

LABORATORY DATA CONSULTANTS, INC.

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Northgate Environmental Management, Inc.

August 12, 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 July 27, 2010. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 23663:

SDG#

Fraction

G0E280415, G0F190506 G0F240560, G0F260448 G0G010578 Dioxins/Dibenzofurans

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

- Standard Operating Procedures (SOP) 40, Data Review/Validation, BRC 2009
- Quality Assurance Project Plan Tronox LLC Facility, Henderson Nevada, June 2009
- NDEP Guidance, May 2006
- USEPA, Contract Laboratory Program National Functional Guidelines for Polychlorinated Dioxins/Diobenzofurans Data Review, September 2005

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

Sincerely,

≝rlinda T. Rauto

Operations Manager/Senior Chemist

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G0E280415

Matrix: Water/Soil

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Dioxins (8290)

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DL 07/27/10 Stage 2B/4

Attachment 1

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LDC #: 23663

SDG #: G0E280415, G0F190506, G0F240560, G0F260448, G0G010578

Page:<u>1</u> of 1 Reviewer: <u>JE</u>

2nd Reviewer: BC

Tronox Northgate Henderson Worksheet

EDD Area	Yes	No	NA	Findings/Comments
I. Completeness				
Is there an EDD for the associated Tronox validation report?	X			
II. EDD Qualifier Population				
Were all qualifiers from the validation report populated into the EDD?	X			
III. EDD Lab Anomalies				and the second s
Were EDD anomalies identified?		Х		
If yes, were they corrected or documented for the client?			х	See EDD_discrepancy_ form_LDC23663_081110.doc
IV. EDD Delivery				
Was the final EDD sent to the client?	X			

Tronox LLC Facility, PCS, Henderson, Nevada Data Validation Reports LDC #23663

Dioxins/Dibenzofurans



Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

May 3, 2010

LDC Report Date:

August 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0E280415

Sample Identification

SSAK8-06-1BPC

SSAK8-06-2BPC

SSAK8-06-3BPC

SSAK8-06-1BPCMS

SSAK8-06-1BPCMSD

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
0152441MB	6/1/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF OCDF	0.059 pg/g 0.23 pg/g 0.094 pg/g 0.070 pg/g 0.12 pg/g 0.13 pg/g	All samples in SDG G0E280415

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) 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 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	All samples in SDG G0E280415

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 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
SSAK8-06-1BPC	¹³ C-OCDD	36 (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
SSAK8-06-1BPC	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 2,3,4,6,7,8-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
SSAK8-06-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-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)	P
SSAK8-06-3BPC	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-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

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0E280415	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 G0E280415	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 G0E280415

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0E280415	SSAK8-06-1BPC	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R)
G0E280415	SSAK8-06-1BPC	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 2,3,4,6,7,8-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)
G0E280415	SSAK8-06-2BPC	1,2,3,4,6,7,8-HpCDD 2,3,7,8-TCDF 1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 2,3,4,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E280415	SSAK8-06-3BPC	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-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0E280415	SSAK8-06-1BPC SSAK8-06-2BPC SSAK8-06-3BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0E280415	SSAK8-06-1BPC SSAK8-06-2BPC SSAK8-06-3BPC	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 G0E280415

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0E280415

No Sample Data Qualified in this SDG

Tronox Northqate Henderson

LDC #: 23663A21	VALIDATION COMPLETENESS WORKSHEET
SDG #: G0E280415	Stage 2B
Laboratory: Test America	

Date: 2	\$4/10
Page:	
Reviewer:_	4
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: 5/3/10
11.	HRGC/HRMS Instrument performance check	4	,
111.	Initial calibration	A	
IV.	Routine calibration/I	A	
V.	Blanks	av	
VI.	Matrix spike/Matrix spike duplicates	KW	
VII.	Laboratory control samples	A	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	Low	
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	SN	FB-040-82D (40D090441)

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	SSAK8-06-1BPC	5	11	015244 IMB	21	31	
2	SSAK8-06-2BPC		12		22	32	
3	SSAK8-06-3BPC		13		23	33	
4	SSAK8-06-1BPCMS		14		24	34	
5	SSAK8-06-1BPCMSD	V	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)

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-PeCDF M. 2,3,4,5,8-HxCDF R. Total FeCDD W. Total HxCDF D. 1,2,3,6,7,8-HxCDD J. 2,3,4,7,8-PeCDF O. 1,2,3,4,6,7,8-HpCDF T. Total HxCDD Y. Total HpCDF	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
D H. 2,3,7,8-TCDF M. 2,3,4,6,7,8-HxCDF R. Total TCDD D 1. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCDF S. Total PeCDD D J. 2,3,4,7,8-PeCDF O. 1,2,3,4,6,7,8-HpCDF T. Total HxCDD	B. 1,2,3,7,8-PeCDD	G. OCDD	L. 1,2,3,6,7,8-HxCDF	Q. OCDF	V, Total TCDF
1. 1,2,3,7,8-PeCDF N. 1,2,3,7,8,9-HxCDF S. Total PeCDD J. 2,3,4,7,8-PeCDF O. 1,2,3,4,6,7,8-HpCDF T. Total HxCDD	C 123478.HXCDD	H. 2,3,7,8-TCDF	M. 2,3,4,6,7,8-HxCDF	R. Total TCDD	W. Total PeCDF
J. 2,3,4,7,8-PeCDF 0. 1,2,3,4,6,7,8-HpCDF T. Total HxCDD	D. 1.2.3.6.7.8-HxCDD	1. 1,2,3,7,8-PeCDF	N. 1,2,3,7,8,9-HxODF	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 #: 23/13/2/ SDG #: 56, 00/2/

VALIDATION FINDINGS WORKSHEET Rlanks

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?

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

N/N N/A

Blank extraction date: 6///Blank analysis date: 6/0//0

Sample Identification Associated Samples: 9.059 51.0 W 0.094 0.070 0.23 Blank ID Compound Conc. units: アツ

Blank extraction date:_______ Blank analysis date:_____

	Sample Identification				
nples:	Sam				
Associated Samples:					
	Q				
	Blank ID				
Conc. units:	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 #: 23663A21

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: 1of / 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: ______ Associated sample units: _

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

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

All (>5X) Associated Samples:

Compound	Compound Blank ID			Sample Identification	tion		
(GODD90441)	FB-04072010-RZD	2X					
O	0.89	0.00445					
Ш	1.5	0.0075					
L.	2.2	0.011					
9	8.3	0.0415					
¥	1.4	0.007					
7	1.6	0.008					
W	1.5	0.0075					
Z	1.6	0.008					
0	1.3	0.0065					
<u>a</u>	1.4	0.007					
ø	4.1	0.0205					
CROL							

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

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

LDC #: 23/28/6-

VALIDATION FINDINGS WORKSHEET Matrix Spike/Matrix Spike Duplicates

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

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

Comp			ı I	\neg																			
Compound %R (Limits) %R (Limits) RPD (Limits) DR and XPP xxxxxx (Un. Sayana and app.)																							
Compound %R (Limits) %R (Limit	a Com	(/)	()	(()	()	•	(()	()		()	()	()	(()	()	()	()	()	()	()	
Compound %R (Limits)	lar	()/	())	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	()	
Comp	7	high con c)!			()	()	()	()	()	()	()	()	()	()	(()	()		^)	()	^)	^)	
30 ID	X	10.70	•																				-
MS/MSD ID		,																					
# Date	ľ		丄																				_

SDG #: Sex Core LDC #: 23/63/4

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".

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

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

#	Date at							()
		Lab ID/Reference	internal Standard		% Recovery (Limit: 40-135%)	40-135%)		LIOIIS / /
			1	38		(40-175)	4/49/c	(G. A)
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	Inter	Internal Standards	Check Standard Used		디	Internal Standards	Check	Check Standard Used
۸. ان	13C-2,3,7,8-TCDF			-	13C-OCDD			
_	13C-2,3,7,8-TCDD			Ŧ.	13C-1,2,3,4-TCDD			
C. 13	13C-1,2,3,7,8-PeCDF			نـ	¹³ C-1,2,3,7,8,9-HxCDD	CDD		
D. 13C.	13C-1,2,3,7,8-PeCDD	0		Σ				
	¹³ C-1,2,3,4,7,8-HxCDF	JF		z				
F.	13C-1,2,3,6,7,8-HxCDD	00		Ö				
G. 13C-	¹³ C-1,2,3,4,6,7,8-HpCDF	CDF		a:			7	
\square	13C-1,2,3,4,6,7,8-HpCDD	CDD						

136.00

SDG #: 16, COLD LDC #: 236342

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".

Y N NA

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	18th /		`	7	(¥)\$7					
Associated Samples		4		8)	M					
Apls > calibrarge	A. 4.0. M. 2. A. 2. H	F. H-> M. O-> &		4-0.2<	ZHZ C					
Sample ID	7	7		3	ul					
Date										
*										

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:

June 17, 2010

LDC Report Date:

August 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0F190506

Sample Identification

SA33-0BPC

SSAN6-06-0BPC

SA200-0BPC

RSAL8-0BPC

RSAK8-0BPC FD

RSAK8-0BPC

SSAK8-02-0BPC

SA70-0BPC

RSAH3-0BPC

SA82-0BPC

SSAK4-01-0BPC

SA167-0BPC

RSAO3-0BPC

SSAK6-01-0BPC

SSAK3-01-0BPC

SA198-0BPC**

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 16 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
7/7/10	1,2,3,4,7,8-HxCDD	20.3	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SA70-0BPC	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
0716172MB	6/28/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.078 pg/g 0.40 pg/g 1.1 pg/g 0.13 pg/g 0.48 pg/g 0.37 pg/g 0.45 pg/g	All samples in SDG G0F190506

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
RSAL8-0BPC	1,2,3,7,8,9-HxCDD	0.37 pg/g	0.37U pg/g
	1,2,3,4,6,7,8-HpCDD	1.8 pg/g	1.8U pg/g
	OCDD	2.7 pg/g	2.7U pg/g

Samples FB-04072010-RZD (from SDG G0D090441), FB-04072010-RZC (from SDG G0D130519), and FB-04062010-RZB (from SDG G0D120488) 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 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 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SSAK8-02-0BPC SA70-0BPC RSAH3-0BPC SA82-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SSAK4-01-0BPC SAK4-01-0BPC SA167-0BPC
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 1,2,3,6,7,8-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	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	SSAN6-06-0BPC SA200-0BPC RSAO3-0BPC SA198-0BPC**
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	SA33-0BPC

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

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
RSAK8-0BPC_FD	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	34 (40-135) 39 (40-135) 26 (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
RSAK8-OBPC	¹³ C-OCDD	31 (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 compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SA33-0BPC 1,2,3,4,6,7,8-HpCDF OCDF SSAK8-02-0BPC SA198-0BPC**		Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects) J (all detects)	P
SA200-0BPC OCDF RSA03-0BPC		Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
RSAK8-0BPC_FD		Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

Sample	Compound	Finding	Criteria	Flag	A or P
SA82-0BPC	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
SSAK6-01-0BPC	2,3,7,8-TCDD 1,2,3,6,7,8-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 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	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0F190506	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 G0F190506	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 RSAK8-0BPC_FD and RSAK8-0BPC 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	RSAK8-0BPC	RSAK8-0BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD 23		33	36 (≤50)			-
1,2,3,7,8-PeCDD	67	98	38 (≤50)	-	-	•
1,2,3,4,7,8-HxCDD	53	78	38 (≤50)	•	-	-
1,2,3,6,7,8-HxCDD	95	130	31 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	58	72	22 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	320	400	22 (≤50)	-	-	-
OCDD	300	320	6 (≤50)	-	-	-
2,3,7,8-TCDF	480	720	40 (≤50)	-	-	-
1,2,3,7,8-PeCDF	970	1400	36 (≤50)	-	-	-
2,3,4,7,8-PeCDF	510	780	42 (≤50)	-		-
1,2,3,4,7,8-HxCDF	1300	1800	32 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	1000	1400	33 (≤50)	-	-	•
2,3,4,6,7,8-HxCDF	260	340	27 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	230	360	44 (≤50)		-	-
1,2,3,4,6,7,8-HpCDF	3800	4700	21 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	2200	3100	34 (≤50)	-	-	-
OCDF	10000	11000	10 (≤50)	-		-

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0F190506

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F190506	RSAL8-0BPC RSAK8-0BPC_FD RSAK8-0BPC SA70-0BPC	1,2,3,4,7,8-HxCDD	J+ (all detects)	Р	Routine calibration (%D)
G0F190506	RSAK8-0BPC_FD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0F190506	RSAK8-0BPC	OCDF	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0F190506	06 SA33-0BPC		J (all detects) J (all detects)	P	Project Quantitation Limit (e)
G0F190506	SA200-0BPC RSAO3-0BPC	OCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0F190506	RSAK8-0BPC_FD RSAK8-0BPC	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)	Р	Project Quantitation Limit (e)
G0F190506	SA82-0BPC	2,3,7,8-TCDF 1,2,3,4,6,7,8-HpCDF OCDF	J (all detects) J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0F190506 SSAK6-01-0BPC		2,3,7,8-TCDD 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 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	J (all detects)	Р	Project Quantitation Limit (e)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F190506	SA33-0BPC SSAN6-06-0BPC SA200-0BPC RSAL8-0BPC RSAK8-0BPC RSAK8-0BPC SSAK8-02-0BPC SA70-0BPC RSAH3-0BPC SA82-0BPC SA67-0BPC SA167-0BPC RSAO3-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SSAK3-01-0BPC SSAK3-01-0BPC SA198-0BPC**	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0F190506 SA33-0BPC SSAN6-06-0BPC SA200-0BPC RSAL8-0BPC RSAK8-0BPC FD RSAK8-0BPC SA70-0BPC SA70-0BPC SA82-0BPC SA82-0BPC SA167-0BPC SA167-0BPC SA167-0BPC SSAK6-01-0BPC SSAK3-01-0BPC SA198-0BPC**		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 G0F190506

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F190506	RSAL8-0BPC	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD	0.37U pg/g 1.8U pg/g 2.7U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F190506

