May 8, 2015

Leanne Tippett Mosby
Division of Environmental Quality
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102-0176

RE: Response to MDNR Letter of May 1, 2015
Bridgeton Landfill, LLC (Bridgeton)

Dear Ms. Mosby:

This letter provides the Bridgeton Landfill's response to your letter of May 1, 2015. We appreciate the opportunity to respond to your questions and to clarify our intentions in regards to limiting the release of sulfur containing compounds from the facility. Bridgeton personnel, and our retained consultants, continue to make great strides in addressing the impacts of the subsurface pyrolysis at the Landfill. The Bridgeton team is poised to start the SO_2 removal pilot study the weeks of June 1 and June15, 2015 for the two respective control technologies. Please rest assured that Bridgeton personnel are focused and fully engaged on addressing not only the emission of SO_2 and other regulated pollutants but also on odors and all other impacted media.

The numbering below is consistent with that found in your letter of May 1, 2015.

1. Bridgeton does intend to conduct a control strategy analysis consistent with EPA's top down method for determining Best Available Control Technology (BACT) to include both single stage and multiple stage processes utilizing single or multiple treatment. Bridgeton's only caveat to this statement, as noted in our previous letter, is if the sulfur compound concentration data along with the corrected landfill gas flow data reveals that the major stationary source threshold has not been exceeded, then there is no legal basis for performing a BACT analysis.

2. Bridgeton fully appreciates that the Department has identified September 21, 2015 as the permit application submission deadline and that we alternatively identified October 1, 2015 in our letter of April 20. The October date was determined by an assessment similar to a Gantt chart analysis for the various action items to include completion of the pilot testing, data analysis, BACT assessment and development of the permit application. This analysis led us to conclude that a date of October 1, 2015 is preferable. Nonetheless, Bridgeton will endeavor to have the application to the MDNR by September 21, 2015.

Bridgeton will have the first report of the LFG analysis and flow rate test data to the MDNR by May 20, 2015. Bridgeton does not; however, intend to continue the LFG analytical testing and flow rate measurements beyond the termination of the pilot studies unless the MDNR can articulate a rational basis for asserting that the sulfur data set available at that time is inadequate to make a reasonable estimate of potential sulfur dioxide emissions.

3. Bridgeton intends to proceed with the ambient air quality modeling consistent with the comments provided in the May 1, 2015 response.

4. As regards providing, by May 8, the PTE for all pollutants using data that is currently available, Bridgeton Landfill is providing here preliminary estimates based on current operating conditions and permit limits. Attachment 1 with this letter provides emission estimates including; facility wide emissions, emissions on an emission unit basis and supporting calculations. These emission calculations are consistent with the calculations submitted with the recent Title V operating permit renewal application dated September 15, 2014 with the following revisions to address the MDNR's specific request, described below.

LFG heating value estimates have been presented which represent the current typical gas composition as measured at the flares, consisting of 10 percent methane and 10-percent hydrogen on average.

Potential emissions from all LFG control devices (*i.e.,* flares) combined are based on the maximum potential flow rate of LFG produced by the Landfill. The Landfill's LFG flare equipment capacity, including four open flares and one enclosed flare, have been designed and permitted to provide significant redundancy in the LFG control system with a focus on insuring odor control at the facility in the event one or more devices become temporarily inoperable. Based on our recent flow testing and analysis of current flow meter accuracy it has been determined that the existing flow meters (also representing historic flow data) have been over reporting the LFG flow rate by 30 to 40 percent in some cases. Current typical flow rate, correlated with recent EPA Method 2 flow measurements, indicates average flow rates are actually between 4,000 and 5,400 standard cubic feet per a minute (scfm). Therefore, for use in calculating total potential emissions for all flares combined, this represents the correct total flow for estimating flare emissions. The highest measured daily flow rate of 5,405 scfm with a 10-percent safety factor added (i.e. 5,946 scfm) has been used in our example calculations to represent the maximum potential LFG flow rate. We note that flow rate is highest impacted by the portion of air in LFG stream (30 to 55 percent by volume), a normal condition of the Bridgeton Landfill GCCS operation which is focused on odor control. This value is subject to further adjustment following conclusion of our field flow evaluation, anticipated to conclude with the pilot test program. As indicated in our response to paragraph #2 above, the first report of the LFG analysis and flow rate test data will be provided to the MDNR by May 20, 2015, per your request.

For purposes of this submittal, potential SO_2 emissions are presented based on current permitted emission limits, which is the best available information at this time. We respectfully disagree with the MDNR's current opinion with regard to the sufficiency of the currently available sulfur test data. Based on testing conducted during the past four months, significant variability in sulfur concentrations has been observed. During some recent test events, test results indicated total sulfur concentrations of up to a 60% difference in samples collected just 30-minutes apart at the same sample location under the same flare equipment operating conditions. This is a clear indication of the variability in sulfur content and making any reasonably accurate estimate of sulfur flow rate on an hourly or annual basis impossible at this time. Making use of a simple average approach to estimate sulfur content for use in an annual estimate is inherently flawed and statistically inaccurate. It is for this reason that additional data is needed in order to estimate sulfur content, and therefore make reasonably accurate estimates of potential sulfur dioxide emissions from the flares on an annual basis. During the pilot test a gas chromatograph will be available on site which will allow additional testing and will aid in further evaluating the variability in sulfur concentrations.

The current sulfur data set includes the data from all testing events conducted at the flares and/or blower outlets during the 9-month period between July 30, 2014 and May 5, 2015. A summary of the recent sulfur testing data will be provided in the May 20th submittal.

As we have previously conveyed, once we have additional flow and TRS sampling data from weekly events and data from the sulfur removal pilot study, we will provide additional evaluation and analysis of the TRS concentration data and flow rate measurements data to the MDNR.

In addition, based upon e-mail correspondence from Tom Phillips with the Office of the Attorney General, we appreciate that the MDNR is concerned about the health impacts of emissions from the Landfill. As the MDNR fully recognizes, there are numerous monitors measuring ambient sulfur compounds positioned at the perimeter of the landfill and beyond. To further assuage the Department's concerns, I have set forth below the full suite of the ongoing air monitoring program that is currently underway at Bridgeton which includes extensive SO_2 and sulfur compound monitoring. Based on the current monitoring program, overseen by MDNR, we remain confident that emissions from the Landfill are not adversely impacting the health of citizens of the state of Missouri.

A. AreaRAE 24/7 monitoring network. A collection of seven (7) perimeter gas monitoring units staged as three (3) clustered sampling points, each sampling point has at least one unit equipped for SO_2 and H_2S readings. This unit collects readings constantly, MDNR streamlines these into hourly readings, and those readings are posted weekly on the MDNR Bridgeton Landfill site. These sensors have 0.00 PPM read-outs, when calibrated are reliably accurate within 0.10 PPM at a minimum.

B. Twice daily instant read air monitoring with a Jerome J605. The Jerome is an H_2S specific PPT (parts per trillion) unit. The unit has cross sensitivity to other sulfur compounds, but is the most accurate instant read device for H_2S on the market today. This was purchased by Bridgeton and provided to the MDNR to enhance the data gathering for ambient concentrations of H_2S.

C. On a weekly basis MDNR analyzes ambient concentrations using Summa canisters. The canisters collect 4 hour samples at three separate locations (one upwind and two downwind) of Bridgeton and have been in use since mid-2013. The data from these canisters is analyzed by the Missouri Department of Health and Senior Services. No levels of concern have been observed for hydrogen sulfide (H_2S), sulfur dioxide (SO_2) or any other reduced sulfur compounds.

D. EPA is also engaged in background air monitoring related to the Westlake site. This monitoring consists of a wide array of high level technologies deployed for monitoring of background concentrations. We believe that both SO_2 and H_2S are being analyzed and to our knowledge there have been no exceedances of health based thresholds.

E. Stantec has performed ambient air sampling on the Bridgeton Landfill at multiple points. This monitoring has included H_2S, SO_2 and other reduced sulfur compounds via Summa canister sampling.

