Derenzo and Associates, Inc.
Environmental Consultants

March 25, 2012

Ms. Trina Vielhauer, Bureau Chief
Bureau of Air Regulation
Department of Environmental Protection
STATE OF FLORIDA
2600 Blair Stone Road, MS 5505
Tallahassee, FL 32399-2400

Subject: Trail Ridge Energy, LLC
DEP File No. 0310358-011-AC (PSD-FL-374B)
LFG Monitoring Sulfur and Chlorine Contents

Dear Ms Vielhauer:

Condition 3.C. of Section III – Emission Unit(s) Specific Conditions of Air Construction Permit 0310358-011-AC (PSD-FL-374B) issued Trail Ridge Energy, LLC (Trail Ridge Energy) specifies that *The permittee shall comply with the following requirements to monitor the sulfur and chlorine content of the landfill gas:*

... the permittee shall sample and analyze the landfill gas for sulfur and chlorine content. The gas sample collected for the analyses shall be a composite sample and collected under normal operating conditions ... The gas sample collection and analyses for sulfur and chlorine content shall be done semi-annually ... Results shall be reported as SO_2 and HCl emission factors in terms of lb/MMscf of landfill gas.

The initial gas sample collection and analyses were completed in February 2007. Therefore, Derenzo and Associates, Inc. (Derenzo and Associates), on behalf of Trail Ridge Energy, is submitting to the Florida Department of Environmental Protection, Division of Air Resource Management (FDEP-DARM) results of sulfur and chlorine analyses that were performed on a sample of landfill gas (LFG) obtained from the Trail Ridge Landfill in March 2012 (semi-annual collection and analyses). The required SO_2 and HCl emission factors (in terms of lb/MMscf of landfill gas) and supporting analytical data are provided in the attached documents.

The air permit application for Trail Ridge Energy developed (based on USEPA AP-42 default LFG composition data) a:

1. SO_2 emission factor of 27.5 lb/MMscf of LFG; and
2. HCl emission factor of 11.95 lb/MMscf of LFG.

39395 Schoolcraft Road • Livonia, MI 48150 • (734) 464-3880 • FAX (734) 464-4368
4970 Northwind Drive, Suite 120 • East Lansing, MI 48823 • (517) 324-1880 • FAX (517) 324-5409

The SO_2 emission factor developed from analyses of the March 28, 2012 sample of gas obtained from the Trail Ridge Landfill is 8.162 lb/MMscf of LFG (<10.185 lb/MMscf of LFG with the incorporation of all non-measured chemicals at its reporting limit).

The HCl emission factor developed from analyses of the March 28, 2012 sample of gas obtained from the Trail Ridge Landfill is 0.86 lb/MMscf of landfill gas (<1.00 lb/MMscf of landfill gas with the incorporation of all non-measured chemicals at its reporting limit).

Please contact us if you have questions or require clarifications

Sincerely,

DERENZO AND ASSOCIATES, INC.

Charles Scamp
Environmental Consultant

attachments
c: Mike Laframboise, Landfill Energy Systems
Christopher L. Kirts, Northeast District Office
Jacksonville Environmental Quality Division

Trail Ridge Energy, LLC (March 28, 2012 Sample)

Sulfur Dioxide Emission Factor for LFG Combustion

LFG Influent Sulfur Compound	Analytical Report Concentrations[A] (ppmv)	Molecular Formula	No. Sulfur Atoms	Sulfur Content[B] as H_2S (ppmv)	Resulting SO_2 Emission Rate (lb./MMcf)
Hydrogen sulfide	32.7	H_2S	1	32.7	5.413 *
Carbonyl sulfide	0.78	CSO	1	0.78	0.129
Methyl mercaptan	5.50	CH_4S	1	5.50	0.910
Ethyl mercaptan	<0.66	C_2H_6S	1	<0.66	<0.109
Dimethyl sulfide	10.33	C_2H_6S	1	10.33	1.710
Carbon disulfide	<0.50	CS_2	2	<1.00	<0.166
Isopropyl mercaptan	<0.66	C_3H_6S	1	<0.66	0.109
tert-Butyl mercaptan	<0.66	$C_4H_{10}S$	1	<0.66	<0.109
n-Propyl mercaptan	<0.66	C_3H_8S	1	<0.66	<0.109
Ethyl methyl sulfide	<0.66	C_3H_8S	1	<0.66	<0.109
Thiophene	<0.66	C_4H_4S	1	<0.66	<0.109
Isobutyl mercaptan	<0.66	$C_4H_{10}S$	1	<0.66	<0.109
Diethyl sulfide	<0.66	$CH_3CH_2SCH_2CH_3$	1	<0.66	<0.109
n-Butyl mercaptan	<0.66	$C_4H_{10}S$	1	<0.66	<0.109
3-Methyl Thiophene	<0.66	C_5H_6S	1	<0.66	<0.109
Dimethyl disulfide	<0.66	CH_3SSCH_3	2	<1.32	<0.218
Tetrahydrothiophene	<0.66	$C_4H_8O_2S$	1	<0.66	<0.109
2-Ethylthiophene	<0.66	C_6H_8S	1	<0.66	<0.109
2,5-Dimethylthiopene	<0.66	C_6H_8S	1	<0.66	<0.109
Diethyl disulfide	<0.66	CH_3SSCH_3	2	<1.32	<0.218
Total				**<61.5**	**<10.185** [C]