No Sample Data Qualified in this SDG

Tronox Northgate Henderson

DC #:23663B21	VALIDATION COMPLETENESS WORKSHEET	Date: 84/10
SDG #: <u>G0F190506</u>	Stage 2B/4	Page:_/of_/ Reviewer:
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
1,	Technical holding times	4	Sampling dates: 6/17/10
11.	HRGC/HRMS Instrument performance check	\$, ,
111.	Initial calibration	★	
IV.	Routine calibration/IS	W	`
V.	Blanks	w	
VI.	Matrix spike/Matrix spike duplicates	<i>N</i>	dieut seitind
VII.	Laboratory control samples	A	dieut perfied
VIII	Regional quality assurance and quality control	N	
IX.	Internal standards	aw	
Χ.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	W	Not reviewed for Stage 2B validation.
XII.	System performance	A	Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	4	
XIV.	Field duplicates	w	0=5+6
XV.	Field blanks	w	FB-04072010 P2D (GODO90441), FB04062010 P2 FB-040722010-P2C (GODI3519) (GODI204 s detected D = Duplicate

Note: A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected D = Duplicate

R = Rinsate FB = Field blank

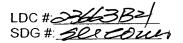
TB = Trip blank

EB = Equipment blank

Validated Samples: ** Indicates sample underwent Stage 4 validation

\mathcal{M}	15019							
1	SA33-0BPC	5	11	SSAK4-01-0BPC		21	0176172MB	31
2	SSAN6-06-0BPC	ć	12	SA167-0BPC		22	. /	32
3	SA200-0BPC	c	13	RSAO3-0BPC	C	23		33
4	RSAL8-0BPC	D	14	SSAK6-01-0BPC	D	24		34
5	RSAK8-0BPC_FD		15	SSAK3-01-0BPC	7	25		35
6	RSAK8-0BPC		16	SA198-0BPC**	c	26		36
7.	SSAK8-02-0BPC		17			27		37
8	SA70-0BPC		18			28		38
9	RSAH3-0BPC		19			29		39
10	SA82-0BPC		20			30		40

Notes:		



VALIDATION FINDINGS CHECKLIST

Page: / of Page: / of Page: 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				
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?	0	D		
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?			l	
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?			1	
VII. Laboratory control samples				
Was an LCS analyzed for this SDG?	4		\perp	
Was an LCS analyzed per extraction batch?	1			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within he QC limits?	1			



VALIDATION FINDINGS CHECKLIST

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2nd Reviewer:_		\sim

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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:

VALIDATION FINDINGS WORKSHEET Routine Calibration

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 NA NA

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?

*	Date Standard ID	ID Compound	(L	Finding Ion 6) Abundance Ratio	Associated Samples	Qualifications
1/2	1,0 6714101853	D53 C	20.3		4-6.8	៕ ィ
						∖!
-						
-						
1						
+						
		-				
	rcuus	Selected ions (m/z)	Ion Abundance Ratio	PCDFs	Selected ions (m/z)	z) Ion Abundance Ratio
- 60.6		M/M+2	0.65-0.89	Tetra-	M/M+2	0.65-0.89
renta	-1	M+2/M+4	1.32-1.78	Penta-	M+2/M+4	1.32-1.78
Неха		M+2/M+4	1.05-1.43	Hexa-	M+2/M+4	1.05-1,43
Hexa	Hexa.''C-HxCDF (IS) only	M/M+2	0.43-0.59	Hexa-13C-HxCDF (IS) only		0.43-0.59
Hepta	Hepta-"C-HpCDF (IS) only	M/M+2	0.37-0.51	Hepta-13C-HpCDF (IS) only		0.37-0.51
Hepta-	-1	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 # UN

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: 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", M'N N'A

Were all samples associated with a method blank? Was a method blank analyzed for each matrix? Was the blank contaminated? If yes, please see qualification below. In date: 25% Blank analysis date:

*|≤S/to*Blank analysis date: Z Blank extraction date: 6 N N N

Associated Samples:

		. Socializado Danas Carribias.				
Compound	Blank ID		Sample I	Sample Identification		
0.76	ORGIBAR	+	*S < SMITO			
5	0.078 0.376	0.376				
4	040	1.8/U				
4	1.1	n/je				
/ K	0.13					
0	0.48					
A	0.37					
Ø	0.45					
		The state of the s				

Blank extraction date:_

Conc. units:

Blank analysis date:

Associated Samples:

	<u> </u>	ī		_		
on						
Sample Identification						
Sa						
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".

LDC #: 23663B21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

Reviewer: 2nd Reviewer:

Page: /of /

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

b/bd Associated sample units: Y M 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:) Field Blank / Rinsate	/ Other:	Associated Samples:		4-12, 14-15 (>5X)	0	
Compound	Blank ID			Sample Identification	ication		
F (G0D090441)	FB-04072010-RZD	2X					
2	0.89	0.00445					
ш	1.5	0.0075					
L	2.2	0.011					
9	8.3	0.0415					
Ж	1.4	0.007					
	1.6	0.008					
×	1.5	0.0075					
Z	1.6	0.008					
0	1.3	0.0065					
ď	1.4	0.007					
٥	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 #: See Cover LDC #:23663B21

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?

Associated sample units: Blank units: pg/L

Sampling date: 4/8/10

2-3, 13, 16 (>5X) Associated Samples: Field blank type: (circle one) Field Blank / Rinsate / Other:

Compound	Blank ID			Sam	Sample Identification	ion		
	FB-04072010-RZC	2X						
	72.0	0.00385	7777					
۵	0.74	0.0037						
Ш	0.82	0.0041						
Щ	4.2	0.021						
9	37	0.185						
Ŧ	0.57	0.00285						
	96:0	0.0048						
1	0.67	0.00335						
×	1.1	0.0055						
7	0.96	0.0048						
Æ	1.0	0.005						
Z	1.0	0.005						
0	2.1	0.0105						
a .	1.5	0.0075						
ō	6.7	0.0335						
CBO								

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 #: 23663B21 SDG #:See Cover

VALIDATION FINDINGS WORKSHEET FIELD Blanks

Page: Lof And Reviewer: Cond Reviewe

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

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

Blank units: pg/L Associated sample units: pg/g

Sampling date: 4/6/10

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

e / Other: Associated Samples:

1 (>5X)

Sample Identification 0.0125 0.0135 0.0034 0.0041 0.0047 0.009 0.006 0.031 0.022 0.007 쫎 FB04062010-RZB Blank ID 0.68 2.5 0.82 0.94 6.2 2.7 1.8 1.2 <u>4</u>. 4.4 Compound ტ ш Ø

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 #: 461 002 LDC #:25/32B

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: 2nd Reviewer:_ Reviewer:

METHOD: HRGC/HRMS Dioxins/Dibenzofurans (EPA SW 846 Method 8290) Plegase see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A". A N 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 (()
		8	V	W	40-	1351	CA & (Fig. 0-A)
			 	38) (
			,	90)) ((/	
)	(
		9	+	Ŋ	\	`	√ (⊊ ⊗)
))	
)	(
)	(
						(
)) (
))	
)	(
)	(
)) (
)	(
))	
						,	
)		
						^	
)) (
		Internal Standards	Check Standard Used		Internal Standards	ards	Check Standard Used
ď	13C-2,3,7,8-TCDF	CDF			್ಯ-೦೦೦		
B	13C-2,3,7,8-TCDD	coo		Ϋ́.	13C-1,2,3,4-TCDD		
ij	13C-1,2,3,7,8-PeCDF	PeCDF		زر	¹³ C-1,2,3,7,8,9-HxCDD		
<u></u>	13C-1,2,3,7,8-PeCDD	PecDD		M			
пј	13C-1,2,3,4,7,8-HXCDF	8-HxCDF		ż			
ıĽ	¹³ C-1,2,3,6,7,8-HxCDD	8-HxCDD		Ö			
Ö	13C-1,2,3,4,6,7,8-HpCDF	7,8-HpCDF		ď			
r	¹³ C-1,2,3,4,6,7,8-HpCDD	,7,8-HpCDD					

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LDC #: 03/63 B3/ SDG #: 5/20/20/20/

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".

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).

Sample ID Finding Associated Samples 1, 2, 7, 16 0, & II, 2, 7, 16 3, 13 4, 10 4,	Qualifications	Johnson					74(E)	
Sample ID Sample ID A, 7, 16 A, 7, F. ZAMP C		1,2.7.16	w	9-5	Q)	7)	m	
Sample ID	apds > calebiange		No.	1	1 -1	111	ZUPC	
	Sample ID	7	3,13	5-6	\$ 10	4	(M)	
Date	Date							

Comments: See sample calculation verification worksheet for recalculations

\$24°CC

LDC#:23663B21 SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

Page:_	_lof
Reviewer:_	4:
2nd Reviewer:	<u></u>

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?

	Concentra	ation (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	6	5	RPD	Difference	Limits	(Parent Only)
А	23	33	36			
В	67	98	38			
С	53	78	38			
D	95	130	31			
E	58	72	22			
F	320	400	22			
G	300	320	6			
Н	480	720	40			
1	970	1400	36			
J	510	780	42			
К	1300	1800	32			
L	1000	1400	33			
М	260	340	27			
N	230	360	44			
0	3800	4700	21			
Р	2200	3100	34			
Q	10000	11000	10			

LDC #: 23/4/3/24

Initial Calibration Calculation Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: Page: 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 = $(A_{\nu}/(C_{\nu})/(A_{\nu})(C_{\nu})$ average RRF = sum of the RRFs/number of standards %RSD = 100 * (S/X)

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

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

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Average RRF (initial)	RRF 2 std	RRF	000%	4
-	19/2	IFT	2,3,7,8-TCDF (19C-2,3,7,8-TCDF)	7001	1004	a		0, 20	wash.
	(405)	01/21/5	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1049	010	201		2/2	4.0
		\ \ \	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	121	600	100	1:00	8/8
			1,2,3,4,6,7,8-HpCDD ("C-1,2,4,6,7,8-HpCDD)	1073	2000		1111	4.1	0.10
		T-		1000	1.0/2	///	(/:/	1.66	7.88
			CCDF ("C-OCDD)	1245	1.522	1.58	1.58	8,42	Sho
~	10/2	01/15/4	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.088	1.0xxx	1.10	017	avi	120
			2,3,7,8-TCDD (19C-2,3,7,8-TCDD)					<u> </u>	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 (1c-OCDD)						
တ	10/2	()+//	2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	0. A.A.	44	160	0.0	000	1/ 0-
	(105)	10//10	2,3,7,8-TCDD (4°C-2,3,7,8-TCDD)	0,945	o arr	000	NO C	0 1	10.00
			1,2,3,6,7,8-HxCDD (19C-1,2,3,8,7,8-HxCDD)	1.135	1.136	14	10-1-	6.3	0 ()
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.065	1060	50.	100	71/	0.00
			OCDF (4°C-OCDD)	2 W	200		1/0/2	100	0

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 #: 20 (COPUL) LDC #: 23/3/2/DV

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 = (A_)(C_b)/(A_b)(C_)

ave. RRF = initial calibration average RRF RRF = continuing calibration RRF A_x = Area of compound, A_k C_x = Concentration of compound, C_k Where:

 $A_{\mathtt{k}} = \mathsf{Area}$ of associated internal standard $C_{\mathtt{k}} = \mathsf{Concentration}$ of internal standard

					Reported	Recalculated	Reported	Recalculated
*		Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	0%	0%
	07/10/DS 47/10	4710	2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	0.944	0.8T	78.0	ox W	X
	(105)		2,3,7,8-TCDD ('3C-2,3,7,8-TCDD)	0.945	089	OXX	1	- 1
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.136	4	4:	0.6	0
		•	1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.065	3	n	20	le v
			OCDF ("C-OCDD)	1.639	1.57	1.57	4	4.
7	281404DS	/ 0/	2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	1.004	1.0	1.0	0.3	4
\bot		01/2/10	7/3/10 2,3,7,8-TCDD (°C-2,3,7,8-TCDD)	1.049	60.	20	- 4	i
		_	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	1.16	0):	0.3	4.0
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	€20:1	80.	1.08	1.0	1.0
			OCDF (12-OCDD)	1.523	1.55	150	×.	(X)
၈	14 1210st	1/	2,3,7,8-TCDF (13C-2,3,7,8-TCDF)	1.088	106	1.06	2.4	4,4
		1/4/10	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)					
			1,2,3,6,7,8-HxCDD (4C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (1°C-1,2,4,6,7,8,-HpCDD)					
			ocpF (*c-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. LDC#:23663B7 SDG #Secross

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer:__ 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 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 = ILCS - LCSD I * 2/(LCS + LCSD)

ادی ان: 12/9/21 تا CS ا

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

culated

	S	ike	Spiked S	ample	80 I	S	ICSD	g	I CS/I CSD	csp
Compound	¥¢	Added.	Concentration (F. A.)	ration	Percent Recovery	Recovery	Percent Recovery	ecovery	RPD	۵
	108	I CSD	↓ SOI	l CSD	Reported	Recalc	Reported	Recalc	Reported	Recalci
2,3,7,8-TCDD	30.0	N.A.	- A	*	(00)	(DD)				
1,2,3,7,8-PeCDD	201		103		(0.3	103				
1,2,3,4,7,8-HxCDD	,		216		10	91				
1,2,3,4,7,8,9-HpCDF	À		114		1/4	114				
OCDF	200	\	228		7	4				
						,				

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. .

