TECHNICAL SUPPORT DOCUMENT

TECHNICAL INFORMATION PRESENTED IN REVIEW OF AN
APPLICATION FOR AN AUTHORITY TO CONSTRUCT PERMIT

APPLICATION SUBMITTED BY

CH2M Hill, Inc.
on behalf of:

Republic Services
770 East Sahara Avenue
Las Vegas, Nevada 89104

For

Republic Dumpco, Incorporated
East of Interstate 15/US 93 Junction,
Apex, Nevada 89124

Part 70 Operating Permit Number: 395
(ATC)

SIC Code – 1442: Construction Sand and Gravel
SIC Code - 4953: Refuse Systems

Clark County
Department of Air Quality and Environmental Management
Permitting Section

October 2010

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Source Information

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Date:	July 16, 2010
Company:	Republic Services
Submitter:	CH2M Hill, Inc.: Catherine MacDougall
Source:	395
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Subject:	Republic Dumpco, Inc. Apex Waste Management Center East of Interstate 15/US 93 Junction Apex, Nevada 89124 T18S, R64E, S10 &18 and T18S, R63E, S24

Source Description

Republic Dumpco, Inc. (Republic) is a producer of construction sand and gravel and an operator of the municipal solid waste landfill. The source operates under Standard Industrial Classification (SIC) Code 4953: Refuse Systems and SIC 1442: Construction Sand and Gravel and North American Industrial Classification System (NAICS) Code 562212: Solid Waste Landfill and NAICS 212321: Construction Sand and Gravel Mining. The source meets or exceeds the major thresholds for PM_{10}, NO_x, SO_x, HAP, and TCS (H_2S) and is a minor source for $PM_{2.5}$, CO, and VOC of air pollutants in the Apex hydrographic basin.

Permitting Action

Republic Dumpco, Inc. applied for a modification to the current Operating Permit. The source requested installation of a 1,400 scfm candlestick (open) flare to the Municipal Solid Waste Landfill. The new flare will burn-off landfill gases and will be to be in compliance with 40 CFR 60 Subpart WWW. Republic will install and utilize a desulfurization system as a control device. The desulfurization system control device will be installed to the capture and collection system to remove H_2S from the landfill gas (LFG) prior to it going to either the proposed 1,400 scfm flare or a power generation station. The desulfurization system is RACT for the new 1,400 scfm flare, by controlling SO_2 emissions. The proposed LFG desulfurization system will reduce SO_x that is emitted from the flare, but it will result in an increase to VOC, HAP, and H_2S emissions.

DAQEM will issue an ATC for a 1,400 scfm flare consistent with AQR Sections 12.4 and 12.5. DAQEM determined the commencement of operation of the proposed flare prior to issuing a Title V revision will not violate AQR Section 12.1.2.1(a)(3). The production limit condition B-12 in the current Title V permit (September 2002) prohibits the source from exceeding a LFG flow rate of 1,000 scfm, unless the owner/operator receives approval from DAQEM after demonstrating the increase will not result in any emissions greater than those listed in the emissions table (Table III-A-2-7) for the existing flare (EU: G09). DAQEM has established that said condition coincides with the current Title V permit control technology requirement, condition C-47, whereby the source is required to install additional control system(s) for SO_2 emissions from the LFG flare (EU: G09) if the flow rate exceeds 1,000 scfm. This ATC will permit the

source to install and operate, based on a timely application, the proposed 1,400 scfm flare with a desulfurization plant separate from the current Title V conditions referenced in this paragraph, and consistent with AQR Section 12.4.

The desulfurization system control device uses a bio-catalyzed process to remove the H_2S from the biogas. The process works similar to a caustic scrubber (absorption section) which removes H_2S and some VOCs with HAPs (benzene, toluene, and xylenes) from the LFG. The scrubbing liquid reacts with the H_2S under slightly alkaline conditions and forms sulfide and water. The treated gas then exits the top of the scrubber to the 1,400 scfm flare or for power generation. The scrubbing liquid, which now contains sulfide and VOCs is directed to a bioreactor where the sulfide is oxidized into elemental sulfur by microbes and the VOCs that were captured in the solution are vented. The cleaned scrubbing solution is then reused in the absorption process. The desulfurization system will have the capacity to operate at a LFG flow rate of 8,997 scfm.