Notes

A. March 29, 2012 LFG sample laboratory analytical results (see Attachment) (average of 3 samples)

B. Determined by multiplying concentration by number of sulfur atoms in the molecule.

C. Calculation of SO_2 emission factor from sulfur content, as H_2S:

(61.5 scf H_2S/MMcf LFG) (1 scf SO_2/scf H_2S) (64.06 lb.SO_2/mol) / (387 ft^3/mol)

10.19 lb SO_2/MMcf LFG

* Sample calculation: SO_2 generation from hydrogen sulfide (H_2S):

Trail Ridge Energy, LLC (March 28, 2012 Sample)

Sulfur Dioxide Emission Factor for LFG Combustion

LFG Influent Sulfur Compound	Measured Concentrations[A] (ppmv)	Molecular Formula	No. Sulfur Atoms	Sulfur Content[B] as H_2S (ppmv)	Resulting SO_2 Emission Rate (lb./MMcf)
Hydrogen sulfide	32.7	H_2S	1	32.7	5.413 *
Carbonyl sulfide	0.78	CSO	1	0.78	0.129
Methyl mercaptan	5.50	CH_4S	1	5.50	0.910
Dimethyl sulfide	10.33	C_2H_6S	1	10.33	1.710
Total				**49.3**	**8.162**

Notes

A. March 29, 2012 LFG sample laboratory analytical results (see Attachment) (average of 3 samples)

B. Determined by multiplying concentration by number of sulfur atoms in the molecule.

* Sample calculation: SO_2 generation from hydrogen sulfide (H_2S):

(32.7 scf H_2S/MMcf LFG) (1 scf SO_2/scf H_2S) (64.06 lb.SO_2/mol) / (387 ft^3/mol)

= 5.41 lb SO_2/MMcf LFG

Trail Ridge Energy, LLC (March 28, 2012 Sample)

LFG Combustion Hydrogen Chloride Emission Factor

LFG Influent Chlorine Coumpounds	Analytical Report Concentration[1] (ppm)	Molecular Formula	No. Chlorine Atoms	HCl Emission Factor (lb./MMcf)
Freon 12 (Dichlorodifluoromethane)	0.513	CCl_2F_2	2	0.097 *
Freon 114 (Dichlorotetrafluroethane)	0.045	$C_2Cl_2F_4$	2	0.008
Chloromethane	<0.160	CH_3Cl	1	<0.015
Vinyl Chloride	0.096	C_2HCl	1	0.009
Chloroethane	0.103	C_2H_5Cl	1	0.010
Freon 11 (Fluorotrichloromethane)	0.089	$CFCl_3$	3	0.025
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	<0.017	$C_2Cl_2F_3$	2	<0.003
3-Chloropropene	<0.200	C_3H_5Cl	1	<0.019
Methylene Chloride (Dichloromethane)	0.343	CH_2Cl_2	2	0.065
1,2-Dichloroethene (as cis-1,2-Dichloroethene)	0.507	$C_2H_2Cl_2$	2	0.096
1,2-Dichloroethene (as trans-1,2-Dichloroethene)	0.023	$C_2H_2Cl_2$	2	0.004
1,1-Dichloroethane	0.040	$C_2H_4Cl_2$	2	0.008
1,1-Dichloroethene	<0.017	$C_2H_2Cl_2$	2	<0.003
Chloroform	<0.017	$CHCl_3$	3	<0.005
1,1,1-Trichloroethane	<0.017	$C_2H_3Cl_3$	3	<0.005
Carbon Tetrachloride	<0.017	CCl_4	4	<0.006
1,2-Dichloroethane	0.610	$C_2H_4Cl_2$	2	0.115
Trichloroethene	0.350	C_2HCl_3	3	0.099
1,2-dichloropropane	0.058	$C_3H_6Cl_2$	2	0.011
Bromodichloromethane	<0.017	$CBrCl_2$	2	<0.003
1,3-Dichloropropene (as cis-1,3-Dichloropropene)	<0.017	$C_3H_4Cl_2$	2	<0.003
1,3-Dichloropropene (as trans-1,3-Dichloropropene)	<0.017	$C_3H_4Cl_2$	2	<0.003
1,1,2-Trichloroethane	<0.017	$C_2H_3Cl_3$	3	<0.005
Tetrachloroethene (Perchloroethene)	0.387	C_2Cl_4	4	0.146
Dibromochloromethane	<0.017	$CHBr_2Cl$	1	<0.002
Chlorobenzene	0.070	C_6H_5Cl	1	0.007
1,1,2,2-Tetrachloroethane	<0.017	$C_2H_2Cl_4$	4	<0.006
1,3-Dichlorobenzene	<0.017	$C_6H_4Cl_2$	2	<0.003
1,4-Dichlorobenzene	0.022	$C_6H_4Cl_2$	2	0.004
alpha-Chlorotoluene	<0.017	C_7H_7Cl	1	<0.002
1,2-Dichlorobenzene	<0.017	$C_6H_4Cl_2$	2	<0.003
1,2,4-Trichlorobenzene	<0.063	$C_6H_3Cl_3$	3	<0.018
Hexachlorobutadiene	<0.063	C_4Cl_6	6	<0.036
Dichlorofluoromethane	0.127	$CHCl_2F$	2	0.024
Chlorodifluoromethane	1.467	$CHClF_2$	1	0.138
Total hydrogen chloride emission factor (lb./MMcf)				**<1.00**