Accurate mass ^(a)	Ion ID	Elemental Composition	Analyte	Descriptor	Accurate Mass ^(s)	O) uoj	Elemental Composition	Analyte
	Σ	C,H,36CI,O	TCDF	4	407 7818	O T W	. U35 37 O	000
	M+2	C12H3*C10	TCDF	•	409.7788	∑ } + 7 +		1 0 1 1 1
••••	Σ	O,Ost,H,Ost	TCDF (S)		417.8250	. ≥	12 12 12 12 12 12 12 12	H200F (A)
	M+2	13C12H,28C1337C1O	TCDF (S)		419,8220	M+2	O. 12. 12. 12. 12. 12. 12. 12. 12. 12. 12	HDCDF (3)
	Σ	C'T' C'O	TCDD		423.7767	M+2	C.H. Cl. 7010.	HPCDD
	M+2	C12H,**C13**C102	TCDD		425.7737	M+4	C.H.*CI.37CI.O.	Hoop
	≆	13C, H, 8CI, O,	TCDD (S)		435.8169	M+2	13C H 3C 13C 1	HPCDD (8)
	M+2	13C, H, 3CI, 3'CIO,	TCDD (S)		437 8140	1 T	130 130 130	
	M+2	C, H, Col, Tolo	HXCDPE		479.7165	+ ₩ + + ₩		(e) 00000
	Lock	,	PFK		[430.9728]	LOCK LOCK	O.F.: 07. 02.0	7 X T Y T Y T Y T Y T Y T Y T Y T Y T Y T
							/- - -	, - -
	M+2	C, H, **Cl, **ClO	PecDF	u.	441 7408	C+W	0:078	1000
		O'D'' TO" H'O'	PecDF)	443 7399	7 + N		7000
	M+2	1.0. H, #ČI, #Č10	PeCDF (S)		457.7377	r 0 + + ₹ ₹	(12 (13 (13 (13 (13 (13 (13 (13 (13 (13 (13	
-	M+4	13C, H, &CI, 37CI, O	PeCDF (S)		459 734B	7 7 7 + X	2 C C C C C C C C C C C C C C C C C C C	
	M+2	C,H, CC, VCO,			469 7780	- + C	(12 (12 (12 (12 (12 (12 (12 (12 (12 (12	
	M+4	C,H, acl, acl, o,	Pecdo		471.7750		150 50 170 C	(6)
		13C, H, 45C, 37C, O,	Pecdo (S)		513 6775		(12 (18 (12 (2)	(2) 20 (2)
		13C, H, 35C, 37C, O,	Pecdo (S)		[422 9278]		7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	מר היי
		C.H.*CI.*CIO	HDCDPE				(10, 17	<u>د</u> ــــــــــــــــــــــــــــــــــــ
		ر الرام الرام	T.Y.					
	M+2	C,H, &CI, VCIO	HXCDF					
		C.D. H. 201.37.10	1 C C Y					
		12.12.13.13.13.13.13.13.13.13.13.13.13.13.13.	HXCDE (S)					
	Q	13C, H, 3Cl, 37ClO	HXCDF (S)					
		C.H. "Cl."ClO.					-	
		C,H,*C ,*C ,O,	HXCDD		****			
	M+2	¹³Čį²Ĥ¸³°Čij³°ČiƸ	HXCDD (S)					
			HXCDD (S)					
			OCDPE					
-	Y O	O.F.7	A H					

The following nuclidic masses were used:

Ø

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

O = 15.994915 ³⁵Cl = 34.968853 ³⁷Cl = 36.965903

S = internal/recovery standard

LDC #: 2363332

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:	
Reviewer:	9
2nd reviewer:	

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

/	Y	N	N/A
	Y	Ν	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?

Example:

Concentr	ration	$= (A_{\bullet})(I_{\bullet})(DF) (A_{i\bullet})(RRF)(V_{\circ})(\%S)$
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 _°	=	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.

Sample I.D. 16 , A	:
Conc. = (5558510) (2000)((8891740) (1.049)(10)(0.98°
12051	/

		<u> </u>			
		O-manus d	Reported Concentration ()	Calculated Concentration ()	Qualification
#	Sample ID	Compound	()		200000000000000000000000000000000000000
			1		
					<u> </u>
		·			
1				<u> </u>	

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

June 21, 2010

LDC Report Date:

August 9, 2010

Matrix:

Soil

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0F240560

Sample Identification

SA68-0.00BPC SSAK5-01-0.00BPC SA75-0.00BPC

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
0716172MB	6/28/10	1,2,3,7,8,9-HxCDD 1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.078 pg/g 0.40 pg/g 1.1 pg/g 0.13 pg/g 0.48 pg/g 0.37 pg/g 0.45 pg/g	All samples in SDG G0F240560

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
SA75-0.00BPC	1,2,3,4,6,7,8-HpCDD	1.0 pg/g	1.0U pg/g
	OCDD	1.6 pg/g	1.6U pg/g

Samples FB-04072010-RZD (from SDG G0D090441) and FB-04062010-RZB (from SDG G0D120488) 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	SSAK5-01-0.00BPC SA75-0.00BPC
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	SA68-0.00BPC

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
SA68-0.00BPC	2,3,7,8-TCDF 1,2,3,4,7,8-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

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0F240560	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 G0F240560	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 G0F240560

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0F240560	SA68-0.00BPC	2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	P	Project Quantitation Limit (e)
G0F240560	SA68-0.00BPC SSAK5-01-0.00BPC SA75-0.00BPC	All compounds reported below the PQL.	J (all detects)	А	Project Quantitation Limit (sp)
G0F240560	SA68-0.00BPC SSAK5-01-0.00BPC SA75-0.00BPC	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 G0F240560

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F240560	SA75-0.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0U pg/g 1.6U pg/g	А	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F240560

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

LDC #: 23663C21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0F240560	_ Stage 2B
Laboratory: Test America	-

	Date:	84/10
	Page:_	
	Reviewer:	
2nd	Reviewer:	$-\sim$

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	1	Sampling dates: 6/21/10
11.	HRGC/HRMS Instrument performance check	4	, ,
111.	Initial calibration	\triangle	
IV.	Routine calibration/it	A	
V	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	w	No assid spl - No Ceral
VII.	Laboratory control samples	Ø	105
VIII.	Regional quality assurance and quality control	Ņ	
IX.	Internal standards	#	
Χ.	Target compound identifications	N	
XI.	Compound quantitation and CRQLs	50	
XII.	System performance	N	
XIII.	Overall assessment of data	A	
XIV.	Field duplicates	N	
XV.	Field blanks	SW	FB04062010-RZB, FB-04072010-RZ

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	SA68-0.00BPC 5	11	0176172NAB	21	31	
2	SSAK5-01-0.00BPC	12	,	22	32	
3	SA75-0.00BPC	13		23	33	
4		14		24	34	
5		15		25	35	·
6		16		26	36	
7		17		27	37	
8		18		28	38	
9		19		29	39	
10		20	·	30	40	

Notes:		

VALIDATION FINDINGS WORKSHEET

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

A, 2,3,7,8-TCDD	F. 1,2,3,4,6,7,8-HpCDD	K. 1,2,3,4,7,8-HxCDF	P. 1,2,3,4,7,8,9-HpCDF	U. Total HpCDD
B. 1,2,3,7,8-PeCDD	g. 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:

3.5

LDC #: 23663C21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Blanks

2nd Reviewer: Reviewer:

Page: 1 of 1

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

Were all samples associated with a method blank?

Y N N/A

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

Was the method blank contaminated? If yes, please see qualification below on date: 6/28/10 Blank analysis date: 7/7/10 N N/A

Blank extraction date: 6/28/10

Conc. units: pg/g		Dialin alialysis date.	1 1	As	Associated samples: All (bl)	mples:	All (bl)		
Compound	Blank ID					Sample	Sample Identification		
	0176172MB	2X	3						
ш	0.078	0.39			VOTO		××		
L.	0.40	2	1.0/0						
9	7-	5.5	1.6/U						
×	0.13	0.65							
0	0.48	2.4							
۵	0.37	1.85							
O	0.45	2.25							
	·								
The state of the 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"

SDG #:See Cover LDC #: 23663C21

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?

Bfank units: pg/L Associated sample units

Sampling date: 4/7/10

Field blank type: (circle one) Field Blank / Rinsate / Other:	Field Blank / Rinsate	/ Other:	Associated Samples:		2-3(>5X)		
Compound	Blank ID			Sample Ide	cation		
St. (GDD090441)	FB-04072010-RZD	5X					
C	0.89	0.00445					
3	1.5	0.0075					
ш	2.2	0.011					
9	8.3	0.0415					
X	1.4	0.007					
L	1.6	0.008					
M	1.5	0.0075					
Z	1.6	0.008					
0	1.3	0.0065					
Q .	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 #: 23663C21

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: / of 2nd Reviewer:_ Reviewer:

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

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

Blank units: pg/L Associated sample units

Sampling date: 4/6/10
Field blank tyne: (circle one) Field Blank / Bi

4 (SEX)

0 034
8.2

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".

SDG #: 501 COULD LDC #: 23/13/2

Compound Quantitation and Reported CRQLs VALIDATION FINDINGS WORKSHEET

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".

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 Late to								
Associated Samples		THE REAL PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS							
GAS > Cal-breezes	H. K. O. P. &	,							
Sample ID	/								
Date									
*									

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:

June 24 through June 25, 2010

LDC Report Date:

August 9, 2010

Matrix:

Soil/Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0F260448

Sample Identification

SSAR4-04-1.00BPC

SSAR4-04-2.00BPC

SSAR4-04-3.00BPC**

SSAR4-04-1.00BPC FD

EB06242010-RZD

SSAJ8-01-6.00BPC

SSAJ8-01-6.00BPC FD

EB0624010-RZB

SSAK8-03-5BPC

SSAK8-03-10BPC

SSAK8-03-15BPC**

SSAK8-03-15BPC FD**

SSAJ8-02-5BPC

SSAJ8-02-10BPC

SSAJ8-02-15BPC**

EB-06252010-RZD

SSAR4-04-3.00BPCMS

SSAR4-04-3.00BPCMSD

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 15 soil samples and 3 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.

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
0181166MB	6/30/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.4 pg/L 6.3 pg/L 3.8 pg/L 7.5 pg/L 4.8 pg/L 14 pg/L	All water samples in SDG G0F260448
0182443MB	7/1/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.13 pg/g 0.56 pg/g 0.10 pg/g 0.10 pg/g 0.044 pg/g 0.21 pg/g 0.099 pg/g 0.68 pg/g	All soil samples in SDG G0F260448

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
EB06242010-RZD	1,2,3,4,6,7,8-HpCDD	9.7 pg/L	9.7U pg/L
	OCDD	16 pg/L	16U pg/L
	1,2,3,4,7,8-HxCDF	11 pg/L	11U pg/L
	1,2,3,4,6,7,8-HpCDF	20 pg/L	20U pg/L
	1,2,3,4,7,8,9-HpCDF	13 pg/L	13U pg/L
	OCDF	53 pg/L	53U pg/L
EB0624010-RZB	1,2,3,4,6,7,8-HpCDD	4.1 pg/L	4.1U pg/L
	OCDD	7.4 pg/L	7.4U pg/L
	1,2,3,4,7,8-HxCDF	5.5 pg/L	5.5U pg/L
	1,2,3,4,6,7,8-HpCDF	11 pg/L	11U pg/L
	1,2,3,4,7,8,9-HpCDF	3.7 pg/L	3.7U pg/L
	OCDF	22 pg/L	22U pg/L
EB-06252010-RZD	1,2,3,4,6,7,8-HpCDD	5.0 pg/L	5.0U pg/L
	OCDD	10 pg/L	10U pg/L
	1,2,3,4,7,8-HxCDF	3.9 pg/L	3.9U pg/L
	1,2,3,4,6,7,8-HpCDF	12 pg/L	12U pg/L
	1,2,3,4,7,8,9-HpCDF	4.3 pg/L	4.3U pg/L
	OCDF	25 pg/L	25U pg/L
SSAR4-04-1.00BPC	1,2,3,4,6,7,8-HpCDD	0.55 pg/g	0.55U pg/g
	OCDD	2.7 pg/g	2.7U pg/g
SSAR4-04-2.00BPC	1,2,3,4,6,7,8-HpCDD	0.57 pg/g	0.57U pg/g
	OCDD	1.8 pg/g	1.8U pg/g
	2,3,7,8-TCDF	0.26 pg/g	0.26U pg/g

Sample	Compound	Reported Concentration	Modified Final Concentration
SSAR4-04-3.00BPC**	1,2,3,4,6,7,8-HpCDD	0.37 pg/g	0.37U pg/g
<u> </u>	OCDD	2.2 pg/g	2.2U pg/g
	2,3,7,8-TCDF	0.40 pg/g	0.40U pg/g
SSAR4-04-1.00BPC_FD	2,3,7,8-TCDF	0.43 pg/g	0.43U pg/g
SSAK8-03-5BPC	1 2 2 4 6 7 8 Hacada	0.15 mm/m	0.4511.00/0
00A110-00-021 0	1,2,3,4,6,7,8-HpCDD OCDD	0.15 pg/g 0.58 pg/g	0.15U pg/g 0.58U pg/g
	2,3,7,8-TCDF		
	1,2,3,4,7,8-HxCDF	0.13 pg/g	0.13U pg/g
	1,2,3,6,7,8-HxCDF	0.20 pg/g 0.13 pg/g	0.20U pg/g 0.13U pg/g
	1,2,3,4,6,7,8-HpCDF		
	1,2,3,4,7,8,9-HpCDF	0.37 pg/g	0.37U pg/g
	OCDF	0.20 pg/g	0.20U pg/g
	OCDF	0.86 pg/g	0.86U pg/g
SSAK8-03-10BPC	1,2,3,4,6,7,8-HpCDD	0.18 pg/g	0.18U pg/g
	OCDD	0.73 pg/g	0.73U pg/g
	1,2,3,4,7,8-HxCDF	0.095 pg/g	0.095U pg/g
	1,2,3,6,7,8-HxCDF	0.085 pg/g	0.085U pg/g
	1,2,3,4,6,7,8-HpCDF	0.21 pg/g	0.21U pg/g
	1,2,3,4,7,8,9-HpCDF	0.12 pg/g	0.12U pg/g
	OCDF	0.76 pg/g	0.76U pg/g
SSAK8-03-15BPC**	OCDD	2.1 pg/g	2.1U pg/g
SSAK8-03-15BPC_FD**	OCDD	2.0 pg/g	2.0U pg/g
SSAJ8-02-5BPC	1,2,3,4,6,7,8-HpCDD	0.11 pg/g	0.11U pg/g
	OCDD	0.70 pg/g	0.70U pg/g
	2,3,7,8-TCDF	0.12 pg/g	0.12U pg/g
	1,2,3,4,7,8-HxCDF	0.15 pg/g	0.15U pg/g
	1,2,3,6,7,8-HxCDF	0.055 pg/g	0.055U pg/g
	1,2,3,4,6,7,8-HpCDF	0.30 pg/g	0,30U pg/g
	1,2,3,4,7,8,9-HpCDF	0.13 pg/g	0.13U pg/g
	OCDF	0.62 pg/g	0.62U pg/g
SSAJ8-02-10BPC	1,2,3,4,6,7,8-HpCDD	0.25 pg/g	0.25U pg/g
	OCDD	0.74 pg/g	0.74U pg/g
	2,3,7,8-TCDF	0.27 pg/g	0.27U pg/g
SSA IS 00 15PD0**	1034678 Hoods	0.40 ==/=	0.4011
SSAJ8-02-15BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.49 pg/g 1.2 pg/g	0.49U pg/g 1.2U pg/g