Republic has proposed a Alternate Operating Scenario in which the candlestick flare may operate without the desulfurization system control device. Republic is required to treat the LFG from the capture and collection system (40 CFR 60, Subpart WWW). Based on the estimates of the predicted future LFG collections, the source anticipates that the existing permitted 1,000 scfm internal combustion flare (EU: G09) may not provide adequate capacity. If the amount of the collected LFG exceeds the capacity of the existing 1,000 scfm LFG flare, Republic may need to operate the proposed candlestick flare (EU: G26) prior to the installation of the sulfur treatment system. It is not known if the desulfurization system will be operational before it becomes necessary to operate the proposed candlestick flare. Therefore, Republic is proposing a Alternate Operating Scenario that would be limited by the same annual PTE that would otherwise apply if the desulfurization unit were operating for the entire year.

Acronyms

Table 1: Acronyms

Acronym	Term
AQR	Clark County Air Quality Regulations
ATC	Authority to Construct
Btu	British Thermal Unit
°C	Degrees Celsius
CAAA	Clean Air Act, as amended
CFR	United States Code of Federal Regulations
CO	Carbon Monoxide
DAQEM	Clark County Department of Air Quality & Environmental Management
EPA	United States Environmental Protection Agency
EU	Emission Unit
°F	Degrees Fahrenheit
ft^3/yr	Cubic foot per year
GCCS	Gas Collection and Control System
HAP	Hazardous Air Pollutant
HP	Horse Power
H_2S	Hydrogen Sulfide
kW	kilowatt
LANDGem	Landfill Gas Emissions Model
LFG	Landfill Gas
m^3/yr	Cubic meter per year

Acronym	Term
Mg/yr	Megagram per year
MMBtu	Millions of British Thermal Units
MMscf	Million Standard Cubic Foot
M/N	Model Number
MSWL	Municipal Solid Waste Landfill
N/A	Not Applicable
NAICS	North American Industry Classification System
NMOC	Non-Methane Organic Compounds
NO_x	Nitrogen Oxides
NRS	Nevada Revised Statutes
OP	Operating Permit
PM_{10}	Particulate Matter less than 10 microns
ppm	Parts per Million
ppmvd	Parts per Million, Volumetric Dry
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
QA/AC	Quality Assurance/Quality Control
RBLC	EPA's RACT/BACT/LAER Clearinghouse database
RMP	Risk Management Plan
SCC	Source Classification Codes
scf	Standard Cubic Foot
scfm	Standard Cubic Feet per minute
SIC	Standard Industrial Classification
SIP	State Implementation Plan
S/N	Serial Number
SO_x	Sulfur Oxides
SSM	Startup, Shutdown, and Malfunction
TCS	Toxic Chemical Substance
TRS	Total Reduced Sulfur
VOC	Volatile Organic Compound

Emission Units

Table 2: Summary of Emission Units

EU	Description	Model No. [1]	Serial No.[1]	SCC
G26	John Zink Candlestick (open) Flare, 1,400 scfm LFG Flow	10x30 LFS & Blower Skid LFF	TBD	50100410
	Control Device - Paques THIOPAQ desulfurization system (Controls of H_2S)	TBD	TBD	50100430

[1]TBD = To Be Determined. The source has 30 days after the installation of the Flare and the desulfurization system to provide DAQEM with a model number and the serial numbers.

Calculation of PTE and NEI

Emissions Calculations:

The NO_x and CO emission factors are supplied by the manufacturer of the flare.

$$\boldsymbol{Flare\ Flow\ Rate} = (1{,}400\ cfm)\left(525{,}600\frac{mins}{yr}\right)\left(0.0005\frac{MMBtu}{ft^3}\right)\left(\frac{1\ yr}{8{,}760\ hrs}\right) = \mathbf{42.0}\ \frac{\boldsymbol{MMBtu}}{\boldsymbol{hr}}$$

<u>NO_x Calculations</u>:

$$\boldsymbol{NO_x}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}} = \left(NO_x\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) =$$

$$NO_x\ \frac{lbs}{hr} = \left(0.068\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right) = \mathbf{2.86}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$\boldsymbol{NO_x}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}} = \left(2.86\ \frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{12.52}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