Notes

1. April 6, 2012 LFG sample laboratory analytical results.

* Example calculation for Freon 12 that assumes complete conversion of chloride to HCl

(0.513 ft^3 Freon 12/MMcf LFG) (2 mol HCl/mol Freon 12) (36.46 lb. HCl/mol) / (387 ft^3/mol)

= 0.097 lb. HCl/MMcf LFG

Trail Ridge Energy, LLC (March 28, 2012 Sample)

LFG Combustion Hydrogen Chloride Emission Factor

LFG Influent Chlorine Compounds	Measured Concentration[1] (ppm)	Molecular Formula	No. Chlorine Atoms	HCl Emission Factor (lb./MMcf)
Freon 12 (Dichlorodifluoromethane)	0.513	CCl_2F_2	2	0.097 *
Freon 114 (Dichlorotetrafluroethane)	0.045	$C_2Cl_2F_4$	2	0.008
Vinyl Chloride	0.096	C_2HCl	1	0.009
Chloroethane	0.103	C_2H_5Cl	1	0.010
Freon 11 (Fluorotrichloromethane)	0.089	$CFCl_3$	3	0.025
Methylene Chloride (Dichloromethane)	0.343	CH_2Cl_2	2	0.065
1,2-Dichloroethene (as cis-1,2-Dichloroethene)	0.507	$C_2H_2Cl_2$	2	0.096
1,2-Dichloroethene (as trans-1,2-Dichloroethene)	0.023	$C_2H_2Cl_2$	2	0.004
1,1-Dichloroethane	0.040	$C_2H_4Cl_2$	2	0.008
1,2-Dichloroethane	0.610	$C_2H_4Cl_2$	2	0.115
Trichloroethene	0.350	C_2HCl_3	3	0.099
1,2-dichloropropane	0.058	$C_3H_6Cl_2$	2	0.011
Tetrachloroethene (Perchloroethene)	0.387	C_2Cl_4	4	0.146
Chlorobenzene	0.070	C_6H_5Cl	1	0.007
1,4-Dichlorobenzene	0.022	$C_6H_4Cl_2$	2	0.004
Dichlorofluoromethane	0.127	$CHCl_2F$	2	0.024
Chlorodifluoromethane	1.467	$CHClF_2$	1	0.138
Total hydrogen chloride emission factor (lb./MMcf)				**0.86**

Notes

1. April 6, 2012 LFG sample laboratory analytical results.

* Example calculation for Freon 12 that assumes complete conversion of chloride to HCl
(0.513 ft^3 Freon 12/MMcf LFG) (2 mol HCl/mol Freon 12) (36.46 lb. HCl/mol) / (387 ft^3/mol)

LABORATORY NARRATIVE
ASTM D-5504
Derenzo & Associates
Workorder# 1203620

Three 1 Liter Tedlar Bag samples were received on March 29, 2012. The laboratory performed the analysis of sulfur compounds via ASTM D-5504 using GC/SCD. The method involves direct injection of the air sample into the GC via a fixed 2.0 mL sampling loop. See the data sheets for the reporting limits for each compound.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

There were no analytical discrepancies.

Definition of Data Qualifying Flags

Seven qualifiers may have been used on the data analysis sheets and indicate as follows:
B - Compound present in laboratory blank greater than reporting limit.
J - Estimated value.
E - Exceeds instrument calibration range.
S - Saturated peak.
Q - Exceeds quality control limits.
U - Compound analyzed for but not detected above the detection limit.
M - Reported value may be biased due to apparent matrix interferences.
File extensions may have been used on the data analysis sheets and indicates as follows:
a-File was requantified
b-File was quantified by a second column and detector
r1-File was requantified for the purpose of reissue

eurofins | Air Toxics

Summary of Detected Compounds
SULFUR GASES BY ASTM D-5504 GC/SCD

Client Sample ID: TREB-1

Lab ID#: 1203620-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	600	33000
Carbonyl Sulfide	600	940
Methyl Mercaptan	600	5400
Dimethyl Sulfide	600	10000

Client Sample ID: TREB-2

Lab ID#: 1203620-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	31000
Methyl Mercaptan	800	5700
Dimethyl Sulfide	800	10000

Client Sample ID: TREB-3

Lab ID#: 1203620-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	600	34000
Methyl Mercaptan	600	5500
Dimethyl Sulfide	600	11000

eurofins | Air Toxics

Client Sample ID: TREB-1

Lab ID#: 1203620-01A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032906**	**Date of Collection:**	**3/28/12 3:30:00 PM**
Dil. Factor:	**150**	**Date of Analysis:**	**3/29/12 09:57 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	600	33000
Carbonyl Sulfide	600	940
Methyl Mercaptan	600	5400
Ethyl Mercaptan	600	Not Detected
Dimethyl Sulfide	600	10000
Carbon Disulfide	750	Not Detected
Isopropyl Mercaptan	600	Not Detected
tert-Butyl Mercaptan	600	Not Detected
n-Propyl Mercaptan	600	Not Detected
Ethyl Methyl Sulfide	600	Not Detected
Thiophene	600	Not Detected
Isobutyl Mercaptan	600	Not Detected
Diethyl Sulfide	600	Not Detected
n-Butyl Mercaptan	600	Not Detected
Dimethyl Disulfide	600	Not Detected
3-Methylthiophene	600	Not Detected
Tetrahydrothiophene	600	Not Detected
2-Ethylthiophene	600	Not Detected
2,5-Dimethylthiophene	600	Not Detected
Diethyl Disulfide	600	Not Detected