5. The air quality analysis will utilize an emission rate that satisfies the definition of "potential-to-emit" and will be based upon the best data that is currently available at the time modeling is performed. As we have previously stated, we do not believe that prior to the start of the sulfur removal pilot study that we will have sufficient data that accurately reflects potential emission rates related to LFG control. Nonetheless, Bridgeton will utilize what we consider to be the best available flow rate and concentration data during the ambient modeling that is slated for submission to the MDNR by June 1, 2015. As we have also previously stated, the flow rate and concentration data may need to be updated upon completion of the pilot study slated to begin the week of June 1, 2015.

6. As discussed above, presuming major source status for SO_2 is confirmed, Bridgeton will submit a construction permit application by September 21, 2015 that includes the following elements.

(a) Bridgeton and their consultants will conduct and document a formal BACT or "BACT-like" analysis, evaluating maximum control efficiency as well as economic, environmental and energy costs of any technologically feasible sulfur removal systems identified.

(b) Bridgeton will develop PTE calculations for each pollutant found in 10 CSR 10-6.020(3)(A), Table 1, - *De Minimis Emission Levels* on an emission unit basis for the entire installation.

(c) Bridgeton will include an air quality impact analysis for sulfur dioxide and any pollutant whose PTE exceeds the regulatory de minimis levels.

(d) Bridgeton will prepare and submit a compliance schedule for construction and approval of the control technologies and/or implementation of process changes as identified above in section (a).

7. Consistent with paragraph No. 7 of the May 1, 2015 letter, the MDNR was provided with written notification on May 4, 2015, of the anticipated commencement of the first pilot study set for the week of May11. Pilot test equipment delivery has since been delayed with a new anticipated pilot test start date of June 1, 2015, as indicated in the preceding sections. The results of the pilot studies will be submitted to the MDNR by July 15, 2015 unless pilot system vendor delays require an extension. Should vendor delivery delays jeopardize the July 15, 2015 submission deadline, the MDNR will be promptly notified with a revised date for delivery of the final report.

Supporting Documentation

By May 20, 2015, Bridgeton will provide copies of the following documentation to the MDNR:

- Copies of landfill gas analysis reports
- Copies of documents addressing sulfur content of landfill gas or any other reports identifying sulfur dioxide or other air emissions from the flare in excess of permit conditions or limits;
- Copies of all flare performance test reports and any related laboratory analysis; and
- Copies of all flare related SO_2 emission calculations

If you have any questions or comments about the information presented in this letter, please do not hesitate to contact me at (314) 744-8139.

Sincerely,

Brian J. Power

Brian J. Power
Environmental Manager

cc: Ms. Darcy Bybee, MDNR/APCP Enforcement Chief
Ms. Kathrina Donegan. St. Louis County Department of Health
Mr. Tom Phillips, Missouri Attorney General's Office
Mr. Aaron Schmidt, Division of Environmental Quality
Mr. Chris Nagel, Solid Waste Management Program
Mr. Tom Markowski, St. Louis Regional Office
Mr. Russell Anderson, Bridgeton Landfill, LLC
Mr. Brian Power, Bridgeton Landfill, LLC
Mr. Michael Liebert, Trinity Consultants

SUMMARY OF FACILITY WIDE EMISSIONS

Bridgeton Landfill

Facility ID: 189-0312

Emission Unit ID	Description	Facility Wide Potential Emissions (TPY)						
		CO	NOx	$PM/PM_{10}/PM_{2.5}$	SO_2 [1]	VOC	Max. Single HAP (HCl)	Total HAPs
	Landfill with GCCS	-	-	-	-	-	-	-
Flares								
EP-008, EP-011, 012, 013, & 014	Enclosed Flare (#7839 & #7840) & Open Flares (#7787, #7788, #7790, & #7736)	67.40	12.39	7.17	70.64	1.60	14.51	16.21
Leachate Management System								
EP-015	Frac Tanks for Storage of Leachate (No Permit Required) [2]	-	-	-	-	-	-	-
EP-16A	316,000 gal Leachate Tank Controlled (#7803)	-	-	-	-	0.06	-	0.01
EP-17A	Four - 1 mmgal Leachate Tanks Controlled (#7804, #7837 & #7838)	-	-	-	-	0.72	-	0.05
EP-18A & B	Permanent RTOs (pending SLCDH permit)	1.98	2.35	0.18	0.01	0.13	-	-
Emergency Generators (Diesel Engines)								
EP-019	Diesel Engine No. 1 for GCCS (#7784)	0.10	3.63	0.01	0.14	0.01	-	0.01
EP-020	Diesel Engine No. 2 for 2500scfm Open Flare (#7839 & #7840)	0.36	0.03	0.001	0.09	0.01	-	0.001
EP-021	Diesel Engine No. 3 for Pretreatment Building (#7837 & #7838)	1.05	1.91	0.06	0.23	0.45	-	0.004
Insignificant Activities								
EP-I01 & EP-I02	Two Portable Diesel Pumps (28.1 kw each)	0.64	0.05	0.003	0.16	0.02	-	-
EP-I03 & EP-I04	Two Portable Light Plants (17.5 kw each)	0.40	0.03	0.002	0.10	0.02	-	-
EP-I05 & EP-I06	Two Portable Baker Pumps (104 kw each)	1.67	1.90	0.10	0.36	0.71	-	-
EP-I07 & EP-I08	Two Portable Air Compressors (224 kw each)	0.86	0.99	0.05	0.19	0.37	-	-
EP-I09	One 500 Gallon Diesel Tank	-	-	-	-	0.001	-	-
EP-I10	97,000-gal Tank for Treated Leachate	-	-	-	-	1.50	-	-
Total		**74.45**	**23.29**	**7.57**	**71.91**	**5.60**	**14.51**	**16.29**

Notes:

1. SO2 emissions are based on current permit limits, as presented in the Title V permit renewal application dated September 15, 2014

2. Potential emissions from the fac tanks have taken into account in the permitted 316,000 gal leachate tank.

3. The hydrogen chloride (HCl) emissions from the facility's landfill gas flaring system is limited to no more than 10 TPY.

These emission estimates were prepared utilizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

SITE SPECIFIC LANDFILL GAS HEATING VALUE
Bridgeton Landfill
Facility ID: 189-0312

Intent:

Calculate the net heating value of the LFG expressed in Btu per standard cubic foot.

References:

A. 40 CFR §60.18(f)(3).
B. *Perry's Chemical Engineers Handbook, 6th Ed.*

Given:

$H_T = k \sum C_i H_i$ (40 CFR 60.18(e)(3))

Where:

H_T = Net heating value of the methane, btu/ft^3
k = Constant = 1.74E-07 (1/ppm)(g-mole/m^3)(MJ/kcal)
C_i = Concentration of sample component, ppm
H_i = Net heat of combustion of sample component, kcal/g-mole

Solution:

$C_{methane}$ = Concentration of methane, ppm
= 10.0% by volume (Site Specific data)
= 100,000 ppm

$H_{methane}$ = Net heat of combustion for methane, kcal/g-mole
= 191.8 kcal/g-mole (Perry's Chemical Engineers' Handbook Table 3-207)

$C_{hydrogen}$ = Concentration of hydrogen, ppm
= 10.0% by volume (Site specific data)
= 100,000 ppm

$H_{hydrogen}$ = Net heat of combustion for hydrogen, kcal/g-mole
= 57.8 kcal/g-mole (Perry's Chemical Engineers' Handbook Table 3-207)

Conversion Factors:

947.82 = Conversion factor for MJ to btu
35.31 = Conversion factor for m^3 to ft^3

H_T = (1.74E-7) [(100,000) (191.8)+(100,000)(57.8)] [(947.82) / (35.31)]

H_T = 116.58 btu/ft^3

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL CRITERIA POLLUTANT EMISSIONS -- EP-011, 012, 013, & 014 OPEN FLARES

Bridgeton Landfill

Facility ID: 189-0312

Parameters:

EP-011 Open Flare =	3,500	scfm	
EP-012 Open Flare =	4,000	scfm	
EP-013 Open Flare =	4,000	scfm	
EP-014 Open Flare =	2,500	scfm	
Annual LFG Flow (Total) =	5,946	scfm	Based on Site specific method 2 flow testing conducted in conjunction with evaluation of historic flow meter accuracy; 10% contingency added to highest flow rate.
Operating Hours =	8,760	hours/yr	
Methane (CH_4) Content =	10%		Site Specific Data
Hydrogen (H2) Content =	10%		Site Specific Data
Landfill gas heating value =	116.58	btu/scf	See Attachment B - Site Specific Landfill Gas Heating Value
MW_{SO2} =	32.06	g/gmol	
MW_{VOC} =	86.18	g/gmol	
LFG Temperature (T) =	25	°C	AP-42 recommended default (11/98)
Moisture Content at the Flare =	8%		(Source: "Landfill Gas Emissions," Louis Kalani and Ray Nardelli, LFG Specialties, presented at 20th Annual Landfill Gas Symposium (SWANA), 3/25/96)
η_{cnt} =	98%		NMOC destruction efficiency in Flare
η_s =	1		Assuming all the sulfur compounds in LFG are converted to SO2

Emission Factors:

CO =	0.37	lb/mmbtu	Manufacturer provided emission factor / AP-42 13.5 Industrial Flares Table 13.5-1
NOx =	0.068	lb/mmbtu	Manufacturer provided emission factor / AP-42 13.5 Industrial Flares Table 13.5-2
$PM/PM_{10}/PM_{2.5}$ =	80	ug/L	AP-42 13.5 Industrial Flares Table 13.5-1, footnote c for lightly smoking flares, multiplied by a safety factor of 2
NMOC Concentration =	595	ppmv-hexane	AP-42 2.4 Municipal Solid Waste Landfills (11/98) recommended default
VOC Concentration =	232	ppmv	VOC is calculated as 39% of NMOC (AP-42 Table 2.4-2 footnote b, 11/98)
Sulfur (S) =	93.8	ppmv-S	AP-42 2.4 Municipal Solid Waste Landfills (11/98) recommended default sulfur concentration of 46.9 ppmv, multiplied by a safety factor of 2.

Equations:

For CO and NOx:

Emissions (lb/hr) = LFG Flow Rate (ft^3/hr) x LFG Heating Value (btu/scf) x Emission Factors (lb/mmbtu) / 10^6

For $PM/PM_{10}/PM_{2.5}$:

Emissions (lb/hr) = LFG Flow Rate (ft^3/hr) x (1-Moisture Content at Flare) x (28.32L/ft^3) x Emission Factors (ug/dsl) x (2.2E-9 lb/ug)

For SO_2:

CM_{SO2} = UM_S x 2.0 x η_S x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{SO2} = Controlled Mass Emissions of SO_2, tons/yr

UM_S = Uncontrolled Mass Emissions of reduced sulfur compounds, kg/yr

$$= Q_{SO2} \times \frac{[\,MW_{SO2} \times 1\ \text{atm}\,]}{[(8.205\times10^{-5}\ m^3\text{-atm/gmol} \cdot {}^\circ K)(1000g / kg)(273 + T\ {}^\circ K)]}$$

Q_{SO2} = Emission Rate of SO_2, m^3/yr

= LFG Flow Rate (ft^3/yr) x Sulfur Concentration from AP-42 (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{SO2} = Molecular Weight of SO_2, g/gmol

T = Temperature of Landfill Gas, °C

Note: Value of 2.0 from the above equation is the ratio of the molecular weight of SO_2 to the molecular weight of S.

For VOC:

CM_{VOC} = UMVOC x (1 - η_{cnt}) x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{VOC} = Controlled Mass Emissions of VOC, tons / yr

UM_{VOC} = Uncontrolled Mass Emissions of VOC, kg/yr

$$= Q_{VOC} \times \frac{[\,MW_{VOC} \times 1\ \text{atm}\,]}{[(8.205\times10^{-5}\ m^3\text{-atm/gmol} \cdot {}^\circ K)(1000g / kg)(273 + T\ {}^\circ K)]}$$

Q_{VOC} = NMOC Emission Rate of hexane, m^3/yr

= LFG Flow Rate (ft^3/yr) x VOC Concentrations as hexane (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{VOC} = Molecular Weight of VOC as hexane, g/gmol

T = Temperature of Landfill Gas, °C

η_{cnt} = NMOC Destruction in Flare, %

Emissions:

PTE of Open Flares

Pollutant	Flare 1 - 4,000 scfm		Flare 2 - 4,000 scfm		Flare 3 - 3,500 scfm		Flare 4 - 2,500 scfm		All Four Flares	
	Emissions		Emissions		Emissions		Emissions		Emissions (Case 1)	
	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)
CO	10.35	45.34	10.35	45.34	9.06	39.68	6.47	28.34	15.39	67.40
NOx	1.90	8.33	1.90	8.33	1.66	7.29	1.19	5.21	2.83	12.39
PM	1.10	4.82	1.10	4.82	0.96	4.22	0.69	3.01	1.64	7.17
PM_{10}	1.10	4.82	1.10	4.82	0.96	4.22	0.69	3.01	1.64	7.17
$PM_{2.5}$	1.10	4.82	1.10	4.82	0.96	4.22	0.69	3.01	1.64	7.17
SO_2 [1]	3.69	16.15	3.69	16.15	3.23	14.13	2.30	10.09	12.90	56.51
VOC	0.25	1.07	0.25	1.07	0.21	0.94	0.15	0.67	0.36	1.60

1. SO2 emissions are based on current permit limits, as presented in the Title V permit renewal application dated September 15, 2014

These emission estimates were prepared utilizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL HAP EMISSIONS -- EP-011, 012, 013, & 014 OPEN FLARES

Bridgeton Landfill
Facility ID: 189-0312

Table 2.4-1 DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS
AP-42 Chapter 2.4 (11/98)

For HAP Compound

CM_{HAP} = UM_{HAP} x (1 - η_{cnt}) x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{HAP} = Controlled Mass Emissions of HAP, tons / yr

UM_{HAP} = Uncontrolled Mass Emissions of HAP, kg/yr

= Q_{HAP} x (MW_{HAP} x 1 atm) / [(8.205x10-5 m3-atm/gmol - °K)(1000g / kg)(273 + T °K)]

Q_{HAP} = HAP Emission Rate, m^3/yr

= Landfill Gas Flow Rate (ft^3/yr) x HAP Concentrations (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{HAP} = Molecular Weight of HAP, g/gmol

T = Temperature of Landfill Gas, °C

η_{cnt} = Destruction efficiency of Flare, %

For HCl

Uncontrolled emissions of total chlorinated compounds as chloride UM_{Cl} is calculated using the equation to calculate UM_{HAP} as shown above, based on the default Cl concentration of 42 ppmv recommeded in AP-42 Section 2.4 (11/98). Controlled emissions of HCl is calculated using Equation 10 in AP-42 Section 2.4.