<u>CO Calculations</u>:

$$CO\ \frac{lbs}{hr} = \left(CO\ EF\ \frac{lb}{MMBtu}\right)\left(Flare\ Flow\ Rate\ \frac{MMBtu}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right)$$

$$CO\ \frac{lbs}{hr} = \left(0.37\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right) = \mathbf{15.54}\ \frac{\boldsymbol{lbs}}{\boldsymbol{hr}}$$

$$CO\ \frac{tons}{yr} = \left(15.54\ \frac{lbs}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{68.07}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

<u>SO_x Calculations</u>:

<u>SO_x EF (Uncontrolled H_2S):</u>

<u>Concentration of Reduced Sulfur Compounds C_s</u>

Reduced Sulfur Compound Concentration obtained from the June 2005 LFG test for Sulfur Gases Using ASTM 4404.
$C_s = \Sigma C_p x S_p$
C_s = Concentration of Reduced Sulfur Compounds, ppmv as Sulfur (S)
C_p = Concentration of each Reduced Sulfur Compounds, ppmv
S_p = Number of moles of S produced form the Combustion of each Reduced Sulfur Compound (i.e., 1 for Sulfides, 2 for Disulfides)

Concentration of Reduced Sulfur Compounds C_s = 3,975 ppm or 3.975E-03 $\frac{lb-mol(S)}{lb-mol\ LFG}$

Reduced Sulfur Compounds detected in the June 2005 LFG sampling are Carbonyl sulfide, Hydrogen Sulfide, Methyl Mercaptan, and Dimethyl Sulfide, ppmv or ppmv/1E6 = lb-mol S

<u>SO_x EF:</u>

$$SO_2\ EF\ \frac{lbs}{scf} = \left(TRS\ Concentration\ \left[\frac{lb-mol}{lb-mol\ LFG}\right]\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(Molecular\ Weight\ of\ \ (S)\right)$$

$$(Ratio\ of\ SO_x{:}S)$$

Where Sulfur (S) Molecular Weight $= 32\ \frac{lb}{lb-mol}$ and the ratio of SO_x:S = $\frac{2\ lbs\ SOx}{1\ lb\ S}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(3.975E-03\frac{lb-mol(S)}{lb-mol\ LFG}\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(\frac{32\ lbs}{lb-mol}\right)\left(\frac{2\ lbs\ SO_x}{lb\ S}\right) = 6.59E-04\frac{lbs\ SO_x}{scf}$$

$$\text{Or}\ \left(6.59E-04\ \frac{lbs}{scf}\right)\left(\frac{scf}{0.0005\ MMBtu}\right) = 1.32\ \frac{lbs}{MMBtu}$$

The emission factor calculation shown above is from the Michigan Department of Environmental Quality "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfills*" and *"Onsite Reduced Sulfur Compounds Concentrations*" summarized in the June 2005 LFG Test for Sulfur gases using ASTM 4404.

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(1.32\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right) = \mathbf{55.44\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(1.32\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{242.83\ \frac{tons}{yr}}$$

<u>SO_x EF (Controlled 92.2% of H_2S by Desulfurization Process):</u>

Concentration of Reduced Sulfur Compounds C_s = 309.40 ppm or 3.094E-04 $\frac{lb-mol(S)}{lb-mol\ LFG}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(TRS\ Concentration\ \left[\frac{lb-mol}{lb-mol\ LFG}\right]\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(Molecular\ Weight\ of\ \ (S)\right)$$

$$(Ratio\ of\ SO_x{:}S)$$

Where Sulfur (S) Molecular Weight $= 32\ \frac{lb}{lb-mol}$ and the ratio of SO_x:S = $\frac{2\ lbs\ SOx}{1\ lb\ S}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(3.094E-04\frac{lb-mol(S)}{lb-mol\ LFG}\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(\frac{32\ lbs}{lb-mol}\right)\left(\frac{2\ lbs\ SO_x}{lb\ S}\right) = 5.13E-05\frac{lbs\ SO_x}{scf}$$

$$\text{or}\ \left(5.13E-05\frac{lbs\ SO_x}{scf}\right)\left(\frac{scf}{0.0005\ MMBtu}\right) = 0.10\ \frac{lbs}{MMBtu}$$

