W ZHE WINTS W			a)]	Ŋ	ΙЧ
M ZUPC MEWAS W				A		
M ZHOC MSWAG WA						
M 34DC MSWAC MM						
			M	γ	\mathcal{M}	√ ← (左)
		0				

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 16, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D200427

Sample Identification

SSAK5-02-1BPC

SSAK6-01-1BPC

SSAK7-03-1BPC

SSAL7-01-1BPC

SSAI3-01-1BPC

Introduction

This data review covers 5 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
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	All samples in SDG G0D200427

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
SSAL7-01-1BPC	OCDD	1.3 pg/g	1.3U pg/g
	1,2,3,4,6,7,8-HpCDF	0.91 pg/g	0.91U pg/g
	OCDF	2.5 pg/g	2.5U pg/g

Samples EB-04152010-2-RZD (from SDG G0D200558) and EB-04152010-1-RZD (from SDG G0D170492) were identified as equipment 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-04152010-2-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-HyCDD 0CDD 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 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HyCDF 1,2,3,4,6,7,8-HpCDF 0CDF	1.6 pg/L 2.9 pg/L 1.4 pg/L 2.6 pg/L 2.3 pg/L 9.8 pg/L 11 pg/L 45 pg/L 48 pg/L 29 pg/L 70 pg/L 56 pg/L 13 pg/L 7.6 pg/L 180 pg/L 58 pg/L 450 pg/L	All samples in SDG G0D200427
EB-04152010-1-RZD	4/16/10	2,3,7,8-TCDD 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 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	0.34 pg/L 0.41 pg/L 0.41 pg/L 7.3 pg/L 60 pg/L 0.19 pg/L 0.39 pg/L 1.3 pg/L 0.33 pg/L 0.63 pg/L 2.2 pg/L 0.62 pg/L 6.8 pg/L	All samples in SDG G0D200427

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

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 1,2,3,4,6,7,8-HpCDF	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 1.7 pg/L 1.9 pg/L 1.9 pg/L 1.1 pg/L	All samples in SDG G0D200427

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
SSAK5-02-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	33 (40-135) 37 (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)	Р
SSAK6-01-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	25 (40-135) 26 (40-135) 16 (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)	Р

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK7-03-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	31 (40-135) 35 (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)	Р
SSAL7-01-1BPC	¹³ C-OCDD	33 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAI3-01-1BPC	¹³ C-OCDD	17 (40-135)	OCDD OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р

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
SSAK6-01-1BPC	2,3,7,8-TCDF 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)	P
SSAI3-01-1BPC	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) J (all detects)	Р
SSAL7-01-1BPC	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	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200427	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200427	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D200427

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D200427	SSAK5-02-1BPC SSAK6-01-1BPC SSAK7-03-1BPC	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)	Р	Internal standards (%R) (i)
G0D200427	SSAL7-01-1BPC SSAI3-01-1BPC	OCDF	UJ (all non-detects)		Internal standards (%R) (i)
G0D200427	SSAK6-01-1BPC	2,3,7,8-TCDF 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)	Р	Project Quantitation Limit (e)
G0D200427	SSAI3-01-1BPC	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) J (all detects)	Р	Project Quantitation Limit (e)
G0D200427	SSAL7-01-1BPC	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (o)
G0D200427	SSAK5-02-1BPC SSAK6-01-1BPC SSAK7-03-1BPC SSAL7-01-1BPC SSAI3-01-1BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D200427	SSAK5-02-1BPC SSAK6-01-1BPC SSAK7-03-1BPC SSAL7-01-1BPC SSAI3-01-1BPC	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 G0D200427

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D200427	SSAL7-01-1BPC	OCDD 1,2,3,4,6,7,8-HpCDF OCDF	1.3U pg/g 0.91U pg/g 2.5U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D200427

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D200427

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23265M21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0D200427	Stage 2B
_aboratory:_Test America	

2nd Reviewer:

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	\downarrow \not \downarrow	Sampling dates: 4/16/10
11.	HRGC/HRMS Instrument performance check	4	, ,
111.	Initial calibration	A	
IV.	Routine calibration/I	A	
V.	Blanks	w	
VI.	Matrix spike/Matrix spike duplicates	TW	No St resid - No Qual
VII.	Laboratory control samples	\$	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	\blacktriangleleft	
XIV.	Field duplicates	N,	(SaD200558)
XV.	Field blanks	SW	(GOD200558) FB-04072010-RZD(GOD090441), ZB-04152010-2-RZD ZB-04152010-1-RZD (GOD170492)

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	SSAK5-02-1BPC 5	11	0112236MB	21	31	
2	SSAK6-01-1BPC	12		22	32	
3	SSAK7-03-1BPC	13		23	33	
4	SSAL7-01-1BPC	14		24	34	
5	SSAI3-01-1BPC	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)

						,			
		U. I otal HpCDD	100 H 1-1-1 //	V. 10tal ICUF	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	W. Iotal PeciDr	TOO TOTAL	A. Total HXCDF	7 TOO - 1 1 - 1 - 1
	P 1234780 UACHE		Q. OCDF		R. Total TCDD		S. Total Pacino		T. Total HxCOD
	K. 1,2,3,4,7,8-HxCDF		L. 1,2,3,6,7,8-HxCDF		M. 2,3,4,6,7,8-HXCDF		N. 1,2,3,7,8,9-HxCDF		O. 1,2,3,4,6,7,8-HpCDF
The second secon	F. 1,2,3,4,6,7,8-HpCDD		6. OCDD		n. 2,3,7,8-1CDF		1. 1,2,3,7,8-PeCDF		J. 4,7,4,7,8-PeCDF
	A. 2,3,7,8-TCDD	D 12378-DOCUD		C 123478 DVOD	מסטארויט, ייניט, יי	D 123678-HVCDD	000x10,10,011, 10	E 123789-HXCOD	

Notes:

LDC #: 33-45-14-2 SDG #: 266 604

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer:

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".

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? Y N/A Y N N/A

Was the blank contaminated? If yes, please see qualification below. As $\frac{1}{2}$

Associated Samples: 10 Blank analysis date: Blank extraction date: A/N N/A

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10 (0 K	Sample Identification						
7							
Associated Samples:							
Associat							
, ,		4	-	17/100	175%		
	Blank ID	SI I S S AND	520	0 64			
Conc. units:	Compound						
Conc.			A	6	1 4		

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

1		1			
				`	
Ę					
Sample Identification					
Sarr					
Blank ID					
Compound					
S					

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 #: 23265M21 SDG #:See Cover

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: of 2nd Reviewer:___ Reviewer:_

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

YN N/A Were field blanks identified in this SDG?

Associated sample units: Blank units: pg/L Sampling date: 4/16/10

b/bd

Associated Samples: AD D Field blank type: (circle one) Field Blank / Rinsate / Other:

(x5<) Sample Identification 0.0145 0.0115 0.008 0.013 0.049 0.145 0.007 0.055 0.225 0.038 0.065 0.24 0.35 0.28 0.9 0.29 2.25 FB-04152010-2-RZD Blank ID 1.6 2.9 2.6 2.3 9.8 180 450 45 13 28 48 8 2 26 Ξ Compound O Ω

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

CRQL

SDG #:See Cover LDC #: 23265M21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Reviewer:

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

Associated sample units: | N/A Were field blanks identified in this SDG? | Blank units: pg/L | Associated sample units | Sampling date: 4/16/10 |

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other

Compound	Blank ID			ŞS	Sample Identification	ation		
	FB-04152010-1-RZD	5X						
Ą	0.34	0.0017						
٥	0.41	0.00205						
ш	0.41	0.00205						
L	7.3	0.0365						
9	09	0.3	:					
I	0.19	0.00095						
	0.39	0.00195						
¥	1.3	0.0065						
	0.33	0.00165						
Z	0.63	0.00315						
0	2.2	0.011						
Δ.	0.62	0.0031						
Ø	6.8	0.034						
CROL								

LDC #: 23265M21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer: Page:

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

Y/N N/A Were field blanks identified in this SDG?

Associated sample units:_ Blank units: pg/L Sampling date: 4/7/10

Associated Samples: Field blank type: (circle-one) Field Blank / Rinsate / Other

Compound	Blank ID			San	Sample Identification	ation		
	FR-04072010-RZD	5X						
O	0.89	0.00445						
Ш	1.5	0.0075						
Ш	2.2	0.011						
9	8.3	0.0415						
×	1.4	0.007						
	1.6	0.008						
W	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
۵	1.4	0.007						
σ	4.1	0.0205						
CROL								

SDG #: 28 COM LDC #: 233624

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:

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".

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

*	ateC	l sh IN/Bofaranca	Internal Standard	3 %	% Recovery (1 imit: 40-135%)	Oualifications

			\$	\mathcal{L}_{II}	5 (40-185	1 \ My \ (\ \ -4. \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
			7	37)	
			/	61)	
)	(
		C	*	28)	
			+	26)	
				9-)	
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		Ŋ	4	<u>(</u> (5))	
			+	38)	
				4)	
)	
		1	Н	M M	J	
)) (4 . <u>8</u>)
		5	#	<u>}</u>)	/
)	(
)	(
)	(
)	
					}	
)	
)
			Check Standard Used		Internal Standards	Check Standard Used
ά	13C-2,3,7,8-TCDF	ÜF		(G)	¹³ C-1,2,3,4,6,7,8-HpCDF	
B.	13C-2,3,7,8-TCDD	סמנ		H. 13C	¹³ C-1,2,3,4,6,7,8-HpCDD	
ij	¹³ C-1,2,3,7,8-PeCDF	PeCDF		l. ¹³ C	¹³ C-OCDD	
o.	¹³ C-1,2,3,7,8-PeCDD	PeCDD		.Υ.	¹³ C-1,2,3,4-TCDD	
ш	¹³ C-1,2,3,4,7,8-HxCDF	3-HxCDF		L. 13C	¹³ C-1,2,3,7,8,9-HxCDD	
ш	13C-123678-HxCDD	3-HxCDD				

LDC #:233/65/1/2/ SDG #: 201 CONUN

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Page: Reviewer:

2nd Reviewer:

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",

N N N

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	John Ke				A 0201		JK (K)				
Associated Samples					tion		In				
Get Malebrang	4.2.0.P. &		* 1. +. + 0. P. R	_	Nos. 3. T. 8- Teat confirmation		ZNPO MENITS	20			
Sample ID	R		* S		4		M				
Date					Y		0				
*											

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 16, 2010

LDC Report Date:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D200558

Sample Identification

EB-04152010-2-RZD

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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0112250MB	4/22/10	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.1 pg/L 8.4 pg/L 0.92 pg/L 0.52 pg/L 0.50 pg/L 1.6 pg/L 1.0 pg/L 1.7 pg/L	All samples in SDG G0D200558

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
EB-04152010-2-RZD	1,2,3,4,6,7,8-HpCDD	9.8 pg/L	9.8U pg/L
	OCDD	11 pg/L	11U pg/L

Sample EB-04152010-2-RZD was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04152010-2-RZD	4/16/10	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD 0CDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	1.6 pg/L 2.9 pg/L 1.4 pg/L 2.6 pg/L 2.3 pg/L 9.8 pg/L 45 pg/L 45 pg/L 29 pg/L 70 pg/L 56 pg/L 13 pg/L 7.6 pg/L 180 pg/L 58 pg/L 450 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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
EB-04152010-2-RZD	¹³ C-1,2,3,7,8-PeCDD	39 (40-135)	1,2,3,7,8-PeCDD	J (all detects) UJ (all non-detects)	Р

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200558	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D200558	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 G0D200558

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D200558	EB-04152010-2-RZD	1,2,3,7,8-PeCDD	J (all detects) UJ (all non-detects)	P	Internal standards (%R) (i)
G0D200558	EB-04152010-2-RZD	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D200558	EB-04152010-2-RZD	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D200558

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D200558	EB-04152010-2-RZD	1,2,3,4,6,7,8-HpCDD OCDD	9.8U pg/L 11U pg/L	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D200558

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23265N21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D200558	_ Stage 2B
Laboratory: Test America	-
METHOD: HRGC/HRMS Diox	ins/Dibenzofurans (EPA SW 846 Method 8290)

Date: 6/7/10
Page: _/of/
Reviewer: ______
2nd Reviewer: ________

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
1.	Technical holding times	A	Sampling dates: 4/16/10
H.	HRGC/HRMS Instrument performance check	4	/ /
111.	Initial calibration	4	
IV.	Routine calibration/I	A	
V.	Blanks	w	
VI.	Matrix spike/Matrix spike duplicates	\mathcal{N}	
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	w	
X	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	√N N	All ZMPC usults -JE(E)
XII.	System performance	N	
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	N	
XV.	Field blanks	W	25=/

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate FB = Field blank ds detected D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	EB-04152010-2-RZD	11	0112250 MB	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)

	11 Total Land	o. Iolai npouo	1000	V. Iotal ICUF	140 61114 /11	W. Iotal PecDF		A. I otal HXCDF	1 de la companya de l
	P. 1,2,3,4,7,8,9-HpCDF		0.000		R Total TCDD	O'al 1000	S Total Bernn	0000	T Total HyOng
	K. 1,2,3,4,7,8-HxCDF		L. 1,2,3,6,7,8-HxCDF		M. 2,3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HXCDF		O. 1,2,3,4,6,7,8-HpCDF
	F. 1,2,3,4,6,7,8-HpCDD	000	g. 0000		H. 2,3,7,8-TCDF		1. 1,2,3,7,8-PeCDF		J. 7,3,4,7,8-PeCDF
00710100	0.001-6,5,5,5	B. 12.378.PaCDD			C. 1,2,3,4,7,9-HXCDD	000000000000000000000000000000000000000	0. 1,2,3,6,7,8-HXCUU	T 123780 EXCOD	0000

Notes:

SDG #: See Cover LDC #: 23265N21

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 2nd Reviewer: Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Y N N N N N

Was the method blank contaminated? If yes, please see qualification below.

Blank extraction date: 4/22/10 N N/A

Conc. units: pg/L

Associated samples: Blank analysis date: 4/27/10

															Γ
						-									
				,											
Sample Identification															
Sample I											-				
	,	0/8.6	11/0	-	-	1		1	'						
	2X	10.5	42	4.6	2.6	2.5	8	9	8.5		=				
Blank ID	0112250MB	2.1	8.4	0.92	0.52	0.50	1.6	1.0	1.7						
pu															
Compound															
		ц	9	×		Σ	0	Ω.	Ø						

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".

SDG #: See Cover LDC #: 23265N21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Page:__ Reviewer:

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

Associated sample units: Were field blanks identified in this SDG? Blank units: pg/L

Sampling date: 4/16/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound	Blank ID			Sar	Sample Identification	ation		
	ER-04152010-2-RZD	2X						
	1.6	0.008						
	2.9	0.0145						
	1.4	0.007						
	2.6	0.013						
	2.3	0.0115						
	9.8	0.049						
	11	0.055						
	45	0.225						
	48	0.24						
	29	0.145						
	70	0.35						
	56	0.28						3
	13	0.065						
	7.6	0.038						
	180	6.0						
	58	0.29						
	450	2.25						

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

LDC#: <u>233651</u>/2/ SDG#: <u>161601</u>11/

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:__ Reviewer:_ 2nd Reviewer:_

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".