Samples EB06242010-RZD, EB0624010-RZB, and EB-06252010-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
EB06242010-RZD	6/24/10	1,2,3,7,8-PeCDD 1,2,3,6,7,8-HxCDD 1,2,3,4,6,7,8-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 1,2,3,7,8,9-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,6,7,8-HpCDF 0CDF	4.3 pg/L 3.7 pg/L 4.1 pg/L 9.7 pg/L 16 pg/L 6.7 pg/L 11 pg/L 7.6 pg/L 3.9 pg/L 4.4 pg/L 20 pg/L 13 pg/L 53 pg/L	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD
EB0624010-RZB	6/24/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.1 pg/L 7.4 pg/L 5.5 pg/L 11 pg/L 3.7 pg/L 22 pg/L	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD
EB-06252010-RZD	6/25/10	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	5.0 pg/L 10 pg/L 2.9 pg/L 3.9 pg/L 3.3 pg/L 12 pg/L 4.3 pg/L 25 pg/L	SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC**

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-04062010-RZB (from SDG G0D120488) 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 1,2,3,4,6,7,8,9-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 1.4 pg/L 1.4 pg/L 4.1 pg/L 4.1 pg/L	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC**

Field Blank ID	Sampling Date	Compound	Concentration	Associated Samples
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 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	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_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. 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
SSAR4-04-2.00BPC	¹³ C-OCDD	29 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAJ8-01-6.00BPC	¹³ C-OCDD	33 (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 compound quantitation and CRQLs were within validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
SSAR4-04-3.00BPC** SSAK8-03-5BPC SSAJ8-02-5BPC SSAJ8-02-10BPC EB06242010-RZD EB-06252010-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	P

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0F260448	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 G0F260448	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

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

XII. System Performance

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

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAR4-04-1.00BPC and SSAR4-04-1.00BPC_FD, samples SSAJ8-01-6.00BPC and SSAJ8-01-6.00BPC_FD, and samples SSAK8-03-15BPC** and SSAK8-03-15BPC_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	SSAR4-04-1.00BPC	SSAR4-04-1.00BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
1,2,3,4,7,8-HxCDD	0.12	0.14	-	0.02 (≤2.6)	-	•
1,2,3,6,7,8-HxCDD	0.24	0.27	-	0.03 (≤2.6)	· -	-
1,2,3,7,8,9-HxCDD	0.31	0.27	-	0.04 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	0.55	0.73	-	0.18 (≤2.6)	-	-
OCDD .	2.7	3.8	-	1.1 (≤5.3)	-	-
2,3,7,8-TCDF	0.57	0,43	-	0.14 (≤0.53)	-	-
1,2,3,7,8-PeCDF	0.72	0.43	-	0.29 (≤2.6)	-	-
2,3,4,7,8-PeCDF	0.40	0.33	-	0.07 (≤2.6)	-	-
1,2,3,4,7,8-HxCDF	1.1	0.70	•	0.4 (≤2.6)	•	-
1,2,3,6,7,8-HxCDF	0.79	0.46	-	0.33 (≤2.6)	-	
2,3,4,6,7,8-HxCDF	0.17	0.15	-	0.02 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.27	0.16	· •	0.11 (≤2.6)	*	-
1,2,3,4,6,7,8-HpCDF	2.6	1.7	-	0.9 (≤2.6)	-	•
1,2,3,4,7,8,9-HpCDF	0.98	0.57	_	0.41 (≤2.6)	•	-
OCDF	6.3	4.1	-	2.2 (≤5.3)	<u>.</u>	-

	Concentra	ition (pg/g)				,	
Compound	SSAJ8-01-6.00BPC	SSAJ8-01-6.00BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P	
2,3,7,8-TCDD	0.36	0.26	-	0.1 (≤0.54)	-		
1,2,3,7,8-PeCDD	1.2	0.7	-	0.5 (≤2.7)		-	
1,2,3,4,7,8-HxCDD	0.96	0.65	-	0.31 (≤2.7)	-	-	
1,2,3,6,7,8-HxCDD	1.5	1.0	*	0.5 (≤2.7)	-	-	
1,2,3,7,8,9-HxCDD	1.2	0.90	-	0.3 (≤2.7)	-	-	
1,2,3,4,6,7,8-HpCDD	5.6	4.4	-	1.2 (≤2.7)	-	-	
OCDD	7.0	5.1	-	1.9 (≤5.4)	-	-	
2,3,7,8-TCDF	7.9	4.7	51 (≤50)	-	J (all detects)	А	
1,2,3,7,8-PeCDF	16	9.6	-	6.4 (≤2.7)	J (all detects)	А	
2,3,4,7,8-PeCDF	8.6	5.3	-	3.3 (≤2.7)	J (all detects)	А	
1,2,3,4,7,8-HxCDF	30	21	35 (≤50)	-	-	-	
1,2,3,6,7,8-HxCDF	21	15	33 (≤50)	-	-	-	
2,3,4,6,7,8-HxCDF	4.6	3.8	-	0.8 (≤2.7)	-	-	
1,2,3,7,8,9-HxCDF	4.0	2.7	-	1.3 (≤2.7)	-		
1,2,3,4,6,7,8-HpCDF	83	62	29 (≤50)	-	-	_	
1,2,3,4,7,8,9-HpCDF	35	31	12 (≤50)	-	-	-	
OCDF	210	150	33 (≤50)	*	-	-	

	Concentra	ation (pg/g)	222	Diff.		
Compound	SSAK8-03-15BPC**	SSAK8-03-15BPC_FD**	RPD (Limits)	Difference (Limits)	Flags	A or P
1,2,3,4,7,8-HxCDD	0.21	0.17	-	0.04 (≤2.6)	-	-

	Concentra	tion (pg/g)	DDD			
Compound	SSAK8-03-15BPC**	SSAK8-03-15BPC_FD**	RPD (Limits)	Difference (Limits)	Flags	A or P
1,2,3,6,7,8-HxCDD	0.26	0.33	-	0.07 (≤2.6)	-	-
1,2,3,7,8,9-HxCDD	0.34	0.35	-	0.01 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDD	1.1	1.1	-	0 (≤2.6)	-	-
OCDD	2.1	2.0	-	0.1 (≤5.3)	-	-
2,3,7,8-TCDF	1.3	1.0	-	0.3 (≤0.53)	-	-
1,2,3,7,8-PeCDF	2.5	2.0		0.5 (≤2.6)	-	-
2,3,4,7,8-PeCDF	1.3	1.2	-	0.1 (≤2.6)	- .	-
1,2,3,4,7,8-HxCDF	4.3	4.5	-	0.2 (≤2.6)	-	-
1,2,3,6,7,8-HxCDF	3.2	3.1	•	0.1 (≤2.6)	-	-
2,3,4,6,7,8-HxCDF	0.78	0.72	-	0.06 (≤2.6)	-	-
1,2,3,7,8,9-HxCDF	0.52	0.61	. -	0.09 (≤2.6)	-	-
1,2,3,4,6,7,8-HpCDF	12	12	-	0 (≤2.6)	-	-
1,2,3,4,7,8,9-HpCDF	4.8	4.8	-	0 (≤2.6)	-	-
OCDF	24	24	-	0 (≤5.3)	-	-
1,2,3,7,8-PeCDD	2.6U	0.22	•	2.38 (≤2.6)	•	-

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0F260448

0.5.5			F1		Page (Octo)
SDG G0F260448	Sample SSAR4-04-2.00BPC SSAJ8-01-6.00BPC	OCDD OCDF	Flag J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A or P	Reason (Code) Internal standards (%R) (i)
G0F260448	SSAR4-04-3.00BPC** SSAK8-03-5BPC SSAJ8-02-5BPC SSAJ8-02-10BPC EB06242010-RZD EB-06252010-RZD	2,3,7,8-TCDF	None	Р	Project Quantitation Limit (2nd column confirmation) (0)
G0F260448	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD EB06242010-RZD SSAJ8-01-6.00BPC_SSAJ8-01-6.00BPC_FD EB0624010-RZB SSAK8-03-5BPC SSAK8-03-10BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-15BPC SSAJ8-02-10BPC SSAJ8-02-15BPC** EB-06252010-RZD	All compounds reported below the PQL. J (all detects		A	Project Quantitation Limit (sp)
G0F260448	SSAR4-04-1.00BPC SSAR4-04-2.00BPC SSAR4-04-3.00BPC** SSAR4-04-1.00BPC_FD EB06242010-RZD SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC SSAK8-03-5BPC SSAK8-03-15BPC SSAK8-03-15BPC** SSAK8-03-15BPC_FD** SSAJ8-02-5BPC SSAJ8-02-10BPC SSAJ8-02-15BPC** EB-06252010-RZD	All compounds reported as EMPC	eported as JK (all detects)		Project Quantitation Limit (k)
G0F260448	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD	2,3,7,8-TCDF	J (all detects)	A	Field duplicates (RPD) (fd)
G0F260448	SSAJ8-01-6.00BPC SSAJ8-01-6.00BPC_FD	1,2,3,7,8-PeCDF 2,3,4,7,8-PeCDF	J (all detects) J (all detects)	А	Field duplicates (Difference) (fd)

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Laboratory Blank Data Qualification Summary - SDG G0F260448

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F260448	EB06242010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	9.7U pg/L 16U pg/L 11U pg/L 20U pg/L 13U pg/L 53U pg/L		Ы
G0F260448	EB0624010-RZB	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	4.1U pg/L 7.4U pg/L 5.5U pg/L 11U pg/L 3.7U pg/L 22U pg/L	A	ы
G0F260448	EB-06252010-RZD	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	5.0U pg/L 10U pg/L 3.9U pg/L 12U pg/L 4.3U pg/L 25U pg/L	A	ы
G0F260448	SSAR4-04-1.00BPC	1,2,3,4,6,7,8-HpCDD OCDD	0.55U pg/g 2.7U pg/g	А	bl
G0F260448	SSAR4-04-2.00BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.57U pg/g 1.8U pg/g 0.26U pg/g	А	bl
G0F260448	SSAR4-04-3.00BPC**	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.37U pg/g 2.2U pg/g 0.40U pg/g	A	bl
G0F260448	SSAR4-04- 1.00BPC_FD	2,3,7,8-TCDF	0.43U pg/g	А	bl
G0F260448	SSAK8-03-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.15U pg/g 0.58U pg/g 0.13U pg/g 0.20U pg/g 0.13U pg/g 0.37U pg/g 0.20U pg/g 0.86U pg/g	A	ы

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0F260448	SSAK8-03-10BPC	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 OCDF	0.18U pg/g 0.73U pg/g 0.095U pg/g 0.085U pg/g 0.21U pg/g 0.12U pg/g 0.76U pg/g	A	bl
G0F260448	SSAK8-03-15BPC**	OCDD	2.1U pg/g	А	bl
G0F260448	SSAK8-03- 15BPC_FD**	OCDD	2.0U pg/g	A	bl
G0F260448	SSAJ8-02-5BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF 1,2,3,4,7,8-HxCDF 1,2,3,6,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.11U pg/g 0.70U pg/g 0.12U pg/g 0.15U pg/g 0.055U pg/g 0.30U pg/g 0.13U pg/g 0.62U pg/g	A	ы
G0F260448	SSAJ8-02-10BPC	1,2,3,4,6,7,8-HpCDD OCDD 2,3,7,8-TCDF	0.25U pg/g 0.74U pg/g 0.27U pg/g	A	bl
G0F260448	SSAJ8-02-15BPC**	1,2,3,4,6,7,8-HpCDD OCDD	0.49U pg/g 1.2U pg/g	A	bl

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0F260448

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0F260448

No Sample Data Qualified in this SDG

Tronox Northgate Henderson VALIDATION COMPLETENESS WORKSHEET

Stage 2B/4

SDG #:	G0F260448	
Laborato	orv: Test America	

LDC #: 23663D21

Date: BA/ HA
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
1.	Technical holding times	A	Sampling dates: 6/34-25/10
11.	HRGC/HRMS Instrument performance check	A	/ /
III.	Initial calibration	A	·
· IV.	Routine calibration/I	A	
V.	Blanks	aw	
VI.	Matrix spike/Matrix spike duplicates	lack	
VII.	Laboratory control samples	4	109
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	w	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	KW	Not reviewed for Stage 2B validation.
XII.	System performance	₩.	· Not reviewed for Stage 2B validation.
XIII.	Overall assessment of data	1	
XIV.	Field duplicates	W,	D=1+4.6+7.11+12
XV.	Field blanks	M	2B=5,8,16. FEXISELUS)

Note:

A = Acceptable

N = Not provided/applicable

SW = See worksheet

ND = No compounds detected

R = Rinsate

FB = Field blank

D = Duplicate

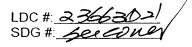
TB = Trip blank

EB = Equipment blank

Validated Samples: ** Indicates sample underwent Stage 4 validation

1	SSAR4-04-1.00BPC	5	11 ,	SSAK8-03-15BPC**	9	21	0182443143	31	
2	SSAR4-04-2.00BPC		12	SSAK8-03-15BPC_FD**		22_	0181166MB	32	
3	SSAR4-04-3.00BPC**		13	SSAJ8-02-5BPC	\perp	23		33	
4	SSAR4-04-1.00BPC_FD	/	14	SSAJ8-02-10BPC		24		34	
5	EB06242010-RZD	W	15	SSAJ8-02-15BPC**	ł	25	·	35	
6,	SSAJ8-01-6.00BPC	9	16	EB-06252010-RZD	W	26		36	
7	SSAJ8-01-6:00BPC_FD	\checkmark	17	SSAR4-04-3.00BPCMS		27		37	
8	EB0624010-RZB	W	18	SSAR4-04-3.00BPCMSD		28		38	
9	SSAK8-03-5BPC	⋬	19			29		39	
10	SSAK8-03-10BPC	3	20			30		40	

Notes:		

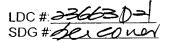


VALIDATION FINDINGS CHECKLIST

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 \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 ≥ 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				
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?				
/II. Laboratory control samples			<u> </u>	
Was an LCS analyzed for this SDG?				
Was an LCS analyzed per extraction batch?	Δ			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within he QC limits?				