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(0.10\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right) = \mathbf{4.20\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(0.10\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{18.40\ \frac{tons}{yr}}$$

<u>PM Calculations</u>:

Emission Factor of 17 lbs/MMSCF for PM_{10} were obtained from AP-42 Chapter 2, Section 2.4, Table 2.4-5 (11/1998)

$$PM_{10}\ EF\ \frac{lbs}{MMBtu} = \left(PM_{10}\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(PM_{10}\ EF\ \frac{lb}{MMBtu}\right) = \left(1.43\ \frac{lbs}{hr}\right)\left(\frac{hr}{42.0\ MMBtu}\right) = \mathbf{0.034\ \frac{lbs}{MMBtu}}$$

$$PM_{10}\ \frac{lbs}{hr} = \left(PM_{10}\ \frac{lb}{MMBtu}\right)\left(\frac{MMscf}{1E6\ scf}\right)(Flare\ Capacity\ [scfm])\left(\frac{60\ minutes}{hr}\right)$$

$$PM_{10}\ \frac{lbs}{hr} = \left(17\ \frac{lb}{MMBtu}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{1{,}400\ scf}{minute}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{1.43\ \frac{lbs}{hr}}$$

$$PM_{10}\ \frac{ton}{yr} = \left(0.034\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{6.26\ \frac{tons}{yr}}$$

The Emission Factor of 5.6 lbs/MMSCF for VOC were obtained from Michigan Department of Environmental Quality's "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfills".*

$$VOC\ \frac{lbs}{hr} = \left(VOC\ EF\ \left[\frac{lb}{MMscf}\right]\right)\left(\frac{MMscf}{1E6\ scf}\right)(Flare\ Capacity\ [scfm])\left(\frac{60\ minutes}{hr}\right)$$

$$VOC\ \frac{lbs}{hr} = \left(5.6\ (5.8)\ \frac{lbs}{MMscf}\right)\left(\frac{MMscf}{1E6\ scf}\right)\left(\frac{1{,}400\ scf}{minutes}\right)\left(\frac{60\ minutes}{hr}\right) = \mathbf{0.47\ \frac{lbs}{hr}}$$

$$VOC\ EF\ \frac{lbs}{MMBtu} = \left(VOC\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(VOC\ EF\ \frac{lb}{MMBtu}\right) = \left(0.47\ \frac{lbs}{hr}\right)\left(\frac{hr}{42.0\ MMBtu}\right) = \mathbf{0.011190\ \frac{lbs}{MMBtu}}$$

$$VOC\ \frac{ton}{yr} = \left(0.011190\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{2.06\ \frac{tons}{yr}}$$

HAP $\frac{lbs}{hr}$ PTE estimated by summing each individual HAP $\frac{lbs}{hr}$. A value of 0.01 $\frac{lbs}{hr}$ was assumed for any individual HAP PTE <0.01 $\frac{ton}{yr}$.

$$HAP\ EF\ \frac{lbs}{MMBtu} = \left(HAP\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(HAP\ EF\ \frac{lb}{MMBtu}\right) = \left(0.27\ \frac{lbs}{hr}\right)\left(\frac{hr}{42.0\ MMBtu}\right) = \mathbf{0.006\ \frac{lbs}{MMBtu}}$$

$$HAP\ \frac{ton}{yr} = \left(0.006\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{1.10\ \frac{tons}{yr}}$$

When calculating TCS it was assumed that 100% of H_2S is converted to SO_x during the combustion process; therefore, it is anticipated that TCS emissions, as H_2S, will not exceed 0.01$\frac{lbs}{hr}$ and 0.04 $\frac{tons}{yr}$.

$$TCS\ EF\ \frac{lbs}{MMBtu} = \left(TCS\ \frac{lbs}{hr}\right)\left(Flare\ Flow\ Rate\ \left[\frac{hr}{MMBtu}\right]\right)$$

$$\left(TCS\ EF\ \frac{lb}{MMBtu}\right) = \left(\mathbf{0.01\ \frac{lbs}{hr}}\right)\left(\frac{hr}{42.0\ MMBtu}\right) = \mathbf{0.0002\ \frac{lbs}{MMBtu}}$$

$$TCS\ \frac{ton}{yr} = \left(0.0002\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right) = \mathbf{0.04\ \frac{tons}{yr}}$$