Container Type: 1 Liter Tedlar Bag

eurofins | Air Toxics

Client Sample ID: TREB-2

Lab ID#: 1203620-02A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032907**	**Date of Collection:**	**3/28/12 3:34:00 PM**
Dil. Factor:	**200**	**Date of Analysis:**	**3/29/12 10:19 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	800	31000
Carbonyl Sulfide	800	Not Detected
Methyl Mercaptan	800	5700
Ethyl Mercaptan	800	Not Detected
Dimethyl Sulfide	800	10000
Carbon Disulfide	1000	Not Detected
Isopropyl Mercaptan	800	Not Detected
tert-Butyl Mercaptan	800	Not Detected
n-Propyl Mercaptan	800	Not Detected
Ethyl Methyl Sulfide	800	Not Detected
Thiophene	800	Not Detected
Isobutyl Mercaptan	800	Not Detected
Diethyl Sulfide	800	Not Detected
n-Butyl Mercaptan	800	Not Detected
Dimethyl Disulfide	800	Not Detected
3-Methylthiophene	800	Not Detected
Tetrahydrothiophene	800	Not Detected
2-Ethylthiophene	800	Not Detected
2,5-Dimethylthiophene	800	Not Detected
Diethyl Disulfide	800	Not Detected

Container Type: 1 Liter Tedlar Bag

eurofins | Air Toxics

Client Sample ID: TREB-3

Lab ID#: 1203620-03A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032908**	**Date of Collection: 3/28/12 3:38:00 PM**	
Dil. Factor:	**150**	**Date of Analysis: 3/29/12 10:46 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	600	34000
Carbonyl Sulfide	600	Not Detected
Methyl Mercaptan	600	5500
Ethyl Mercaptan	600	Not Detected
Dimethyl Sulfide	600	11000
Carbon Disulfide	750	Not Detected
Isopropyl Mercaptan	600	Not Detected
tert-Butyl Mercaptan	600	Not Detected
n-Propyl Mercaptan	600	Not Detected
Ethyl Methyl Sulfide	600	Not Detected
Thiophene	600	Not Detected
Isobutyl Mercaptan	600	Not Detected
Diethyl Sulfide	600	Not Detected
n-Butyl Mercaptan	600	Not Detected
Dimethyl Disulfide	600	Not Detected
3-Methylthiophene	600	Not Detected
Tetrahydrothiophene	600	Not Detected
2-Ethylthiophene	600	Not Detected
2,5-Dimethylthiophene	600	Not Detected
Diethyl Disulfide	600	Not Detected

Container Type: 1 Liter Tedlar Bag

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1203620-04A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032904**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/28/12 09:14 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)
Hydrogen Sulfide	4.0	Not Detected
Carbonyl Sulfide	4.0	Not Detected
Methyl Mercaptan	4.0	Not Detected
Ethyl Mercaptan	4.0	Not Detected
Dimethyl Sulfide	4.0	Not Detected
Carbon Disulfide	5.0	Not Detected
Isopropyl Mercaptan	4.0	Not Detected
tert-Butyl Mercaptan	4.0	Not Detected
n-Propyl Mercaptan	4.0	Not Detected
Ethyl Methyl Sulfide	4.0	Not Detected
Thiophene	4.0	Not Detected
Isobutyl Mercaptan	4.0	Not Detected
Diethyl Sulfide	4.0	Not Detected
n-Butyl Mercaptan	4.0	Not Detected
Dimethyl Disulfide	4.0	Not Detected
3-Methylthiophene	4.0	Not Detected
Tetrahydrothiophene	4.0	Not Detected
2-Ethylthiophene	4.0	Not Detected
2,5-Dimethylthiophene	4.0	Not Detected
Diethyl Disulfide	4.0	Not Detected

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1203620-05A

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032902**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/28/12 07:52 PM**	

Compound	%Recovery
Hydrogen Sulfide	98
Carbonyl Sulfide	91
Methyl Mercaptan	95
Ethyl Mercaptan	89
Dimethyl Sulfide	93
Carbon Disulfide	98
Isopropyl Mercaptan	87
tert-Butyl Mercaptan	88
n-Propyl Mercaptan	86
Ethyl Methyl Sulfide	99
Thiophene	95
Isobutyl Mercaptan	91
Diethyl Sulfide	95
n-Butyl Mercaptan	94
Dimethyl Disulfide	99
3-Methylthiophene	97
Tetrahydrothiophene	103
2-Ethylthiophene	109
2,5-Dimethylthiophene	95
Diethyl Disulfide	111

Container Type: NA - Not Applicable

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1203620-05AA

SULFUR GASES BY ASTM D-5504 GC/SCD

File Name:	**I032903**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 3/28/12 08:17 PM**	

Compound	%Recovery
Hydrogen Sulfide	97
Carbonyl Sulfide	93
Methyl Mercaptan	104
Ethyl Mercaptan	98
Dimethyl Sulfide	106
Carbon Disulfide	107
Isopropyl Mercaptan	94
tert-Butyl Mercaptan	97
n-Propyl Mercaptan	95
Ethyl Methyl Sulfide	110
Thiophene	102
Isobutyl Mercaptan	97
Diethyl Sulfide	99
n-Butyl Mercaptan	96
Dimethyl Disulfide	106
3-Methylthiophene	105
Tetrahydrothiophene	114
2-Ethylthiophene	116
2,5-Dimethylthiophene	103
Diethyl Disulfide	120