VALIDATION FINDINGS CHECKLIST

Page: of Pag

VIII. Regional Quality Assurance and Quality Control	1	1	<u>.</u>	
Were performance evaluation (PE) samples performed?	ļ <u>.</u>	/	1	
Were the performance evaluation (PE) samples within the acceptance limits?	<u> </u>	<u> </u>	<u></u>	
IX. Internal standards	,	т		
Were internal standard recoveries within the 40-135% criteria?		/	ļ	
Was the minimum S/N ratio of all internal standard peaks ≥ 10?		<u> </u>	<u> </u>	
X. Target compound identification	т	1	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?		ļ		
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?	/		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		· . [5],		
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?		27 FEE		-
XII System performance				
System performance was found to be acceptable.				
XIII. Overall assessment of data			eri Vergenis	
Overall assessment of data was found to be acceptable.				
XIV: Field duplicates			\$475 - 3.5 6.5	
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	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 #: See Cover LDC #: 23663D21

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? N N/A N/A N/A N/A

Was the method blank contaminated? If yes, please see qualification below. n date: 6/30/10 Blank analysis date: 7/9/10 Blank extraction date: 6/30/10

Associated samples: Conc. units: pg/L

Compound	Blank ID					Sample I	Sample Identification		
	0181166MB	5X	ĸ	α	16				
Ц	4.4	22	9.7/0	4.1/U	5.0/U				
9	6.3	31.5	16/U	7.4/U	10/N				
X	3.8	19	11/U	5.5/U	3.9/U				
0	7.5	37.5	20/N	11/U	12/N				
d	4.8	24	13/0	3.7/U	4.3/U				
ø	14	70	53/U	22/U	25/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 #: 23663D21

VALIDATION FINDINGS WORKSHEET

Page: 1 of 2-2nd Reviewer: 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? Was the method blank contaminated? If yes, please see qualification below

N N/A

Associated samples: Blank analysis date: 7/11/10 Blank extraction date: 7/1/10 Conc. units: pg/g

All Soils (bl)

0.055/U 0.11/U 0.30/U 0.13/U 0.70/U 0.12/U 0.15/U 0.62/U 2.0/∪ 2.1/∪ 0.085/U 0.095/U 0.21/U 0.18/U 0.73/U 0.12/U 0.76/U þ Sample Identification 0.15/U 0.58/U 0.20/U 0.13/U 0.37/U 0.20/U 0.86/∪ 0.13/U 0.43/U 0.40/U 0.37/U 2.2/∪ 0.26/U 0.57/U 1.8/U 2.7/U 0.55/U 0.495 0.65 0.22 1.05 ĸ 2.8 0.5 0.5 3.4 0182443MB Blank ID 0.044 0.099 0.13 0.56 0.10 0.10 0.68 0.21 Compound ග 0 Ø Φ I

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"

3D21	Cover
2366	See
# 0	# 9
	S

VALIDATION FINDINGS WORKSHEET Blanks

Page: Zof≱ 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: 7/11/10 Blank extraction date: 7/1/10

Conc. units: pg/g				Ass	Associated samples:	nples:	All Soils (bl)	1		
Compound	Blank ID					Sample	Sample Identification			
	0182443MB	5X	14	15						
Ľ	0.13	0.65	0.25/U	0.49/U						
9	0.56	2.8	0.74/U	1.2/U						
Н	0.10	0.5	0.27/U							
×	0.10	0.5								
_1	0.044	0.22								
0	0.21	1.05								
d	0.099	0.495								
σ	0.68	3.4								

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 #: 23663D21

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 Associated sample units

b/bd Sampling date: 6/24/10

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

Associated Samples:

6 - 7 (> 5X)

					,													
	ation		·															
	Sample Identification																	
	S																	
Associated dailipies.												-						
, Ourel.		X9	0.0215	0.0185	0.0205	0.0485	0.08	0.0255	0.0335	0.055	0.038	0.0195	0.022	0.1	0.065	0.265		
אווואין אווואמנכ	Blank ID	EB06242010-RZD	4.3	3.7	4.1	9.7	16	5.1	6.7	11	7.6	3.9	4.4	20	13	53		
וובל ו ובות ו		EBO																
reid bigin type: (circle die) i ieid bigin/ i illisate/ otrei:	Compound												-				1	
reid Diair	3		В	٥	Ш	F	9	Н	_	¥	-1	M	z	0	<u>a</u>	a		200

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 #: 23663D21

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?

b/bd Associated sample units:_ Blank units: pg/L

Sampling date: 6/24/10

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

Associated Samples: 1/1

1 - 4 (> 5X)

Sample Identification 0.0205 0.0275 0.0185 0.055 0.037 0.11 쫎 EB06242010-RZB Blank ID 5.5 4.1 7.4 3.7 - 22 Compound Ö 0 Ø

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 #: 23663D21

VALIDATION FINDINGS WORKSHEET

Field Blanks

Page:_ Reviewer: 2nd Reviewer:

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

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

Associated sample units: Blank units: pg/L

Sampling date: 6/25/10

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

9 - 15 (> 5X)

										 		 	_	 	
tion															
Sample Identification															
Sa															
	X9	0.02	0.05	0.0145	0.0195	0.0165	90:0	0.0215	0.125						
Compound Blank ID	モダー EB06252010-RZD	5.0	10	2.9	3.9	3.3	12	4.3	25						
Compound															
သိ		Ш	ပ	エ	¥	Γ	, 0	۵	ø						CROL

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".

SDG #: See Cover LDC #: 23663D21

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: 1 of / 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

b/bd Associated sample units:

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

Field blank type: (circle one) Field Blank / Rinsate / Other:	e) Field Blank / Rinsate	/ Other:	Associated Samples:	6 - 7, 9 - 15(>5X)	
Compound	Blank ID		Sal	Sample Identification	
- (CCDDB0441)	FB-0	5X			
O	0.89	0.00445			
Ш	1.5	0.0075			
Ľ.	2.2	0.011			
ග	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			
	1.4	0.007			
δ	4.1	0.0205			
	THE STATE OF THE S				
				ar programme and the state of t	
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 #: 23663D21 SDG #: See Cover

VALIDATION FINDINGS WORKSHEET Field Blanks

Page: / of 2nd Reviewer: Reviewer:

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

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

Sampling date: 4/6/10

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

1-4 (>5X) Associated Samples:

1							_						 	 	 	
1-4 (~C~)	ation															
1-1	Sample Identification															
illpies.	Š															
Associated Samples.																
,																
, Olliel.		X9	0.0034	0.0125	0.031	0.0135	0.007	0.0041	0.0047	0.009	0.006	0.022				
reid Dialin type, (oil de Oile) Field Dialin / Nilsate / Oillei.	Blank ID	FB04062010-RZB	0.68	2.5	6.2	2.7	1.4	0.82	0.94	1.8	1.2	4.4				
		FB04														
type. (all a	Compound	(G0D120488)														
I ICIN DIGILIA	ပိ	(60	ш	Ľ	၅	I	ᅶ		z	0	Ω.	a				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:

- DE # 3378301 SDG #: 2010

VALIDATION FINDINGS WORKSHEET Internal Standards

Page:__

2nd Reviewer: Reviewer:

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

*	Date	Lab ID/Reference	Internal Standard	•	% Recovery (Limit: 40-135%)		Qualifications
-		٨	+	8	(40-135	135	JM 7 (4. A)
\mid)	()	
		9	¥	33)	(/	_
)	^	
)		
		(SM) _/	+	Ŋ	T (40-	-1351	Notheral
)		
)	(
))	
)	(
))	
)	(
)	(
)	(
)	(
)	(
)		
					_	^	
))	
		Internal Standards	Check Standard Used		Internal Standards	andards	Check Standard Used
4	13C-2,3,7,8-TCDF	ODF			13C-OCDD		
B.	13C-2,3,7,8-TCDD	coo		ᅶ	¹³ C-1,2,3,4-TCDD		
ij	13C-1,2,3,7,8-PeCDF	PeCDF		نـ	¹³ C-1,2,3,7,8,9-HxCDD		
ان	13C-1,2,3,7,8-PeCDD	Pecdo		Σ			
ய	¹³ C-1,2,3,4,7,8-HxCDF	8-HxCDF		z			
F.	13C-1,2,3,6,7,8-HxCDD	8-HxCDD		Ö			
υj	¹³ C-1,2,3,4,6,7,8-HpCDF	7,8-HpCDF		a:			7
r	¹³ C-1,2,3,4,6,7,8-HpCDD	,7,8-HpCDD					

1DC #:25630>

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: 10f A Reviewer: 2nd Reviewer: 1

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

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

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).

	Date	Sample ID	Finding	Associated Samples	Qualifications
II		3,9,13,14,516	6 No s. S. T. 8-Tast and imadium	matin	Nave 7
 		(n)	2UD-	MAX.	1/E(E)
$\vdash \vdash$					
+					
-					
⊢⊢					
-					

Comments: See sample calculation verification worksheet for recalculations

LDC#:<u>23663D21</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	4	RPD	Difference	Limits	(Parent Only)
С	0.12	0.14		0.02	(<u><</u> 2.6)	
D	0.24	0.27		0.03	(<2.6)	
E	0.31	0.27		0.04	(<2.6)	
F	0.55	0.73		0.18	(<2.6)	
G	2.7	3.8		1.1	(<u><</u> 5.3)	
Н	0.57	0.43		0.14	(≤0.53)	
ı	0.72	0.43		0.29	(<u><</u> 2.6)	
J	0.40	0.33		0.07	(<u><</u> 2.6)	
к	1.1	0.70	٠	0.4	(<u>≤</u> 2.6)	
L	0.79	0.46		0.33	(<u><</u> 2.6)	
м	0.17	0.15		0.02	(<u><</u> 2.6)	·
N	0.27	0.16		0.11	(<u><</u> 2.6)	
0	2.6	1.7		0.9	(≤2.6)	
Р	0.98	0.57		0.41	(<u>≤</u> 2.6)	
Q	6.3	4.1		2.2	(≤5.3)	

	Concentrat	tion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	6	7	RPD	Difference	Limits	(Parent Only)
Α	0.36	0.26		0.1	(≤0.54)	
В	1.2	0.70		0.5	(≤2.7)	
С	0.96	0.65		0.31	(<u><</u> 2.7)	
D	1.5	1.0		0.5	(<u><</u> 2.7)	
E	1.2	0.90		0.3	(<2.7)	
F	5.6	4.4		1.2	(<2.7)	
G	7.0	5.1		1.9	(<5.4)	
Н	7.9	4.7	51			idit=/8
I	16	9.6		6.4	(<2.7)	K

rtd;

LDC#: 22663D21 SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

Reviewer 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?

	Concentra	tion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	6	7	RPD	Difference	Limits	(Parent Only)
J	8.6	5.3		3.3	(<2.7)	1 dets/A
к	30	21	35			
L	21	15	33			
М	4.6	3.8		0.8	(<u><</u> 2.7)	
N	4.0	2.7		1.3	(<u><</u> 2.7)	
0	83	62	29			
Р	35	31	12			
Q .	210	150	33			

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	11	12	RPD	Difference	Limits	(Parent Only)
С	0.21	0.17		0.04	(<u><</u> 2.6)	
D	0.26	0.33		0.07	(≤2.6)	
E	0.34	0.35		0.01	(<u>≤</u> 2.6)	
F	1.1	1.1		0	(<u><</u> 2.6)	
G	2.1	2.0		0.1	(≤5.3)	
Н	1.3	1.0		0.3	(≤0.53)	
I	2.5	2.0		0.5	(≤2.6)	
J	1.3	1.2		0.1	(≤2.6)	
κ	4.3	4.5		0.2	(<2.6)	
L	3.2	3.1		0.1	(<2.6)	
М	0.78	0.72		0.06	(≤2.6)	
N	0.52	0.61		0.09	(<u><</u> 2.6)	
o	12	12		0	(<2.6)	
Р	4.8	4.8		0	(≤2.6)	
Q	24	24		0	(≤5.3)	·
В	2.6U	0.22		2.38	(<u><</u> 2.6)	



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

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

				Reported	Recalculated	Reported	Recalculated	Reported	Recalculated
*:	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (Initial)	Average RRF	RRF	RRF	200	
<u> </u>	2401	11	2.3.7.8-TCDF (190-2.3.7.8-TCDF)	11 00 1	7001	122	(mag)	Ush.	%RSD
	1	17.8/		1.00	1.00.	100	1:00	6/6	な人
	(405)	01/01/0	2,3,7,8-TCDD (13C-2,3,7,8-TCDD)	1.04 9	1.049	1.06	10%	4.12	8
		\ \ \	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	6911	1.60	1.20	1.50	*	N
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.073	1.073	// //		7.66	120
			OCDF (40-OCDD)	1.523	1.522	80/	& J /	\$ 45	300
Ø	Cofer	17191	* > 1/10 2,3,7,8-TCDF (190-2,3,7,8-TCDF)	XXX -	98/1	61	61,	000	100
		2/1/4	2.3.7.8-TCDD (13C-2.3.7.8-TCDD)	00%	000%	2	1. 0		10
			1,2,3,6,7,8-HxCDD ("C-1,2,3,6,7,8-HxCDD)						
			1,2,3,4,6,7,8-HpCDD (4C-1,2,4,6,7,8,-HpCDD)						
			OCDF (40-000D)						
6			2,3,7,8-TCDF (19C-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 (19C-1,2,4,6,7,8,-HpCDD)						
			OCDF (40-OCDD)		-				

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

LDC #: 23/2/2/2

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_)

Where:

 $A_{\rm a}=$ Area of associated internal standard $C_{\rm k}=$ Concentration of internal standard ave. RRF = initial calibration average RRF RRF = continuing calibration RRF A_x = Area of compound, A_x = Concentration of compound, C_x = Concentration of compound, C_x