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

#	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	: 40-135%)	Qualifications (/)
		/	7	J	39	(40-135)	VIMP (B)
						()	
						()	
-						()	
						()	
					-)	
						()	
						()	
						()	
					-	(
						()	
						()	
					-	()	
						()	
						()	
						()	
						()	
				-		(
						()	
						()	
		Internal Standards	Check Standard Used		ln.	Internal Standards	Check Standard Used
A	13C-2,3,7,8-TCDF	CDF		છ	¹³ C-1,2,3,4,6,7,8-HpCDF	I _P CDF	
В.	¹³ C-2,3,7,8-TCDD	CDD		Ξ	¹³ C-1,2,3,4,6,7,8-HpCDD	pCDD	
ပ	¹³ C-1,2,3,7,8-PeCDF	-PeCDF			13C-OCDD		
ات	¹³ C-1,2,3,7,8-PeCDD	-Ресо		ᅶ	13C-1,2,3,4-TCDD		
ш	¹³ C-1,2,3,4,7,8-HxCDF	8-HxCDF		į.	¹³ C-1,2,3,7,8,9-HxCDD	200	
ц	¹³ C-1 2 3 6 7 8-HxCDD	8-HxCDD					

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 22, 2010

LDC Report Date:

June 10, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D240497

Sample Identification

SSAL3-04-1BPC

SSAL3-03-1BPC

SSAM2-01-3BPC**

SSAL3-04-1BPCMS

SSAL3-04-1BPCMSD

SSAM2-01-3BPCMS

SSAM2-01-3BPCMSD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 7 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
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	SSAM2-01-3BPC**
0118247MB	4/28/10	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 1,2,3,4,6,7,8-HpCDF	0.038 pg/g 0.026 pg/g 0.10 pg/g 0.28 pg/g 0.17 pg/g 0.24 pg/g 0.18 pg/g 0.31 pg/g 0.13 pg/g 0.15 pg/g 0.064 pg/g 0.19 pg/g 0.15 pg/g 0.15 pg/g	SSAL3-04-1BPC SSAL3-03-1BPC

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

Samples FB-04072010-RZD (from SDG G0D090441) and FB-04132010-RIG2-RZE (from SDG G0D150582) 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-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	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 1.6 pg/L 1.7 pg/L 1.9 pg/L 1.9 pg/L	SSAL3-04-1BPC SSAL3-03-1BPC
FB-04132010-RIG2-RZE	4/13/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.40 pg/L 0.65 pg/L 2.5 pg/L 0.66 pg/L 0.41 pg/L 0.53 pg/L 0.97 pg/L	SSAM2-01-3BPC**

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) and relative percent differences (RPD) were not within QC limits for several compounds, the MS, 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
SSAL3-04-1BPC	¹³ C-OCDD	36 (40-135)	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAM2-01-3BPC**	¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,6,7,8-HpCDD	36 (40-135) 33 (40-135) 39 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,6,7,8-HpCDD	J (all detects) UJ (all non-detects)	Р

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
SSAL3-04-1 BPC SSAL3-03-1 BPC	OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

Sample	Compound	Finding	Criteria	Flag	A or P
SSAM2-01-3BPC**	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D240497	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D240497	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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

No field duplicates were identified in this SDG.

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0D240497

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D240497	SSAL3-04-1BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D240497	SSAM2-01-3BPC**	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,6,7,8-HpCDD	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D240497	SSAL3-04-1BPC SSAL3-03-1BPC	OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D240497	SSAM2-01-3BPC**	2,3,7,8-TCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D240497	SSAL3-04-1BPC SSAL3-03-1BPC SSAM2-01-3BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D240497	SSAL3-04-1BPC SSAL3-03-1BPC SSAM2-01-3BPC**	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D240497

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D240497

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23265O21	VALIDATION COMPLETENESS WORKSHEET
SDG #:G0D240497	_ Stage 2B/4
Laboratory: Test America	

Date:	2
Page: <u>//of/</u>	
Reviewer: Q	
2nd Reviewer:	

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
1.	Technical holding times	A	Sampling dates: 4/22/10
П.	HRGC/HRMS Instrument performance check	4	′ ′
111.	Initial calibration	4	
IV.	Routine calibration/I	A	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	aw	
VII.	Laboratory control samples	A	105
VIII.	Regional quality assurance and quality control	N,	
IX.	Internal standards	W	·
Χ.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	₹N	
XII.	System performance	A	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	~W	FBOX072010-R2D(40)090441), FB-04132010-R162-R220

Note:

A = Acceptable N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

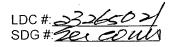
TB = Trip blank

EB = Equipment blank

Validated Samples:

PVV	120.17				 	
1	SSAL3-04-1BPC	11	0118247MB	21	31	
2	SSAL3-03-1BPC	12	0/23335 MB	22	32	
3 8	SSAM2-01-3BPC ** 2	13		23	33	
4	SSAL3-04-1BPCMS	14		24	34	
5	SSAL3-04-1BPCMSD	15		25	 35	
6	SSAM2-01-3BPCMS	16		26	36	Total Control
7	SSAM2-01-3BPCMSD	17		27	 37	
8	·	18		28	38	
9		19		29	39	
10		20		30	40	

Notes:_				

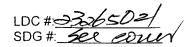


VALIDATION FINDINGS CHECKLIST

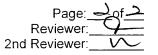
Page: of Reviewer: 2nd Reviewer:

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)?	1			
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) \leq 20% for unlabeled standards and \leq 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) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?				
V. Blanks	1,72			
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?				



VALIDATION FINDINGS CHECKLIST



VIII. Regional Quality Assurance and Quality Control	T	· ·		
Were performance evaluation (PE) samples performed?	ļ	/	1	
Were the performance evaluation (PE) samples within the acceptance limits?		<u> </u>		
IX. Internal standards		· -	1	<u></u>
Were internal standard recoveries within the 40-135% criteria?				
Was the minimum S/N ratio of all internal standard peaks ≥ 10?		<u> </u>		
X. Target compound identification		1		
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?			ļ	
Was the Ion Abundance Ratio for the two quantitation ions within criteria?		<u> </u>	ļ	
Was the signal to noise ratio for each target compound and labeled standard ≥ 2.5 ?	/		<u> </u>	
Does the maximum intensity of each specified characteristic ion coincide within \pm 2 seconds (includes labeled standards)?				
For PCDF identification, was any signal (S/N \geq 2.5, at \pm 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			1	
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	1. 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:

SDG # Les COMP LDC #: 2326502

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer:

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". YN N/Y

Were all samples associated with a method blank?

N/A

Was a method blank analyzed for each matrix?

Was the blank contaminated? If yes, please see qualification below. A/N N/A

Associated Samples: Blank extraction date: \$3/0 Blank analysis date: \$7/5 Conc. units: \$9/9

-							
					-		
no							
Sample Identification							
San							
	•		-				
Blank ID	012 335111B	0.085	0.60	0.086	0.079	41.0	
	12/P			7	7		
Compound		Ŧ	.	<i>H</i>	6		
					Ź	Ø	

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

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 #: 23265021

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of Reviewer: 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below.

Blank analysis date: 5/15/10 Blank extraction date: 4/28/10

Associated samples: Conc. units: pg/g

																_	_	 _
Sample Identification																		
Sample																		
	5X	0.19	0.13	0.5	1.4	0.85	1.2	6.0	1.55	0.65	0.75	0.32	0.95	0.75	1.15			
Blank ID	0118247MB	0.038	0.026	0.10	0.28	0.17	0.24	0.18	0.31	0.13	0.15	0.064	0.19	0.15	0.23			
pur																		
Compound									;									
		۵	ш	ΙĿ	ပ	I		7	ᅩ		Σ	z	0	۵	σ			

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 #: 23265021 SDG #:See Cover

VALIDATION FINDINGS WORKSHEET

Field Blanks

Reviewer: 2nd Reviewer:

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

Associated sample units: Y/N N/A Were field blanks identified in this SDG? Blank units: pg/L

b/bd

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank /\Rinsate / Other:

1-2 (>5X)

Associated Samples:

Sample Identification 0.00445 0.0075 0.0415 0.0075 0.0065 0.0205 0.011 0.007 0.008 0.008 0.007 걺 EB-04072010-RZD Blank ID 0.89 1.5 1.6 2.2 8.3 4. 1.6 1.5 4. 4.1 Compound O Σ

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

SDG #: See Cover LDC #:23265021

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ 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
Sampling date: 4/13/10

Associated sample units:_

b/bd

Associated Samples: Sampling date: 4/13/10
Field blank type: (circle o(e) Field Blank / Rinsate / Other.

3 (>5X)

Sample Identification 0.00325 0.00205 0.00265 0.00485 0.0125 0.0033 0.002 K EB-04132010-RIG2-RZE Blank ID 0.40 0.65 99.0 0.41 0.53 2.5 0.97 Compound 0 ≥

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

ב דבה מוויצלות מחיל רונייביבד הבחוצי

CRQL

VALIDATION FINDINGS WORRSHIE Matrix Spike/Matrix Spike Duplicates

SDG #: 20/2

2nd Reviewer: Reviewer:

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".

| NA | 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.

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

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

1				27	0014				
D	Date	MS/MSD ID	Compound	%R (Limits)	WISD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications	
		4/5	\mathcal{H}	(/876/Le	181-87	()		10 64.40	
		/	0	4	(81-18) dS)			
			Ø	U71-52) 76	1/7175-41			1	
1				()	(,,) ,	()		(anc>4xs4	
				()	()	()		(10 201 July	
				()	()	(
		6/7	K)	()	DE1-64,671	35 (529)	n	16 Can 20	
		/ /	4	(15/2 (73-147)	40 (385)		7	
			V	(SH+08) 1L	()	1/88)78			
			\mathcal{L}	73 (86-134)	1186-1341	73 (528)			
1			少	ı	100 100	58(332)			
	1		#	0 (79-137)	12-127	()			
			4	8781-134	(/)	(LZS) /S			
			7	76432	(261-92) 90	()			
-			K	15/72-140	()	66 (532)			
	┪		Y	()/	162 (63452	45(438)			
			N	(55+2L) 8+	551 22-152	()			
			0	35 (81-B7)	151-181854	1281831			
ı			4	75 (79-139	25,79-139	125-196			
			Ø	0 (75-H)	178 75-4411	12315451			
1			4	()	0, (-27-130)	105=1000		(US VISAN	
				<u> </u>	(, ,)	()		1,3	
				()	()	(14XP CONGO AX	V

LDC #:232/502/ SDG #:201 COUN

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: Reviewer:__ 2nd Reviewer:

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 La							
Inter 13C-2,3,7,8-TCDF 13C-2,3,7,8-TCDF 13C-1,2,3,7,8-PCDD 13C-1,2,3,7,8-PCDD 13C-1,2,3,7,8-PCDD 13C-1,2,3,7,8-PCDD	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	:: 40-135%)		Qualifications (/)
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		7		36	1 –1	** \rangle	VM + (4. 2)
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe))	
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe)) (
13C-2,3,7,8-TCC 13C-2,3,7,8-PC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe	W	2	**1	98))	(子号, 下)
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		4	1	M M		(ì
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe			Š	39	^)	(Λ
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe)	(
13C-2,3,7,8-TCC 13C-2,3,7,8-PCC 13C-1,2,3,7,8-Pc 13C-1,2,3,7,8-Pc 13C-1,2,3,7,8-Pc	(マッカ)	W	Ŋ	/	(40-1	1321	NO and
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		A	72	7))	
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		1	W	9))	
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		/	M	_		(
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe		+	1	,		(
13C-2,3,7,8-TCC 13C-2,3,7,8-PCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe			7	-		^	/
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe))	
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe)	(
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe))	
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe)	(
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,4,7,8-I							
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,4,7,8-I						^	
13C-2,3,7,8-TCC 13C-2,3,7,8-TCC 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe)		
13C-2,3,7,8-TCD 13C-2,3,7,8-TCD 13C-1,2,3,7,8-Pe 13C-1,2,3,7,8-Pe 13C-1,2,3,4,7,8-I	Internal Standards	Check Standard Used		1	Internal Standards	ards	Check Standard Used
			:	13C-OCDD			
			ᅶ	13C-1,2,3,4-TCDD			
			نـ	¹³ C-1,2,3,7,8,9-HxCDD	CDD		
			Σ				
			z				
1	0		o				
G. ¹³ C-1,2,3,4,6,7,8-HpCDF	DF		a.				7
	۵۵						

LDC #: 226502 | SDG #: 264 51240/

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Reviewer:

Page:

2nd Reviewer:

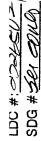
METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290)

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

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	1675 (e)	4		(Y) Y X					
Associated Samples	7	4		M		AND THE REAL PROPERTY OF THE P			
Finding	A > calch rouse	I	0	ZNDC MENTE					
Sample ID	ر ا	8)		M					
Date						0			
*									

Comments: See sample calculation verification worksheet for recalculations



Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

Page: 2nd Reviewer:_ Reviewer:

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:

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

 $A_{\bf k}=$ Area of associated internal standard $C_{\bf k}=$ Concentration of internal standard X= Mean of the RRFs

RRF = $(A_u)(C_u)/(A_u)(C_v)$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

L									
				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (0,3 std)	RRF (7.5 std)	%RSD	"RSD
-	10/2	11	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0.93/35	1933	19/12/2 1 QUARE	×96780	1001/	0011
	(302)	0///2	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)	1.0382	T	C140.1	104700	489709	A X 8 1
		,	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.0990d	1.09904	1.11730	11/1/33	10381/7	4938
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	789660	0.99884	1.05541	1.05541	52/036	C 3/5
			OCDF (4c-ocpp)	1.2524	1252d	1.32988	1.32988	0.39898	9 400
8	19/2	01/11/4	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.088	1.10	0//	65.	02/
		,	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-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 (**c-OCDD)						
၉			2,3,7,8-TCDF (¹⁸ 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 (15C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,8,7,8,-HpCDD)						
			ocpf (1°c-ocpb)						

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.



Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:__ Page:__ Reviewer:

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,)(C,)/(A,)(C,)

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_x = Area of compound,$ $C_x = Concentration of compound,$

 $A_{\rm s}=$ Area of associated internal standard $C_{\rm k}=$ Concentration of internal standard

					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	Q%	Q%
-	SUEALITA	1.4	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	0.92135	20/00-1	501001	8.7	1/80/
	-25	01/5/16	2,3,7,8-TCDD (¹³C-2,3,7,8-TCDD)	1.03870	1.139,5	516811	10	4.7
	,	_	1,2,3,6,7,8-HxCDD (°C-1,2,3,6,7,8-HxCDD)	1.09904	67841.1	628/11	ハイ	1.0
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	7289660	85/01.1	1.10758	/ / / /	//://
			OCDF ("C-OCDD)	1.26224	1.57414	1.67414	20.0	0.00
И	14MY105/2	/	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	78.0	0.97	201	10.5
		5/16/10	2,3,7,8-TCDD (°C-2,3,7,8-TCDD)					
		,	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
		-	1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (1°C-OCDD)					
ဇ			2,3,7,8-TCDF (*8C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (13C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)					
			OCDF (°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.