Table 3: MSWL LFG Flare Combustion Emissions

EU	Flare Rate (MMBtu/hr)	LFG Flow	EF (lb/ MMBtu)	Pollutant	PTE	
					lbs/ hr	tons/yr
G26	42.0	1,400 scfm and 735,840,000 ft^3/yr	0.034[1,2]	**PM_{10} Total**	1.43	6.26
			0.034	**$PM_{2.5}$ Total**	1.43	6.26
			0.068[3,4]	**NO_X Total**	2.86	12.52
			0.37[3,5]	**CO Total**	15.54	68.07
			0.10[6,7,8]	**SO_X Total**	4.20	18.40
			0.01[9,10]	**VOC Total**	0.47	2.06
			6.0E-03[11]	**HAP Total**	0.27	1.10
			2.0E-04[12]	**TCS Total**	0.01	0.04

[1]PM_{10} EF of 17 lbs/MMscf was obtained from AP-42, Chapter 2, Section 2.4, Table 2.4-5 (11/1998).
[2]PM_{10} lb/hr = (PM_{10} EF, lb/MMscf)(MMscf/1E6 scf)(Flare capacity, scfm)(60 minutes/hr) and PM_{10} ton/yr = (PM_{10} EF lbs/MMBtu)(Flare Flow Rate, MMBtu/hr)(8,760 hrs/yr)(ton/2,000 lbs).
[3]NO_x and CO EFs are supplied by John Zink Company for a 1,400 scfm candlestick (open) landfill flare.

[4]NO_x lb/hr = (NOx EF, lb/MMBtu)(Flare Flow Rate, MMBtu/yr)/(Annual Operation, hr/yr) and NOx ton/yr = (NOx EF, lb/MMBtu)((Flare Flow Rate, MMBtu/yr)(ton/2,000 lbs).
[5]CO lb/hr = (CO EF, lb/MMBtu)(Flare Flow Rate, MMBtu/yr)/(Annual Operation, hr/yr) and CO ton/yr = (CO EF, lb/MMBtu)((Flare Flow Rate, MMBtu/yr)(ton/2,000 lbs).
[6]SO_2 EF, lb SO_x/scf = (TRS Concentration, lb-mol/1 lb-mol LFG)(1 lb-mol LFG/386 scf)(molecular Weight of Sulfur (S))(Ration of SO_x:S), where the molecular weight of sulfur = 32 lb/lb-mole and the Ratio of SO_x:S = 2 lbs SOx/1 lb S. EF calculations shown in the calculation section are from the Michigan Department of Environmental Quality "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfill*" and onsite reduced sulfur compounds concentrations summarized in the June 2005 LFG test for sulfur gases using ASTM 4404.
[7]Using the reduced sulfur compound concentration obtained from the June 2005 LFG test for Sulfur gases using ASTM 4404 a concentration can be derived to use for the Concentration of Reduced Sulfur Compounds, C_S = 309.4 ppm. Reduced sulfur compounds detected in the June 2005 LFG sampling are Carbonyl Sulfide, Hydrogen Sulfide, methyl Marcaptan, and Dimethyl Sulfide in ppmv or ppmv/1E6 = lb-mol S.
[8]SO_x lb/hr = (SO_x EF, lb/MMscf)(Flare Flow Rate, scfm)(60 minute/hr) and SO_x ton/yr = (SO_x EF, lb/MMBtu)(Flare Flow Rate, MMBtu/hr)(8,760 hr/yr)(ton/2,000 lbs).
[9]VOC EF of 5.6 lb/MMscf were obtained from the Michigan Department of Environmental Quality "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfills*".
[10]VOC lb/hr = (VOC EF, lb/MMscf)(1 MMscf/1E6 scf)(Flare Capacity, scfm)(60 minute/hr) and VOC ton/yr = (VOC EF, lb/MMBtu)(Flare Flow Rate, MMBtu/hr)(8,760 hr/yr)(ton/2,000 lbs)
[11]HAP lb/hr PTE was estimated by summing each individual HAP lb/hour. A value of 0.01 lb/hour was assumed for any individual HAP PTE <0.01 lb/hr and HAP PTE ton/yr was estimated summing each individual HAP ton/yr. A value of 0.01 ton/yr was assumed for any individual HAP PTE <0.01 ton/yr.
[12]It was assumed that 100% of H_2S is converted to SO_x during the combustion process; therefore, it is anticipated that TCS emissions, as H_2S, will not exceed 0.01 lb/hr and 0.04 ton/yr.