L					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	a %	0%
	11/2/04/05		2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	1.00d	1.05	50.1	<i>Y</i> . <i>N</i> .	4. V.
		01/11/2	2,3,7,8-TCDD (¹³ C-2,3,7,8-TCDD)	1.049	0.99	0.00	7.6	5.2
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	 N.:	<u></u>	<u>ر</u> ب	$\bar{\tilde{W}}$
l			1,2,3,4,6,7,8-HpCDD (1°C-1,2,4,6,7,8,-HpCDD)	1.673	20.	20.	Ų	·
			OCDF (*c-OCDD)	1.523	1.50	1.50	1.5	5.1
8	127/04/05	1/2/1)	7/2 / ,) 2,3,7,8-TCDF (*C-2,3,7,8-TCDF)	1.004	26.0	0.92	7.80	LX
		01/1/	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)	6 70°1	160	0.91	130	N.O
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.163	80.1	1.08	7.5	1.0
			1,2,3,4,6,7,8-HpCDD (°C-1,2,4,6,7,8,-HpCDD)	(.073	1.02	107	4.0	4
			ocpf (*c-ocpp)	425.	1.39	1.29	9.0	0 6
က	1514050		2,3,7,8-TCDF (¹³ C-2,3,7,8-TCDF)	1.086	0.88	188	N K	8,81
		115/10	2,3,7,8-TCDD (1°C-2,3,7,8-TCDD)					
		_	1,2,3,6,7,8-HxCDD (°C-1,2,3,6,7,8-HxCDD)					
			1,2,3,4,6,7,8-HpCDD (1°C-1,2,4,6,7,8,-HpCDD)					
			ocpr (4c-ocpp)					

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. Comments:

SDG #: 2010 LDC # JOI

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:

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

MS/MSD samples: __

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

	ďS	Ke	Samole	Spiked	Sample	Matrix Spike	Spike	Matrix Spike Duplicate	a Duplicata	Reported	Recalculated
Compound	E A	Added	Concentration (PS/8)	Concentration (PS/Q)	itration 5/Q	Percent Recovery	ecovery	Percent Recovery	Recovery	RPD	RPD
	, ne	L NA		V N	MSD	Reported	Recalc	Renorted	Recate	4	****
2.3.7.8-TCDD	N.	0.70	P.N.	202	1.10	98	38	201	100	Ŧ,	<u>+</u>
1.2.3.7.8-PeCDD	106	201	7	100	108	(03	60	(03	103	(·/	0.)
123478-HxCDD	<u></u>	X –	890.0	127	4	1	120	(15	115	4.4	Z.
12.3.4.7.8.9-HpCDF	>		950	7	8	4	4	701	T0)	59	6.8
OCDF	u W	0/4	3,6	23%	225	100	60	105	105	4.9	7.80
)	

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

LDC #: 32662 [2] SDG #568 GRUON

VALIDATION FINDINGS WORKSHEET Laboratory Control Sample Results Verification

Page:bf /	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 duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

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

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

Recalculated

Reported

Recalc

Reported

Recalc

Reported

A XX

100

2 = 0 = V

Percent Recovery

Percent Recovery

9

LCS/LCSD RPD

dsol Y Concentration (FSA) Spiked Sample 181 150 D W 4 ទ 200 TCSD * P5/8 Added Spike 9 9 300 501 2 LCS ID: 018242 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

00

103

20 10

501

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 2.5

Analyte	HPCDF HPCDF HPCDF HPCDD (S) HPCDD (S) NCDPE (S)	000F 000D 000D 000D (S) 000D (S) PCDPE	
Elemental Composition	C. H ³ Cl ₃ ClO C. H ³ Cl ₃ ClO C. H ³ Cl ₃ Cl ₂ C. H ³ Cl ₃ ClO C. H ³ Cl ₃ ClO ₂ C. H ³ Cl ₃ ClO ₂ C. H ³ Cl ₃ Cl ₂ C. H ³ Cl ₃ Cl ₂ Cl ₂ H ³ Cl ₃ Cl ₂ Cl ₂ H ³ Cl ₃ Cl ₂ Cl ₂ H ³ Cl ₃ Cl ₂ Cl ₂ Cl ₂ H ³ Cl ₃ Cl ₂ Cl ₂ Cl ₂ H ³ Cl ₃ Cl ₂ Cl ₂ Cl ₂ Cl ₃ Cl ₂ Cl ₂ Cl ₂	C,120CJ,77ClO C,120CJ,77ClO C,120CJ,77ClO ₂ C,20CJ,77ClO ₂ 13C,20CJ,77ClO ₂ 13C,20CJ,77ClO ₂ C,20CJ,77ClO ₂ C,20CJ,77ClO ₂ C,10CJ,77ClO ₂ C,10CJ,77ClO	
Ol nol	M M M M M M M M M M M M M M M M M M M	M M H + + + + + + + + + + + + + + + + +	
Accurate Mass ^(s)	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 (S) TCDF (S) TCDD TCDD TCDD (S) TCDD (S) TCDD (S)	PecdF PecdF PecdF (S) PecdD PecdD PecdD (S) PecdD (S) PecdD (S)	HXCDF HXCDF (S) HXCDF (S) HXCDD HXCDD HXCDD HXCDD (S) HXCDD (S) PFK
Elemental Composition	C ₁₂ H ₂ ²⁰ Cl ₂ O C ₁₂ H ₂ ²⁰ Cl ₃ O (3C ₁₂ H ₂ ²⁰ Cl ₃ O (3C ₁₂ H ₂ ²⁰ Cl ₃ O C ₁₂ H ₂ ²⁰ Cl ₂ O C ₁₂ H ₂ ²⁰ Cl ₂ O (3C ₁₂ H ₂ ²⁰ Cl ₃ O (3C ₁₂ H ₂ ²⁰ Cl ₃ O (3C ₁₂ H ₂ ²⁰ Cl ₃ O C ₁₂ H ₂ ²⁰ Cl ₃ OCl ₃ O C ₁₂ H ₂ ²⁰ Cl ₃ OCl ₃ OCl ₃ OCl ₃ O	C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO C ₁₂ H ₃ ³ C ₁ ,3 ⁷ C ₁ O ¹³ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ C ₁ O ¹³ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO ₂ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO ₂ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO ₂ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO ₂ C ₁₂ H ₃ ³ C ₁ ,3 ⁷ ClO C ₂ F ₁₃	C ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO C ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO 10 ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO C ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO C ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO 10 ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO 10 ₁₂ H ₂ ²⁶ C ₁₃ ²⁷ ClO C ₁₂ H ₂ ²⁶ Cl ₃ ²⁷ ClO
Ol nol	CK 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	M M H + 2 + 2 + 2 M M H + 2 + 4 C M H + 4 + 4 C C C K M H + 4 + 4 C C K M H + 4 C C K M H + 4 C C K M H + 4 C C C K M H + 4 C C C K M H + 4 C C C K M H + 4 C C C C C C C C C C C C C C C C C C	M M M M H + 2 M M M M H + 4 + 2 M M M M H + 4 + 4 + 2 M M M M M H + 4 + 4 + 2 M M M M M M M H + 4 + 2 M M M M M M M M M M M M M M M M M M M
Accurate mass ^(s)	303.9016 305.8987 315.9419 317.9389 319.8965 321.8936 333.9338 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	-	N	თ

The following nuclidic masses were used:

₫

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

O = 15.994915 $^{36}C_1 = 34.968853$ $^{37}C_1 = 36.965903$

S = internal/recovery standard

LDC #: 23/23/02/ SDG #/20/ COUN

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page:	<u>/</u> of_/
Reviewer:_	<u>a</u>
2nd reviewer:_	h

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

/Y	И	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?

Concentration = $(A_{\bullet})(I_{\bullet})(DF)$ $(A_{\bullet})(RRF)(V_{\circ})(\%S)$

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

A_s = Area of the characteristic ion (EICP) for the specific internal standard

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

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

RRF = Relative Response Factor (average) from the initial calibration

Df = Dilution Factor.

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

Example:

Sample I.D. ________

Conc. = (174155)(2000)(0.26)(0.26)(0.38)

= 0.3Tp=/g

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

Laboratory Data Consultants, Inc. Data Validation Report

Project/Site Name:

Tronox LLC Facility, PCS, Henderson, Nevada

Collection Date:

June 29 through June 30, 2010

LDC Report Date:

August 9, 2010

Matrix:

Soil/Water

Parameters:

Dioxins/Dibenzofurans

Validation Level:

Stage 2B & 4

Laboratory:

TestAmerica, Inc.

Sample Delivery Group (SDG): G0G010578

Sample Identification

SSAK3-06-1BPC

SSAK3-06-2BPC

SSAJ2-05-1BPC

SSAJ2-05-5BPC FD

SSAJ2-05-5BPC

SSAJ2-05-10BPC**

SSAK5-05-1BPC

SSAK5-05-9BPC

SSAK6-05-1BPC

SSAK6-05-1BPC FD

EB-06292010-RZD

SA94-0BPC

SA105-0BPC

SSAJ2-05-1BPCMS

SSAJ2-05-1BPCMSD

SSAK6-06-1BPC

^{**}Indicates sample underwent Stage 4 review

Introduction

This data review covers 15 soil samples and one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8290 for Polychlorinated Dioxins/Dibenzofurans.

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

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

Blank results are summarized in Section V.

Field duplicates are summarized in Section XIV.

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

The following are definitions of the data qualifiers:

- J+ Data are qualified as estimated, with a high bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J- Data are qualified as estimated, with a low bias likely to occur. False positives or false negatives are unlikely to have been reported.
- J Data are qualified as estimated; it is not possible to assess the direction of the potential bias. False positives or false negatives are unlikely to have been reported.
- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- R Data are qualified as rejected. There is a significant potential for the reporting of false negatives or false positives.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- B The analytical result may be a false positive totally attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JB The analytical result may be biased high and partially attributable to blank contamination. This qualifier is applicable to radiochemistry analysis only.
- JK The analytical result is an estimated maximum possible concentration (EMPC).
- X The analytical result is not used for reporting because a more accurate and precise result is reported in its place.
- J-TDS The analytical result is estimated based on failure of the Total Dissolved Solids (TDS) correctness check performed in accordance with the Standard Method 1030E.
- J-CAB The analytical result is estimated based on failure of the cation-anion balance correctness check performed in accordance with Standard Method 1030E.
- J-TDS & CAB The analytical result is unreliable based on the failure of the cation-anion balance and TDS correctness check performed in accordance with standard Method 1030E.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

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

II. HRGC/HRMS Instrument Performance Check

Instrument performance was checked at the required daily frequency.

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

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

III. Initial Calibration

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

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

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

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

IV. Routine Calibration (Continuing)

Routine calibration was performed at the required frequencies.

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

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
0187271MB	7/6/10	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,7,8-HxCDF 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	0.49 pg/g 2.7 pg/g 0.21 pg/g 0.42 pg/g 0.28 pg/g 0.76 pg/g	All soil samples in SDG G0G010578
0188260MB	7/7/10	1,2,3,4,7,8-HxCDD 1,2,3,6,7,8-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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	1.8 pg/L 1.5 pg/L 2.8 pg/L 11 pg/L 1.4 pg/L 1.8 pg/L 2.0 pg/L 1.7 pg/L 1.5 pg/L 3.8 pg/L 1.1 pg/L 8.2 pg/L	All water samples in SDG G0G010578

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
SSAK3-06-2BPC	OCDD	12 pg/g	12U pg/g
SSAK5-05-9BPC	1,2,3,4,6,7,8-HpCDD	1.0 pg/g	1.0U pg/g
	OCDD	2.8 pg/g	2.8U pg/g
EB-06292010-RZD	OCDD	13 pg/L	13U pg/L
	1,2,3,4,6,7,8-HpCDF	5.5 pg/L	5.5U pg/L

Sample EB-06292010-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-06292010-RZD	6/29/10	OCDD 1,2,3,4,6,7,8-HpCDF	13 pg/L 5.5 pg/L	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK6-05-1BPC SSAK6-05-1BPC SSAK6-05-1BPC SSAK6-06-1BPC

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

Samples FB-04072010-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 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 1.6 pg/L 1.6 pg/L 1.3 pg/L 1.4 pg/L 4.1 pg/L	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-1BPC SSAK6-05-1BPC SSAK6-05-1BPC SSAK6-05-1BPC
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 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 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 1.5 pg/L 6.7 pg/L	SA94-0BPC SA105-0BPC

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

VI. Matrix Spike/Matrix Spike Duplicates

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

VII. Laboratory Control Samples (LCS)

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

VIII. Regional Quality Assurance and Quality Control

Not applicable.

IX. Internal Standards

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

Sample °	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK3-06-1BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-OCDD	38 (40-135) 21 (40-135)	OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р
SSAK3-06-2BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	24 (40-135) 29 (40-135) 11 (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
SSAJ2-05-5BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD	39 (40-135) 28 (40-135)	1,2,3,4,6,7,8-HpCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	Р
SSAJ2-05-10BPC**	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) 39 (40-135) 32 (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
SSAK5-05-9BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	30 (40-135) 31 (40-135) 20 (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
SSAK6-05-1BPC	¹³ C-OCDD	38 (40-135)	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р
SSAK6-05-1BPC_FD	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	32 (40-135) 31 (40-135) 17 (40-135)	1,2,3,4,6,7,8-HpCDD OCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects) UJ (all non-detects)	Р

Sample	Internal Standards	%R (Limits)	Compound	Flag	A or P
SSAK6-06-1BPC	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-1,2,3,6,7,8-HxCDD 13C-1,2,3,4,6,7,8-HpCDF 13C-1,2,3,4,6,7,8-HpCDD 13C-0CDD	24 (40-135) 22 (40-135) 25 (40-135) 28 (40-135) 24 (40-135) 24 (40-135) 14 (40-135) 14 (40-135) 9.9 (40-135)	All TCL compounds	J (all detects) UJ (all non-detects)	Р
SA105-0BPC	¹³ C-1,2,3,4,6,7,8-HpCDF ¹³ C-1,2,3,4,6,7,8-HpCDD ¹³ C-OCDD	35 (40-135) 39 (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
SSAJ2-05-1BPC	2,3,7,8-TCDF	Sample result exceeded calibration range.	Reported result should be within calibration range.	J (all detects)	Р
SSAJ2-05-5BPC_FD	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)	Р
SSAJ2-05-5BPC	1,2,3,4,7,8-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)	Р
SSAK6-05-1BPC	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

Sample	Compound	Finding	Criteria	Flag	A or P
SSAK6-05-1BPC_FD	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 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)	P
SA94-0BPC	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)	Р
SA105-0BPC	2,3,7,8-TCDF 1,2,3,4,7,8-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

All compounds reported below the PQL were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0G010578	All compounds reported below the PQL.	J (all detects)	A