Container Type: NA - Not Applicable

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Page 1 of 1

Project Manager Michael Brack
Collected by: (Print and Sign) Mike Brack
Company Derenzo & Assoc Email Mbrack@derenzo.com
Address 39395 Schoolcraft City Livonia State MI Zip 48150
Phone 734-464-3880 Fax

Project Info:
P.O. # FLD-18
Project # 1201048
Project Name Trail Ridge

Turn Around Time:
☒ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	TREB-1	-	3/28/12	1530	D-5504	-	-		
02A	TREB-2	-	"	1534	"	-	-		
03A	TREB-3	-	"	1538	"	-	-		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
	3/28/12 1600		3/29/12 0900
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes: Landfill Gas

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	FedEx		NA	Cool	Yes No (None)	1203620

Form 1293 rev.11

LABORATORY NARRATIVE
EPA Method TO-15
Derenzo & Associates
Workorder# 1204105

Three 6 Liter Summa Canister samples were received on April 05, 2012. The laboratory performed analysis via EPA Method TO-15 using GC/MS in the full scan mode.

This workorder was independently validated prior to submittal using 'USEPA National Functional Guidelines' as generally applied to the analysis of volatile organic compounds in air. A rules-based, logic driven, independent validation engine was employed to assess completeness, evaluate pass/fail of relevant project quality control requirements and verification of all quantified amounts.

Receiving Notes

There were no receiving discrepancies.

Analytical Notes

The canisters in this work order were pressurized with Helium prior to sampling, per client request. Dilution factors have been adjusted accordingly.

Dilution was performed on all of the samples due to the presence of high level non-target species.

The reported CCV for each daily batch may be derived from more than one analytical file due to the client's request for non-standard compounds.

Non-standard compounds may have different acceptance criteria than the standard TO-14A/TO-15 compound list as per contract or verbal agreement.

Definition of Data Qualifying Flags

Eight qualifiers may have been used on the data analysis sheets and indicates as follows:

B - Compound present in laboratory blank greater than reporting limit (background subtraction not performed).

J - Estimated value.

E - Exceeds instrument calibration range.

S - Saturated peak.

Q - Exceeds quality control limits.

U - Compound analyzed for but not detected above the reporting limit.

UJ- Non-detected compound associated with low bias in the CCV and/or LCS.

N - The identification is based on presumptive evidence.

File extensions may have been used on the data analysis sheets and indicates as follows:

a-File was requantified

b-File was quantified by a second column and detector

r1-File was requantified for the purpose of reissue

eurofins | Air Toxics

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: TREC-1

Lab ID#: 1204105-01A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	15	520	72	2600
Freon 114	15	43	100	300
Vinyl Chloride	15	100	37	270
Chloroethane	58	100	150	270
Freon 11	15	96	82	540
Methylene Chloride	150	360	510	1200
1,1-Dichloroethane	15	40	59	160
cis-1,2-Dichloroethene	15	510	58	2000
1,2-Dichloroethane	15	610	59	2500
Trichloroethene	15	350	78	1900
1,2-Dichloropropane	15	58	67	270
Tetrachloroethene	15	330	99	2200
Chlorobenzene	15	58	67	270
trans-1,2-Dichloroethene	15	34	58	130
Dichlorofluoromethane	58	120	240	530
Chlorodifluoromethane	58	1600	210	5600

Client Sample ID: TREC-2

Lab ID#: 1204105-02A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	18	500	88	2500
Freon 114	18	46	120	320
Vinyl Chloride	18	94	46	240
Chloroethane	72	100	190	270
Freon 11	18	85	100	480
Methylene Chloride	180	320	620	1100
1,1-Dichloroethane	18	37	72	150
cis-1,2-Dichloroethene	18	480	71	1900
1,2-Dichloroethane	18	600	72	2400
Trichloroethene	18	330	96	1800
1,2-Dichloropropane	18	64	83	290
Tetrachloroethene	18	390	120	2600

eurofins | Air Toxics

Summary of Detected Compounds
EPA METHOD TO-15 GC/MS FULL SCAN

Client Sample ID: TREC-2

Lab ID#: 1204105-02A

Chlorobenzene	18	69	82	320
Dichlorofluoromethane	72	130	300	560
Chlorodifluoromethane	72	1400	250	5000

Client Sample ID: TREC-3

Lab ID#: 1204105-03A

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	18	520	88	2500
Freon 114	18	46	120	320
Vinyl Chloride	18	95	46	240
Chloroethane	72	110	190	300
Freon 11	18	87	100	490
Methylene Chloride	180	350	620	1200
1,1-Dichloroethane	18	42	72	170
cis-1,2-Dichloroethene	18	530	71	2100
1,2-Dichloroethane	18	620	72	2500
Trichloroethene	18	370	96	2000
1,2-Dichloropropane	18	53	83	240
Tetrachloroethene	18	440	120	3000
Chlorobenzene	18	83	82	380
1,4-Dichlorobenzene	18	34	110	200
trans-1,2-Dichloroethene	18	18	71	72
Dichlorofluoromethane	72	130	300	540
Chlorodifluoromethane	72	1400	250	4900

eurofins | Air Toxics

Client Sample ID: TREC-1

Lab ID#: 1204105-01A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040531**	**Date of Collection:**	**3/28/12 3:10:00 PM**
Dil. Factor:	**29.2**	**Date of Analysis:**	**4/6/12 09:52 AM**