Matrix Spike/Matrix Spike Duplicates Results Verification VALIDATION FINDINGS WORKSHEET

Jo Co		3
Page: 1	Reviewer:	2nd Reviewer:_

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

SSR = Spiked sample result, SR = Sample result SA = Spike added Where:

RPD = I MSR - MSDR I * 2/(MSR + MSDR) Ø

MSR = Matrix spike percent recovery MSDR = Matrix spike duplicate percent recovery

MS/MSD samples:

	as	jike	Sample	Spiked Sample	Sample	Matrix Snike	Snike	Matrix Spike Duplicate	Duplicate	Reported	Recalculated
Compound	A W	Added)	Concentration	Concentration ()	tration	Percent Recovery	ecovery	Percent Recovery	ecovery	RPD	RPD
	MS	MSD		SM	USW	Reported	Recalc	Reported	Recalc	g 2	1
2,3,7,8-TCDD	7.7	96	5.7	₹.0E	0	60)	100)	9	0	Cos	200
1,2,3,7,8-PeCDD	201	27.8	W	18	151	+01	501	49	74	58	22
1,2,3,4,7,8-HxCDD		_	5:4	00 00	1.52	11	1	7.2	77	4.9	5.8
1,2,3,4,7,8,9-HpCDF	>		96	177	438	75	707	363	355	96	88
OCDF	112	19/	(aa)	K	8 T 2	. 0	0	011	1107	. Ó.	*
											-

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% 0 AX of the recalculated results. usea

V-Walidation Workshapts/Dioxing0/MSDCI C90 21

LDC #: <u>2336522</u>/ SDG # *Sec LUM*

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:__ Page:__ Reviewer:

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

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0/033335

RPD = I LCS - LCSD I * 2/(LCS + LCSD)

	σ,	nike	Spiked S	ample	SD I	S	1 CSD	ď	I CS/I CSD	CSD
Compound		Added 75/2	Concentration (Þ3/9)	tration	Percent Recovery	ecovery	Percent Recovery	ecovery	RF	RPD
	l CS	I CSD	1.08	1 CSD	Reported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	oæ	NA	x. X	¥	(2)	(>				
1,2,3,7,8-PeCDD	(00)		1.4	-	14	4				
1,2,3,4,7,8-HxCDD			5		511	15				
1,2,3,4,7,8,9-HpCDF	^		22		22	(22				
OCDF	2020	<i>/</i>	358		8 ~ /	128				
				-				-		

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)	Ol nol	Elemental Composition	Analyte	Descriptor	Accurate Mass ^(a)	Ol nol	Elemental Composition	Analyte
-	303,9016 305,8987 315,9419 317,9389 319,8965	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	C ₂ H, %Cl ₄ O C ₂ H, %Cl ₄ OC10 19C ₂ H, %Cl ₄ O 19C ₂ H, %Cl ₄ O C ₂ H, %Cl ₄ O ₂ C ₄ H, %Cl ₄ O ₂	TCDF TCDF (S) TCDF (S) TCDD (C)	4	407.7818 409.7788 417.8250 419.8220 423.7767	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	C,2 H*Cl,2 ClO C,2 H*Cl,3 ClO C,2 H*Cl,0 13 C,2 H*Cl,0 C,2 H*Cl,3 ClO C,2 H*Cl,3 ClO	HPCDF HPCDF (S) HPCDF HPCDD HPCDD
	331.9368 331.9368 333.9338 375.8364 [354.9792]	M M M + 2 LOCK	Carl 4 20 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	TCDD (S) TCDD (S) HXCDPE PFK		435.8169 437.8140 479.7165 [430.9728]	M+4 M+4 LOCK	19C127	HPCDD (S) HPCDD (S) NCDPE PFK
a	339,8597 341,8567 351,9000 353,8970 355,8546 357,8516 367,8949 369,8919 409,7974 [354,9792]	M+2 M+4 M+4 M+4 M+4 M+2 COCK	C ₁₂ H ₃ *C ₁ *7ClO C ₁₂ H ₃ *C ₁₃ *ClO C ₁₂ H ₃ *C ₁₃ *ClO (C ₁₂ H ₃ *C ₁₃ *ClO C ₁₂ H ₃ *C ₁₃ *ClO ₂ C ₁₂ H ₃ *C ₁₃ *ClO ₂ C ₁₂ H ₃ *C ₁₃ *ClO ₂ (C ₁₂ H ₃ *C ₁₃ *ClO ₂ (C ₁₂ H ₃ *C ₁₃ *ClO ₂ (C ₁₂ H ₃ *C ₁₃ *ClO ₂ (C ₁₃ *ClO ₂)	Pecde Pecde Pecde (S) Pecdd (S) Pecdd (S) Pecdd (S) Pecdd (S) Pecdd (S) Pecdd (S)	ر ن	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775 [422.9278]	M+2 M+4 M+4 M+4 M+4 M+4 LOCK	C ₁₂ *Cl ₁ 3*ClO C ₁₂ *Cl ₂ 3*Cl ₂ O C ₁₂ *Cl ₃ *Cl ₂ O C ₁₂ *Cl ₃ *Cl ₂ O ₂ 13C ₁₂ *Cl ₃ *Cl ₂ O ₂ 13C ₁₂ *Cl ₃ *Cl ₂ O ₂ G ₁₂ *Cl ₃ *Cl ₂ O ₂ G ₁₂ *Cl ₃ *Cl ₂ O ₂ C ₁₀ *Cl ₃ *Cl ₂ O ₂ C ₁₀ *Cl ₃ *Cl ₂ O ₂	OCDF OCDD OCDD (S) OCDD (S) OCDD (S) DCDPE PFK
က	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]	M+2 M+4 M+2 M+2 M+4 M+4 LOCK	C ₁ , H ₂ & C ₁ , or Clo C ₁ , H ₂ & C ₁ , or Clo (1) C ₁ , H ₂ & C ₁ , or Clo (2) H ₂ & C ₁ , or Clo C ₁ , H ₂ & C ₁ , or Clo C ₁ , H ₂ & C ₁ , or Clo (1) C ₁ , H ₂ & C ₁ , or Clo (1) C ₁ , H ₂ & C ₁ , or Clo (1) C ₁ , H ₂ & C ₁ , or Clo C ₁ , H ₂ & C ₁ , or Clo C ₁ , H ₂ & C ₁ , or Clo C ₂ , F ₁ , or Clo	HXCDF HXCDF (S) HXCDF (S) HXCDD HXCDD HXCDD (S) HXCDD (S) CCDPE PFK					

The following nuclidic masses were used:

Ē

H = 1.007825 O = 15.994915 C = 12.000000 ³⁵Cl = 34.968853 ³⁷Cl = 36.965903 F = 18.9984

S = internal/recovery standard

LDC #: 2326502/ SDG #: 1021 conel

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VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	of
Reviewer:	<u>Q</u>
2nd reviewer:	v

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

Percent solids, applicable to soil and solid matrices

y∕ N ∣	N/A	Were all recalculated results for detected ta	arget compounds agree within 10.0% of the reported results?
Conce	ntration	$a = \frac{(A_{\bullet})(I_{\bullet})(DF)}{(A_{\bullet})(RRF)(V_{\bullet})(\%S)}$	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D.
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	/ .2
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (3622/003) (2000) (167886538 (0.99684) (10.1)6.87
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	/
RRF	=	Relative Response Factor (average) from the initial calibration	= 76.6 pg/g
Df	=	Dilution Factor.	/ ()

Were all reported results recalculated and verified for all level IV samples?

				,	
#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
					1
					<u> </u>
					
					_
					·
			·		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 23, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D270515

Sample Identification

SSAI3-06-1BPC SSAJ2-01-1BPC

Introduction

This data review covers 2 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	All samples in SDG G0D270515

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

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	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 1.6 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D270515

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
SSAI3-06-1BPC	¹³ C-2,3,7,8-TCDF ¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	24 (40-135) 20 (40-135) 22 (40-135) 19 (40-135) 20 (40-135) 18 (40-135) 20 (40-135) 20 (40-135) 18 (40-135)	All TCL compounds	J (all detects) UJ (all non-detects)	Р

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
SSAJ2-01-1BPC	2,3,7,8-TCDF OCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270515	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270515	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D270515

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D270515	SSAI3-06-1BPC	All TCL compounds	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D270515	SSAJ2-01-1BPC	2,3,7,8-TCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D270515	SSAI3-06-1BPC SSAJ2-01-1BPC	All compounds reported below the PQL.	J (all detects)	Α	Project Quantitation Limit (sp)
G0D270515	SSAI3-06-1BPC SSAJ2-01-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D270515

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D270515

No Sample Data Qualified in this SDG

Tronox Northgate Henderson T

LDC #: 23265P21	_ VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D270515	Stage 2B
Laboratory: Test America	

	Date:	6/7/10
	Page:_ Reviewer:	/of /
2nd	Reviewer:	<u></u>

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
1.	Technical holding times	A	Sampling dates: 4/23/10
II.	HRGC/HRMS Instrument performance check	4	/ /
111.	Initial calibration	1	
IV.	Routine calibration/IX	A	
V	Blanks /	W	
VI.	Matrix spike/Matrix spike duplicates	NW	No splass'd - No Cenal
VII.	Laboratory control samples	A	100
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	5(N	
XII.	System performance	N	
XIII.	Overall assessment of data	#/	
XIV.	Field duplicates	N	
XV.	Field blanks	W	FB-040[2010-RZD (GDD090441)

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	SSAI3-06-1BPC	11	0/2337514/3	21	31	
2	SSAJ2-01-1BPC	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	10017001	
			TOOGH-8,0,1,4,0,3,1	U. Total HpCDD
o. 1,2,3,7,8-PeCUU	G. OCDD	L. 1,2,3,6,7,8-HxCDF	3000	
10071001			000	V. lotal TCDF
C. 1,5,5,4,7,9-HXCUU	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	100 H	
			17: 10tal 1000	W. Total PeCDF
U. 1,2,3,6,7,8-HxCDD	I. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	o Total Backs	
11000			S. Lotal recold	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		
			- COST TXCOC	Y Total Hoone

Notes:

LDC #: 33365+ SDG #200 COM

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer.

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

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

Were all samples associated with a method blank?

Was a method blank analyzed for each matrix?

 $|V|_{NNA}$ Was the blank contaminated? If yes, please see qualification below. Blank extraction date: $|V|_{NNA}$

XSKI Sample Identification Associated Samples: 010 0.083 0.60 0/2/555M 0.086 Blank ID Compound Conc. units: 29/9 H #

Associated Samples: Blank analysis date: Blank extraction date:_ Conc. units:

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 #: 23265P21 SDG #:See Cover

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:__ Reviewer:

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

Associated sample units:_ Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units
Sampling date: 4/7/10

b/bd

Field blank type: (circle one) Field Blank / Rinsate / Other.

Associated Samples:

Sample Identification 0.00445 0.0075 0.0415 0.0075 0.008 0.008 0.011 0.007 X EB-04072010-RZD Blank ID 0.89 1.6 1.6 2.2 8.3 4. Compound ტ

0.0065

1.3 4. 4.1

0.0205

0.007

CRQL

SDG #: 201 dangs LDC #252/AP

VALIDATION FINDINGS WORKSHEET

Internal Standards

Page:__

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".

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

XVVA

		\														7										Ī			_
Qualifications (/)	LIMI P LAP								Ą														Check Standard Used						
% Recovery (Limit: 40-135%)	(-56/-64) 7	() (()	()	())	())	()	()	())	()	()	()	()	()	()	()	(()	Internal Standards	¹³ C-1,2,3,4,6,7,8-HpCDF	¹³ C-1,2,3,4,6,7,8-HpCDD	13C-OCDD	¹³ C-1,2,3,4-TCDD	¹³ C-1,2,3,7,8,9-HxCDD	
%	70°	20	4	6	20	8/	0	20	90															Ω.	H.	-	ᅶ	<u>ا -</u> اد	<u> </u>
Internal Standard	A	Ø	U	0			4	1															Check Standard Used						
Lab ID/Reference	/																						Internal Standards	ЭF	ΩC	eCDF	CDD	HxCDF	
Date																								¹³ C-2,3,7,8-TCDF	13C-2,3,7,8-TCDD	¹³ C-1,2,3,7,8-PeCDF	¹³ C-1,2,3,7,8-PeCDD	¹³ C-1,2,3,4,7,8-HxCDF	70077 8 7 8 7 7 5
#																								A.	B.	C)	D.	ш	U

LDC #33-16 PM SDG #: 28-1-000001

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of Reviewer:

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? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

Qualifications	Los of Eles	ンケ(ト)						
Associated Samples								
Finding	4.8 > Call by 1219	All END C MANGE			,			
Sample ID	Φ	M						
Date					0			
*								

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 23, 2010

LDC Report Date:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D270522

Sample Identification

EB-04232010-RZE

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.

Raw data were not reviewed for this SDG. The review was 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
5/16/10	1,2,3,4,7,8-HxCDD	20.1	0120219MB	1,2,3,4,7,8-HxCDD	J+ (all detects)	Р

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
0120219MB	4/30/10	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 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 1,2,3,4,6,7,8-HpCDF	0.65 pg/L 0.82 pg/L 1.9 pg/L 6.8 pg/L 0.67 pg/L 1.1 pg/L 2.8 pg/L 0.71 pg/L 0.89 pg/L 0.99 pg/L 0.34 pg/L 2.7 pg/L 3.8 pg/L	All samples in SDG G0D270522

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
EB-04232010-RZE	1,2,3,4,6,7,8-HpCDD	2.7 pg/L	2.7U pg/L
	OCDD	21 pg/L	21U pg/L
	1,2,3,4,7,8-HxCDF	5.1 pg/L	5.1U pg/L
	1,2,3,6,7,8-HxCDF	2.0 pg/L	2.0U pg/L
	2,3,4,6,7,8-HxCDF	2.0 pg/L	2.0U pg/L
	1,2,3,4,6,7,8-HpCDF	7.3 pg/L	7.3U pg/L
	1,2,3,4,7,8,9-HpCDF	3.0 pg/L	3.0U pg/L
	OCDF	16 pg/L	16U pg/L

Sample EB-04232010-RZE was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04232010-RZE	4/23/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 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	2.7 pg/L 21 pg/L 3.8 pg/L 1.7 pg/L 5.1 pg/L 2.0 pg/L 2.0 pg/L 7.3 pg/L 3.0 pg/L 16 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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 compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270522	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270522	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D270522

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D270522	EB-04232010-RZE	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D270522	EB-04232010-RZE	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 G0D270522

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D270522	EB-04232010-RZE	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.7U pg/L 21U pg/L 5.1U pg/L 2.0U pg/L 2.0U pg/L 7.3U pg/L 3.0U pg/L 16U pg/L	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D270522

No Sample Data Qualified in this SDG

Tronox Northgate Henderson T

_DC #: <u>23265Q21</u>	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D270522	Stage 2B
_aboratory:_Test America	
HETHOD, LIDOC/LIDMO Dis-	distribility of the second of DA CMA 040 Marks at 00000

47/10
<u></u>
9_
V-

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: 4/23/10
II.	HRGC/HRMS Instrument performance check	- ♣	/ /
111.	Initial calibration	A	
IV.	Routine calibration/NVV	KW	
V.	Blanks	av	
· VI.	Matrix spike/Matrix spike duplicates	N	
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	4	·
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	5 N	All ZMPE MSults (Qflag)-VF(E)
XII.	System performance	N	
XIII.	Overall assessment of data	\$	
XIV.	Field duplicates	N	
XV.	Field blanks	W	&B=

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

FB = Field blank

R = Rinsate

D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	EB-04232010-RZE W	11	0/20219413	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 Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

		O. lotal HpCDD		V. lotal ICDF		W. Iotal PeCDF		A. Iotal HXCUF	V TOTAL 11-00F	
	P 1234780-U2ODE		0.000		מחידו מים ד		S Total People		T. Total HxCDD	
	K. 1,2,3,4,7,8-HxCDF		L. 1,2,3,6,7,8-HxCDF		M. 2,3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HXCDF		O. 1,2,3,4,6,7,8-HpCDF	
	F. 1,2,3,4,6,7,8-HpCDD		6. OCOD		H. 2,3,7,8-1CDF		I. 1,2,3,7,8-PeCDF	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	J. Z,3,4,7,8-PeCDF	
1000	A. 4.3,7,8-1CDD	B 12378-Decrin		C 103478-EVOD	מסאנוים, יינים, יי		U. 1,2,3,6,7,8•HXCUU	F 123780-HWODD	000000000000000000000000000000000000000	

Notes:

LDC #: 2365831 SDG # 500 COULD

VALIDATION FINDINGS WORKSHEET

Page:

2nd Reviewer:__ Reviewer:

Routine Calibration

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". X N N A N A N A

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

Were all percent differences (%D) of RRFs \leq 20% for unlabeled compounds and \leq 30% for labeled?