All compounds reported as EMPC were qualified as follows:

Sample	Finding	Flag	A or P
All samples in SDG G0G010578	All compounds reported as estimated maximum possible concentration (EMPC).	JK (all detects)	A

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

XII. System Performance

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

XIII. Overall Assessment of Data

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

XIV. Field Duplicates

Samples SSAJ2-05-5BPC and SSAJ2-05-5BPC_FD and samples SSAK6-05-1BPC and SSAK6-05-1BPC_FD were identified as field duplicates. No polychlorinated dioxins/dibenzofurans were detected in any of the samples with the following exceptions:

	Concentra	ition (pg/g)		5,44		
Compound	SSAK6-05-1BPC	SSAK6-05-1BPC_FD	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	61	74	19 (≤50)	-	-	-
1,2,3,7,8-PeCDD	250	240	4 (≤50)	-	-	_
1,2,3,4,7,8-HxCDD	200	210	5 (≤50)	-	-	-
1,2,3,6,7,8-HxCDD	390	340	14 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	340	280	19 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	1100	1200	9 (≤50)	-	•	-
OCDD	1200	1200	0 (≤50)	-	-	-
2,3,7,8-TCDF	1700	1700	0 (≤50)	-	•	-
1,2,3,7,8-PeCDF	3900	3300	17 (≤50)	-	-	-
2,3,4,7,8-PeCDF	2400	1900	23 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	6800	5600	19 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	5000	4000	22 (≤50)	-	+	-
2,3,4,6,7,8-HxCDF	1000	900	11 (≤50)	-	-	.
1,2,3,7,8,9-HxCDF	1200	830	36 (≤50)	-		-
1,2,3,4,6,7,8-HpCDF	19000	15000	24 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	8200	7400	10 (≤50)	-	-	-
OCDF	54000	46000	16 (≤50)	-	-	-

	Concentrat	ion (pg/g)				
Compound	SSAJ2-05-5BPC_FD	SSAJ2-05-5BPC	RPD (Limits)	Difference (Limits)	Flags	A or P
2,3,7,8-TCDD	130	190	38 (≤50)	-	-	
1,2,3,7,8-PeCDD	530	610	14 (≤50)	-	-	-
1,2,3,4,7,8-HxCDD	420	430	2 (≤50)	-	-	_
1,2,3,6,7,8-HxCDD	760	860	12 (≤50)	-	-	-
1,2,3,7,8,9-HxCDD	680	730	7 (≤50)	-	-	-
1,2,3,4,6,7,8-HpCDD	2700	3600	29 (≤50)	-	-	-
OCDD	3100	3600	15 (≤50)	-	-	-
2,3,7,8-TCDF	3200	4200	27 (≤50)	-	-	-
1,2,3,7,8-PeCDF	9600	13000	30 (≤50)	-	-	-
2,3,4,7,8-PeCDF	5200	6700	25 (≤50)	-	-	-
1,2,3,4,7,8-HxCDF	19000	23000	19 (≤50)	-	-	-
1,2,3,6,7,8-HxCDF	11000	15000	31 (≤50)	-	-	-
2,3,4,6,7,8-HxCDF	2700	3700	31 (≤50)	-	-	-
1,2,3,7,8,9-HxCDF	2300	3300	36 (≤50)	_	-	•
1,2,3,4,6,7,8-HpCDF	50000	66000	28 (≤50)	-	-	-
1,2,3,4,7,8,9-HpCDF	26000	35000	30 (≤50)	•	-	-
OCDF	150000	200000	29. (≤50)	_	-	_

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Data Qualification Summary - SDG G0G010578

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0G010578	SSAK3-06-1BPC	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)
G0G010578	SSAK3-06-2BPC SSAJ2-05-10BPC** SSAK5-05-9BPC SSAK6-05-1BPC_FD SA105-0BPC	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)
G0G010578	SSAJ2-05-5BPC	1,2,3,4,6,7,8-HpCDD 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0G010578	SSAK6-05-1BPC	OCDD	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0G010578	SSAK6-06-1BPC	All TCL compounds	J (all detects) UJ (all non-detects)	Р	Internal standards (%R) (i)
G0G010578	SSAJ2-05-1BPC	2,3,7,8-TCDF	J (all detects)	Р	Project Quantitation Limit (e)
G0G010578	SSAJ2-05-5BPC_FD	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)	Р	Project Quantitation Limit (e)
G0G010578	SSAJ2-05-5BPC	1,2,3,4,7,8-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)
G0G010578	SSAK6-05-1BPC	2,3,7,8-TCDF OCDF	J (all detects) J (all detects)	Р	Project Quantitation Limit (e)
G0G010578	SSAK6-05-1BPC_FD	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 1,2,3,4,6,7,8-HpCDF 1,2,3,4,7,8,9-HpCDF OCDF	J (all detects)	P	Project Quantitation Limit (e)

SDG	Sample	Compound	Flag	A or P	Reason (Code)
G0G010578	SA94-0BPC	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)	Р	Project Quantitation Limit (e)
G0G010578	SA105-0BPC	2,3,7,8-TCDF 1,2,3,4,7,8-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)
G0G010578	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-9BPC SSAK6-05-1BPC SSAK6-05-1BPC_FD EB-06292010-RZD SA94-0BPC SAI05-0BPC SSAK6-06-1BPC	All compounds reported below the PQL.	J (all detects)	A	Project Quantitation Limit (sp)
G0G010578	SSAK3-06-1BPC SSAK3-06-2BPC SSAJ2-05-1BPC SSAJ2-05-5BPC_FD SSAJ2-05-5BPC SSAJ2-05-10BPC** SSAK5-05-1BPC SSAK5-05-9BPC SSAK6-05-1BPC_FD EB-06292010-RZD SA94-0BPC SA105-0BPC SSAK6-06-1BPC	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 G0G010578

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0G010578	SSAK3-06-2BPC	OCDD	12U pg/g	А	bl

SDG	Sample	Compound	Modified Final Concentration	A or P	Code
G0G010578	SSAK5-05-9BPC	1,2,3,4,6,7,8-HpCDD OCDD	1.0U pg/g 2.8U pg/g	A	bl
G0G010578	EB-06292010-RZD	OCDD 1,2,3,4,6,7,8-HpCDF	13U pg/L 5.5U pg/L	А	bi

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Equipment Blank Data Qualification Summary - SDG G0G010578

No Sample Data Qualified in this SDG

Tronox LLC Facility, PCS, Henderson, Nevada Dioxins/Dibenzofurans - Field Blank Data Qualification Summary - SDG G0G010578

No Sample Data Qualified in this SDG

Tronox Northgate Henderson ΞT

LDC #: 23663E21	VALIDATION COMPLETENESS WORKSHEE
SDG #: G0G010578	Stage 2B/4
Laboratory: Test America	

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2nd	Reviewe	er:	$ \vee$	_	

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: 6/29-30/10
11.	HRGC/HRMS Instrument performance check	4	,
III.	initial calibration	<u> </u>	
IV.	Routine calibration/I	1	
V.	Blanks	W	
VI.	Matrix spike/Matrix spike duplicates	aw	14/15 -207 No Qual (20x)
VII.	Laboratory control samples	\triangleleft	105
VIII.	Regional quality assurance and quality control	N	
IX.	Internal standards	W	
X.	Target compound identifications	A	Not reviewed for Stage 2B validation.
XI.	Compound quantitation and CRQLs	\sim	Not reviewed for Stage 2B validation.
XII.	System performance	\rightarrow	Not reviewed for Stage 2B validation.
XIII	Overall assessment of data	1	
XIV.	Field duplicates	W,	D=3+4.9+10
XV.	Field blanks	<₩	2B=11. fBs (Se(WS)

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: ** Indicates sample underwent Stage 4 validation

								
1	SSAK3-06-1BPC	11	EB-06292010-RZD V	1 2	1	0187271MB	31	,
2	SSAK3-06-2BPC	12	SA94-0BPC	2	2	0188260413	32	
3	SSAJ2-05-1BPC	13	SA105-0BPC	2	3		33	
4	SSAJ2-05-5BPC_FD	14	SSAJ2-05-1BPCMS	2	4		34	
5	SSAJ2-05-5BPC	15	SSAJ2-05-1BPCMSD	/ 2	5		35	
6	SSAJ2-05-10BPC**	16	SSAK6-06-LBPC	2	6	2000	36	
7	SSAK5-05-1BPC	17		2	7		37	
8	SSAK5-05-9BPC	18		2	28		38	
9	SSAK6-05-1BPC	19		2	9		39	
10	SSAK6-05-1BPC_FD	20		3	30		40	

Notes:	
	·



VALIDATION FINDINGS CHECKLIST

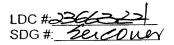
Page: _/of _

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)?				
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?				
and internal standard 2 10?		*	• •	
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?			l	
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>
Reviewer:_	9
2nd Reviewer:	\sim

				
VIII. Regional Quality Assurance and Quality Control	1		.	1
Were performance evaluation (PE) samples performed?				
Were the performance evaluation (PE) samples within the acceptance limits?	<u> </u>	<u> </u>	<u>L</u>	<u></u>
IX. Internal standards	r	ı	1	T
Were internal standard recoveries within the 40-135% criteria?	ļ.,	_	-	
Was the minimum S/N ratio of all internal standard peaks ≥ 10?			<u> </u>	
X. Target compound identification	Τ	I	T	T
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?		<u> </u>	<u> </u>	
XI. Compound quantitation/CRQLs			<u>.</u>	<u> </u>
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			Ī	
Field duplicate pairs were identified in this SDG.				
Target compounds were detected in the field duplicates.	/		<u></u>	
XV. Field blanks		7 4 5/3		
Field blanks were identified in this SDG.				
Target compounds were detected in the field blanks.				

VALIDATION FINDINGS WORKSHEET

METHOD: HRGC/HRMS Dloxins/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 12378-PeCDD	g, ocdd	L. 1,2,3,6,7,8-HxCDF	a, ocbf	V. Total TCDF
	100 H 0 H 0 H 0 H 0 H 0 H 0 H 0 H 0 H 0	M 2 3 4 6 7 8-H×CDF	R. Total TCDD	W. Total PeCDF
C. 1,2,3,4,7,8-HXCDD	n. 2,3,7,8•100F	100000000000000000000000000000000000000		
0 1 2 3 6 7 8.H×CDD	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-HPODF	T. Total HxCDD	Y. Iotal npcor

Notes:

SDG #: See Cover LDC #: 23663E21

VALIDATION FINDINGS WORKSHEET

Page: 1 of 1 Reviewer:_ 2nd Reviewer:_

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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. X N N/A

Blank analysis date: 7/14/10 Blank extraction date: 7/6/10 Conc. units: pg/g

All Soils (bl)

Sample Identification (1 Associated samples: 1.0/0 2.8/U 12/U 2.45 13.5 1.05 3.8 2.1 4. 섥 0187271MB Blank ID 0.49 0.28 0.21 0.42 0.76 2.7 Compound G

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 #: 23663E21

VALIDATION FINDINGS WORKSHEET Blanks

Page: 1 of 1 Reviewer:_ 2nd Reviewer:

METHOD: HRGC/HRMS Dioxins (EPA Method 8290)

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

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 date: 7/12/10 Blank analysis date: 7/12/10 Y N N/A

Blank extraction date: 7/7/10

d Blank ID Sample I	Digith Extraction date. 77710 Digith aligipals date. 77210 Accordated cample: All H2Oc (bl)
1.8 9 1.4 1.4 7 1.4 7 1.5 5.5 1.3/U 5.5/U 5.5/U 5.5/U 5.5/U 5.5 8.2 4.1 5.5/U	Blank ID Sample
1.8 9 11	Blank ID Sample In Sample
1.8 9 1.5 1.5 7.5 2.8 14 1.4 7 1.8 9 2.0 10 2.0 10 3.8 19 5.5 41	Blank ID Sample II Sampl
0188260MB 5X 11 1.8 9 14 1.5 7.5 13/U 1.4 7 1.8 9 2.0 10 8.5 1.7 8.5 19 5.5/U 3.8 19 5.5/U 1.1 5.5 41	Blank ID Sample
1.8 9 1.1	d Blank ID Sample I 1.8 9 14 2.8 14 7 1.8 9 13/U 2.0 10 65.5/U 1.7 8.5 7.5 1.7 8.5 7.5 1.5 7.5 7.5 1.7 8.5 7.5 1.1 5.5 41 8.2 41 6.5,6/U
1.8 9 11	Blank ID Sample
1.8 9 13/U 2.8 1.7 8.5 13/U 5.5/U 5.	Blank ID Sample
0188260MB 5X 11 1.8 9 1 1.5 7.5 13/U 1.4 7 1 1.8 9 9 2.0 10 8.5 1.5 7.5 8.5 1.5 7.5 19 5.5/U	Blank ID Sample
1.8 9 11	d Blank ID Sample In Sample I
1.8 9 11	d Blank lib 5X 11 Sample lib 1.8 9 14 14 14 13/U 13/U 13/U 13/U 13/U 13/U 11 14 <t< td=""></t<>
1.8 9 11 2.8 14 11 1.8 9 1.9 1.1 1.8 9 1.4 1.4 1.4 7 1.8 9 1	d Blank ID Sample ID 1.8 9 Sample ID 1.5 7.5 13/U 1.4 7 13/U 1.8 9 13/U 1.8 9 10
1.8 9 11	d Blank ID Sample ID 0.188260MB 5X 11 1.8 9 3mple ID 1.5 7.5 13/U 1.4 7 13/U 1.8 9 9
1.8 9 11	d Blank ID Sample ID 0.188260MB 5X 11 Sample ID 1.8 9 14 14 14 14 14 14 13/U 13/U 13/U 11/L
1.8 9 11 1.5 7.5 13/U 55 13/U	d Blank ID Sample I 0.188260MB 5X 11 Sample I 1.8 9 14 14 2.8 14 55 13/U
0188260MB 5X 11 1.8 9 1.5 7.5 2.8 14	d Blank ID Sample Id 0.188260MB 5X 11 Sample Id 1.8 9 1.5 7.5 1.4 1.5
1.8 9 1.5 7.5	Blank ID Sample
1.8 9 11 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8 1.8	Blank ID Sample Sample Sample
0188260MB 5X 11	Blank ID Sample
	d Blank ID Sample I
	Sample I
	date. This Diam analysis date. The Descripted comples.