CM_{HCl} = UM_{Cl} × η_{col} × 1.03 × η_{cnt}

η_{col} = % of collected landfill gas routed to flare, Assuming 100%

1.03 = Ratio of the molecular weight of HCl to the molecular weight of Cl

Given

η_{cnt} = 98% Destruction efficiency in Flare

T = 25 °C Landfill Gas Temperature (assumed per AP-42, 11/98)

EP-012 & EP-013 Open Flares = 8,000 scfm = 4,204,800,000 scf/yr

EP-011 Open Flare = 3,500 scfm = 1,839,600,000 scf/yr

EP-014 Open Flare = 2,500 scfm = 1,314,000,000 scf/yr

Operating Hours = 8,760 hr/yr

AP 42 Compound List	HAP	VOC	Mole	Raw LFG at Flare Inlet		Flare CE	Flare Exhaust	
	Y/N	Y/N	Weight	ppmv	kg/yr	(%)	lb/hr	TPY
1,1,1-Trichloroethane (methyl chloroform)	Yes	No	133.41	0.48	5.46E+02	98%	0.0025	0.0109
1,1,2,2-Tetrachloroethane	Yes	Yes	167.85	1.11	1.59E+03	98%	0.0073	0.0318
1,1-Dichloroethane (ethylidene dichloride)	Yes	Yes	98.97	2.35	1.98E+03	98%	0.0091	0.0396
1,1-Dichloroethene (vinylidene chloride)	Yes	Yes	96.94	0.2	1.65E+02	98%	0.0008	0.0033
1,2-Dichloroethane (ethylene dichloride)	Yes	Yes	98.96	0.41	3.46E+02	98%	0.0016	0.0069
1,2-Dichloropropane (propylene dichloride)	Yes	Yes	112.99	0.18	1.73E+02	98%	0.0008	0.0035
2-Propanol (isopropyl alcohol)	NO	Yes	60.11	50.1	2.57E+04	98%	0.1172	0.5133
Acetone	NO	No	58.08	7.01	3.47E+03	98%	0.0158	0.0694
Acrylonitrile	Yes	Yes	53.06	6.33	2.86E+03	98%	0.0131	0.0573
Bromodichloromethane	No	Yes	163.83	3.13	4.37E+03	98%	0.0200	0.0874
Butane	No	Yes	58.12	5.03	2.49E+03	98%	0.0114	0.0498
Carbon disulfide	Yes	Yes	76.13	0.58	3.76E+02	98%	0.0017	0.0075
Carbon monoxide	No	No	28.01	141	3.37E+04	98%	0.1537	0.6732
Carbon tetrachloride	Yes	Yes	153.84	0.004	5.24E+00	98%	0.0000	0.0001
Carbonyl sulfide	Yes	Yes	60.07	0.49	2.51E+02	98%	0.0011	0.0050
Chlorobenzene	Yes	Yes	112.56	0.25	2.40E+02	98%	0.0011	0.0048
Chlorodifluoromethane	No	No	86.47	1.3	9.58E+02	98%	0.0044	0.0192
Chloroethane (ethyl chloride)	Yes	Yes	64.52	1.25	6.87E+02	98%	0.0031	0.0137
Chloroform	Yes	Yes	119.39	0.03	3.05E+01	98%	0.0001	0.0006
Chloromethane	Yes	Yes	50.49	1.21	5.21E+02	98%	0.0024	0.0104
Dichlorobenzene (1,4-Dichlorobenzene)	Yes	Yes	147	0.21	2.63E+02	98%	0.0012	0.0053
Dichlorodifluoromethane	No	No	120.91	15.7	1.62E+04	98%	0.0739	0.3236
Dichlorofluoromethane	No	No	102.92	2.62	2.30E+03	98%	0.0105	0.0460
Dichloromethane (methylene chloride)	Yes	No	84.94	14.3	1.04E+04	98%	0.0473	0.2070
Dimethyl sulfide (methyl sulfide)	No	Yes	62.13	7.82	4.14E+03	98%	0.0189	0.0828
Ethane	No	No	30.07	889	2.28E+05	98%	1.0403	4.5567
Ethanol	No	Yes	46.08	27.2	1.07E+04	98%	0.0488	0.2136
Ethylbenzene	Yes	Yes	106.16	4.61	4.17E+03	98%	0.0190	0.0834
Ethyl mercaptan (ethanethiol)	No	Yes	62.13	1.25	6.62E+02	98%	0.0030	0.0132
Ethylene dibromide	Yes	Yes	187.88	0.001	1.60E+00	98%	0.0000	0.0000
Fluorotrichloromethane	No	No	137.38	0.76	8.90E+02	98%	0.0041	0.0178
Hexane	Yes	Yes	86.18	6.57	4.83E+03	98%	0.0220	0.0965
Hydrogen sulfide	No	No	34.08	35.5	1.03E+04	98%	0.0471	0.2062
Mercury (total) [1]	Yes	No	200.61	0.000292	4.99E-01	0%	0.0001	0.0005
Methyl ethyl ketone	No	Yes	72.11	7.09	4.36E+03	98%	0.0199	0.0871
Methyl isobutyl ketone	Yes	Yes	100.16	1.87	1.60E+03	98%	0.0073	0.0319
Methyl mercaptan	No	Yes	48.11	2.49	1.02E+03	98%	0.0047	0.0204
Pentane	No	Yes	72.15	3.29	2.02E+03	98%	0.0092	0.0405
Perchloroethylene (tetrachloroethylene)	Yes	No	165.83	3.73	5.27E+03	98%	0.0241	0.1054
Propane	No	Yes	44.09	11.1	4.17E+03	98%	0.0190	0.0834
Toluene (methylbenzene)	Yes	Yes	92.14	39.30	3.09E+04	98%	0.1409	0.6172
Trichloroethylene (trichloroethene)	Yes	Yes	131.4	2.82	3.16E+03	98%	0.0144	0.0632
t-1,2-dichloroethene	No	Yes	96.94	2.84	2.35E+03	98%	0.0107	0.0469
Vinyl chloride	Yes	Yes	62.5	7.34	3.91E+03	98%	0.0179	0.0782
Xylenes	Yes	Yes	106.16	12.1	1.09E+04	98%	0.0500	0.2190
Hydrogen Chloride [1]	Yes	No	36.50	42.0	1.31E+04	0%	3.3121	14.5071
						Total HAP (including HCl)	3.70	16.21
						Max Single HAP (HCl)	3.31	14.51
						Max Single HAP (not HCl)	0.14	0.62

Footnotes:

1. Flare Control Efficiency is not applied.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL CRITERIA POLLUTANT EMISSIONS -- EP-008 ENCLOSED FLARE

Bridgeton Landfill

Facility ID: 189-0312

Parameters:

EP-008 Enclosed Flare =	3,500	scfm	
Operating Hours =	8,760	hours/yr	
Methane (CH_4) Content =	10%		Site Specific Data
Hydrogen (H2) Content =	10%		Site Specific Data
Landfill gas heating value =	116.58	btu/scf	See Page 2 of 5 - Site Specific Landfill Gas Heating Value
MW_{SO2} =	32.06	g/gmol	
MW_{VOC} =	86.18	g/gmol	
LFG Temperature (T) =	25	°C	AP-42 recommended default (11/98)
Moisture Content at the Flare =	8%		(Source: "Landfill Gas Emissions," Louis Kalani and Ray Nardelli, LFG Specialties, presented at 20th Annual Landfill Gas Symposium (SWANA), 3/25/96)
η_{cnt} =	98%		Manufacturer provided overall flare destruction efficiency.
η_s =	1		Assuming all the sulfur compounds in LFG are converted to SO2

Emission Factors:

CO =	0.15	lb/mmbtu	
NOx =	0.08	lb/mmbtu	
$PM/PM_{10}/PM_{2.5}$ =	80	ug/l	AP-42 13.5 Industrial Flares Table 13.5-1, footnote c for lightly smoking flares, multiplied by a safety factor of 2
NMOC Concentration =	595	ppmv-hexane	AP-42 2.4 Municipal Solid Waste Landfills (11/98) recommended default
VOC Concentration =	232	ppmv	VOC is calculated as 39% of NMOC (AP-42 Table 2.4-2 footnote b, 11/98)
Sulfur (S) =	93.8		AP-42 2.4 Municipal Solid Waste Landfills (11/98) recommended default sulfur concentration of 46.9 ppmv, multiplied by a safety factor of 2.

Equations:

For CO and NOx:

Emissions (lb/hr) = LFG Flow Rate (ft^3/hr) x LFG Heating Value (btu/scf) x Emission Factors (lb/mmbtu) / 10^6

For $PM/PM_{10}/PM_{2.5}$:

Emissions (lb/hr) = LFG Flow Rate (ft^3/hr) x (1-Moisture Content at Flare) x (28.32L/ft^3) x Emission Factors (ug/dsl) x (2.2E-9 lb/ug)

For SO_2:

CM_{SO2} = UM_S x 2.0 x η_S x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{SO2} = Controlled Mass Emissions of SO_2, tons/yr

UM_S = Uncontrolled Mass Emissions of reduced sulfur compounds, kg/yr

$$= Q_{SO2} \times \frac{[MW_{SO2} \times 1\ atm]}{[(8.205\times10^{-5}\ m^3\text{-atm/gmol}\cdot °K)(1000g/kg)(273 + T\ °K)]}$$

Q_{SO2} = Emission Rate of SO_2, m^3/yr

= LFG Flow Rate (ft^3/yr) x Sulfur Concentration from AP-42 (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{SO2} = Molecular Weight of SO_2, g/gmol

T = Temperature of Landfill Gas, °C

Note: Value of 2.0 from the above equation is the ratio of the molecular weight of SO_2 to the molecular weight of S.

