Cottonwood Hills Recycling & Disposal Facility
Emission Totals for 2014 Air Emissions Report (in tons per year) Using Title V Permit Values

														Anthropogenic		Biogenic
	SO2	NOx	NMOC	CO	Ammonia **	PM	PM10	PM2.5	HAPs *	Methylene Chloride	1,1,1-TCA	H2S	Methane	CH4	N2O	Total CO2
Landfill	-	-	2.67	-	-	-	-	-	0.552	0.063	0.0033	3.43	449.33	-	-	-
Open Flare	21.72	27.81	2.76	151.36	-	7.631	7.631	7.631	0.129	0.006	0.004	-	-	0.76	0.15	31513.41
Roads	-	-	-	-	-	3.26	0.88	0.13	-	-	-	-	-	-	-	-
Solidification			0.000			0.000	0.000	0.000						-	-	-
Stockpile/ Cover					-	0.031	0.014	0.005						-	-	-
Rock Crushing Engine	0.04	0.69	0.05	0.149	-	0.05	0.05	0.05	-	-	-	-	-	-	-	-
Rock Crushing Process	-	-	-	-	-	0.013	0.013	0.013	-	-	-	-	-	-	-	-
Tub Grinder	0.000	0.000	0.000	0.000	-	0.000	0.000	0.000	0.000	-	-	-	-	-	-	-
Totals	21.77	28.49	5.48	151.51		10.98	8.59	0.201	0.681	0.069	0.007	3.43	449.33	0.76	0.15	31513.41

NOTES:
** Methylene Chloride, 1,1,1-TCA and methane are reported separately*
*** Ammonia assumed to be insignificant since leachate is insignificant.*

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Open Flare Data

						SO2 Emissions		NOX Emissions		VOM Emissions		CO Emissions		PM Emissions	
						SO2 (lb/hr) per 1000 scfm = 3.956		NOX (lb/hr) for 3000 scfm flare = 6.45		VOM (lb/hr) for 3000 scfm flare = 0.64		CO (lb/hr) for 3000 scfm flare = 35.11		PM (lb/hr) for 3000 scfm flare = 1.77	
Month	D	Run Hours	mscf	% Methane	mmBtu/hr	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
December 13		743.0													
January	31	683.6	62.087	51.3%	28.971	5.99	2.05	6.45	2.20	0.64	0.22	35.1	12.00	1.77	0.605
February	28	672.0	50.840	50.4%	23.307	4.99	1.68	6.45	2.17	0.64	0.22	35.1	11.80	1.77	0.595
March	31	718.8	54.249	44.2%	21.811	4.98	1.79	6.45	2.32	0.64	0.23	35.1	12.62	1.77	0.636
April	30	720.0	48.417	52.0%	22.901	4.43	1.60	6.45	2.32	0.64	0.23	35.1	12.64	1.77	0.637
May	31	742.0	52.212	52.2%	24.791	4.64	1.72	6.45	2.39	0.64	0.24	35.1	13.03	1.77	0.657
June	30	718.6	53.738	46.4%	22.680	4.93	1.77	6.45	2.32	0.64	0.23	35.1	12.62	1.77	0.636
July	31	744.0	57.733	54.1%	28.410	5.12	1.90	6.45	2.40	0.64	0.24	35.1	13.06	1.77	0.658
August	31	744.0	51.838	49.9%	23.529	4.59	1.71	6.45	2.40	0.64	0.24	35.1	13.06	1.77	0.658
September	30	716.9	50.410	48.0%	22.010	4.64	1.66	6.45	2.31	0.64	0.23	35.1	12.59	1.77	0.634
October	31	716.3	57.067	52.8%	27.407	5.25	1.88	6.45	2.31	0.64	0.23	35.1	12.57	1.77	0.634
November	30	701.9	59.137	43.3%	23.292	5.55	1.95	6.45	2.26	0.64	0.22	35.1	12.32	1.77	0.621
December	31	744.0	61.319	52.2%	29.115	5.43	2.02	6.45	2.40	0.64	0.24	35.1	13.06	1.77	0.658
TOTALS	365	8622.2	659.049	49.7%	34.578	5.04	21.72	6.45	27.81	0.64	2.76	35.1	151.36	1.77	7.631