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	15	520	72	2600
Freon 114	15	43	100	300
Chloromethane	150	Not Detected	300	Not Detected
Vinyl Chloride	15	100	37	270
Chloroethane	58	100	150	270
Freon 11	15	96	82	540
1,1-Dichloroethene	15	Not Detected	58	Not Detected
Freon 113	15	Not Detected	110	Not Detected
Methylene Chloride	150	360	510	1200
1,1-Dichloroethane	15	40	59	160
cis-1,2-Dichloroethene	15	510	58	2000
Chloroform	15	Not Detected	71	Not Detected
1,1,1-Trichloroethane	15	Not Detected	80	Not Detected
Carbon Tetrachloride	15	Not Detected	92	Not Detected
1,2-Dichloroethane	15	610	59	2500
Trichloroethene	15	350	78	1900
1,2-Dichloropropane	15	58	67	270
cis-1,3-Dichloropropene	15	Not Detected	66	Not Detected
trans-1,3-Dichloropropene	15	Not Detected	66	Not Detected
1,1,2-Trichloroethane	15	Not Detected	80	Not Detected
Tetrachloroethene	15	330	99	2200
Chlorobenzene	15	58	67	270
1,1,2,2-Tetrachloroethane	15	Not Detected	100	Not Detected
1,3-Dichlorobenzene	15	Not Detected	88	Not Detected
1,4-Dichlorobenzene	15	Not Detected	88	Not Detected
alpha-Chlorotoluene	15	Not Detected	76	Not Detected
1,2-Dichlorobenzene	15	Not Detected	88	Not Detected
1,2,4-Trichlorobenzene	58	Not Detected	430	Not Detected
Hexachlorobutadiene	58	Not Detected	620	Not Detected
trans-1,2-Dichloroethene	15	34	58	130
Bromodichloromethane	15	Not Detected	98	Not Detected
Dibromochloromethane	15	Not Detected	120	Not Detected
Dichlorofluoromethane	58	120	240	530
Chlorodifluoromethane	58	1600	210	5600

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	110	70-130
Toluene-d8	104	70-130
4-Bromofluorobenzene	101	70-130

eurofins | Air Toxics

Client Sample ID: TREC-2

Lab ID#: 1204105-02A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040532**	**Date of Collection: 3/28/12 5:00:00 PM**	
Dil. Factor:	**35.8**	**Date of Analysis: 4/6/12 10:33 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	18	500	88	2500
Freon 114	18	46	120	320
Chloromethane	180	Not Detected	370	Not Detected
Vinyl Chloride	18	94	46	240
Chloroethane	72	100	190	270
Freon 11	18	85	100	480
1,1-Dichloroethene	18	Not Detected	71	Not Detected
Freon 113	18	Not Detected	140	Not Detected
Methylene Chloride	180	320	620	1100
1,1-Dichloroethane	18	37	72	150
cis-1,2-Dichloroethene	18	480	71	1900
Chloroform	18	Not Detected	87	Not Detected
1,1,1-Trichloroethane	18	Not Detected	98	Not Detected
Carbon Tetrachloride	18	Not Detected	110	Not Detected
1,2-Dichloroethane	18	600	72	2400
Trichloroethene	18	330	96	1800
1,2-Dichloropropane	18	64	83	290
cis-1,3-Dichloropropene	18	Not Detected	81	Not Detected
trans-1,3-Dichloropropene	18	Not Detected	81	Not Detected
1,1,2-Trichloroethane	18	Not Detected	98	Not Detected
Tetrachloroethene	18	390	120	2600
Chlorobenzene	18	69	82	320
1,1,2,2-Tetrachloroethane	18	Not Detected	120	Not Detected
1,3-Dichlorobenzene	18	Not Detected	110	Not Detected
1,4-Dichlorobenzene	18	Not Detected	110	Not Detected
alpha-Chlorotoluene	18	Not Detected	93	Not Detected
1,2-Dichlorobenzene	18	Not Detected	110	Not Detected
1,2,4-Trichlorobenzene	72	Not Detected	530	Not Detected
Hexachlorobutadiene	72	Not Detected	760	Not Detected
trans-1,2-Dichloroethene	18	Not Detected	71	Not Detected
Bromodichloromethane	18	Not Detected	120	Not Detected
Dibromochloromethane	18	Not Detected	150	Not Detected
Dichlorofluoromethane	72	130	300	560
Chlorodifluoromethane	72	1400	250	5000