For VOC:

CM_{VOC} = UMVOC x (1 - η_{cnt}) x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{VOC} = Controlled Mass Emissions of VOC, tons / yr

UM_{VOC} = Uncontrolled Mass Emissions of VOC, kg/yr

$$= Q_{VOC} \times \frac{[MW_{VOC} \times 1\ atm]}{[(8.205\times10^{-5}\ m^3\text{-atm/gmol}\cdot °K)(1000g/kg)(273 + T\ °K)]}$$

Q_{VOC} = NMOC Emission Rate of hexane, m^3/yr

= LFG Flow Rate (ft^3/yr) x VOC Concentrations as hexane (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{VOC} = Molecular Weight of VOC as hexane, g/gmol

T = Temperature of Landfill Gas, °C

η_{cnt} = NMOC Destruction in Flare, %

Emissions:

Pollutant	PTE of John Zink ZTOF 3500 scfm Enclosed Flare	
	(lb/hr)	(TPY)
CO	3.67	16.08
NOx	1.96	8.58
PM	0.96	4.22
PM_{10}	0.96	4.22
$PM_{2.5}$	0.96	4.22
SO_2[1]	3.23	14.13
VOC	0.21	0.94

1. SO2 emissions are based on current permit limits, as presented in the Title V permit renewal application dated September 15, 2014

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL HAP EMISSIONS -- EP-008 ENCLOSED FLARE

Bridgeton Landfill

Facility ID: 189-0312

Table 2.4-1 DEFAULT CONCENTRATIONS FOR LFG CONSTITUENTS
AP-42 Chapter 2.4 (11/98)

For HAP Compound

CM_{HAP} = UM_{HAP} x (1 - η_{cnt}) x (2.205 lbs / kg) x (ton / 2000 lbs)

where, CM_{HAP} = Controlled Mass Emissions of HAP, tons / yr

UM_{HAP} = Uncontrolled Mass Emissions of HAP, kg/yr

= Q_{HAP} x (MW_{HAP} x 1 atm) / [(8.205x10-5 m3-atm/gmol - °K)(1000g / kg)(273 + T °K)]

Q_{HAP} = HAP Emission Rate, m^3/yr

= Landfill Gas Flow Rate (ft^3/yr) x HAP Concentrations (ppmv) / 10^6 x (0.02832m^3 / ft^3)

MW_{HAP} = Molecular Weight of HAP, g/gmol

T = Temperature of Landfill Gas, °C

η_{cnt} = Destruction efficiency of Flare, %

For HCl

Uncontrolled emissions of total chlorinated compounds as chloride UM_{Cl} is calculated using the equation to calculate UM_{HAP} as shown above, based on a default Cl concentration of 42 ppmv recommeded in AP-42 Section 2.4 (11/98). Controlled emissions of HCl is calculated using Equation 10 in AP-42 Section 2.4.

CM_{HCl} = UM_{Cl} × η_{col} × 1.03 × η_{cnt}

η_{col} = 75% Percent of landfill gas collected and routed to flare

1.03 = Ratio of the molecular weight of HCl to the molecular weight of Cl^-

Given

η_{cnt} = 98% Destruction efficiency in Flare

T = 25 °C Landfill Gas Temperature (assumed per AP-42, 11/98)

EP-008 Enclosed Flare = 3,500 scfm = 1,839,600,000 scf/yr

Operating Hours = 8,760 hr/yr

AP 42 Compound List	HAP Y/N	VOC Y/N	Mole Weight	Raw LFG at Flare Inlet ppmv	Raw LFG at Flare Inlet kg/yr	Flare CE (%)	Flare Exhaust lb/hr	Flare Exhaust TPY
1,1,1-Trichloroethane (methyl chloroform)	Yes	No	133.41	0.48	1.36E+02	98%	0.0006	0.0027
1,1,2,2-Tetrachloroethane	Yes	Yes	167.85	1.11	3.97E+02	98%	0.0018	0.0079
1,1-Dichloroethane (ethylidene dichloride)	Yes	Yes	98.97	2.35	4.90E+02	98%	0.0023	0.0099
1,1-Dichloroethene (vinylidene chloride)	Yes	Yes	96.94	0.2	4.13E+01	98%	0.0002	0.0008
1,2-Dichloroethane (ethylene dichloride)	Yes	Yes	98.96	0.41	8.65E+01	98%	0.0004	0.0017
1,2-Dichloropropane (propylene dichloride)	Yes	Yes	112.99	0.18	4.33E+01	98%	0.0002	0.0009
2-Propanol (isopropyl alcohol)	NO	Yes	60.11	50.1	6.42E+03	98%	0.0293	0.1283
Acetone	NO	No	58.08	7.01	8.67E+02	98%	0.0040	0.0173
Acrylonitrile	Yes	Yes	53.06	6.33	7.16E+02	98%	0.0033	0.0143
Bromodichloromethane	No	Yes	163.83	3.13	1.09E+03	98%	0.0050	0.0219
Butane	No	Yes	58.12	5.03	6.23E+02	98%	0.0028	0.0125
Carbon disulfide	Yes	Yes	76.13	0.58	9.41E+01	98%	0.0004	0.0019
Carbon monoxide	No	No	28.01	141	8.41E+03	98%	0.0384	0.1683
Carbon tetrachloride	Yes	Yes	153.84	0.004	1.31E+00	98%	0.0000	0.0000
Carbonyl sulfide	Yes	Yes	60.07	0.49	6.27E+01	98%	0.0003	0.0013
Chlorobenzene	Yes	Yes	112.56	0.25	6.00E+01	98%	0.0003	0.0012
Chlorodifluoromethane	No	No	86.47	1.3	2.40E+02	98%	0.0011	0.0048
Chloroethane (ethyl chloride)	Yes	Yes	64.52	1.25	1.72E+02	98%	0.0008	0.0034
Chloroform	Yes	Yes	119.39	0.03	7.63E+00	98%	0.0000	0.0002
Chloromethane	Yes	Yes	50.49	1.21	1.30E+02	98%	0.0006	0.0026
Dichlorobenzene(1,4-Dichlorobenzene)	Yes	Yes	147	0.21	6.58E+01	98%	0.0003	0.0013
Dichlorodifluoromethane	No	No	120.91	15.7	4.04E+03	98%	0.0185	0.0809
Dichlorofluoromethane	No	No	102.92	2.62	5.75E+02	98%	0.0026	0.0115
Dichloromethane (methylene chloride)	Yes	No	84.94	14.3	2.59E+03	98%	0.0118	0.0518
Dimethyl sulfide (methyl sulfide)	No	Yes	62.13	7.82	1.04E+03	98%	0.0047	0.0207
Ethane	No	No	30.07	889	5.70E+04	98%	0.2601	1.1392
Ethanol	No	Yes	46.08	27.2	2.67E+03	98%	0.0122	0.0534
Ethylbenzene	Yes	Yes	106.16	4.61	1.04E+03	98%	0.0048	0.0209
Ethyl mercaptan (ethanethiol)	No	Yes	62.13	1.25	1.65E+02	98%	0.0008	0.0033
Ethylene dibromide	Yes	Yes	187.88	0.001	4.00E-01	98%	0.0000	0.0000
Fluorotrichloromethane	No	No	137.38	0.76	2.22E+02	98%	0.0010	0.0044
Hexane	Yes	Yes	86.18	6.57	1.21E+03	98%	0.0055	0.0241
Hydrogen sulfide	No	No	34.08	35.5	2.58E+03	98%	0.0118	0.0516
Mercury (total)[1]	Yes	No	200.61	0.000292	1.25E-01	0%	0.0000	0.0001
Methyl ethyl ketone	No	Yes	72.11	7.09	1.09E+03	98%	0.0050	0.0218
Methyl isobutyl ketone	Yes	Yes	100.16	1.87	3.99E+02	98%	0.0018	0.0080
Methyl mercaptan	No	Yes	48.11	2.49	2.55E+02	98%	0.0012	0.0051
Pentane	No	Yes	72.15	3.29	5.06E+02	98%	0.0023	0.0101
Perchloroethylene (tetrachloroethylene)	Yes	No	165.83	3.73	1.32E+03	98%	0.0060	0.0264
Propane	No	Yes	44.09	11.1	1.04E+03	98%	0.0048	0.0209
Toluene (methylbenzene)	Yes	Yes	92.14	39.30	7.72E+03	98%	0.0352	0.1543
Trichloroethylene (trichloroethene)	Yes	Yes	131.4	2.82	7.90E+02	98%	0.0036	0.0158
t-1,2-dichloroethene	No	Yes	96.94	2.84	5.87E+02	98%	0.0027	0.0117
Vinyl chloride	Yes	Yes	62.5	7.34	9.77E+02	98%	0.0045	0.0195
Xylenes	Yes	Yes	106.16	12.1	2.74E+03	98%	0.0125	0.0547
Hydrogen Chloride[1]	Yes	No	36.50	42.0	3.27E+03	0%	0.6210	2.7201
						Total HAP (including HCl)	0.7182	3.1459
						Max Single HAP (HCl)	0.6210	2.7201
						Max Single HAP (not HCl)	0.0352	0.1543