EXAMPLE CALCULATIONS

mmBtu = Flow (scfm) x 60 min/hr x % methane x 909.6 btu/cft (@ 14.7 psia and 60F) / 1000000Btu/mmBtu
lbs/hr = mmBtu/hr x Permitted Pollutant Factor (lb/mmBtu) x Run Hours / (Days/mo x 24hrs/day)
tpy = lbs/hr / 2000 lbs/ton x 8760 hrs/yr

Percent Throughputs

Dec-Feb	*24.3%*	*Mar-May*	*25.3%*
Jun-Aug	*25.6%*	*Sep-Nov*	*24.8%*

PM10	7.631 tpy	1.770 lbs/hr	*Assumed to be same as*
PM2.5	7.631 tpy	1.770 lbs/hr	*TSP per AP-42, Table 2.4.4*

Sulfur: Average Cs for reporting year was **397** ppm

397	ppm H2S	64	mol. Wt. SO2 x	60,000	scfh x	1 T x	=		
1,000,000		385.4	scf/lb-mole			2000 lbs		3.956	lbs/hour per 1000 scfm

Annual	*Rate/hr =*	*659.049*	*mscf /*	*8622.2*	*hrs =*	*0.0764365*	*MCF/hr or*	*1.8056128* *MCF/day*
Peak Ozone	*Rate/hr =*	*163.310*	*mscf /*	*2206.6*	*hrs =*	*0.0740085*	*MCF/hr or*	*1.775104* *MCF/day*

WM01225

Cottonwood Hills RDF Open Flare Data
2014 Annual Air Emissions Report

Anthropogenic GHG				Biogenic GHG					
CH4 Emissions		N2O Emissions		Combustion CO2		Pass-Through CO2		Total CO2	
CH4 (lb/mmBtu)=	7.05E-03	N2O (lb/mmBtu)=	1.39E-03	CO2 (lb/mmBtu)=	114.79	Based on % CO2		Combustion+Pass-Through	
lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
0.204	0.07	0.040	0.01	3,325.74	1,136.74	5,130.63	1,753.65	8,456.37	2,890.39
0.164	0.06	0.032	0.01	2,675.48	898.96	4,352.68	1,462.50	7,028.16	2,361.46
0.154	0.06	0.030	0.01	2,503.72	899.88	4,884.75	1,755.66	7,388.47	2,655.54
0.162	0.06	0.032	0.01	2,628.89	946.40	3,744.14	1,347.89	6,373.03	2,294.29
0.175	0.06	0.034	0.01	2,845.83	1,055.80	3,901.54	1,447.47	6,747.37	2,503.27
0.160	0.06	0.032	0.01	2,603.57	935.51	4,649.25	1,670.55	7,252.83	2,606.06
0.200	0.07	0.039	0.01	3,261.31	1,213.21	4,131.51	1,536.92	7,392.82	2,750.13
0.166	0.06	0.033	0.01	2,700.94	1,004.75	4,049.05	1,506.25	6,749.99	2,511.00
0.155	0.06	0.031	0.01	2,526.55	905.69	4,241.17	1,520.32	6,767.72	2,426.00
0.193	0.07	0.038	0.01	3,146.20	1,126.81	4,361.87	1,562.20	7,508.07	2,689.02
0.164	0.06	0.032	0.01	2,673.73	938.30	5,541.56	1,944.72	8,215.30	2,883.02
0.205	0.08	0.040	0.02	3,342.19	1,243.29	4,569.71	1,699.93	7,911.90	2,943.23
0.244	0.76	0.048	0.15	3,969.32	12,305.34	4,456.80	19,208.07	8,426.12	31,513.41