Did all routine calibration standards meet the Ion Abundance Ratio criteria?

Y/N N/A

-									Ī
0.88-1.20	M+2/M+4	Hepta-		0.88-1.20	M+2/M+4			Hepta-	
0.37-0.51	M/M+2	Hepta- ¹³ C-HpCDF (IS) only		0.37-0.51	M/M+2	-	Hepta-13C-HpCDF (IS) only	Hepta-13C-Hp	
0.43-0.59	M/M+2	Hexa- ¹³ C-HxCDF (IS) only		0.43-0.59	M/M+2		Hexa-13C-HxCDF (IS) only	Hexa- ¹³ C-HxC	
1.05-1.43	M+2/M+4	Неха-		1.05-1.43	M+2/M+4			Hexa-	
1.32-1.78	M+2/M+4	Penta-		1.32-1.78	M+2/M+4			Penta-	
0.65-0.89	M/M+2	Tetra-		0.65-0.89	M/M+2			Tetra-	
Ion Abundance Ratio	Selected ions (m/z)	PCDFs	Itio	Ion Abundance Ratio	Selected ions (m/z)	Sele	PCDDs		
								,	
THEAD CCS	84c	7	1.0	20.	7	14MY10405 4	14M/1/	01/91/5	
Qualifications (C)	Associated Samples	Finding Ion Abundance Ratio A	Finding %D = 0	Finding (Limit: <	Compound	ard ID	Standard ID	Date	*

0.76-1.02

M+2/M+4

Octa-

0.76-1.02

M+2/M+4

Octa-

LDC #: 23265Q21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Blanks

Page: 1 of 1 Reviewer: 2nd Reviewer:

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?

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. ∀Z Z >

Blank extraction date: 4/30/10

Blank analysis date: 5/16/10

Conc. units: pg/L				Ass	Associated samples:	mples:	All (bl)		
Compound	Blank iD					Sample	Sample Identification		
	0120219MB	5X	1						
D	0.65	3.25							
Ш	0.82	4.1							
Ľ.	1.9	9.5	2.7/U						
9	6.8	34	21/U						
Ι	0.67	3.35	1						
_	1.1	5.5							
¥	2.8	14	5.1/U						
7	0.71	3.55	2.0/U						
W	0.89	4.45	2.0/0						
Z	0.99	4.95							-
0	3.4	17	U/E'-Z						
۵	2.7	13.5	3.0/U						
ø	3.8	19	16/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".

1/1/DoitTransid0000E0041110

SDG #: See Cover LDC #: 23265Q21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:__ Reviewer:_

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

X/N N/A Were field blanks identified in this SDG?

Associated sample units:

Blank units: pg/L Sampling date: 4/23/10

Field blank type: (circle one) Field Blank / Rinsate / Other.

Sample Identification None Associated Samples: 0.0135 0.0085 0.0255 0.0365 0.105 0.019 0.015 검 0.01 0.01 0.08 EB-04232010-RZE Blank ID 2.7 3.8 5.1 2.0 2.0 7.3 3.0 21 16 Compound დ

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

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Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 23, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D270529

Sample Identification

SSAI3-05-3BPC

Introduction

This data review covers one soil 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	All samples in SDG G0D270529

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

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 1,2,3,4,6,7,8-HpCDF	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 G0D270529

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.

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
SSAI3-05-3BPC	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270529	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270529	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	Α

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 G0D270529

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D270529	SSAI3-05-3BPC	2,3,7,8-TCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0D270529	SSAI3-05-3BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D270529	SSAI3-05-3BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D270529

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D270529

No Sample Data Qualified in this SDG

Tronox Northgate Henderson TENESS WORKSHEET

DC #: 23265R2T	ANTIDATION COMPLETEMESS MO
SDG #: <u>G0D270529</u>	Stage 2B
aboratory: Test America	

Page: Reviewer: 2nd Reviewer:

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
l.	Technical holding times	A	Sampling dates: 4/03/10
II.	HRGC/HRMS Instrument performance check	A	/ /
111.	Initial calibration	#	
IV.	Routine calibration/IOV	1	
V.	Blanks	w	
VI.	Matrix spike/Matrix spike duplicates	5N	No splassid-Noteral
VII.	Laboratory control samples	♦	209
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Ø	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	5N	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	w	FB-040T2010-R2D(401090441)

Note: A = Acceptable

SW = See worksheet

N = Not provided/applicable

ND = No compounds detected

R = Rinsate FB = Field blank D = Duplicate

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAI3-05-3BPC	11	0/23335MB	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)

		U. Total HpCDD	1 ()	V. Total ICDF	- 40 M - 17 - 17 / 17	VV. 1 otal Pecur	7.00.11.44.7	A. Lotal HXCUF	V Total Hacon
	P. 1234789-HACDE	10041-860111-16111	0.000 E		R Total TOD		S. Total Pacino		T. Total HxCDD
	K. 1,2,3,4,7,8-HxCDF		L. 1,2,3,6,7,8-HXCDF		M. 2,3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HxCDF		O. 1,2,3,4,6,7,8-HpCDF
	F. 1,2,3,4,6,7,8-HpCDD		6. OCDD		H. 2,3,7,8-TCDF		1. 1,2,3,7,8-PeCDF		J. Z,3,4,7,8-PeCDF
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A. 2,3,7,8-1CDD	R 12378.00.00	0000 1-0, 101-1		C. 1,2,3,4,7,8-HXCUU	000000000000000000000000000000000000000	UUUXH•6,7,6,6,2,1	F 123780-UVODD	00081-8,0,7,6,4,1

Notes:

SDG #: 200 COULD LDC #: 232255

VALIDATION FINDINGS WORKSHEET

Reviewer: 2nd Reviewer:_

Page:_

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".

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? (Y) N/A Y N N/A

Was the blank contaminated? If yes, please see qualification below. In date: $5/3/\rho$ Blank analysis date: $5/5/\rho$

Associated Samples: 13/10 Blank analysis date: 57 Blank extraction dațe: 🗲 NN NA

ノメソノ

Sample Identification 60 070 086 j 2800 0/48XSC Blank ID Compound Conc. units:

Blank analysis date: Blank extraction date: Conc. units:

Associated Samples:

	 	 	 		
				,	
tion					
Sample identification					
Sai					
Blank ID					
Compound					

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".

SDG #:See Cover LDC #: 23265R21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:_ Page:

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

Associated sample units:__ Y N/A Were field blanks identified in this SDG?

Brank units: pg/L Associated sample units
Sampling date: 4/7/10

All (>5X) Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

				_				_	_				_	 	 	
	1	:														
ation																
Sample Identification																
S																
	ΣΥ	0.00445	0.0075	0.011	0.0415	0.007	0.008	0.0075	0.008	0.0065	0.007	0.0205				
Blank ID	FB-04072010-RZD	0.89	1.5	2.2	8.3	1.4	1.6	1.5	1.6	1.3	1.4	4.1				
Compound																
		ပ	ш	L		ᅩ	_	Σ	z	0		σ				CROL

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

עבם מומיימום מדוממדו....דויםווו

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: Of. Reviewer: 2nd Reviewer:

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? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
			H> calib lange		1 LAKTEI
		M	ZND Weults	m	1/F/F/
			(& +/2E)		
			\		
	0				

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 26, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D270573

Sample Identification

SSAI3-04-1BPC

Introduction

This data review covers one soil 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.

Raw data were not reviewed for this SDG. The review was 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.
- 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	All samples in SDG G0D270573

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

Sample EB-04262010-1-RZD (from SDG G0D280571) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04262010-1-RZD	4/26/10	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.1 pg/L 6.8 pg/L 7.6 pg/L 4.5 pg/L 1.3 pg/L 12 pg/L 5.3 pg/L 25 pg/L	All samples in SDG G0D270573

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

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 1,2,3,4,6,7,8-HpCDF 0CDF	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 1.6 pg/L 1.7 pg/L 1.9 pg/L 1.9 pg/L 1.1 pg/L	All samples in SDG G0D270573

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.

X. Target Compound Identifications

Raw data were not reviewed for this SDG.

XI. Project Quantitation Limit

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270573	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270573	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D270573

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D270573	SSAI3-04-1BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D270573	SSAI3-04-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D270573

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D270573

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

_DC #:23265S21	_ VALIDATION COMPLETENESS WORKSHEET
SDG #: <u>G0D270573</u>	Stage 2B
_aboratory:_Test America	
METHOD: HDOOMHDMOD:	'and Dille and of some of AEDA COM CACAMA Hard COCCO

Date:47/10	
Page: //of / Reviewer:	
2nd Reviewer:	

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
l.	Technical holding times	A	Sampling dates: 4/26/10
11.	HRGC/HRMS Instrument performance check	A	′ ′
111.	Initial calibration	4	
IV.	Routine calibration/NV	A	
V.	Blanks	M/	,
VI.	Matrix spike/Matrix spike duplicates	w	No splassid - No Qual
VII.	Laboratory control samples	\forall	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	SW	All-ZMPC results (2+tog) - VE(E)
XII.	System performance	N	,
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	N	
XV.	Field blanks	m/	EB-04262901-1RZD(G0)280571), FB-040720/0822

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	SSAI3-04-1BPC	11	0/23335143	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)

F. 1,2,3,4,6,7,8-HpCDD K. 1,2,3,4,7,8-HxCD G. OCDD L. 1,2,3,6,7,8-HxCDI H. 2,3,7,8-TCDF M. 2,3,4,6,7,8-HxCD I. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCD J. 2,3,4,7,8-PeCDF O. 1,2,3,4,6,7,8-HpC	6,7,8-HpCDD K. 1,2,3,4,7,8-HxCDF L. 1,2,3,6,7,8-HxCDF TCDF M. 2,3,4,6,7,8-HxCDF N. 1,2,3,7,8,9-HxCDF S-PeCDF O. 1,2,3,4,6,7,8-HpCDF	xCDF P. 1,2,3,4,7,8,9-HpCDF xCDF Q. OCDF xCDF R. Total TCDD xCDF S. Total PeCDD HDCDF T Total Hoch	U. Total HpCDD V. Total TCDF W. Total PeCDF X. Total HxCDF
--	---	--	--

Notes:

LDC #: 33-26557 SDG #54.00009

VALIDATION FINDINGS WORKSHEET

Reviewer: 2nd Reviewer: Page:

METHOD: HRGC/HRMS PCB Congeners (EPA Method 1668)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed? Was the method blank contaminated? If yes, please see qualification below. In date: c/2//0
Blank analysis date: C/15//0

Blank analysis date: 5/15/ Blank extraction date: \$73/10 Conc. units: \$79 Y N/A

Associated samples:

Compound	Blank ID	Samule Identification	
3.5	012335VB		
7	0.085		
-/4	0,60		
#	0.086		
0	0.079		
K	6.14		

Sample Identification Associated samples: Blank ID Compound

Blank analysis date:

Blank extraction date:

Conc. units:

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 #: <u>23265S21</u> SDG #: <u>See Cover</u>

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page: of Reviewer: 2

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

	۵
N/A Were field blanks identified in this SDG?	Associated sample units:_
ere field bla	pg/L
× ∀N	units:
Z	3lank

Sampling date: 4/26/10
Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

Compound	Blank ID EB-04262010-1-RZD	2X		Sa	Sample Identification	ation		
	2.1	0.0105						
	7.6	0.038						
	4.5	0.0225						
	1.3	0.0065						
	12	90:0						
	5.3	0.0265						
	25	0.125						
	-							

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

SDG #:See Cover LDC #: 23265S21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:__ Reviewer:_

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

Associated sample units: Y/N N/A Were field blanks identified in this SDG?

Blank units: pg/L Associated sample units

Sampling date: 4/7/10

Associated Samples: Field blank type: (circle one Field Blank/ Rinsate / Other

Sample Identification 0.00445 0.0075 0.0415 0.0075 0.0065 0.0205 0.008 0.008 0.007 0.011 0.007 2 EB-04072010-RZD Blank ID 0.89 2.2 8.3 4. 1.6 1.6 1.3 1.4 4. Compound Ó

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

CRQL

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 26, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D270574

Sample Identification

SSAJ2-02-3BPC

Introduction

This data review covers one soil 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.

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).

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.

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
5/16/10	¹³ C-1,2,3,4,6,7,8-HpCDD	38.9	SSAJ2-02-3BPC	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	Р

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
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	All samples in SDG G0D270574

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

Sample EB-04262010-1-RZD (from SDG G0D280571) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04262010-1-RZD	4/26/10	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.1 pg/L 6.8 pg/L 7.6 pg/L 4.5 pg/L 1.3 pg/L 12 pg/L 5.3 pg/L 25 pg/L	All samples in SDG G0D270574

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

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 1,2,3,4,6,7,8-HpCDF	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 1.6 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0D270574

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.

X. Target Compound Identifications

All target compound identifications were within validation 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
SSAJ2-02-3BPC	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)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270574	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D270574	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

XII. System Performance

The system performance was acceptable.

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 G0D270574

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D270574	SSAJ2-02-3BPC	1,2,3,4,6,7,8-HpCDD	J+ (all detects)	Р	Routine calibration (%D) (c)
G0D270574	SSAJ2-02-3BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Compound quantitation and CRQLs (e)
G0D270574	SSAJ2-02-3BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D270574	SSAJ2-02-3BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D270574

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D270574

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D270574

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23265T21 Stage 28 SDG #: G0D270574 Laboratory: Test America

Reviewer: 2nd Reviewer:

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
1	Technical holding times	A	Sampling dates: 4/26/10
П,	HRGC/HRMS Instrument performance check	4	. / /
111.	Initial calibration	1	
IV.	Routine calibration/IX	w	
V.	Blanks	W	1
VI.	Matrix spike/Matrix spike duplicates	M	Nosplassid-No Cenal
VII.	Laboratory control samples	\triangle	209
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	AMA	
Χ.	Target compound identifications	*	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	N	
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	N.	
XV.	Field blanks	W	FB-04072010-RZD (GODO90441), ZB-04262010-1-RZD(G

A = Acceptable Note:

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

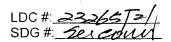
TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAJ2-02-3BPC 5	11	0/23375 MB	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:				

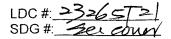


VALIDATION FINDINGS CHECKLIST

Page: / of 2
Reviewer: 2
2nd Reviewer:

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	<i>'</i>	· · · · · · · · · · · · · · · · · · ·	, 	
Was the initial calibration performed at 5 concentration levels?		ſ		
Were all percent relative standard deviations (%RSD) ≤ 20% for unlabeled standards and ≤ 30% for labeled standards?				1
Did all calibration standards meet the Ion Abundance Ratio criteria?				
Was the signal to noise ratio for each target compound \geq 2.5 and for each recovery and internal standard \geq 10?				
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?				
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 30% for labeled standards?				
Did all routine calibration standards meet the Ion Abundance Ratio criteria?		4		
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?				