Footnotes:

1 Flare Control Efficiency is not applied.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL VOC AND HAP EMISSIONS -- EP-016A

316,000 Gallon Tank

Bridgeton Landfill

Facility ID 189-0312

Description:

VOC and HAP emissions from the 316,000 gal leachate tank - estimated using Water 9.

Parameters:

Tank Diameter =	14.7 meters			
Effective Tank Length/Width =	13.0 meters			
Tank Depth =	7.6 meters			
No. of Blowers per Tank =	2			
Aeration Capacity of Each Blower =	360 cfm	=	0.17	m^3/s
Leachate Flow Rate =	300,000 gal/day	=	13.14	liter/s
RTO Control Efficiency =	98%			

Emissions:

Pollutant	Uncontrolled Emissions Water 9 Output [1]		Controlled Emissions [3]
	(Mg/yr)	(TPY)	(TPY)
Benzene	**0.34**	**0.37**	**0.01**
1,4 Dichlorobenzene	**0.02**	**0.02**	**0.00**
Ethylbenzene	**0.01**	**0.01**	**0.00**
2 Butanone	1.52	1.67	0.03
Methyl Isobutyl Ketone	0.11	0.12	0.00
Phenol	**0.02**	**0.03**	**0.00**
Toluene	**0.05**	**0.05**	**0.00**
Methyl Ethanoate	0.53	0.59	0.01
2-Hexanone	0.08	0.08	0.00
Caprolactam	0.00003	0.00003	0.00
Xylene	**0.05**	**0.05**	**0.00**
Total VOC	**2.73**	**3.01**	**0.06**
Total HAPs	**0.49**	**0.54**	**0.01**

Footnotes:

[shaded box] represents hazardous air pollutants

1. Uncontrolled VOC and HAP emissions from one tank are estimated using Water 9.
2. The four leachate tanks have the same dimensions and configurations.
   Uncontrolled Emissions (four tanks) = Uncontrolled Emissions (one tank) × 4
3. Controlled Emissions = Uncontrolled Emissions (four tanks) × (1 - 98%)

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL VOC AND HAP EMISSIONS -- EP-017A
Four One Million Gallon Tanks T1 - T4
Bridgeton Landfill
Facility ID 189-0312

Description:

VOC and HAP emissions from four 1 mmgal leachate tanks - estimated using Water 9.

Parameters:

No. of 1 mmgal Leachate Tanks =	4			
Tank Diameter =	22.2 meters			
Effective Tank Length/Width =	19.6 meters			
Tank Depth =	10.3 meters			
No. of Blowers per Tank =	2			
Aeration Capacity of Each Blower =	2,140 cfm	=	1.0	m^3/s
Leachate Flow Rate =	300,000 gal/day	=	13.14	liter/s
TO Control Efficiency =	98%			

Emissions:

Pollutant	Uncontrolled Emissions			Controlled
	One Tank - Water 9 [1]		Four Tanks [2]	Emissions [3]
	(Mg/yr)	(TPY)	(TPY)	(TPY)
Benzene	0.40	0.44	1.76	0.04
1,4 Dichlorobenzene	0.02	0.03	0.11	0.00
Ethylbenzene	0.02	0.02	0.07	0.00
2 Butanone	4.70	5.17	20.68	0.41
Methyl Isobutyl Ketone	0.27	0.29	1.17	0.02
Phenol	0.07	0.08	0.31	0.01
Toluene	0.06	0.06	0.25	0.01
Methyl Ethanoate	2.47	2.72	10.87	0.22
2-Hexanone	0.18	0.20	0.79	0.02
Caprolactam	0.0002	0.0002	0.0007	0.00001
Xylene	0.06	0.06	0.24	0.00
Total VOC	**8.25**	**9.08**	**36.25**	**0.72**
Total HAPs	**0.62**	**0.68**	**2.74**	**0.05**

Footnotes:

[ ] represents hazardous air pollutants

1. Uncontrolled VOC and HAP emissions from one tank are estimated using Water 9.
2. The four leachate tanks have the same dimensions and configurations.
   Uncontrolled Emissions (four tanks) = Uncontrolled Emissions (one tank) × 4
3. Controlled Emissions = Uncontrolled Emissions (four tanks) × (1 - 98%)

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM RTOs -- EP-018A & B

Bridgeton Landfill

Facility ID 189-0312

Two identical thermal oxidizers, each with a heat capacity of 2.75 mmBtu/hr, will be used as the only odor control devices serving Bridgeton's leachate treatment system.

Parameters:

Thermal Oxidizer Heat Capacity [1] =	5.5	mmBtu/hr
Natural Gas Heating Value =	1,024	Btu/scf
Working Hours =	8,760	hr/yr

Emission Factors:

Criteria Pollutants [2]

NOx =	100	lb/mmscf
CO =	84	lb/mmscf
$PM/PM_{10}/PM_{2.5}$ =	7.6	lb/mmscf
SO_2 =	0.6	lb/mmscf
VOC =	5.5	lb/mmscf

Greenhouse Gases [3]

CO_2 Emission Factor =	53	kg/mmBtu =	116.89	lb/mmBtu
CH_4 Emission Factor =	0.0032	kg/mmBtu =	0.0071	lb/mmBtu
N_2O Emission Factor =	0.0006	kg/mmBtu =	0.0014	lb/mmBtu

Global Warming Factors [4]:

CO_2 Global Warming Factor =	1
CH_4 Global Warming Factor =	25
N_2O Global Warming Factor =	298

Sample Calculations:

Criteria Pollutants

Input Rate (mmscf/hr) = Heat Input (Btu/hr) / Natural Gas Heating Value (Btu/scf)/ 10^6

Emissions (lb/hr) = Emission Factor (lb/mmscf)× Input Rate/Unit (mmscf/hr) × No. of Units

Emissions (TPY) = Emissions (lb/hr) × 8,760 (hr/yr) / 2,000 (lb/ton)

Greenhouse Gases

Emissions (lb/hr) = Emission Factor (lb/mmBtu)× Heating Capacity (Btu/hr) / 10^6

Emissions (TPY) = Emissions (lb/hr) × 8,760 (hr/yr) / 2000 (lb/ton)

CO_2e (TPY) = Σ Ci Emission (TPY) × Ci Global Warming Factor

Emissions:

Pollutant	Combustion Emissions	
	(lb/hr)	(TPY)
NOx	0.54	2.35
CO	0.45	1.98
$PM/PM_{10}/PM_{2.5}$	0.04	0.18
SO_2	0.003	0.01
VOC	0.03	0.13
CO_2	643	2,816
CH_4	0.04	0.17
N_2O	0.01	0.03

Footnotes:

1. Based on manufacturer specification.
2. Emission factors are from AP-42 Section 1.4, Tables 1.4-1 and 1.4-2.
3. 40 CFR Part 98, Table C-1 and C-2
4. 40 CFR Part 98, Table A-1

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM DIESEL ENGINE No. 1 -- EP-019

Caterpillar Model No. SR5, Engine Model C32 TA
Bridgeton Landfill, LLC
Bridgeton, Missouri
Facility ID. 189-0312

This emergency generator/engine set is used to provide supplemental electricity supply to the GCCS.