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Open Flare HAPs

Gas Flow Rate:	659 mscf	18,676,520	m^3/yr
Operating Hours:	8622.17 hours		

CAS Number	COMPOUND (2)	MEDIAN ppmv	DATA SOURCE (3)	MOLECULAR WEIGHT	GRAVIMETRIC CONCENTRATION (mg/M^3)	Uncontrolled (1) POTENTIAL TO EMIT INMOC (Mg/yr)	Uncontrolled (1) POTENTIAL TO EMIT INMOC (tons/yr)	Controlled Destruction 98% (tons/yr)
71556	1,1,1-Trichloroethane (methyl chloroform)	1.59	Site Specific	133.42	8.67	0.1619	0.1803	**0.0036**
79345	1,1,2,2-Tetrachloroethane	1.11	AP-42	167.86	7.62	0.1423	0.1585	0.0032
75343	1,1-Dichloroethane (ethylidene dichloride)	0.00	Site Specific	98.96	0.00	0.0000	0.0000	0.0000
75354	1,1-Dichloroethene (vinylidene chloride)	0.20	AP-42	96.95	0.79	0.0148	0.0165	0.0003
107062	1,2-Dichloroethane (ethylene dichloride)	7.84	Site Specific	98.96	31.71	0.5923	0.6594	0.0132
78875	1,2-Dichloropropane (propylene dichloride)	0.18	AP-42	112.99	0.83	0.0155	0.0173	0.0003
107131	Acrylonitrile	6.33	AP-42	53.06	13.74	0.2566	0.2856	0.0057
75150	Carbon disulfide	0.58	AP-42	76.14	1.81	0.0337	0.0376	0.0008
56235	Carbon tetrachloride	0.00	AP-42	153.84	0.00	0.0000	0.0000	0.0000
463581	Carbonyl sulfide	0.49	AP-42	60.07	1.20	0.0225	0.0250	0.0005
108907	Chlorobenzene	4.30	Site Specific	112.56	19.81	0.3699	0.4118	0.0082
75003	Chloroethane (ethyl chloride)	1.25	AP-42	64.52	3.30	0.0616	0.0686	0.0014
67663	Chloroform	0.03	AP-42	119.39	0.15	0.0027	0.0030	0.0001
75092	Dichloromethane (methylene chloride)	4.28	Site Specific	84.94	14.85	0.2774	0.3089	**0.0062**
100414	Ethylbenzene	4.42	Site Specific	106.16	19.20	0.3586	0.3992	0.0080
110543	n-Hexane	3.49	Site Specific	86.17	12.26	0.2294	0.2554	0.0051
78933	Methyl ethyl ketone	7.09	AP-42	72.10	20.91	0.3905	0.4347	0.0087
108101	Methyl isobutyl ketone	1.87	AP-42	100.07	7.65	0.1429	0.1591	0.0032
127184	Perchloroethylene (tetrachloroethene)	0.00	Site Specific	165.85	0.00	0.0000	0.0000	0.0000
79016	Trichloroethlyene	6.48	Site Specific	131.39	34.83	0.6506	0.7243	0.0145
75014	Vinyl chloride	0.42	Site Specific	62.50	1.07	0.0199	0.0222	0.0004
71432	Benzene	1.56	Site Specific	78.11	4.99	0.0933	0.1038	0.0021
106467	1,4-Dichlorobenzene(p)	0.00	Site Specific	147.01	0.00	0.0000	0.0000	0.0000
108883	Toluene	20.84	Site Specific	92.13	78.52	1.4665	1.6326	0.0327
95476	o-Xylenes	0.73	Site Specific	106.16	3.15	0.0588	0.0655	0.0013
108383	m-Xylenes	5.49	Site Specific	106.16	23.82	0.4450	0.4954	0.0099
	Total HAPS						6.46	**0.1293**

NOTES: (1) UNCONTROLLED LANDFILL GAS CONCENTRATIONS (a) - (SCC 50200602) where a = Reference 9-35. SCC = Source Classification Code

(2) Hazardous Air Pollutants listed in Title I of the 1990 Clean Air Act Amendments.

(3) HAPs information obtained from EPA AP-42 Section 2.4, 5th edition, 11/98.

Cottonwood Hills RDF
2014 Annual Air Emissions Report
LANDFILL GAS EMISSION RATE CALCULATIONS Using Title V Permit Values

The equation below was used to create Table 2 on the following page.