Table 4: Desulfurization System VOC Emissions Calculations[1]

Pollutant	Molecular Weight	Inlet Feed Gas			Treated Feed Gas			Bioreactor Vent	
		lb/hr	lb-mol/hr	mol % (ppm)	lb/hr	lb-mol/hr	mol % (ppm)	lbs/hr	tons/yr
H_2S[2]	34.00	30.13	0.89	7.13E-04	0.68	0.02	1.50E-05	0.01	0.01
Benzene	78.114	1.11	0.0142	10.00	0.91	0.0117	8.00	0.20	0.86
Toluene	92.141	5.22	0.0567	40.00	4.54	0.0493	36.00	0.68	2.99
Xylenes	106.167	3.76	0.0354	25.00	3.22	0.3030	22.00	0.54	2.37
Total VOC for the Desulfurization System								**1.43**	**6.23**

[1]The complete PTE calculations, which the factors in this table are the based on, are located in Modification 9 Supplemental information that was supplied to DAQEM on August 27, 2010. The PTE is based on a flow rate of 8,997 scfm.
[2]H_2S is treated in the Desulfurization System therefore; a nominal amount is estimated to be vented.

a. The Permittee shall operate the flare with no visible emissions as determined by the methods specified in paragraph 40 CFR 60.18(f), except for periods not to exceed a total of five (5) minutes during any two (2) consecutive hours. *[40 CFR 60.18(c)(1)]*

b. Neither the actual nor the allowable emissions from the individual emission units shall exceed the calculated PTE as listed in Tables 5 and 6.

Table 5: PTE (tons per year)

EU	Rating	Conditions	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_x	VOC	HAP	H_2S
G26	42.0 MMBtu/hour	735,840,000 ft^3/year	6.26	6.26	12.52	68.07	18.40	8.29	7.33	0.05
Total			**6.26**	**6.26**	**12.52**	**68.07**	**18.40**	**8.29**	**7.33**	**0.05**

Table 6: PTE (pounds per hour)

EU	Rating	Conditions	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_x	VOC	HAP	H_2S
G26	42.0 MMBtu/hour	1,400 scfm	1.43	1.43	2.86	15.54	4.20	1.90	1.70	0.02
Total			**1.43**	**1.43**	**2.86**	**15.54**	**4.20**	**1.90**	**1.70**	**0.02**

Alternate Operating Scenario:

Under the proposed Alternate Operating Scenario (initial operating scenario), Republic would limit the amount of LFG flared in the proposed 1,400 scfm candlestick flare (EU: G26) to 84,000 cubic feet per hour or 55,857,359 cubic feet per year until the desulfurization system is operational. The emission factors used to calculate the Alternate Operating Scenario are the same as during normal operation for all pollutants except SO_x. The LFG flow to the proposed candlestick LFG flare will be metered.

SO_x: Emissions Calculations per Alternate Operating Scenario

Concentration of Reduced Sulfur Compounds C_s = 3,975 ppm or 3.975E-03 $\frac{lb-mol(S)}{lb-mol\ LFG}$

SO_x EF:

$$SO_2\ EF\ \frac{lbs}{scf} = \left(TRS\ Concentration\ \left[\frac{lb-mol}{lb-mol\ LFG}\right]\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(Molecular\ Weight\ of\ \ (S)\right)$$

$$(Ratio\ of\ SO_x{:}S)$$

Where Sulfur (S) Molecular Weight $= 32\ \frac{lb}{lb-mol}$ and the ratio of SO_x:S = $\frac{2\ lbs\ SOx}{1\ lb\ S}$

$$SO_2\ EF\ \frac{lbs}{scf} = \left(3.975E-03\frac{lb-mol(S)}{lb-mol\ LFG}\right)\left(\frac{lb-mol\ LFG}{386\ scf}\right)\left(\frac{32\ lbs}{lb-mol}\right)\left(\frac{2\ lbs\ SO_x}{lb\ S}\right) = 6.59E-04\frac{lbs\ SO_x}{scf}$$

$$\text{Or}\left(6.59E-04\ \frac{lbs}{scf}\right)\left(\frac{scf}{0.0005\ MMBtu}\right) = 1.32\ \frac{lbs}{MMBtu}$$