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	105	70-130
Toluene-d8	103	70-130
4-Bromofluorobenzene	101	70-130

eurofins | Air Toxics

Client Sample ID: TREC-3

Lab ID#: 1204105-03A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040533**	**Date of Collection: 3/28/12 6:45:00 PM**	
Dil. Factor:	**35.8**	**Date of Analysis: 4/6/12 11:06 AM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	18	520	88	2500
Freon 114	18	46	120	320
Chloromethane	180	Not Detected	370	Not Detected
Vinyl Chloride	18	95	46	240
Chloroethane	72	110	190	300
Freon 11	18	87	100	490
1,1-Dichloroethene	18	Not Detected	71	Not Detected
Freon 113	18	Not Detected	140	Not Detected
Methylene Chloride	180	350	620	1200
1,1-Dichloroethane	18	42	72	170
cis-1,2-Dichloroethene	18	530	71	2100
Chloroform	18	Not Detected	87	Not Detected
1,1,1-Trichloroethane	18	Not Detected	98	Not Detected
Carbon Tetrachloride	18	Not Detected	110	Not Detected
1,2-Dichloroethane	18	620	72	2500
Trichloroethene	18	370	96	2000
1,2-Dichloropropane	18	53	83	240
cis-1,3-Dichloropropene	18	Not Detected	81	Not Detected
trans-1,3-Dichloropropene	18	Not Detected	81	Not Detected
1,1,2-Trichloroethane	18	Not Detected	98	Not Detected
Tetrachloroethene	18	440	120	3000
Chlorobenzene	18	83	82	380
1,1,2,2-Tetrachloroethane	18	Not Detected	120	Not Detected
1,3-Dichlorobenzene	18	Not Detected	110	Not Detected
1,4-Dichlorobenzene	18	34	110	200
alpha-Chlorotoluene	18	Not Detected	93	Not Detected
1,2-Dichlorobenzene	18	Not Detected	110	Not Detected
1,2,4-Trichlorobenzene	72	Not Detected	530	Not Detected
Hexachlorobutadiene	72	Not Detected	760	Not Detected
trans-1,2-Dichloroethene	18	18	71	72
Bromodichloromethane	18	Not Detected	120	Not Detected
Dibromochloromethane	18	Not Detected	150	Not Detected
Dichlorofluoromethane	72	130	300	540
Chlorodifluoromethane	72	1400	250	4900

Container Type: 6 Liter Summa Canister

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	101	70-130
4-Bromofluorobenzene	98	70-130

eurofins | Air Toxics

Client Sample ID: Lab Blank

Lab ID#: 1204105-04A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040517**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/5/12 06:52 PM**	

Compound	Rpt. Limit (ppbv)	Amount (ppbv)	Rpt. Limit (ug/m3)	Amount (ug/m3)
Freon 12	0.50	Not Detected	2.5	Not Detected
Freon 114	0.50	Not Detected	3.5	Not Detected
Chloromethane	5.0	Not Detected	10	Not Detected
Vinyl Chloride	0.50	Not Detected	1.3	Not Detected
Chloroethane	2.0	Not Detected	5.3	Not Detected
Freon 11	0.50	Not Detected	2.8	Not Detected
1,1-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Freon 113	0.50	Not Detected	3.8	Not Detected
Methylene Chloride	5.0	Not Detected	17	Not Detected
1,1-Dichloroethane	0.50	Not Detected	2.0	Not Detected
cis-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Chloroform	0.50	Not Detected	2.4	Not Detected
1,1,1-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Carbon Tetrachloride	0.50	Not Detected	3.1	Not Detected
1,2-Dichloroethane	0.50	Not Detected	2.0	Not Detected
Trichloroethene	0.50	Not Detected	2.7	Not Detected
1,2-Dichloropropane	0.50	Not Detected	2.3	Not Detected
cis-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
trans-1,3-Dichloropropene	0.50	Not Detected	2.3	Not Detected
1,1,2-Trichloroethane	0.50	Not Detected	2.7	Not Detected
Tetrachloroethene	0.50	Not Detected	3.4	Not Detected
Chlorobenzene	0.50	Not Detected	2.3	Not Detected
1,1,2,2-Tetrachloroethane	0.50	Not Detected	3.4	Not Detected
1,3-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,4-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
alpha-Chlorotoluene	0.50	Not Detected	2.6	Not Detected
1,2-Dichlorobenzene	0.50	Not Detected	3.0	Not Detected
1,2,4-Trichlorobenzene	2.0	Not Detected	15	Not Detected
Hexachlorobutadiene	2.0	Not Detected	21	Not Detected
trans-1,2-Dichloroethene	0.50	Not Detected	2.0	Not Detected
Bromodichloromethane	0.50	Not Detected	3.4	Not Detected
Dibromochloromethane	0.50	Not Detected	4.2	Not Detected
Dichlorofluoromethane	2.0	Not Detected	8.4	Not Detected
Chlorodifluoromethane	2.0	Not Detected	7.1	Not Detected

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	103	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	101	70-130

eurofins | Air Toxics

Client Sample ID: CCV

Lab ID#: 1204105-05A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040506**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/5/12 12:44 PM**	

Compound	%Recovery
Freon 12	113
Freon 114	105
Chloromethane	114
Vinyl Chloride	107
Chloroethane	113
Freon 11	111
1,1-Dichloroethene	100
Freon 113	108
Methylene Chloride	110
1,1-Dichloroethane	108
cis-1,2-Dichloroethene	105
Chloroform	108
1,1,1-Trichloroethane	112
Carbon Tetrachloride	115
1,2-Dichloroethane	111
Trichloroethene	103
1,2-Dichloropropane	102
cis-1,3-Dichloropropene	102
trans-1,3-Dichloropropene	105
1,1,2-Trichloroethane	103
Tetrachloroethene	104
Chlorobenzene	102
1,1,2,2-Tetrachloroethane	102
1,3-Dichlorobenzene	105
1,4-Dichlorobenzene	99
alpha-Chlorotoluene	105
1,2-Dichlorobenzene	100
1,2,4-Trichlorobenzene	100
Hexachlorobutadiene	106
trans-1,2-Dichloroethene	102
Bromodichloromethane	106
Dibromochloromethane	108
Dichlorofluoromethane	111
Chlorodifluoromethane	110