NMOC equation from 40 CFR 60.754 (a)(1)(i) used to estimate Annual NMOC Emission Rate:

$$Mnmoc\ (Mg/yr) = \sum_{i=1}^{n} 2\ k\ Lo\ M_i\ [e^{(-kti)}\ (Cnmoc)\ (3.6 \times 10^{-9})]$$

Where

Mnmoc =	total NMOC emission rate from the landfill in megagrams per year (Mg/yr)
k =	methane generation rate constant, year $^{-1}$
Lo =	methane generation potential, cubic meters per megagram solid waste (m^3/Mg)
M_i =	mass of solid waste in the ith section, Mg
Cnmoc =	concentration of NMOC, parts per million by volume as hexane
3.6×10^{-9}=	conversion factor

NMOC Equation Constants

k =	0.023 yr^{-1}
Lo =	139.6 m^3/Mg solid waste
Cnmoc =	595 ppmv as hexane NMOC concentration (from NSPS Subpart WWW, 40 CFR 60.754(a)(1))

NMOC emission rate from RATE TABLE on following page...

Year for emission calculation = **2014**

NMOC emissions for 2014 = 62.55 Mg/yr = 68.95 ton/yr

Conversion of NMOC emission rate to Landfill Gas Rate

Maximum Annual Landfill Gas Rate:

62.55 Mg NMOC/yr * 10^6 g/Mg * g-mole/86.17 g * 24.45 l/g-mole * 1 m^3/1000 l* 10^6 m³/595 m³ NMOC = 29,829,050 m³/yr

Daily Gas Rate:

29,829,050 m³/yr * 35.31 ft³/m³ * 1 yr/365 days = 2,885,650 ft³/day

Gas Constant for 25 C and 760 mmHg

62.36 l-mmHg/g-mole-K x 298 K ÷ 760 mmHg = 24.45 l/g-mole

Example Emission Calculation for NMOC

Conversion from ppm_v to mg/m^3

NMOC concentration as hexane = 595 ppm_v

595 m^3 NMOC (as hexane)/10^6 m^3 LFG *1000 liters/m^3 * mole/24.45 liters * 86.17 g/mole *1000 mg/g

= 2096.98 mg/m^3 NMOC as hexane

NMOC Emissions Calculation

NMOC emissions = 2,096.98 mg/m^3 LFG * 29,829,050 m^3 LFG/yr * 1 Mg/10^9 mg * 1.1023 ton/Mg

NMOC emissions = 68.95 tons/yr NMOC as hexane

Collection Efficiency= 0.75 %

Cover Factor= 0.15

Controlled NMOC Emissions = 2.666 tons/yr NMOC as hexane

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Waste Acceptance

Year	Waste Receipts gcy	Waste Receipts bcy	Waste Receipts (ton)	Waste Receipts (Mg)
2000	11,253	5,627	4,220	3,828
2001	759,749	379,875	284,906	258,465
2002	837,003	418,501	313,876	284,746
2003	1,282,080	641,040	384,624	348,929
2004	1,443,807	721,904	433,142	392,944
2005	1,497,231	748,616	449,169	407,484
2006	1,850,556	925,278	555,167	503,644
2007	1,600,248	800,124	480,074	435,521
2008	1,327,855	663,928	398,357	361,387
2009	1,651,631	825,816	495,489	449,505
2010	1,542,690	771,345	462,807	419,856
2011	1,710,919	855,460	513,276	465,641
2012	1,696,343	848,171	508,903	461,674
2013	1,514,265	757,132	454,279	412,120
2014	1,269,442	634,721	380,833	345,489
2015	0	0		0
2016	0	0		0
2017	0	0		0
2018	0	0		0
2019	0	0		0
2020	0	0		0
Total			6,119,122	5,551,231

Note: 1 Mg = 1.1023 ton

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Cover Factor/ NMOC Emissions Calculations

LANDFILL:	Cottonwood	Enter the name of the landfill.
UNIT:	Active Units	Enter the name of the unit (if any)
CURRENT ACRE	63.6	Enter the footprint acreage.