VALIDATION FINDINGS CHECKLIST

Page: of 2
Reviewer: 2nd Reviewer:

VIII. Regional Quality Assurance and Quality Control			, , , , , , , , , , , , , , , , , , ,	
Were performance evaluation (PE) samples performed?				- 184 A-184 A-
Were the performance evaluation (PE) samples within the acceptance limits?			/	
IX. Internal standards			T	
Were internal standard recoveries within the 40-135% criteria?				
Was the minimum S/N ratio of all internal standard peaks ≥ 10?	/	1	<u> </u>	
X. Target compound identification		1		
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?		<u> </u>		
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?		<u> </u>		
Did compound spectra contain all characteristic ions listed in the table attached?	/	ļ	ļ	
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)?	/	T		
For PCDF identification, was any signal (S/N \geq 2.5, at \pm 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.				
KV. Field blanks				
Field blanks were identified in this SDG.				
Farget 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. oceb	L. 1,2,3,6,7,8-HxCDF	a.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	1. 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 #: 23%

VALIDATION FINDINGS WORKSHEET

Page:

2nd Reviewer: Reviewer:

Routine Calibration

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".

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

Qualifications (C)	1446 A(F)											Ion Abundance Ratio	0.65-0.89	1.32-1.78	1.05-1.43	0.43-0.59	0.37-0.51	0.88-1.20
Associated Samples	(+ NE)											Selected ions (m/z)	M/M+2	M+2/M+4	M+2/M+4	M/M+2	M/M+2	M+2/M+4
Finding Ion Abundance Ratio	M											PCDFs	Tetra-	Penta-	Неха-	Hexa-13C-HxCDF (IS) only	Hepta-13C-HpCDF (IS) only	Hepta-
Finding %D (Limit: <30.0%)	38.9		-									Ion Abundance Ratio	0.65-0.89	1.32-1.78	1.05-1.43	0.43-0.59	0.37-0.51	0.88-1.20
Compound	13C-F						ı					Selected ions (m/z) Ion Abu	M/M+2 0	M+2/M+4	M+2/M+4	M/M+2 0	M/M+2 0.	M+2/M+4 0.
Standard ID	44/1030559											PCDDs Select		2		-		~
# Date	2/19/10											PC	Tetra-	Penta-	Неха-	Hexa-13C-HxCDF (IS) only	Hepta-13C-HpCDF (IS) only	Hepta-

0.76-1.02

M+2/M+4

Octa-

0.76-1.02

M+2/M+4

Octa-

SDG #: Sec COM LDC #: 23-25/5/7>

VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

Page:

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

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

Were all samples associated with a method blank? N N/A Y/N N/A

Was a method blank analyzed for each matrix?

Was the blank contaminated? If yes, please see qualification below. ∀ Z Z

Blank analysis date: 5/5/10
Associated Samples: Blank extraction dạte: ≦ Conc. units: 25/5

Blank ID
0/2535W/3
0.085
0.60
0.086
079
4,

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

·					
Sample Identification					
San					
				-	
Blank ID					
Compound				and the first of t	
	<u> </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".

SDG #: See Cover LDC #: 23265T21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:

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

b/bd Associated sample units:_ Y N/A Were field blanks identified in this SDG?

Blank units: pg/L Sampling date: 4/26/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Sample Identification 0.0105 0.0225 0.0065 0.0265 0.034 0.038 0.125 Σ 90.0 FB-04262010-1-RZD Blank ID 2.1 6.8 4.5 1.3 5.3 25 12 Compound

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

CRO

SDG #:See Cover LDC #: 23265T21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:_ Page: Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 5290)

KN N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L Sampling date: 4/7/10

Associated Samples: Field blank type: (circle one Field Blank) Rinsate / Other:

All (>5X)

Compound	Blank ID			Sar	Sample Identification	ıtion		
	FB.	5X						
O	0.89	0.00445						
Ш	1.5	0.0075						
ш	2.2	0.011						
	8.3	0.0415						
¥	1.4	0.007						
7	1.6	0.008						
M	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
ď	1.4	0.007						
Ø	4.1	0.0205						
CRQL								

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

TEE CHINCIE GTIOOTETE.GIM

LDC #: 233/67P

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary). Y N N/A

Qualifications	1 1 to 1		(よ) オフ									
Associated Samples	This		AU									
Finding	15. Je	/	ZAC LESULTO									
Sample ID	,		M									
Date							0					
-			- 1	- 1			H	1	i	- 1	- 1	- 11

Comments: See sample calculation verification worksheet for recalculations

SDG # SEL CONCO

LDC #:

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Reviewer:

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 = $(A_u)(C_u)/(A_u)(C_v)$ 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,

 $A_{\rm b} = {\rm Area~of~associated~internal~standard~} \\ C_{\rm b} = {\rm Concentration~of~internal~standard~} \\ X = {\rm Mean~of~the~RRFs} \\$

L									
				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF 6 3. std	RRF S std)	OSB%	Coa %
-	10/2	11	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	0.92/35	26/20	11 /	. 6	1801/	0011
	(305)	2/1/10	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.03870	1.0387	10	104720	489709	A × 00-1
			1,2,3,6,7,8-HxCDD (15C-1,2,3,6,7,8-HxCDD)	1.0990d	1.05904		11/1/20	10501	4938
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)		0.9988	1.05541	100041	52/02/	7 3/5
			OCDF (4C-OCDD)	1.2524	12500	1.32988	1.32988	039898	9 400
2	1ch	01/14/4	2,3,7,8-TCDF (¹\$C-2,3,7,8-TCDF)	8801	1.088	1.10	011	651	201
			2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)						
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF (1°C-OCDD)						
၈			2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)						
			2,3,7,8-TCDD (130-2,3,7,8-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 (19C-1,2,4,6,7,8,-HpCDD)						
			OCDF (*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.



Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:__ Reviewer: Page:

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 = $(A_{\nu})(C_{\nu})/(A_{\nu})(C_{\nu})$

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 $A_{\rm g}=$ Area of associated internal standard $C_{\rm g}=$ Concentration of internal standard $A_x = Area of compound, C_x = Concentration of compound,$

L								
					Reported	Recalculated	Reported	Recalculated
		Calibration		Average RRF	RRF	RR		
*	Standard ID	Date	Compound (Reference Internal Standard)	(initial)	(၁၁)	(၁၁)	%D	Q%
-	1441/12/15	١	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	25/26.0	20/00.1	501001	8.7	136
	/ 54.	01/5/16	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)	1,03870	516811	516811	10	9.7
		,	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.09904	67841.1	628/11	11	1.0
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	7.89660	1.10758	1.10758	///	/://
			OCDF (3c-OCDD)	1.26224	1.51414	1.47414	20.0	000
2	144 YOCK	/	2,3,7,8-TCDF (**C-2,3,7,8-TCDF)	1.088	76.0	96.0	185	10.00
		5/13/10	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)				13.2	1.8.1
		<i>, ,</i>	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (°C-1,2,4,6,7,8,-HpCDD)					
			ocpf (¹c-ocpp)					
က	14MX/18D5	1/1	2,3,7,8-TCDF (³C-2,3,7,8-TCDF)	0.92/35	868501	87850N	1.7	11,7
		01/51/5	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	21.8501	px 78/1	60/28/1	140	140
		`	1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.0990d	1.19487	1.19487	18	00.
			1,2,3,4,6,7,8-HpCDD (¹³ C-1,2,4,6,7,8,-HpCDD)	78966.0	46911	1.10322	Lai	107
			OCDF (4°C-OCDD)	p2295/	387677	1.494x	184	184

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

SDG # SEL CLIM LDC #:3335/577

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: -Reviewer:

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

The percent recoveries (%R) and Relative Percent Difference (RPD) of the laboratoy 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

LCS = Laboraotry control sample percent recovery RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0/33335

Recalculated dsol/sol RPD Percent Recovery ICSD Reported 4 N 和 Recalc V Percent Recovery Reported 80 15 N N N CSD ¥ Spiked Sample Concentration 125/9) 7 200 10 イス dsol Added Spike 800 E 200 Compound 1,2,3,4,7,8,9-HpCDF 1,2,3,4,7,8-HxCDD 1,2,3,7,8-PeCDD 2,3,7,8-TCDD OCDF

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.

Analyte	НРООР (S) НРООР (S) НРООР (S) НРООР (S) НРООР (S) НРООР (S)	0CDF 0CDD 0CDD 0CDD (S) 0CDD (S) 0CDPE PFK	
Elemental Composition	C ₁₂ H ²⁶ Cl ₁₃ TClO C ₁₂ H ²⁶ Cl ₃ TClO ₂ C ₁ H ²⁶ Cl ₃ TClO ₂ C ₁ H ²⁶ Cl ₃ TClO ₂	C1.20C1,37C1O C1.20C1,37C12O C1.20C1,37C102 C1.20C1,37C102 13C.20C1,37C102 13C.20C1,37C102 C1.20C1,37C12O C1.20C1,37C12O	
Ol nol	Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z Z	M+2 M+4 M+4 M+4 COCK	
Accurate Mass ^(a)	407.7818 409.7788 417.8250 419.8220 423.7767 425.7737 435.8169 437.8140 479.7165 [430.9728]	441.7428 443.7399 457.7377 459.7348 469.7780 471.7750 513.6775	
Descriptor	4	ហ	
Analyte	TCDF TCDF (\$) TCDF (\$) TCDD TCDD TCDD (\$) TCDD (\$) HXCDPE	Pecde Pecde Pecde (S) Pecde Pecde Pecde (S) Pecde (S) Pecde (S) Pecde (S) Pecde (S)	HXCDF HXCDF (S) HXCDF (S) HXCDD HXCDD HXCDD HXCDD (S) HXCDD (S) HXCDD (S)
Elemental Composition	C; H; & Ci O C; E H; & Ci O C; E H; & Ci O C; E H; & Ci O C; E H; & Ci O C; E H; & Ci O; O C; E H; & Ci O; O C; E H; & Ci O; O C; E H; & Ci O; O C; E H; & Ci O; O C; E H; & Ci O; O C; E H; & Ci O; O	C, H, & C, 4, 700 C, H, & C, 4, 700 C, H, & C, 1, 7010 19 C, H, & C, 1, 7010 C, L, H, & C, 1, 7010 C, L, H, & C, 1, 7010 19 C, L, H, & C, 1, 7010 19 C, H, & C, 1, 7010 C, F, 1, 801, 7010 C, F, 1, 801, 7010	C ₁ , H ³ Cl ³ TOO C ₁ , H ³ Cl ³ TOO O ₁ , H ³ Cl ³ TOO O ₁ , H ³ Cl ³ TOO C ₁ , H ³ Cl ³ TOO C ₁ , H ³ Cl ³ TOO C ₁ , H ³ Cl ³ TOO O ₂ , H ³ Cl ³ TOO O ₂ , H ³ Cl ³ TOO O ₂ , H ³ Cl ³ TOO C ₁ , H ³ Cl ³ TOO C ₂ , H ³
Ol no!	W W W W W W W W W W W W W W W W W W W	M+2 M+4 M+4 M+4 M+4 M+2 COCK	M+4 M+4 M+2 M+4 M+4 M+4 M+4
Accurate mass ^(a)	303.9016 305.8987 315.9419 317.9389 319.8965 321.8936 331.9368 333.9338 375.8364 [354.9792]	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 403.8529 445.7555 [430.9728]
Descriptor	-	2	ဇာ

(a) The following nuclidic masses were used:

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18.9984

O = 15.994915 $^{36}CI = 34.968853$ $^{37}CI = 36.965903$

LDC #: 2326572/ SDG #: 2000

only.

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	/of_/
Reviewer:	2
2nd reviewer:	Q-
	T

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

Y/N N	√A	Were all recalculated results for detected t	arget compounds agree within 10.0% of the reported results?
Concer	ntration	$= \frac{(A_{\cdot})(I_{\circ})(DF)}{(A_{\circ})(RRF)(V_{\circ})(\%S)}$	Example:
A_{x}	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D,:
A_{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	223
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (307629.23) (2000) (404834.73 (1.03870) (10.34) (93)
V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	,
RRF	=	Relative Response Factor (average) from the initial calibration	=15.7 Fg/g
Df	=	Dilution Factor.	\vee
0/ 0		Descent celide, applicable to sail and celid matrices	

Were all reported results recalculated and verified for all level IV samples?

#	Sample ID	Compound	Reported Concentration ()	Calculated Concentration ()	Qualification
		4-			
			,		

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 26, 2010

LDC Report Date:

June 9, 2010

Matrix:

Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D280571

Sample Identification

EB-04262010-1-RZD

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.

Raw data were not reviewed for this SDG. The review was 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
5/6/10	1,2,3,6,7,8-HxCDF	20.1	0123391MB	1,2,3,6,7,8-HxCDF	J+ (all detects)	Р

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
0123391MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 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	1.3 pg/L 4.1 pg/L 2.7 pg/L 1.0 pg/L 2.1 pg/L 3.1 pg/L 4.4 pg/L 3.4 pg/L	All samples in SDG G0D280571

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
EB-04262010-1-RZD	1,2,3,4,6,7,8-HpCDD	2.1 pg/L	2.1U pg/L
	OCDD	6.8 pg/L	6.8U pg/L
	1,2,3,4,7,8-HxCDF	7.6 pg/L	7.6U pg/L
	1,2,3,6,7,8-HxCDF	4.5 pg/L	4.5U pg/L
	1,2,3,4,6,7,8-HpCDF	12 pg/L	12U pg/L
	1,2,3,4,7,8,9-HpCDF	5.3 pg/L	5.3U pg/L

Sample EB-04262010-1-RZD was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04262010-1-RZD	4/26/10	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	2.1 pg/L 6.8 pg/L 7.6 pg/L 4.5 pg/L 1.3 pg/L 12 pg/L 5.3 pg/L 25 pg/L	No associated samples in this SDG

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. 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 compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280571	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280571	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D280571

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D280571	EB-04262010-1-RZD	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D280571	EB-04262010-1-RZD	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 G0D280571

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0D280571	EB-04262010-1-RZD	1,2,3,4,6,7,8-HpCDD OCDD 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	2.1U pg/L 6.8U pg/L 7.6U pg/L 4.5U pg/L 12U pg/L 5.3U pg/L	А	. bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D280571

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

LDC #: 23265U21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0D280571	Stage 2B
Laboratory: <u>Test America</u>	-
METHOD LIDOCALDIAG D.	· /D' / / / / / / / / / / / / / / / / / /

Reviewer: 2nd Reviewer:

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
1.	Technical holding times	A	Sampling dates: 4/26/10
И.	HRGC/HRMS Instrument performance check	A	'/ /
111.	Initial calibration	\triangle	
IV.	Routine calibration/I	W.	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	N	client find
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	A	
X	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	→N	AllZMPC(R+lag) - JK(F)
XII.	System performance	N	,
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	W	ZB=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	EB-04262010-1-RZD W	11	0/23391MB	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	0 1001100110	
R 10378.Do			F: 1,2,3,4,7,8,8-HDCUF	U. Total HpCDD
	G. ocpp	L. 1,2,3,6,7,8-HXCDF	#000 C	
0 1034 10 11000			900	V. Total TCDF
UUUXH-6,1,1,5,5,1	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HXCDF	000 H 00 F	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				W. Total PeCDF
U. 1,2,3,6,7,8-HXCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxCDF	7000 Total 8	
1001				X. Total HxCDF
E. 1,4,3,7,0,9-AXCUU	J. 2,3,4,7,8-PeCDF	O. 1,2,3,4,6,7,8-HpCDF	T Total Lyon	

Notes:

LDC #: 25656421

VALIDATION FINDINGS WORKSHEET Routine Calibration

Page: of Reviewer: 2nd Reviewer:

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".