Parameters:

Diesel Engine Power =	1,000 kW
Operating Hours[1] =	500 hr/yr
Fuel Combustion[2] =	72 gal/hr
Density of Diesel [3] =	7.1 lb/gal
Average diesel heating value[3] =	19,300 btu/lb
Fire Rate =	9.87 mmbtu/hr

Emission Factor:

NOx (uncontrolled) [4] =	4.93 g/hp-hr	=	1.45E-02 lb/kW-hr
CO [4] =	0.13 g/hp-hr	=	3.83E-04 lb/kW-hr
$PM/PM_{10}/PM_{2.5}$ [4] =	0.018 g/hp-hr	=	5.31E-05 lb/kW-hr
VOC (assumed 100% of Hydrocarbons) [4] =	0.01 g/hp-hr	=	2.95E-05 lb/kW-hr
$SO_2 = 0.00809S_1$ [5] =	0.0004045 lb/hp-hr	=	5.42E-04 lb/kW-hr

Criteria Pollutant Emissions:

Potential Emissions from the Diesel Engine		
Pollutant	Emission Factor	Emissions
	(lb/hr)	(TPY)
NOx (uncontrolled)	14.54	3.63
CO	0.38	0.10
$PM/PM_{10}/PM_{2.5}$	0.05	0.01
VOC	0.03	0.01
SO_2	0.54	0.14

HAP Emissions[6]:

Potential HAP Emissions from the Diesel Engine			
HAP [7]	Emission Factor	Emissions	
	(lb/mmbtu)	(lb/hr)	(TPY)
Benzene	7.76E-04	7.66E-03	1.91E-03
Toluene	2.81E-04	2.77E-03	6.93E-04
Xylenes	1.93E-04	1.90E-03	4.76E-04
Propylene	2.79E-03	2.75E-02	6.88E-03
Formaldehyde	7.89E-05	7.78E-04	1.95E-04
Acetaldehyde	2.52E-05	2.49E-04	6.22E-05
Acrolein	7.88E-06	7.77E-05	1.94E-05
Naphthalene	1.30E-04	1.28E-03	3.21E-04
Total HAPs		**4.22E-02**	**1.06E-02**

Footnotes:

1. Operation of the generator is limited to less than 500 hr/yr for emergency operation, maintenance, and testing in accordance with United States Environmental Protection Agency (USEPA)' s memorandum on September 6, 1995 addressing the determination of Potential to Emit (PTE) for emergency generators.

2. The maximum fuel consumption of the engine is 72 gal/hr at full load.

3. Footnote a to AP-42 Section 3.4, Table 3.4-1

4. Manufacturer guaranteed emission factors

5. Pursuant to 40 CFR 80.510(a)(1), beginning June 1, 2007, all Nonroad, Locomotive, and Marine (NRLM) diesel fuel is subject to the surfur content standard: 500 ppm maximum. 500 ppm = 0.05% S_1 = 0.05

6. HAP emission factors are from AP-42 Section 3.4, Table 3.4-3 and Table 3.4-4. HAP emission calculations are based on annual fuel comsumptions.

7. Hazardous air pollutant listed in the Clean Air Act.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM DIESEL ENGINE No. 2 -- EP-020

Caterpillar Model No. XQ175-2, Engine Model CAT C6.6 ACERT
Bridgeton Landfill, LLC
Bridgeton, Missouri
Facility ID. 189-0312

This emergency generator/engine set is used to provide supplemental electricity supply to the 2,500 scfm flare.

Parameters:

Diesel Engine Power = 175.0 hp = 130.6 kw
Operating Hours[1] = 500 hr/yr
Average BSFC [2] = 7,000 Btu/hp-hr
Maximum Fire Rate = 1.2 mmBtu/hr

[redacted]:

NOx [3] = 0.4 g/kW-hr
CO [3] = 5.0 g/kW-hr
$PM/PM_{10}/PM_{2.5}$ [3] = 0.02 g/kW-hr
VOC (assumed 100% of Hydrocarbons) [3] = 0.19 g/kW-hr
SO_2 [4] = 0.00205 lb/hp-hr

Criteria Pollutant Emissions:

Potential Emissions from the Diesel Engine		
Pollutant	Emissions	
	(lb/hr)	(TPY)
NOx	0.11	0.03
CO	1.44	0.36
$PM/PM_{10}/PM_{2.5}$	0.01	0.001
VOC	0.05	0.01
SO_2	0.36	0.09

HAP Emissions :

Potential HAP Emissions from the Diesel Engine			
HAP [5]	Emission Factor	Emissions	
	(lb/mmbtu)	(lb/hr)	(TPY)
Benzene	9.33E-04	1.14E-03	2.86E-04
Toluene	4.09E-04	5.01E-04	1.25E-04
Xylenes	2.85E-04	3.49E-04	8.73E-05
1,3-Butadiene	3.91E-05	4.79E-05	1.20E-05
Formaldehyde	1.18E-03	1.45E-03	3.61E-04
Acetaldehyde	7.67E-05	9.40E-05	2.35E-05
Acrolein	9.25E-05	1.13E-04	2.83E-05
Naphthalene	8.48E-05	1.04E-04	2.60E-05
Total HAPs		**3.80E-03**	**9.49E-04**

Footnotes:

1. Operation of the generator is limited to less than 500 hr/yr for emergency operation, maintenance, and testing in accordance with United States Environmental Protection Agency (USEPA)' s memorandum on September 6, 1995 addressing the determination of Potential to Emit (PTE) for emergency generators.
2. AP42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1, Footnote a.
3. Based on manufacturer specs, the engine is designed to meet the USEPA Tier 4 interim emission standards.
4. AP-42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1.
5. AP-42 Section 3.3, Table 3.3-2, hazardous air pollutants listed in the Clean Air Act.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM DIESEL ENGINE No. 3 -- EP-021

Perkins Diesel Engine Model 2506C-E15TAG3
Bridgeton Landfill, LLC
Bridgeton, Missouri
Facility ID. 189-0312

This emergency generator/engine set is used to provide supplemental electricity supply to the pretreatment building.