COVER TYPE	COVER FACTOR	ACREAGE		
Active area	0.6265	10	0.0985	Enter the average size of the active face. The cover factor is based on 50% air and 50% daily cover.
Intermediate	0.1110	29.3	0.0511	Enter the acreage with 12" soil (or other like material).
Final Cover A	0.0305	0	0.0000	Enter the acreage with 2 feet clay and 6 inches top soil.
Final Cover B	0.0295	0	0.0000	Enter the acreage with 3 feet clay and 6 inches top soil.
Final Cover C	0.0132	24.3	0.0050	Enter the acreage with 3 feet clay, 2.5 feet protective soil and 6 inches top soil.
Final Cover D	0.0000	0	0.0000	Enter the acreage with 3 feet clay, 40 ml HDPE, 2.5 feet protective soil and 6 inches top soil.
		63.6	Total Liner Acreage Constructed	
COVER ATTENUATION FACTOR (CAF) =			0.1547	This is the cover attenuation factor for the specified unit.

LANDFILL GAS COLLECTION SYSTEM

CAPTURE EFFICIENCY (CE): 0.75 Gas Collection System and Open Flare began operating in Feb 2008

CONTROL EQUIPMENT EFFICIENCY (CEE): 0.98 Gas Collection System and Open Flare began operating in Feb 2008

Cottonwood Hills RDF
2014 Annual Air Emissions Report
TOTAL HAP EMISSION ESTIMATES Using Title V Permit Values

Modeled Landfill Gas Rate	29,829,050 m³/yr
Gas Collection Efficiency:	75%
Cover Factor:	0.15

Hourly Rate
0.1202 mcf/hr

HAP/ VOC Compounds	Median ppmv	Molecular Weight	Mass Concentration (mg/m³)	Uncontrolled Potential Emissions (Mg/yr)	Uncontrolled Potential Emissions (tons/yr)	After Controls ton/yr	After Controls lb/hr
1,1,1-Trichloroethane **(methyl chloroform)*	0.48	133.42	2.62	0.08	0.09	**0.0033**	0.0008
1,1,2,2-Tetrachloroethane*	1.11	167.85	7.62	0.23	0.25	0.0097	0.0022
1,1-Dichloroethane (ethylidene dichloride)*	2.35	98.95	9.51	0.28	0.31	0.0121	0.0028
1,1-Dichloroethene (vinylidene chloride)*	0.20	96.94	0.79	0.02	0.03	0.0010	0.0002
1,2-Dichloroethane (ethylene dichloride)*	0.41	98.96	1.66	0.05	0.05	0.0021	0.0005
1,2-Dichloropropane (propylene dichloride)*	0.18	112.98	0.83	0.02	0.03	0.0011	0.0002
Acrylonitrile*	6.33	53.06	13.74	0.41	0.45	0.0175	0.0040
Benzene* (AP-42 no co-disposal default)	1.91	78.11	6.10	0.18	0.20	0.0078	0.0018
Carbon disulfide*	0.58	76.13	1.81	0.05	0.06	0.0023	0.0005
Carbon tetrachloride*	0.004	153.84	0.03	0.001	0.001	0.0000	0.0000
Carbonyl sulfide*	0.49	60.07	1.20	0.04	0.04	0.0015	0.0003
Chlorobenzene*	0.25	112.56	1.15	0.03	0.04	0.0015	0.0003
Chloroethane (ethyl chloride)*	1.25	64.52	3.30	0.10	0.11	0.0042	0.0010
Chloroform*	0.03	119.39	0.15	0.004	0.005	0.0002	0.0000
Chloromethane (methyl chloride)*	1.21	50.49	2.50	0.07	0.08	0.0032	0.0007
Dichloromethane **(methylene chloride)*	14.3	84.94	49.68	1.48	1.63	**0.0632**	0.0144
Ethylbenzene*	4.61	106.16	20.02	0.60	0.66	0.0255	0.0058
Hexane*	6.57	86.18	23.16	0.69	0.76	0.0294	0.0067
Mercury (total)*	2.92E-04	200.61	0.002	0.0001	0.0001	0.0000	0.0000
Methyl ethyl ketone*	7.09	72.11	20.91	0.62	0.69	0.0266	0.0061
Methyl isobutyl ketone*	1.87	100.16	7.66	0.23	0.25	0.0097	0.0022
Perchloroethylene **(tetrachloroethene)*	3.73	165.83	25.30	0.75	0.83	0.0322	0.0073
Toluene* (AP-42 no co-disposal default)	39.30	92.13	148.09	4.42	4.87	0.1883	0.0430
Trichloroethene*	2.82	131.38	15.15	0.45	0.50	0.0193	0.0044
Vinyl chloride*	7.34	62.50	18.76	0.56	0.62	0.0239	0.0054
Xylene*	12.1	106.16	52.54	1.57	1.73	0.0668	0.0153
Total HAPs					**14.279**	**0.552**	**0.126**
Total Non-VOM Haps (1,1,1 TCA + dichloromethane + PCE)					**11.728**	**0.454**	**0.104**