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

Were all percent differences (%D) of RRFs \leq 20% for unlabeled compounds and \leq 30% for labeled?

Did all routine calibration standards meet the lon Abundance Ratio criteria?

Y/N/N/A

*	Date	Standard ID	Compound	Finding %D > D	%D ≥0 0.00,000	Finding Ion Abundance Ratio	Associated Samples		Qualifications ()
	01/7/5	2 HOLY 10 HADS	77/2	20.			ak	7	1 Late 1 (1)
	, ,								
							:		
			7						
	1.								
\sqcap									
		PCDDs	Selected ions (m/z)	Ion Abundance Ratio	tio	PCDFs	Selected ions (m/z)	(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
I	Неха-		M+2/M+4	1.05-1.43		Неха-	M+2/M+4		1.05-1.43
	Hexa-13C-HxC	Hexa-13C-HxCDF (IS) only	M/M+2	0.43-0.59		Hexa-13C-HxCDF (IS) only			0.43-0.59
	Hepta- ¹³ C-Hp	Hepta-¹³C-HpCDF (IS) only	, M/M+2	0.37-0.51		Hepta-13C-HpCDF (IS) only	ly 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 #: 23265U21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Blanks

Reviewer: 2nd Reviewer: Page:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

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. YN N/Y

Blank analysis date: 5/06/10 Blank extraction date: 5/3/10 Conc. units: pg/L

Sample Identification Associated samples: 0/8′9 2.1/∪ 7.6/U 4.5/U 12/N 5.3/N 20.5 13.5 10.5 15.5 6.5 젊 22 17 S 0123391MB Blank ID 1.3 1.0 3.4 4.1 2.7 2.1 3.1 4.4 Compound

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".

SDG #: See Cover LDC #: 23265U21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Page: Reviewer:

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

Associated sample units: |Y|N N/A Were field blanks identified in this SDG? | Blank units: pg/L Associated sample units | Sampling date: 4/26/10

Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

pd/q

None

Compound	Blank ID			Sam	Sample Identification	tion		
	FB-04262010-1-RZD	2X						
11_	2.1	0.0105						
9	8.9	0.034						
¥	7.6	0.038						
7	4.5	0.0225						
W	1.3	0.0065						
0	12	90.0						
a	5.3	0.0265						
σ	25	0.125					1	
							:	
			-					
CROL								

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

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

April 27, 2010

LDC Report Date:

June 8, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D280586

Sample Identification

SSAK3-05-1BPC

SSAK8-05-1BPC

Introduction

This data review covers 2 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0123335MB	5/3/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.085 pg/g 0.60 pg/g 0.086 pg/g 0.079 pg/g 0.14 pg/g	All samples in SDG G0D280586

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

Samples 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	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 1.6 pg/L 1.4 pg/L 1.4 pg/L 1.4 pg/L 1.4 pg/L	All samples in SDG G0D280586

Sample concentrations were compared to concentrations detected in the equipment 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
SSAK8-05-1BPC	¹³ C-OCDD	37 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р

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
SSAK3-05-1BPC	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)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280586	All compounds reported below the PQL.	J (all detects)	Α

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D280586	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 G0D280586

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D280586	SSAK8-05-1BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D280586	SSAK3-05-1BPC	1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects)	А	Project Quantitation Limit (e)
G0D280586	SSAK3-05-1BPC SSAK8-05-1BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D280586	SSAK3-05-1BPC SSAK8-05-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D280586

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D280586

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D280586

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ET

DC #: 23265V21	VALIDATION COMPLETENESS WORKSHEE
SDG #: <u>G0D280586</u>	Stage 2B
_aboratory:_Test America	

Reviewer: 2nd Reviewer:

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
1.	Technical holding times	A	Sampling dates: 4/27/10
11.	HRGC/HRMS Instrument performance check	A	/ '/
HI.	Initial calibration	A	
IV.	Routine calibration/I	1	
V.	Blanks	W	1
VI.	Matrix spike/Matrix spike duplicates	W	No splassid- No Qual,
VII.	Laboratory control samples	\triangle	105
VIII.	Regional quality assurance and quality control	N ,	
IX.	Internal standards	KW	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	ŹN	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	w	TB-04072010-RZD (40 D090441)

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	SSAK3-05-1BPC	11	0/23335MB	21	31	
2	SSAK8-05-1BPC	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:			

SDG #: 261 CON LDC #: 333/5/

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer:___ Reviewer: Page:_

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".

Were all samples associated with a method blank? N N/A

Was the blank contaminated? If yes, please see qualification below. In date $\frac{1}{2}$ Was a method blank analyzed for each matrix?

Blank extraction date: 43/10 Blank analysis date: 47 N N N N N N

Sample Identification Associated Samples: 0/28335MB 6000 0.088 0.085 0,00 Blank ID Conc. units: 25/9 Compound

Blank analysis date:_ Blank extraction 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".

SDG #:See Cover LDC #: 23265V21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:__ Reviewer:

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

Associated sample units: | N/A N/A Were field blanks identified in this SDG? | Blank units: pg/L | Associated sample units | Sampling date: 4/7/10 |

Field blank type: (circle one) Field Blank / Rinsate / Other:

Ħ

Associated Samples:

Compound	Blank ID			Sai	Sample Identification	ıtion		
	FR-04072010-RZD	2X						
၁	0.89	0.00445						
Ш	1.5	0.0075						
ш	2.2	0.011						
9	8.3	0.0415						
¥	1.4	0.007						
<u></u>	1.6	0.008						
M	1.5	0.0075						
Z	1.6	0.008						
0	1.3	0.0065						
d.	1.4	0.007						· ·
Ø	4.1	0.0205						
							, ****	
			:					
Cao								

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

LDC#:232651/2/ SDG#:16600001

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: _of _ Reviewer: _O__ 2nd Reviewer: __&

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".

MA Are all internal standard recoveries were within the 40-135% criteria?

Qualifications /	JM A (4.																						
it: 40-135%)	(40-135	()	()	()	(()	()	()	()	()	(()	()	()	(()	()	()	()	()	()	()	
% Recovery (Limit: 40-135%)	37																						
Internal Standard	+																						
Lab ID/Reference Internal Stands	7																						
# Date																							
*																							

A. '3C-2.3.7.8-TCDF Check Standard Used G. '3C-1.2.3.4.6.7.8-HpCDF B. '3C-2.3.7.8-TCDD H. '3C-1.2.3.4.6.7.8-HpCDD C. '3C-1.2.3.7.8-PeCDF H. '3C-1.2.3.4.6.7.8-HpCDD D. '3C-1.2.3.7.8-PeCDF I. '3C-0.2DD E. '3C-1.2.3.7.8-PeCDF K. '3C-1.2.3.4.6.7.8-HpCDD E. '3C-1.2.3.7.8-HyCDD L. '3C-1.2.3.7.8,9-HyCDD	-					
13C-2.3,7,8-TCDF 13C-2.3,7,8-TCDD 13C-1.2,3,7,8-PeCDF 13C-1,2,3,7,8-PeCDD 13C-1,2,3,4,7,8-HxCDF 13C-1,2,3,4,7,8-HxCDF 13C-1,2,3,4,7,8-HxCDD	H	Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
T	٠	¹³ C-2,3,7,8-TCDF		G.	¹³ C-1,2,3,4,6,7,8-HpCDF	
- ¥	ю.	¹³ C-2,3,7,8-TCDD		Ξ	¹³ C-1,2,3,4,6,7,8-HpCDD	
Y	ú	¹³ C-1,2,3,7,8-PeCDF			aaoo-o _{ε,}	
	<u> </u>	¹³ C-1,2,3,7,8-PeCDD		Α.	13C-1,2,3,4-TCDD	
13C-1 2 3 6 7 8-HVCDD	ய்	¹³ C-1,2,3,4,7,8-HxCDF		Γ.	13C-1,2,3,7,8,9-HxCDD	
	ш	¹³ C-1 2 3 6 7 8-HxCDD				

VALIDATION FINDINGS WORKSHEET

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

A. 2.3.7 8-TCDD				į
000-000	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HXCDF		
B. 12.3.7 8-Decon			L. 1,4,0,4,7,8,8-HDCDF	U. Total HpCDD
0000	6. OCDD	L. 1,2,3,6,7,8-HxCDF		
			i. 0000	V. Total TCDF
C. 1,4,5,4,7,8-HXCDD	H. 2,3,7,8-TCDF	M 224670 H.Opr		
		100XU-0,1,0,1,0,1	R. Total TCDD	W Total Decine
D. 1,2,3,6,7,8-HxCDD	1 1 2 3 7 8 00000			
	100m 10; (5;4; :	N. 1,2,3,7,8,9-HXCDF	S Total Bach	
T 122780-12500				A. Lotal HXCDF
UUUXII-6'0' ''0''' ''	J. 2,3,4,7,8-PeCDF	0. 1.2.3.4.6.7 8-HDCDE	1	
			otal HXCDD	Y Total Landin

Notes:

LDC #: 232651/2/ SDG #:2010000

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of Reviewer:

Reviewer:

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 M/A WE

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
		7	O. & > callbrange	/ 0	Left (e)
		al	ZNDC 115110AS (R)	m	レオノオン
			j		
	0				

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 28, 2010

LDC Report Date:

June 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0D300450

Sample Identification

SSAN6-07-1BPC

Introduction

This data review covers one soil 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.

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).

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.

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
5/17/10	1,2,3,4,7,8-HxCDD	20.2	SSAN6-07-1BPC	1,2,3,4,7,8-HxCDD	J+ (all detects)	Р

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
0124370MB	5/4/10	1,2,3,4,6,7,8-HpCDD 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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.12 pg/g 0.49 pg/g 0.26 pg/g 0.13 pg/g 0.28 pg/g 0.15 pg/g 0.35 pg/g 0.18 pg/g 0.80 pg/g	All samples in SDG G0D300450

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

Sample FB-04072010-RZC (from SDG G0D130519) 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-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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF 0CDF	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 1.1 pg/L 0.96 pg/L 1.0 pg/L 1.0 pg/L 1.0 pg/L 1.5 pg/L 6.7 pg/L	All samples in SDG G0D300450

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
SSAN6-07-1BPC	¹³ C-2,3,7,8-TCDF ¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	22 (40-135) 27 (40-135) 30 (40-135) 31 (40-135) 32 (40-135) 29 (40-135) 33 (40-135) 33 (40-135) 28 (40-135)	All TCL compounds	J (all detects) UJ (all non-detects)	Р
0124370MB	¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-OCDD	36 (40-135) 37 (40-135) 38 (40-135) 33 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 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)	Р

X. Target Compound Identifications

All target compound identifications were within validation 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
SSAN6-07-1BPC	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) J (all detects)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300450	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300450	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

XII. System Performance

The system performance was acceptable.

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 G0D300450

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D300450	SSAN6-07-1BPC	1,2,3,4,7,8-HxCDD	J+ (all detects)	Р	Routine calibration (%D) (c)
G0D300450	SSAN6-07-1BPC	All TCL compounds	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D300450	SSAN6-07-1BPC	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) J (all detects)	Р	Compound quantitation and CRQLs (e)
G0D300450	SSAN6-07-1BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0D300450	SSAN6-07-1BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D300450

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D300450

No Sample Data Qualified in this SDG

Tronox Northgate Henderson Т

LDC #: 23265W21	_ VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D300450	Stage 2B.4
Laboratory: Test America	

Reviewer: 2nd Reviewer:

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	\forall	Sampling dates: 4/8//0
11.	HRGC/HRMS Instrument performance check	1	/ /
111.	Initial calibration	4	
IV.	Routine calibration/lox	W.	
V.	Blanks	SW	
VI.	Matrix spike/Matrix spike duplicates	w	NO 50 ass'd
VII.	Laboratory control samples	A	100
VIII.	Regional quality assurance and quality control	N /	
IX.	Internal standards	aw	
Χ.	Target compound identifications	A	
XI.	Compound quantitation and CRQLs	SW	
XII.	System performance	A	
XIII.	Overall assessment of data	#	
XIV.	Field duplicates		
XV.	Field blanks	w	TB-04072010-RZC(GOD130519)

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

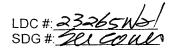
TB = Trip blank

EB = Equipment blank

Validated Samples:

1	SSAN6-07-1BPC	11	0/24370148	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:		

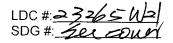


VALIDATION FINDINGS CHECKLIST

Page: / of Age Reviewer: 2nd Reviewer:

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

Metrica: BioxinorBioenzenaria (El Treverse meansa elle	Í.,			
Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times	1/	<u> </u>	Ι	
All technical holding times were met.	 		 	
Cooler temperature criteria was met.			<u> </u>	
II. GC/MS Instrument performance check	T	F	г	Г
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 \geq 2.5 and for each recovery and internal standard \geq 10?		/		
IV. Continuing calibration				
Was a routine calibration performed at the beginning and end of each 12 hour period?		(
Were all percent differences (%D) \leq 20% for unlabeled standards and \leq 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?				



VALIDATION FINDINGS CHECKLIST

Page: 2 of 2
Reviewer: 2nd Reviewer: ______

VIII. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?		/	1_	
Were the performance evaluation (PE) samples within the acceptance limits?	<u> </u>			1
IX. Internal standards			·	
Were internal standard recoveries within the 40-135% criteria?	<u> </u>			
Was the minimum S/N ratio of all internal standard peaks ≥ 10?		<u> </u>	<u> </u>	
X. Target compound identification		· ·	1	
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?	/	_	ļ	
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?	/		ļ	
Does the maximum intensity of each specified characteristic ion coincide within ± 2 seconds (includes labeled standards)?		·		
For PCDF identification, was any signal (S/N \geq 2.5, at \pm seconds RT) detected in the corresponding PCDPE channel?				
Was an acceptable lock mass recorded and monitored?				
XI. Compound quantitation/CRQLs			Year is	
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. ocbb	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:

SDG #: JELGOND LDC #: 232/5W2

VALIDATION FINDINGS WORKSHEET

Page: Reviewer: 2nd Reviewer:

Routine Calibration

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".

Were all percent differences (%D) of RRFs \leq 20% for unlabeled compounds and \leq 30% for labeled? Was a routine calibration was performed at the beginning and end of each 12 hour period?