The emission factor calculation shown above is from the Michigan Department of Environmental Quality "*Emission Calculation Fact Sheet for Municipal Solid Waste Landfills"* and *"Onsite Reduced Sulfur Compounds Concentrations*" summarized in the June 2005 LFG Test for Sulfur gases using ASTM 4404.

$$SO_x\ \frac{lbs}{hr} = \left(SO_x\ EF\ \left[\frac{lb}{MMBtu}\right]\right)\left(Flare\ Flow\ Rate\ \left[\frac{MMBtu}{hr}\right]\right)$$

$$SO_x\ \frac{lbs}{hr} = \left(1.32\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right) = \mathbf{55.44\ \frac{lbs}{hr}}$$

$$SO_x\ \frac{tons}{yr} = \left(\frac{55{,}857{,}359\ \frac{ft^3}{yr}}{735{,}840{,}000\ \frac{ft^3}{yr}}\right)\left(1.32\ \frac{lbs}{MMBtu}\right)\left(42.0\ \frac{MMBtu}{hr}\right)\left(\frac{8{,}760\ hrs}{yr}\right)\left(\frac{ton}{2{,}000\ lbs}\right)$$

$$= \mathbf{18.40}\ \frac{\boldsymbol{tons}}{\boldsymbol{yr}}$$

Table 7: Alternate Operating Scenario MSWL LFG Flare Combustion Emissions

EU	Flare Rate (MMBtu/hr)	LFG Flow	EF (lb/ MMBtu)	Pollutant	PTE[1]	
					lbs/hr	tons/yr
G26	42.0	1,400 scfm and 55,857,359 ft^3/yr	0.034	**PM_{10} Total**	1.43	0.48
			0.034	**$PM_{2.5}$Total**	1.43	0.48
			0.068	**NO_X Total**	2.86	0.95
			0.37	**CO Total**	15.54	5.17
			0.10	**SO_X Total**	55.44	18.40
			0.01	**VOC Total**	0.47	0.16
			6.0E-03	**HAP Total**	0.27	0.08
			2.0E-04	**TCS Total**	0.01	0.01

[1]PTE is based on the flow to the flare. The flow rate is based on 1,400 scfm and 105,120,000 ft^3 per year.

c. During the Alternate Operating Scenario neither the actual nor the allowable emissions from the individual emission units shall exceed the calculated PTE as listed in Tables 9 and 10.

Table 8: PTE for Alternate Operating Scenario (tons per year)

EU	Rating	Conditions	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_x	VOC	HAP	H_2S
G26	42.0 MMBtu/hour	55,857,359 ft^3/yr	0.48	0.48	0.95	5.17	18.40	0.16	0.08	0.01
Total			**0.48**	**0.48**	**0.95**	**5.17**	**18.40**	**0.16**	**0.08**	**0.01**

Table 9: PTE for Alternate Operating Scenario (pounds per hour)

EU	Rating	Conditions	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_x	VOC	HAP	H_2S
G26	42.0 MMBtu/hour	1,400 scfm	1.43	1.43	2.86	15.54	55.44	0.47	0.27	0.01
Total			**1.43**	**1.43**	**2.86**	**15.54**	**55.44**	**0.47**	**0.27**	**0.01**

Production Limits

1. The Permittee shall not allow the actual flow of landfill gas to the open flare (EU: G26) to exceed 1,400 scfm and 735,840,000 ft^3/yr.

a. The Permittee shall operate the desulfurization system control device when the flare (EU: G26) is in operation, except when operating under the Contingency Scenario. The Contingency Scenario is the initial operating scenario and will be discontinued upon commencement of operation of the desulfurization system control device.

2. During the time that the Contingency Scenario is in effect, the Permittee shall not allow the actual flow of landfill gas to the open flare (EU: G26) exceed 1,400 scfm nor 55,857,359 ft^3/year.
3. The Permittee shall limit the combined total calendar year emissions from the two operating scenarios identified in this section to the PTE in Table IV-A-2.