Other Compounds	Median ppmv	Molecular Weight	Mass Concentration (mg/m³)	Uncontrolled Potential Emissions (Mg/yr)	Uncontrolled Potential Emissions (tons/yr)	After Controls ton/yr	After Controls lb/hr
Methane	540000.0	16.00	353374.23	10540.82	11619.14	**449.33**	102.59
NMOC (VOM)				62.55	68.95	**2.67**	0.61
Hydrogen Sulfide ***	300.0	34.00	417.18	12.44	13.72	**3.43**	0.78

** = Hazardous Air Pollutants listed in Title III of the 1990 Clean Air Act Amendments*
*** = Exempt VOC*
Information obtained from EPA AP-42 5th Edition Section 2.4 (11/98) on individual NMOC and HAP concentrations in Tables 2.4-1 and 2.4-2 and footnote c of table 2.4-2.
The control efficiency is based on an average 0% area coverage of gas extraction wells at the facility. There is no collection system in place
See cover_02.xls for cover factor determination.

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Crusher Engine Data

		SO2 Emissions		NOX Emissions		VOM Emissions		CO Emissions		PM Emissions	
	Engine	SO2(lb/hr)=	0.32	NOX(lb/hr)=	4.9	VOM(lb/hr)=	0.39	CO(lb/hr)=	1.06	PM(lb/hr=)	0.35
Month	Run Hours	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
December 13	33										
January	32	0.320	0.005	4.900	0.078	0.390	0.006	1.060	0.017	0.350	0.006
February	25	0.320	0.004	4.900	0.061	0.390	0.005	1.060	0.013	0.350	0.004
March	2	0.320	0.000	4.900	0.005	0.390	0.000	1.060	0.001	0.350	0.000
April	64	0.320	0.010	4.900	0.157	0.390	0.012	1.060	0.034	0.350	0.011
May	70	0.320	0.011	4.900	0.172	0.390	0.014	1.060	0.037	0.350	0.012
June	23	0.320	0.004	4.900	0.056	0.390	0.004	1.060	0.012	0.350	0.004
July	27	0.320	0.004	4.900	0.066	0.390	0.005	1.060	0.014	0.350	0.005
August	8	0.320	0.001	4.900	0.020	0.390	0.002	1.060	0.004	0.350	0.001
September	17	0.320	0.003	4.900	0.042	0.390	0.003	1.060	0.009	0.350	0.003
October	0	0.320	0.000	4.900	0.000	0.390	0.000	1.060	0.000	0.350	0.000
November	13	0.320	0.002	4.900	0.032	0.390	0.003	1.060	0.007	0.350	0.002
December	0	0.320	0.000	4.900	0.000	0.390	0.000	1.060	0.000	0.350	0.000
TOTALS	281	0.320	0.045	4.900	0.688	0.390	0.055	1.060	0.149	0.350	0.049

EXAMPLE CALCULATIONS

Engine Size = 158 hp

tpy = Run Hours x Rate (lb/hr) /2000 lb/ton

lbs/hr = Run Hours / 24 hrs/day / # of days/month x Rate (lb/hr)