Parameters:

Diesel Engine Power =	543	kW
Operating Hours[1] =	500	hr/yr
Fuel Combustion[2] =	34.9	gal/hr
Density of Diesel[3] =	7.1	lb/gal
Average diesel heating value[3] =	19,300	btu/lb
Heat Input =	4.78	mmbtu/hr

Emission Factor:

NOx[4] =	6.4	g/kw-hr	=	1.41E-02	lb/kW-hr
CO[4] =	3.5	g/kw-hr	=	7.70E-03	lb/kW-hr
$PM/PM_{10}/PM_{2.5}$[4] =	0.2	g/kw-hr	=	4.40E-04	lb/kW-hr
VOC (assumed 100% of TOC)[5] =	0.00247	lb/hp-hr	=	3.29E-03	lb/kW-hr
SO_2[5] =	0.00205	lb/hp-hr	=	1.66E-03	lb/kW-hr

Emissions:

Potential Emissions from the Diesel Engine		
Pollutant	Emission Factor	Emissions
	(lb/hr)	(TPY)
NOx (uncontrolled)	7.65	1.91
CO	4.18	1.05
$PM/PM_{10}/PM_{2.5}$	0.24	0.06
VOC	1.79	0.45
SO_2	0.90	0.23

HAP Emissions[6]:

Potential HAP Emissions from the Diesel Engine			
HAP[7]	Emission Factor	Emissions	
	(lb/mmbtu)	(lb/hr)	(TPY)
Benzene	9.33E-04	4.46E-03	1.12E-03
Toluene	4.09E-04	1.96E-03	4.89E-04
Xylenes	2.85E-04	1.36E-03	3.41E-04
1,3-Butadiene	3.91E-05	1.87E-04	4.67E-05
Formaldehyde	1.18E-03	5.64E-03	1.41E-03
Acetaldehyde	7.67E-05	3.67E-04	9.17E-05
Acrolein	9.25E-05	4.42E-04	1.11E-04
Naphthalene	8.48E-05	4.06E-04	1.01E-04
Total HAPs		**1.48E-02**	**3.71E-03**

Footnotes:

1. Operation of the generator is limited to less than 500 hr/yr for emergency operation, maintenance, and testing in accordance with United States Environmental Protection Agency (USEPA)' s memorandum on September 6, 1995 addressing the determination of Potential to Emit (PTE) for emergency generators.
2. The maximum fuel consumption of the engine is 34.9 gal/hr at 110% load.
3. Footnote a to AP-42 Section 3.4, Table 3.4-1
4. According to manufacturer specifications, the engine is compliance with USEPA Tier 2 emission standards as codified in 40 CFR 89.112
5. AP-42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1.
4. AP-42 Section 3.3, Table 3.3-2, hazardous air pollutants listed in the Clean Air Act.
5. Hazardous air pollutant listed in the Clean Air Act.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM INSIGNIFICANT ACTIVITIES

Portable Pump, Yanmar 3KNDA Diesel Engines (EP-I01 & EP-I02)

Portable Magnum Light Plant Diesel Engines, Kubota d1005 Motor (EP-I03 & EP-I04)

Bridgeton Landfill, LLC

Bridgeton, Missouri

Facility ID. 189-0312

Parameters:

Portable Engine EP-I01 =	37.7 hp	=	28.1	kw
Portable Engine EP-I02 =	37.7 hp	=	28.1	kw
Portable EngineEP-I03 =	23.5 hp	=	17.5	kw
Portable Engine EP-I04 =	23.5 hp	=	17.5	kw
Estimated Operating Hours =	2080 hr/yr			
Average BSFC [1] =	7,000 Btu/hp-hr			

Emission Factor :

NOx [2] =	0.4 g/kW-hr	CO_2 [4] =	73.96 kg/mmbtu
CO [2] =	5.0 g/kW-hr	CH_4 [4] =	0.003 kg/mmbtu
$PM/PM_{10}/PM_{2.5}$ [2] =	0.02 g/kW-hr	N_2O [4] =	0.0006 kg/mmbtu
VOC (assumed 100% of Hydrocarbons) [2] =	0.19 g/kW-hr		
SO_2 [3] =	0.00205 lb/hp-hr		

Criteria Pollutant Emissions:

Potential Emissions from the Portable Diesel Engines								
Pollutant	**EP-I01**		**EP-I02**		**EP-I03**		**EP-I04**	
	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)
NOx	0.02	0.03	0.02	0.03	0.02	0.02	0.02	0.02
CO	0.31	0.32	0.31	0.32	0.19	0.20	0.19	0.20
$PM/PM_{10}/PM_{2.5}$	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
VOC	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SO_2	0.08	0.08	0.08	0.08	0.05	0.05	0.05	0.05
CO_2	42.90	44.62	42.90	44.62	26.77	27.84	26.77	27.84
CH_4	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
N_2O	0.0003	0.0004	0.000	0.000	0.0002	0.0002	0.0002	0.0002

Footnotes:

1. AP42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1, Footnote a.
2. Based on manufacturer specs, these engines meet the USEPA Tier 4 interim emission standards.
3. AP-42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM INSIGNIFICANT ACTIVITIES CONT.
Portable baker pump, John Deer 4045TF285 Diesel Engine (EP-I05 & EP-I06)
Sullair 900H Portable Air Compressor, Caterpillar Diesel C-9 ATAAC Diesel Engine (EP-I07 & EP-I08)
Bridgeton Landfill, LLC
Bridgeton, Missouri
Facility ID. 189-0312

Parameters:

Portable Diesel Engine EP-I05 =	104 kw	=	139.36	hp
Portable Diesel Engine EP-I06 =	104 kw	=	139.36	hp
Estimated Operating Hours =	2080 hr/yr			
Portable Diesel Engine EP-I07 =	224 kw	=	300.16	hp
Portable Diesel Engine EP-I08 =	224 kw	=	300.16	hp
Estimated Operating Hours =	500 hr/yr			
Average BSFC [1] =	7,000 Btu/hp-hr			

Emission Factor:

NOx (uncontrolled) [2] =	4 g/kw-hr	=	8.80E-03 lb/kW-hr
CO [2] =	3.5 g/kw-hr	=	7.70E-03 lb/kW-hr
$PM/PM_{10}/PM_{2.5}$ [2] =	0.2 g/kw-hr	=	4.40E-04 lb/kW-hr
VOC (assumed 100% of Hydrocarbons) [2] =	0.00247 lb/hp-hr	=	3.29E-03 lb/kW-hr
SO_2 [3] =	0.00205 lb/hp-hr	=	1.66E-03 lb/kW-hr
CO_2 [4] =	73.96 kg/mmbtu		
CH_4 [4] =	0.003 kg/mmbtu		
N_2O [4] =	0.0006 kg/mmbtu		

Criteria Pollutant Emissions:

Potential Emissions from the Portable Diesel Engines								
Pollutant	EP-I05		EP-I06		EP-I07		EP-I08	
	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)
NOx (uncontrolled)	0.92	0.95	0.92	0.95	1.97	0.49	1.97	0.49
CO	0.80	0.83	0.80	0.83	1.72	0.43	1.72	0.43
$PM/PM_{10}/PM_{2.5}$	0.05	0.05	0.05	0.05	0.10	0.02	0.10	0.02
VOC	0.34	0.36	0.34	0.36	0.74	0.18	0.74	0.18
SO_2	0.17	0.18	0.17	0.18	0.37	0.09	0.37	0.09
CO_2	158.73	165.08	158.73	165.08	341.88	85.47	341.88	85.47
CH_4	0.01	0.007	0.01	0.007	0.01	0.003	0.01	0.003
N_2O	0.001	0.001	0.001	0.001	0.003	0.001	0.003	0.001

Footnotes:

1. AP42 Section 3.3 Gasoline and Diesel Industrial Engines, Table 3.3-1, Footnote a.
2. Thse diesel engines meet USEPA Tier 3 Emission Standards (40 CFR 98.112) based on the manufacturer specs.
3. AP-42 Section 3.4 Table 1.

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.

POTENTIAL EMISSIONS FROM INSIGNIFICANT ACTIVITIES CONT.

One 500 Gallon Diesel Fuel Tank and 97,000 Gal Tank for Storage of Treated Leachate
Bridgeton Landfill, LLC
Bridgeton, Missouri
Facility ID. 189-0312

ID	Tank	Content	Volume (gal)	Length (ft)	Width (ft)	Height (ft)	Diameter (ft)	Emissions [1] (lb/yr)	Emissions (TPY)
EP-I09	500 gal Diesel Tank	Diesel	500	6.1	-	-	4	1.21	0.0006
EP-I10 [2]	97,000 Gal Tank	Treated Leachate	97,000	-	-	26	25.2	2,998.88	1.50

Footnote:

1. Tanks emissions were estimated using TANKS 4.09d (see attached output results).
2. Emissions from the treated leachate tank were estiated using TANKS 4.09d program (see attached output results).

These emission estimates were prepared utililizing the best information available at the time of preparation, we reserve the right to adjust or amend these calculations based on additional information as it becomes available.