Did all routine calibration standards meet the Ion Abundance Ratio criteria?

*	Date	Standard ID	Compound	Finding %D 00 (Limit: <30.0%)	Finding Ion Abundance Ratio	Associated Samples	Qualifications /
	2/11/10	17M/10405	2 / 2	20. Y		11/1 + NB	J+Jeh/P(0)
l	,,	,					
\neg							
			,				
	·						
\exists							
\top							
\top							
十							
1							
		PCDDs	Selected ions (m/z)	Ion Abundance Ratio	PCDFs	Selected ions (m/z)	z) Ion Abundance Ratio
T	Tetra-		M/M+2	0.65-0.89	Tetra-	M/M+2	0.65-0.89
T	Penta-		M+2/M+4	1.32-1.78	Penta-	M+2/M+4	1.32-1.78
T	Неха-		M+2/M+4	1.05-1.43	Hexa-	M+2/M+4	1.05-1.43
Ī	Hexa-13C-HxCDF (IS) only	DF (IS) anly	M/M+2	0,43-0.59	Hexa-13C-HxCDF (IS) only	M/M+2	0.43-0.59
	Hepta-13C-HpCDF (IS) only	CDF (IS) only	M/M+2	0.37-0.51	Hepta-13C-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

SDG #: See Cover LDC #: 23265W21

VALIDATION FINDINGS WORKSHEET

Page: 1 of

Reviewer:_ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. N N/A

Blank analysis date: 5/15/10 Blank extraction date: 5/4/10

Conc. units: pg/g

All (>5X) Sample Identification Associated samples:_ 2.45 0.65 0.75 9.0 1.75 1.3 1.4 X 0.9 0124370MB Blank ID 0.12 0.49 0.26 0.13 0.28 0.15 0.35 0.18 0.80 Compound

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".

SDG #:See Cover LDC #:23265W21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer:

Page: Reviewer:_

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

(Y/N N/A Were field blanks identified in this SDG?

b/bd Associated sample units:_

Blank units: pg/L Sampling date: 4/8/10

Field blank type: (circle one) Field Blank Rinsate / Other.

All (>5X) Associated Samples:

Compound	Blank ID		Sai	Sample Identification		
	FB-04072010-RZC	ZX XS				
U	0.77	0.00385				
O	0.74	0.0037				
Ц	0.82	0.0041			.	
Ц	4.2	0.021				
Ø	37	0.185				
T	0.57	0.00285				
	0.96	0.0048				
ſ	0.67	0.00335				
×	1.1	0.0055				
-1	0.96	0.0048			•••• • • • • • • • • • • • • • • • • •	
W	1.0	0.005				
Z	1.0	0.005				
0	2.1	0.0105				
Ω.	1.5	0.0075				
σ	6.7	0.0335				
CROL						

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

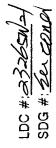
1:1:

LDC#:<u>232651</u>1/2/ SDG#:**20. COUP**

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:

Date Lab ID/Reference Internal Standard A B C C C C C C C C C C C C	p	% Recovery (Limit: 40-135%)	1. 40-135%)	() andipartition
			: +0-100/8)	Quaillicanolis (
		77	(40-135)	1 My A (all)
O O WHOT DOWN		75	()	
ONHAT MANT		30	()	
WHWT MAWH		/8	()	
HW T MAWH		M S	()	
		29	()	
		33	()	
MAM		33	(//)	/
		88	(A)	>
			()	
		38	()	MANTO (AB 400
		37	(
+		300)	
		90 90	()	À
			()	
			(
			(
_			()	
			()	
Internal Standards Check Standard Used	ndard Used	1	Internal Standards	Check Standard Used
		1. 13C-OCDD		
12C-2.3,7,8-TCDD		K. 13C-1,2,3,4-TCDD	(
¹³ C-1,2,3,7,8-PeCDF			KCDD	
¹³ C-1,2,3,7,8-PeCDD		M		
¹³ C-1,2,3,4,7,8-HxCDF		z		
¹3C-1,2,3,6,7,8-HxCDD		O.		
¹³ C-1,2,3,4,6,7,8-HpCDF		a.		7
¹³ C-1,2,3,4,6,7,8-HpCDD				



VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: of Reviewer:

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".

Were the correct internal standard (IS), quantitation ions and relative response factors (RRF) used to quantitate the compound? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
		/	H.I.K.L.O. P. &	/	JA (e)
			>culib nange		
		(L)	site recults	lπ	(K)
		A+24 × TO 14185			
	0				

Comments: See sample calculation verification worksheet for recalculations



VALIDATION FINDINGS WORKSHEET Initial Calibration Calculation Verification

Page: Of Reviewer: Stand Reviewer:

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 = $(A_{\star}/(C_{\star})/(A_{\star})(C_{\star})$ everage RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

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

A_a = Area of associated internal standard C_k = Concentration of internal standard s, X = Mean of the RRFs

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	Average RRF (initial)	RRF (C 3 std)	RRF (CS std)	%RSD	%RSD
-	10/2	2//2	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	28/66.0	0.93/35	8 Jan 8.0	0,94963	1080	60017
	(305)	2/1/10	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.03870	1.03870	x1401	104720	489709	A 801
		· 	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.0990L	1.09904	1.11730	1.11430	105817	4938
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	789660	0.9988	1.05541	1.0504/	52/C25	7/20
			OCDF (*C-OCDD)	1.2524	1.25.24	1.32988	1.32988	868680	9 400
7	10th	4/21/10	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.088	1.10	0/1	65.	02.1
		,	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)			<u></u>			,
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)						
			OCDF (13C-OCDD)						
က	1992		2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	1.017	1017	1,01	701	530	670
		01/11/5	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	166.0	1860	101	101	111	190
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	55/1	1.150	1	1	160	1000
\int			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,8,7,8,-HpCDD)	1044	Trao!	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	7	Na W	na Na
			OCDF (1°C-OCDD)	1.544	1.00	1.66	186	NXX.X	00:00
				7, -, -, -, -, -, -, -, -, -, -, -, -, -,			150	<i>y.</i> 0.	0.17

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 #:233/5/NJ

Routine Calibration Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: Reviewer:

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 = $(A_x)(C_x)/(A_x)(C_x)$

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF Where:

 A_x = Area of compound, C_x = Concentration of compound,

 $A_{\rm k} = {\sf Area}$ of associated internal standard $C_{\rm k} = {\sf Concentration}$ of internal standard

<u>L</u>					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	RRF (CC)	RRF (CC)	Q%	۵%
-	144×10315	1.	2,3,7,8-TCDF (1°C-2,3,7,8-TCDF)	25/26	818001	818001	11.7	1.1
		15/18/10	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.63870	1.18429	65/281.1	a.th)	140
		\ \	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	7.89904	1:19487	1.19487	7.80	120
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	789860	1.10322	1.10322	7.01	10.7
			OCDF (1°C-OCDD)	1.26224	1.49485	1.49482	18.4	184
N	TANJOHOS	4/1/10	2,3,7,8-TCDF (¹³C-2,3,7,8-TCDF)	1.017	1.04	1.04	4.8	4.0
		11./	2,3,7,8-TCDD ('3C-2,3,7,8-TCDD)	1,660	1.07	1.07	7.7	7.7
			1,2,3,6,7,8-HxCDD (¹³ C-1,2,3,6,7,8-HxCDD)	1.155	/×'/	171	4.5	4.5
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.044	4/:/	4/1	1.7	1.1
			OCDF ("C-OCDD)	1.544	1.6	1.61	4.1	4.
က	BUSIONS	6/18/19	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	1.088	1.15	1.15	5.3	6.3
	\	. / /	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (³ C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD ("C-1,2,4,6,7,8,-HpCDD)					
			ocpf (3c-ocpp)					

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.



VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

Page:	Reviewer:	2nd Reviewer:
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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: SS(

Where: SSC = Spiked sample concentration SA = Spike added

RPD = ILCS - LCSD I * 2/(LCS + LCSD)

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

LCS ID: 0/24370

Γ	7		7	- T	T	T	Т	Ī		Ī			=
	CSD	Q	Recalculated										
	1 CS/I CSD	RPD	Reported										
	g	ecovery	Recalc										
	ICSD	Percent Recovery	Reported										
	S	ecovery	Recalc	911	117	501	90	<i>pe/</i>	\				
	9	Percent Recovery	Reported	911	117	105	80	40					
	ample	tration	1 CSD	NA				/					
	Spiked 5	Concentration (+79)	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	43.1	117	501	2.68	348					
	ike	Added (page)	I CSD	237NA			\	*					
	S	¥ ₽¥	1.08	oæ	001			300					
		Compound		2,3,7,8-TCDD	1,2,3,7,8-PeCDD	1,2,3,4,7,8-HxCDD	1,2,3,4,7,8,9-HpCDF	OCDF					

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)	Oj uoj	Elemental Composition	Analyte	Descriptor	Accurate Mass ^(a)	Ol nol	Elemental Composition	Analyte
-	303.9016 305.8987 315.9419 317.9389 319.8965	M W W W W W W W W W W W W W W W W W W W	C124, 250, 0 C124, 250, 37010 13C12, 4, 250, 0 13C12, 24, 250, 37010 C12, 4, 250, 0	TCDF TCDF TCDF (S) TCDF (S)	4	407.7818 409.7788 417.8250 419.8220	ΣΣ Σ Σ + + Σ + + 0 4 0 0	C ₁₂ H*Cl ₄ 7ClO C ₁₂ H*Cl ₄ 7Cl ₂ O 19C ₁₂ H*Cl ₂ O 19C ₁₂ H*Cl ₃ 7ClO	HPCDF HPCDF HPCDF (S) HPCDF
	321.8936 331.9368 333.938 375.8364 [354.9792]	01 01 01 X	C12H	TCDD (S) TCDD (S) HXCDPE PFK		425.7737 435.8169 437.8140 479.7165 [430.9728]	M+4 M+4 M+4 COCK	C ₁₂ 1 C ₁ 2 C ₁₂ H*C ₁₃ C ₁₀ 2 13C ₁₂ H*C ₁₃ C ₁₀ 2 13C ₁₂ H*C ₁₃ C ₁₀ 2 C ₁₂ H*C ₁₃ C ₁₀ 2 C ₁₇ H*C ₁₃ C ₁₀ 2	HPCDD (S) HPCDD (S) NCDPE PFK
а	339.8597 341.8567 351.9000 353.8970 355.8546 357.8516 367.8949 369.8919 409.7974 [354.9792]	M M M H + 2 A A A A A A A A A A A A A A A A A A	C ₁₂ H ₃ C ₁ C ₁ O C ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O G ₁₂ H ₃ C ₁ C ₁ O	Pecde Pecde (S) Pecde (S) Pecdd Pecdd Pecdd (S) Pecdd (S) Pecdd (S) Pecdd (S)	ம	441.7428 443.7399 457.7377 459.7348 469.7780 513.6775 [422.9278]	M+2 M+4 M+2 M+4 M+4 LOCK	C1.24Cl.37ClO C1.24Cl.37ClO C1.24Cl.37ClO C1.24Cl.37ClO C1.24Cl.37ClO 13C1.24Cl.37ClO 13C1.24Cl.37ClO 13C1.37Cl.37ClO C1.24Cl.37Cl.2O C1.24Cl.37Cl.2O	000 F 000 F 000 D 000 C 000 (S) 000 D E PFK
ဗ	373.8208 375.8178 383.8639 385.8610 389.8156 391.8127 401.8559 445.7555 [430.9728]	M M M H + 2 M M M M + 4 M M M + 4 + 4 M M M + 4 + 4 M M M + 4 + 4 M M M M M M M M M M M M M M M M M M M	C ₁₂ H ₂ *C ₁ 4*ClO C ₁₂ H ₂ *C ₁ 4*ClO C ₁₂ H ₂ *C ₁ 4ClO C ₁₂ H ₂ *ClO C ₁₂ H ₂ *Cl ₃ *ClO C ₁₂ H ₂ *Cl ₃ *ClO ₂ C ₁₂ H ₂ *Cl ₃ *ClO ₂ C ₁₂ H ₂ *Cl ₃ *Cl ₂ O C ₁₂ H ₂ *Cl ₃ *Cl ₂ O C ₁₂ H ₂ *Cl ₃ *Cl ₂ O	HCDF HCDF HCDF (S) HCDD HCDD HCDD HCDD (S) HCDD (S)					

The following nuclidic masses were used:

T

H = 1.007825 C = 12.000000 $^{13}C = 13.003355$ F = 18.9984

O = 15.994915 $^{36}Cl = 34.968853$ $^{37}Cl = 36.965903$

S = internal/recovery standard

LDC #: 23265W2/ SDG #: 200 COULD

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:_	/of
Reviewer:	9
2nd reviewer:	((

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

/	Y	N	N/A
,	y /	N	N/A

Were all reported results recalculated and verified for all level IV samples?

Were all recalculated results for detected target compounds agree within 10.0% of the reported results?

Conce	ntration	$n = \frac{(A_s)(I_s)(DF)}{(A_s)(RRF)(V_s)(\%S)}$	Example:
A_{\star}	=	Area of the characteristic ion (EICP) for the compound to be measured	Sample I.D;:
A _{is}	=	Area of the characteristic ion (EICP) for the specific internal standard	12 (2
l _s	=	Amount of internal standard added in nanograms (ng)	Conc. = (1325/070) (2000) ((7745/08) (0.99/) (10.12) 0.914
V _°	=	Volume or weight of sample extract in milliliters (ml) or grams (g).	/
RRF	=	Relative Response Factor (average) from the initial calibration	=37.3 pg/g
Df	=	Dilution Factor.	/ ()
%S	=	Percent solids, applicable to soil and solid matrices only.	, and the second

				<u> </u>	
			Reported Concentration	Calculated Concentration	
#	Sample ID	Compound	()	()	Qualification
		,			
			- 		
			·		,

Laboratory Data Consultants, Inc. Data Validation Report

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

Collection Date: April 28, 2010

LDC Report Date: June 8, 2010

Matrix: Soil

Parameters: Dioxins/Dibenzofurans

Validation Level: Stage 2B

Laboratory: TestAmerica, Inc.

Sample Delivery Group (SDG): G0D300454

Sample Identification

RSAQ3-1BPC RSAQ3-2BPC SA169-4BPC RSAQ3-2BPCMS

RSAQ3-2BPCMSD

Introduction

This data review covers 5 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.