Emission Rates for SO2, NOX, VOM, CO and PM were taken from Section 7.3.6 and 7.2.12 of Cottonwood Title V Permit, 11/06/02

Percent Throughputs

Dec-Feb	*28.7%*	*Mar-May*	*43.3%*
Jun-Aug	*18.5%*	*Sep-Nov*	*9.6%*

		hrs/day
Annual Hours	281	1.08
Peak Ozone Hours	58	0.89

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Cottonwood Hills RDF
2014 Annual Air Emissions Report
Crusher Unit Throughput Data

		Uncontrolled		Controlled	90%
Month	Throughput tons	PM Emissions * tpy	PM Emissions * lbs/hr	PM Emissions * tpy	PM Emissions * lbs/hr
December 13	660				
January	640	0.01	0.90	0.001	0.09
February	500	0.01	0.90	0.001	0.09
March	40	0.00	0.90	0.000	0.09
April	1,280	0.03	0.90	0.003	0.09
May	1,400	0.03	0.90	0.003	0.09
June	460	0.01	0.90	0.001	0.09
July	540	0.01	0.00	0.001	0.00
August	160	0.00	0.90	0.000	0.09
September	340	0.01	0.90	0.001	0.09
October	-	0.00	#DIV/0!	0.000	#DIV/0!
November	260	0.01	0.90	0.001	0.09
December	-	0.00	#DIV/0!	0.000	#DIV/0!
TOTALS	5,620	0.13	0.90	0.013	0.09

EXAMPLE CALCULATIONS
** PM Emissions assumed to be the same for TSP, PM10 & PM2.5*
tpy = PM Emissions Factor x Throughput (tons)/2000 lb/ton
PM Emissions Factor: 0.04522 lbs/Ton processed
Emission Factors for PM were taken from Condition 7.2.6 of Cottonwood Title V Permit, 11/06/02

Percent Throughputs

Dec-Feb	*28.7%*	*Mar-May*	*43.3%*
Jun-Aug	*18.5%*	*Sep-Nov*	*9.6%*

Processing Rates:

Annual	*20.0*	*tons/hr*
Jun-Aug	*20.0*	*tons/hr*

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Fugitive Roadway Emissions

Vehicle Type	AP-42 Data: Vehicle Wt. Unloaded (ton)	Vehicle Wt. Loaded (ton)	Mean Vehicle Weight (tons)	% of all Trucks	* Trucks/ Yr	Net Vehicle Weight (tons)	W: Mean Vehicle Weight (tons)
Transfer Trailer	16.5	38.5	27.5	50%	15,050	331,100	13.75
Front End Loader	19.3	28.8	24.05	13%	3,913	37,174	3.13
Rear End Loader	15.5	23	19.25	13%	3,913	29,348	2.50
Roll-Off Container	17.8	26.8	22.3	5%	1,505	13,545	1.12
Other	14	30.9	22.45	3%	903	15,261	0.67
T-Plate	3.8	5	4.4	0%	-	-	-
Private Truck	2.6	3.1	2.85	1%	301	151	0.03
Tractor Trailer	15.6	35.2	25.4	0%	-	-	-
Dump Trucks	12	17	14.5	0%	-	-	-
Volvo	26	38	32	15%	4,515	54,180	4.80
				100%	30,100	480,757	26.00
					actual tons in 2014 >>	380,833	
					100,00 tons of soil cover	100,000	

Spreadsheet Inputs:

s = surf. mat. silt content (unpaved) =	6.4	% (from Table 13.2.2-1)	
sL=paved road surface silt load (g/m2) =	7.4	g/m2 (Table 13.2.1-3)	
M = surface material moist. cont. =	0.2	% (default value)	
P = # of day/yr with precip. =	115	days	
UPR = Total length of unpaved roads =	2000	ft	0.38 miles
PR = Total length of paved roads =	0	ft	0.00 miles
VMT = Vehicle mile traveled			
W = fleet mean vehicle weight (tons)			
N = Number of days in the averaging period	365		
Control Efficiency	90%	*(Per Title V Application 01040051 dated April 2001)*	