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	113	70-130
Toluene-d8	100	70-130
4-Bromofluorobenzene	98	70-130

eurofins | Air Toxics

Client Sample ID: LCS

Lab ID#: 1204105-06A

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040507**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/5/12 01:26 PM**	

Compound	%Recovery
Freon 12	116
Freon 114	107
Chloromethane	111
Vinyl Chloride	108
Chloroethane	118
Freon 11	112
1,1-Dichloroethene	107
Freon 113	109
Methylene Chloride	108
1,1-Dichloroethane	107
cis-1,2-Dichloroethene	108
Chloroform	108
1,1,1-Trichloroethane	112
Carbon Tetrachloride	117
1,2-Dichloroethane	118
Trichloroethene	111
1,2-Dichloropropane	109
cis-1,3-Dichloropropene	112
trans-1,3-Dichloropropene	115
1,1,2-Trichloroethane	110
Tetrachloroethene	109
Chlorobenzene	108
1,1,2,2-Tetrachloroethane	110
1,3-Dichlorobenzene	112
1,4-Dichlorobenzene	105
alpha-Chlorotoluene	110
1,2-Dichlorobenzene	109
1,2,4-Trichlorobenzene	111
Hexachlorobutadiene	111
trans-1,2-Dichloroethene	112
Bromodichloromethane	115
Dibromochloromethane	113
Dichlorofluoromethane	Not Spiked
Chlorodifluoromethane	Not Spiked

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	104	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	99	70-130

eurofins | Air Toxics

Client Sample ID: LCSD

Lab ID#: 1204105-06AA

EPA METHOD TO-15 GC/MS FULL SCAN

File Name:	**3040508**	**Date of Collection: NA**	
Dil. Factor:	**1.00**	**Date of Analysis: 4/5/12 01:43 PM**	

Compound	%Recovery
Freon 12	117
Freon 114	111
Chloromethane	118
Vinyl Chloride	106
Chloroethane	120
Freon 11	113
1,1-Dichloroethene	113
Freon 113	113
Methylene Chloride	111
1,1-Dichloroethane	111
cis-1,2-Dichloroethene	109
Chloroform	111
1,1,1-Trichloroethane	113
Carbon Tetrachloride	118
1,2-Dichloroethane	117
Trichloroethene	112
1,2-Dichloropropane	107
cis-1,3-Dichloropropene	110
trans-1,3-Dichloropropene	112
1,1,2-Trichloroethane	111
Tetrachloroethene	108
Chlorobenzene	111
1,1,2,2-Tetrachloroethane	113
1,3-Dichlorobenzene	116
1,4-Dichlorobenzene	109
alpha-Chlorotoluene	113
1,2-Dichlorobenzene	114
1,2,4-Trichlorobenzene	118
Hexachlorobutadiene	117
trans-1,2-Dichloroethene	122
Bromodichloromethane	115
Dibromochloromethane	113
Dichlorofluoromethane	Not Spiked
Chlorodifluoromethane	Not Spiked

Container Type: NA - Not Applicable

Surrogates	%Recovery	Method Limits
1,2-Dichloroethane-d4	106	70-130
Toluene-d8	102	70-130
4-Bromofluorobenzene	98	70-130

Air Toxics LTD.

CHAIN-OF-CUSTODY RECORD

Sample Transportation Notice
Relinquishing signature on this document indicates that sample is being shipped in compliance with all applicable local, State, Federal, national, and international laws, regulations and ordinances of any kind. Air Toxics Limited assumes no liability with respect to the collection, handling or shipping of these samples. Relinquishing signature also indicates agreement to hold harmless, defend, and indemnify Air Toxics Limited against any claim, demand, or action, of any kind, related to the collection, handling, or shipping of samples. D.O.T. Hotline (800) 467-4922

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630-4719
(916) 985-1000 FAX (916) 985-1020

Project Manager MIKE BRADY

Collected by: (Print and Sign) [signature]

Company DEGENZO & ASSOCIATES Email

Address 37335 SCHOOLCRAFT City LIVONIA State MI Zip 48150

Phone 734 464 3880 Fax 734 464 4368

Project Info:
P.O. # 1507
Project # 120148
Project Name TRAIL RIDGE ENERGY

Turn Around Time:
☑ Normal
☐ Rush
specify

Lab Use Only
Pressurized by:
Date:
Pressurization Gas: N_2 He

Lab I.D.	Field Sample I.D. (Location)	Can #	Date of Collection	Time of Collection	Analyses Requested	Canister Pressure/Vacuum Initial	Final	Receipt	Final (psi)
01A	TREC-1	4187	3/28/12	15:10	TO-15 CHLORINATED ONLY	26	3.0		
02A	TREC-2	5686	3/28/12	17:00	" " "	26.5	3.5		
03A	TREC-3	34433	3/28/12	18:45	" " "	25.5	3.0		

Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
[signature]	4/3/12 1200	[signature]	4/5/12 0850
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time
Relinquished by: (signature)	Date/Time	Received by: (signature)	Date/Time

Notes:
LANDFILL GAS SAMPLES (PADDED)

Lab Use Only	Shipper Name	Air Bill #	Temp (°C)	Condition	Custody Seals Intact?	Work Order #
	Tetra		NA	Good	Yes No None	1204105

Form 1293 rev.11