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 # 23662E2

VALIDATION FINDINGS WORKSHEET FIELD Blanks

Tot	9	لِ
Page:_	Reviewer	2nd Reviewer:

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

			_
	\ \ <mark>\</mark>	0	T T
N/A Were field blanks identified in this SDG?	Blank units: 🌣🌮 🚣 Associated sample units: 🕰 🚓	Sampling date: 4/29//0	Field blank type: (circle one) Field Blank / Rinsate /Other.
3	Blan	Sam	Field

6	1	 				 _	$\overline{}$		1	1	 	\neg	1	ı	 1
				,											
×															
1-10, 16 (xex)	ion														
	ple iden														
Associated Samples:	Sa														
Associate															
g. 129															
Rinsate Other															
Field Blank / I	Blank ID	13	5'5												
Sampling date: 4/24/10 Field blank type: (circle one) Field Blank / Rinsate Other	pu	c	Q												
npling date:_ d blank type	Compound														.al
San															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 #: 23663E21

VALIDATION FINDINGS WORKSHEET Field Blanks

} 2nd Reviewer: Reviewer:

Page: __l of_

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

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

b/bd Associated sample units: Blank units: pg/L

Sampling date: 4/7/10

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

16,1-10 (>5X) Associated Samples:

F		_												 				
	ation																	
	Sample Identification																	
	Sa																	
									,									
		5X	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	(G0D090441)																OBO
			ပ	Ξ	и.	၅	メ	7	Σ	z	0	Ь	Ö		l	l		2

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 #:23663E21

VALIDATION FINDINGS WORKSHEET Field Blanks

2nd Reviewer:_ Reviewer:

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

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

Sampling date: 4/8/10

b/bd

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

12 - 13 (>5X) Sample Identification Associated Samples: 0.00335 0.0048 0.0105 0.0075 0.00385 0.00285 0.0048 0.0055 0.0335 0.0037 0.0041 0.005 0.185 0.005 0.021 쫎 FB-04072010-RZC Blank ID 0.74 96.0 0.77 0.82 96.0 0.57 0.67 1.0 1.0 1.5 4.2 [2.1 6.7 37 Compound O 0 O Ω I Σ Z ш

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 #123463274 SDG #1546.40 MM

VALIDATION FINDINGS WORKSHEET Internal Standards

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

Lab ID/Reference	_			- / /
	Internal Standard		% Recovery (Limit: 40-135%)	Qualifications (r)
	4	38	(40-135)	W1 (F 0-B)
		7		/
			()	
d	V	4	()	(F-4.0-8)
	1	2		
		11	()	
			()	
5	4	39	()	(4.0-B)
	T	7 8	(
7	*	33	()	
		80	(
		Ψ,	()	
№	4	30	()	
	+	8	()	
		20	(
				/
4	Н	38	(}	
Internal Standards	Check Standard Used		Internal Standards	Check Standard Used
13C-2 3 7 8-TCDF			1,2-000	
13C.2.3.7 8-TCDD		Υ.	¹³ C-1,2,3,4-TCDD	
13C-1,2,3,7,8-PeCDF		زر	¹³ C-1,2,3,7,8,9-HxCDD	
13C-1,2,3,7,8-PeCDD		Σ		
¹³ C-1,2,3,4,7,8-HxCDF		ż		
13C-1,2,3,6,7,8-HxCDD		o'		
¹³ C-1,2,3,4,6,7,8-HpCDF		o.	7	
13C-1,2,3,4,6,7,8-HpCDD				

SDG #: 461 00 2/2 LDC #: 236632-

VALIDATION FINDINGS WORKSHEET Internal Standards

Page: 스어스 2nd Reviewer: Reviewer:

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

YNAN/A

Was the S/N ratio all internal standard peaks ≥ 10?

LDC #:23/632-

VALIDATION FINDINGS WORKSHEET Compound Quantitation and Reported CRQLs

Page: Or A Reviewer: Cand 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/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	sols aleb rouse	S Associated Samples	Qualifications
		3	[+]	Æ	7 Let 3/7
		4	0-8	4	
		5	K.0-B	5	
		9	# . &	9	
		()	F. H-L. 0-B	Q)	
		7	H.I.K.L. 0-8	[2	
					,
		(3	4. K 0-8	€1	\bigwedge
		M	N P C	MY	(¥) 4 7

Comments: See sample calculation verification worksheet for recalculations

LDC#:23663D21 SDG#: See Cover

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	9	10	RPD	Difference	Limits	(Parent Only)
Α	61	74	19			
В	250	240	4			
С	200	210	5			
D .	390	340	14			
E	340	280	19			
F	1100	1200	9			
G	1200	1200	0			
Н	1700	1700	0			
-	3900	3300	17			
J	2400	1900	23			
к	6800	5600	19			
L	5000	4000	22			
М	1000	900	11			
N	1200	830	36			_
0	19000	15000	24		_	
Р	8200	7400	10			
Q	54000	46000	16			

	Concentrat	tion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	4	5	RPD	Difference	Limits	(Parent Only)
Α	130	190	38			
В	530	610 [,]	14			
С	420	430	2			
D	760	860	12			
E	680	730	7			
F	2700	3600	29			
G	3100	3600	15			

LDC#: 22663E21 SDG#: See Cover

VALIDATION FINDINGS WORKSHEET Field Duplicates

__of__ Reviewer: 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?

	Concentrat	ion (pg/g)	(≤50)	(pg/g)	(pg/g)	Qualifications
Compound	4	5	RPD	Difference	Limits	(Parent Only)
н	3200	4200	27			
	9600	13000	30			
J	5200	6700	25			
к	19000	23000	19			
L	11000	15000	31			
м	2700	3700	31			
N	2300	3300	36			
О	50000	66000	28			
P	26000	35000	30			
Q	150000	200000	29			

V:\FIELD DUPLICATES\23663E21.wpd

SDG #: 48 COUNT

"# DOT

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

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

 $A_{\rm a}$ = Area of associated internal standard $C_{\rm a}$ = 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 ()	RRF A A Laid	US#%	0000
-	10/2	12/	2,3,7,8-TCDF (19C-2,3,7,8-TCDF)	4001	4001	10		0/8	12.0
	(405)	01/01/6	2,3,7,8-TCDD (19C-2,3,7,8-TCDD)	1.049	1.049	106	101	7/04	1000
			1,2,3,8,7,8-HXCDD (19C-1,2,3,8,7,8-HXCDD)	1.163	162	05.	000	io	8,8
\perp		· · · · · ·	1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	1.073	1.073	1/1/		1.67	1000
			OCDF ("C-OCDD)	1.523	1.573	20.	X ()	842	Buo
~	10/2	4/11/10	2,3,7,8-TCDF (*30-2,3,7,8-TCDF)	1.088	XXX	1.10	011	120	110
			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 (19C-1,2,4,6,7,8,-HpCDD)						
			ocpf ("c-ocpb)						
က	10/2	ベノトンノ	2,3,7,8-TCDF (19C-2,3,7,8-TCDF)	44	44	160	0.0	000	1
	(105)	0//10	2.3,7,8-TCDD (13C-2,3,7,8-TCDD)	0945	o arn	OX OX	No.	0 1	1000
			1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.12	1.130	14	101-	0. A	
			1,2,3,4,6,7,8-HpCDD (13C-1,2,4,6,7,8,-HpCDD)	590:	1080	.00	100	11/	10.00
			OCDF ("C-OCDD)	ーイルの	600	()			1111

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 #: 23/1322/ SDG #: 1/20/Cay

VALIDATION FINDINGS WORKSHEET Routine Calibration Results Verification

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

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

hrit = confinding calibration HRF A_x = Area of compound, C_x = Concentration of compound,

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

					Reported	Recalculated	Reported	Recalculated
*	Standard ID	Calibration Date	Compound (Reference Internal Standard)	Average RRF (initial)	RRF (CC)	RRF (CC)	Q%	a %
	2017/81	,	2,3,7,8-TCDF (°C-2,3,7,8-TCDF)	7460	160	16.0	w.	2.0
		1/14/10	7/14/10 2,3,7,8-TCDD (°C-2,3,7,8-TCDD)	0.945	0.93	0.43	7:7	(,)
		,	1,2,3,6,7,8-HxCDD (13C-1,2,3,6,7,8-HxCDD)	1.136	r/./	1.7	€.\	. w
			1,2,3,4,6,7,8-HpCDD (*C-1,2,4,6,7,8,-HpCDD)	1.065	1.08	1.08	0.1	0.7
			OCDF (*c-OCDD)	1.639	1.57	7.57	4.3	4.3
7	17410SD2	01/1/12		8801	ta1	1.04	4.3	4.4
		11111	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 (1°C-1,2,4,6,7,8,-HpCDD)					
			ocpf (*c-ocpb)					
က			2,3,7,8-TCDF (°C-2,3,7,8-TCDF)					
			2,3,7,8-TCDD (1°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)					
			ocpf (*c-ocpb)					

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 #->3/63 & ->

Laboratory Control Sample Results Verification VALIDATION FINDINGS WORKSHEET

2nd Reviewer: 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 duplicate (if applicable) were recalculated for the compounds identified below using the following calculation:

% Recovery = 100 * SSC/SA

Where: SSC = Spiked sample concentration SA = Spike added

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

LCS = Laboraotry control sample percent recovery

LCSD = Laboratory control sample duplicate percent recovery

1cs ID: 0 18/27

	S	ike	Spiked S	amole	SUT	8	I CSD	g,	USD I/SD I	CSD
Compound	Z X	Added,	Concentration (+)	tration (2)	Percent Recovery	ecovery	Percent Recovery	есочегу	RPD	Q,
	108	l CSD	1 831	LCSD	Raported	Recalc	Reported	Recalc	Reported	Recalculated
2,3,7,8-TCDD	0.00		0.05	NK	(D)	a0)				
1,2,3,7,8-PeCDD	201	J	101	, , 	101	101				
1,2,3,4,7,8-HxCDD			011		110	110				
1,2,3,4,7,8,9-HpCDF	>		011		e11	(10				
OCDF	280	>	195	/	97	97				
						-				
								·		

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

ions monitored for HRGC/HRMS Analysis of PCDDs/PCDFs

<u></u>			
Analyte	HPCDF HPCDF (3) HPCDD (3) HPCDD (3) NCDPE (3)	000F 000D 000D 000D 000D (8) 000P (8)	
Elemental Composition	C ₁₂ H ²⁶ C ₁₃ C ₁₅	C1.200,37010 C1.200,3701,0 C1.200,37010,0 C1.200,37010,0 19C1.200,3701,0,0 C1.200,3701,0,0 C1.200,3701,0,0	
Ol nol	M M M M M M M M M M M M M M M M M M M	M M + 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	
Accurate Mass ^(s)	407.7818 409.7788 417.8250 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	ഗ	
Analyte	TCDF TCDF (8) TCDD (8) TCDD (8) TCDD (8) TCDD (8) HXCDPE	Pecde Pecde Pecde (S) Pecdd Pecdd Pecdd (S) Pecdd (S) Pecdd (S) Pecdd (S)	HXCDF HXCDF (S) HXCDD (S) HXCDD (S) HXCDD (S) HXCDD (S) HXCDD (S) HXCDD (S) HXCDD (S)
Elemental Composition	C ₁₂ H ₂ 3C ₁ O C ₁₂ H ₂ 3C ₁ O 19C ₁₂ H ₂ 3C ₁ O 19C ₁₂ H ₂ 3C ₁ O C ₁₂ H ₂ 3C ₁ O C ₁₂ H ₂ 3C ₁ O ₂ 19C ₁₂ H ₂ 3C ₁ O ₂ 19C ₁₂ H ₂ 3C ₁ O ₂ 19C ₁₂ H ₂ 3C ₁ O ₂ C ₁ C ₁₄ 3C ₁₃ 7C ₁ O C ₁ C ₁₄ 3C ₁₃ 7C ₁ O	C,2H,3°Cl,3°ClO C,2H,3°Cl,3°ClO 1°C,2H,3°Cl,3°ClO C,2H,3°Cl,3°ClO C,2H,3°Cl,3°ClO ₂ C,2H,3°Cl,3°ClO ₂ 1°C,2H,3°Cl,3°ClO ₂ 1°C,2H,3°Cl,3°ClO ₂ C,2H,3°Cl,3°ClO ₂ C,2H,3°Cl,3°ClO ₂ C,2H,3°Cl,3°ClO ₂ C,2H,3°Cl,3°ClO	C, H, 201, 7010 C, H, 201, 7010 C, H, 201, 701, 0 C, H, 201, 7010 C, H, 201, 7010, 0 C, H, 201, 7010, 0 C, H, 201, 7010, 0 C, H, 201, 701, 0 C, H, 201, 701, 0 C, H, 201, 701, 0 C, H, 201, 701, 0
Ol nol	M W W W W W W W W W W W W W W W W W W W	M + 2 2 W + 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	M M M M H + + 2 C C K + + 4 A C C K + + 4 A C C K + + 4 A C C K + + 4 A C C K + 4 A C C K + 4 A C C K C C K C C C C C C C C C C C C C
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
Descriptor	-	N	ဗ

The following nuclidic masses were used: €

H = 1.007825 C = 12.000000 ¹³C = 13.003355 F = 18,9984

0 = 15.994915 3 Cl = 34.968853 37 Cl = 36.965903

S = internal/recovery standard

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

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

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

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

YN.	N/A Were all recalculated results for detected t	arget compounds agree within 10.0% of the reported results?
Conce	entration = $(A_{\bullet})(I_{\bullet})(DF)$ $(A_{\bullet})(RRF)(V_{\bullet})(\%S)$	Example:
\mathbf{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 	
i,	 Amount of internal standard added in nanograms 	Conc. = (/2/4466) (2000)(

V _o	=	Volume or weight of sample extract in milliliters (ml) or grams (g).
RRF	=	Relative Response Factor (average) from the initial

Df	=	Dilution	Factor.

(ng)

Percent solids, applicable to soil and solid matrices %S

Example:			
Sample I.D.	6	. <u>A</u>	

Conc. = (12/4466) (2000)((1/348600) (0.945) (10.26	18.92)
= 2.4 pg/q	,

		Reported Calculated			
			Reported Concentration	Concentration	
#	Sample ID	Compound	()	()	Qualification
					ļ
-					
					<u> </u>
					