Formulas for Emissions Factors:

Unpaved Road: E = k * [s/12]^a * [W/3]^b * [(365 - p)/365] (AP-42 Chapter 13.2.2, 12/03)

Constant	PM2.5	PM10	PM30(TSP)
k (lb/VMT)	0.23	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

Paved Road E = [(k * (sL/2)^0.65 * (W/3)^1.5)]* [1 - P/(4 * N)] (AP-42 Chapter 13.2.1, 12/03)

Constant	PM2.5	PM10	PM30(TSP)
k (lb/VMT)	0.004	0.016	0.082

Emission Calculations:

W = Fleet Mean Vehicle Weight = 26.00 tons *Sum of Mean Vehicle Wt x % Vehicles on Site*

	Vehicles	Miles	E (2.5)	E (10)	E (TSP)
Unpaved Roads	30,100	0.38	0.2364	1.5418	5.7114
Paved Roads	30,100	0.00	0.2200	0.8800	4.5102
Total (tons/yr) - Uncontrolled			1.35	8.79	32.56
Control Efficiency			90%	90%	90%
Total (tons/yr) - Controlled			0.13	0.88	3.26
Total (lb/hr) - Controlled			**0.104**	**0.676**	**2.505**

NOTES:

** Vehicle count calculated using actual waste volume data (tons) and AP-42 net vehicle wt. Distribution of vehicles types*

*** Factors for PM emissions from vehicle exhaust, break wear and tire wear are not subtracted out, since EPA MOBILE 6.2 is*

**** Hourly emission rate calculated assuming 2600 operating hrs/yr.*

33.40 *ton waste per VMT = waste tonnage / # vehicles / road length (miles)*

Cottonwood Hills RDF
2014 Annual Air Emissions Report
Fugitive Stockpile/Cover Emissions

Month	Operating Days	Waste Intake	Intake Rate (tons/day)	Soil Cover Density (lb/cy)	Refuse Density (lb/cy)	Percent Soil Volume	Cover Used (tons/day)	Fugitive Dust Emissions (tons) PM2.5	PM10	TSP
January	22	30,076	1,367	2,600	1,100	15%	485	0.000	0.001	0.002
February	20	25,262	1,263	2,600	1,100	15%	448	0.000	0.001	0.002
March	21	31,506	1,500	2,600	1,100	15%	532	0.000	0.001	0.003
April	22	29,663	1,348	2,600	1,100	15%	478	0.000	0.001	0.002
May	22	28,988	1,318	2,600	1,100	15%	467	0.000	0.001	0.002
June	20	37,258	1,863	2,600	1,100	15%	660	0.000	0.001	0.003
July	22	36,903	1,677	2,600	1,100	15%	595	0.000	0.001	0.003
August	22	32,743	1,488	2,600	1,100	15%	528	0.000	0.001	0.003
September	20	31,029	1,551	2,600	1,100	15%	550	0.000	0.001	0.002
October	23	34,446	1,498	2,600	1,100	15%	531	0.000	0.001	0.003
November	20	27,170	1,359	2,600	1,100	15%	482	0.000	0.001	0.002
December	21	35,789	1,704	2,600	1,100	15%	604	0.000	0.001	0.003
TOTALS	255	380,833	1,493	2,600	1,100	15%	529	**0.005**	**0.014**	**0.031**

Cover Used (tons/day) = Waste Disposal rate (tpd) x Soil Cover Density (lb/cy) / Refuse Density (lb/cy) x % Soil Volume

Formulas for Emissions Factors:
Aggregate Handling/Storage Piles (from AP-42 Chapter 13.2.4, 1/95):

E (lb/ton of material) = k x (0.0032) x [(U/5)^1.3 / (M/2)^1.4]

Constant	PM2.5	PM10	TSP	Comment
U (mph)	9.66	9.66	9.66	Wind speed for St. Louis, Mo. from Tanks 4.0 Model database
M (%)	12	12	12	Table 13.2.4-1; MSW Cover
k	0.11	0.35	0.74	
E (lb/ton)	**0.0001**	**0.0002**	**0.0005**	