Raw data were not reviewed for this SDG. The review was 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 with the following exceptions:

Method Blank ID	Extraction Date	Compound	Concentration	Associated Samples
0124370MB	5/4/10	1,2,3,4,6,7,8-HpCDD 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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.12 pg/g 0.49 pg/g 0.26 pg/g 0.13 pg/g 0.28 pg/g 0.15 pg/g 0.35 pg/g 0.18 pg/g 0.80 pg/g	All samples in SDG G0D300454

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

Samples EB-04282010-RZB (from SDG G0D300598) was identified as an equipment blank. No polychlorinated dioxin/dibenzofuran contaminants were found in this blank with the following exceptions:

Equipment Blank ID	Sampling Date	Compound	Concentration	Associated Samples
EB-04282010-RZB	4/28/10	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 1,2,3,6,7,8-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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	3.8 pg/L 5.2 pg/L 5.2 pg/L 7.5 pg/L 3.7 pg/L 16 pg/L 12 pg/L 2.7 pg/L 2.0 pg/L 43 pg/L 9.9 pg/L 76 pg/L	All samples in SDG G0D300454

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

Samples FB-04062010-RZB (from SDG G0D120488) 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-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	All samples in SDG G0D300454

Sample concentrations were compared to concentrations detected in the equipment 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) and relative percent differences (RPD) were not within QC limits for several 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
RSAQ3-1BPC	¹³ C-2,3,7,8-TCDF ¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	32 (40-135) 35 (40-135) 36 (40-135) 31 (40-135) 38 (40-135) 36 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 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	J (all detects) UJ (all non-detects)	Р

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
RSAQ3-2BPC	¹³ C-2,3,7,8-TCDF ¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,6,7,8-HxCDD	37 (40-135) 35 (40-135) 38 (40-135) 39 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 2,3,7,8-TCDF	J (all detects) UJ (all non-detects)	Р
SA169-4BPC	¹³ C-2,3,7,8-TCDF ¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDF ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,7,8-HxCDF ¹³ C-1,2,3,6,7,8-HxCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	25 (40-135) 31 (40-135) 35 (40-135) 30 (40-135) 32 (40-135) 31 (40-135) 26 (40-135) 22 (40-135) 12 (40-135)	All TCL compounds	J (all detects) UJ (all non-detects)	Р
0124370MB	¹³ C-2,3,7,8-TCDD ¹³ C-1,2,3,7,8-PeCDD ¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-OCDD	36 (40-135) 37 (40-135) 38 (40-135) 33 (40-135)	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 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)	Р

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
SA169-4BPC	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	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)	Р

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300454	All compounds reported below the PQL.	J (all detects)	А

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0D300454	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	А

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 G0D300454

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0D300454	RSAQ3-1BPC	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 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	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D300454	RSAQ3-2BPC	2,3,7,8-TCDD 1,2,3,7,8-PeCDD 1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-HxCDD 1,2,3,7,8,9-HxCDD 2,3,7,8-TCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D300454	SA169-4BPC	All TCL compounds	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0D300454	SA169-4BPC	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	J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0D300454	RSAQ3-1BPC RSAQ3-2BPC SA169-4BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0D300454	RSAQ3-1BPC RSAQ3-2BPC SA169-4BPC	All compounds reported as EMPC	JK (all detects)	А	Project Quantitation Limit (k)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0D300454

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0D300454

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0D300454

No Sample Data Qualified in this SDG

Tronox Northgate Henderson T

LDC #: 23265X21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0D300454	_ Stage 2B
Laboratory: Test America	
METHOD: HRGC/HRMS Dioxi	ns/Dibenzofurans (EPA SW 846 Method 8290)

	Date:	6/9/v
		<u>of</u>
	Reviewer:	
2nd	Reviewer:	a
		/

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

echnical holding times RGC/HRMS Instrument performance check itial calibration outine calibration/I lanks latrix spike/Matrix spike duplicates aboratory control samples	A A A A A A A A A A A A A A A A A A A	Sampling dates: 4/38/10
outine calibration/IX lanks latrix spike/Matrix spike duplicates	w	
outine calibration/I value Section w		
lanks latrix spike/Matrix spike duplicates	w	
latrix spike/Matrix spike duplicates	1.1	
	w	
sharatan, cantral asymptos		
aboratory control samples	\rightarrow	109
egional quality assurance and quality control	N	
iternal standards	W	·
arget compound identifications	N	
ompound quantitation and CRQLs	√SN	
ystem performance	N	
verall assessment of data	A	
ield duplicates	N	
ield blanks	w	FBOX062010-R2B(40) 120488), 2B04282010- Sedested D= Duplicate (40) 300
a o	rget compound identifications mpound quantitation and CRQLs stem performance rerall assessment of data eld duplicates eld blanks	rget compound identifications N Impound quantitation and CRQLs Stem performance N Identifications N Identifications N Identifications N Identifications N Identifications Identifications N Identifications N Identifications N Identifications N Identifications N Identifications N Identifications N Identifications N Identifications N Identifications Identifications N Identifications N Identifications Identifica

N = Not provided/applicable SW = See worksheet

R = Rinsate

FB = Field blank

TB = Trip blank

EB = Equipment blank

Validated Samples:

1	RSAQ3-1BPC	5	11	0/24370113	21	31	
2	RSAQ3-2BPC		12		22	32	
3	SA169-4BPC		13		23	33	
4	RSAQ3-2BPCMS		14		24	34	
5	RSAQ3-2BPCMSD	$\overline{}$	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 Dloxins/Dibenzofurans (EPA SW 846 Method 8290)

							-		
	U. Total HpCDD		V. Total TCDF		W. Total PeCDF		X. Total HXCDF		Y. Total HpCDF
11001100170070	1.1,4,5,4,7,6,8+HDCUF	#000 O	4: 000	מחסד ביניד ש		Total Boom	S. Total recold	, 000×1240F F	יייייייייייייייייייייייייייייייייייייי
K. 1,2,3,4,7,8-HxCDF		L. 1,2,3,6,7,8-HxCDF		M. 2,3,4,6,7,8-HxCDF		N. 1,2,3,7,8,9-HXCDF		O. 1,2,3,4,6,7,8-HpCDF	
F. 1,2,3,4,6,7,8-HpCDD		ေ . ဝင်ပည		H. Z,3,7,8-1CDF		I. 1,2,3,7,8-PeCDF		·	
٨. ٤.٩.٢.8-١ ١٥٥٥	B 12378.0000		C. 123478 HVCDD		1000	UUUXH-8,1,9,8,1,9	E 123789-H×CDD		

Notes:

LDC #: 23265X21

SDG #: See Cover

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 Reviewer: 2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Was a method blank performed for each matrix and whenever a sample extraction was performed?

Was the method blank contaminated? If yes, please see qualification below. N N/A

Blank analysis date: 5/15/10 Blank extraction date: 5/4/10 Conc. units: pg/g

All (>5X) Sample Identification Associated samples: 2.45 0.65 0.75 1.75 9.0 د. 1.4 0.0 첢 0124370MB Blank ID 0.12 0.49 0.26 0.13 0.28 0.15 0.35 0.18 0.80 Compound

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".

SDG #: See Cover LDC #: 23265X21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Reviewer:_ Page:

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

YN N/A Were field blanks identified in this SDG?

b/bd Associated sample units: Blank units: pg/L

Sampling date: 4/28/10

Field blank type: (circle one) Field Blank / Rinsate / Other:

Associated Samples:

Compound	Blank ID			Sample Identification	ation		
	FB04282010-RZB	5X					
Ш	3.8	0.019					
O	5.2	0.026					
Ι	5.2	0.026					
	7.5	0.0375					
٦	3.7	0.0185					
×	16	0.08					
7	12	90.0					
M	2.7	0.0135					
Z	2.0	0.01					
0	43	0.215					
G L	6.6	0.0495					
Ö	76	0.38					
					-		
CROL							!

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

SDG #: See Cover LDC #: 23265X21

VALIDATION FINDINGS WORKSHEET

Field Blanks

2nd Reviewer: Page:__ Reviewer:

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

N/A Were field blanks identified in this SDG?

Associated sample units:

Blank units: pg/L Sampling date: 4/6/10

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

VALIDATION FINDINGS WORRSHEET Matrix Spike/Matrix Spike Duplicates

上、 と、 な、 は、 へい SDG #: Sex

Reviewer: 2nd Reviewer:

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".

| 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.

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

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

Qualifications	16 6.22									\	CMSONCOCI												
Associated Samples	4																						
RPD (Limits)	18/5/18	63(532)	32 (xx 0))	49(532)	()	()	25 (5 33)	()		(()	()	()	((()	()	()	()	()	()	()
MSD %R (Limits)	()	()	94 (79-137)	()	()	())	23 (84-137)	()	141 (75-141)	()	()	()	()	(()	()	()	()	()	()	()	
MS %R (Limits)	145188-134	220 80-137	(,)	13618/-1341	218(72-146)	155 63-152	(22/5/ 42/	34(81-137)	139,79-139)	(17+56) 99+	(()	()	()	()) ()	()	()	()	()	()	()	()
Compound	F	4	7	Н	V	7	/۷		A	×						At 3							
OI OSW/SW	4/5	,														(souple has	_						
Date																							
#																							

LDC #: 23265X7

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: /of/ Reviewer: 2nd Reviewer: 8

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".

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

Date	Lab ID/Reference	Internal Standard	% Recovery (Limit: 40-135%)	Qualifications ())
	/	#	32 (40-135)	1/4/ A (A-B.F.H-N)
		(3		
		V	98	
		B	() / &	
		2		
		\mathcal{H}	36 ()	À
			()	
	8	A	S7 ()	1 My F (A-E H)
		Ø		
		P	() & & &	
		7		^
	N	7	() 52	1 M1/P (A1)]
		В	() /8	
-		2	() 58	
		P	() 08	
		7	<i>w</i>	
		7	() / K	
		4	()	
		$\dot{\mathcal{H}}$)	
		/	(
			()	
	Internal Standards	Check Standard Used	Internal Standards	Check Standard Used
13C-2,3,7,8-TCDF	CDF		G. 13C-1,2,3,4,6,7,8-HpCDF	
13C-2,3,7,8-TCDD	CDD		H. 13C-1,2,3,4,6,7,8-HpCDD	
¹³ C-1,2,3,7,8-PeCDF	-PeCDF		1. ¹³ C-OCDD	
¹³ C-1,2,3,7,8-PeCDD	-PeCDD		K. 13C-1,2,3,4-TCDD	
¹³ C-1,2,3,4,7,8-HxCDF	',8-HxCDF		L. ¹³ C-1,2,3,7,8,9-HxCDD	
130 4 0 0 4	130.1 2 3 6 7 8 12/000			

SDG #: 201 COLL LDC #: 23.3/5%

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: Jof -2nd Reviewer: Reviewer:_

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".

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

Y N N/A

Charles	#	Date	Lab ID/Reference	Internal Standard		% Recovery (Limit: 40-135%)	40-135%)	Qualifications (12)
## 35 () ND LW ## 35			SMOTS4510	*		36	7	J/W/A (ABGO)
4 (M5) A 35 (XX	'') \	(/	
4 (MS)				١٧		3 25	/ /	
4 (M5)				7	(1)) €8	()	
4 (MS))	(
S			(**	W		(No and
SCMSD SS				Ñ	W	7	(
S S S S S S S S S S				9	36)	(
S(MSD)				1	W X)	(
STMSD				/				
P			asmi	4	37))	
P				Ø	78))	
Part Part				U	300)).	
Part Part				P	75) -	(
F S S (N	30)	(
Continue Continue				7	33)		
C-2,3,7,8-PcCDF C-1,2,3,4,5,7,8-PxCDF C-1,2,3,4,5,7,8-PxCDF C-1,2,3,4,5,7,8-PxCDF C-1,2,3,4,5,7,8-PxCDF C-1,2,3,4,7,8-PxCDF C-1,2,3,7,8,9-PxCDD C-1,2,3,7,8,9-Px				<u> </u>	70			
Check Standard Used Check Standard Used Check Standard Used Check Standard Used Check Standard Used Internal Standards Check Standard Used				+	26)		
Check Standard Used Check Standard Used					6/)	(/	
Internal Standards Check Standard Used () () "C-2,3,7,8-TCDF G. "3C-1,2,3,4,6,7,8-HpCDF () "3C-2,3,7,8-PeCDF H. "3C-1,2,3,4,6,7,8-HpCDD () "3C-1,2,3,7,8-PeCDF H. "3C-1,2,3,4,6,7,8-HpCDD () "3C-1,2,3,7,8-PeCDF H. "3C-1,2,3,4,6,7,8-HxCDP () "3C-1,2,3,7,8-HxCDF H. "3C-1,2,3,7,8-HxCDP () "3C-1,2,3,7,8-HxCDF L. "3C-1,2,3,7,8-HxCDP ())		>
internal Standards Check Standard Used Internal Standards () '3C-2,3,7,8-TCDF G. '3C-1,2,3,4,6,7,8-HpCDF () '3C-2,3,7,8-TCDD H. '3C-1,2,3,4,6,7,8-HpCDD () '3C-1,2,3,7,8-PeCDF H. '3C-0CDD () '3C-1,2,3,7,8-PeCDD K. '3C-1,2,3,4-TCDD () '3C-1,2,3,7,8-HxCDF K. '3C-1,2,3,7,8-HxCDD () '3C-1,2,3,7,8-HxCDF L. '3C-1,2,3,7,8-HxCDD ())	(
Internal Standards Check Standard Used Internal Standards 1³C-2,3,7,8-TCDF G. ¹³C-1,2,3,4,6,7,8-HpCDF A. ¹²C-1,2,3,4,6,7,8-HpCDD 1³C-1,2,3,7,8-PeCDF H. ¹³C-0CDD A. ¹²C-0CDD 1³C-1,2,3,7,8-PeCDF K. ¹³C-1,2,3,4-TCDD K. ¹³C-1,2,3,7,8-HxCDD 1³C-1,2,3,4,7,8-HxCDF L. ¹³C-1,2,3,7,8-HxCDD L. ¹³C-1,2,3,7,8,-HxCDD))	
13C-2,3,7,8-TCDF G. 13C-1,2,3,4,6,7,6 13C-2,3,7,8-TCDD H. 13C-1,2,3,4,6,7,6 13C-1,2,3,7,8-PeCDF I. 13C-0CDD 13C-1,2,3,7,8-PeCDD K. 13C-1,2,3,4-TCD 13C-1,2,3,7,8-HXCDF L. 13C-1,2,3,7,8,9-P			Internal Standards	Check Standard Used		Int	ernal Standards	Check Standard Used
13C-2,3,7,8-TCDD H. 13C-1,2,3,7,8-PeCDF 1. 13C-1,2,3,7,8-PeCDD K. 13C-1,2,3,4,7,8-HxCDF L. 13C-1,2,3,6,7,8-HxCDD L.	∢	¹³ C-2,3,7,8-T(CDF		Ö	¹3С-1,2,3,4,6,7,8-Hp	CDF	
13C-1,2,3,7,8-PeCDF 1.3C-1,2,3,7,8-PeCDD K. 13C-1,2,3,4,7,8-HxCDF L. 1.3C-1,2,3,6,7,8-HxCDP L.	B)	¹³ C-2,3,7,8-T(CDD		Ξ	13C-1,2,3,4,6,7,8-Hp	осор	
13C-1,2,3,7,8-PeCDD K. 13C-1,2,3,4,7,8-HxCDF L.	Ö	13C-1,2,3,7,8-	PeCDF			¹³ C-OCDD		
13C-1,2,3,4,7,8-HxCDF	٥.	13C-1,2,3,7,8-	PeCDD		¥.	13C-1,2,3,4-TCDD		
\dashv	ш	¹³ C-1,2,3,4,7,	8-HxCDF			13C-1,2,3,7,8,9-HxC	00	
	Ч	13C-12367	8-HxCDD					

LDC #:232/2

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

Reviewer:

2nd Reviewer:

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? Compound quantitation and CRQLs were adjusted to reflect all sample dilutions and dry weight factors (if necessary).

*	Date	Sample ID	Finding	Associated Samples	Qualifications
		3	H. K.L. O.P. 8	3	(e) 4/8/9/
			> call by sance		
		<u> </u>	ENDE USULACIO)	M	7 (E)
					\
	0				

Comments: See sample calculation verification worksheet for recalculations