Production limits were submitted by the source.

Review of Applicable Regulations

As the calculations for Modification 9 were being determined it was decided to perform a five year review for NEI, starting with Modification 3 issued December 2006 and including Modifications 4, 6, 8, and 9; where Modification 5 has not been issued and Modification 7 was withdrawn by the source. The NEI for Modification 3 was not added to the overall NEI because it was assessed in Modification 3 PTE. Actual annual emission data was not considered in the NEI calculations for the last five years due to the fact that there have not been two consecutive and representative years of data collected between modifications.

Table 10: 2006 Fugitive Emissions Estimates for Landfill Gas

2006 Fugitive Emissions Limits from Landfill Gas		
Pollutants	**Maximum Emission based on 2006 Estimates**	
	lb/hour	**ton/year**
VOC (Including HAP, but not H_2S)	7.51	32.89
HAP (Not Including H_2S)	7.34	32.16
TCS (H_2S)	33.62	147.27

Table 11: Five Year Permitting Action NEI Summary

	PM_{10}	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_x**	**VOC**	**HAP**	**TCS (H_2S)**
Modification 3 PTE Non-Fugitives: Issued 12/2006	322.76	12.35	106.65	31.88	172.28	10.73	0.43	0.00
Modification 4, Revision 1 NEI:	-66.52	0.00	2.07	-0.69	3.95	-0.67	2.88	0.00
Modification 6 NEI	-0.08	-0.08	0.09	-0.08	0.97	-0.04	-0.03	0.00
Modification 8 NEI	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00
Modification 9 NEI	**6.26**	**6.26**	**12.52**	**68.07**	**18.40**	**8.29**	**7.33**	**0.05**
Total NEI [5 year look back]	**-60.34**	**6.18**	**14.68**	**67.30**	**23.32**	**7.68**	**10.19**	**0.05**
Source: Modification 9 PTE	262.42	18.53	121.33	99.18	195.60	18.41	10.62	0.05

Table 12: Summary of Requirements in AQR Sections 12

	PM_{10}	**$PM_{2.5}$**	**NO_x**	**CO**	**SO_x**	**VOC**	**HAP**	**H_2S**
Non-fugitive PTE (tpy)	262.42	18.53	121.33	99.18	195.60	18.41	10.62	0.05
Landfill Fugitive (tpy)	0.00	0.00	0.00	0.00	0.00	32.89	32.16	147.27
NEI From AQR	6.26	6.26	12.52	68.07	18.40	8.29	7.33	0.05

	PM_{10}	$PM_{2.5}$	NO_x	CO	SO_x	VOC	HAP	H_2S
Sections 12 (tpy)								
Minor Source	< 100 tpy	< 100 tpy	< 100 tpy	< 100 tpy	≤ 100 tpy	< 100 tpy	If single HAP ≤ 10 tpy and all HAP ≤ 25 tpy	< 1.0 tpy
Control Technology	NA	NA	NA	RACT	RACT	NA	NA	NA
Area Classification	PSD	PSD	Non-attain-ment for Ozone	PSD	PSD	Non-attain-ment for Ozone	PSD	PSD
Notice of Proposed Action	If NEI ≥ 15 tpy	If NEI ≥ 15 tpy	If NEI ≥ 40 tpy	**If NEI ≥ 50 tpy**	If NEI ≥ 40 tpy	If NEI ≥ 40 tpy	If NEI ≥ 10 tpy for all HAP	If NEI ≥ 10 tpy
Preconstruction Ambient Air Monitoring	10 μg/m^3 24-hour[1]	No	14 μg/m^3 annual[1]	575 μg/m^3 8-hour[1]	13 μg/m^3 24-hour[1]	If NEI ≥ 100 tpy for O_3	No	0.2 μg/m^3 1-hour[1]

Note: Apply PTE threshold to new sources, NEI threshold to modifying sources.
[1]PSD Monitoring Significance Levels for Pre-Construction is based on Averaging Time.

1. The proposed modification does not trigger a major modification for any regulated pollutant based on the NEI indicated above. However, the NEI for the proposed action exceeded the minor NSR significance threshold for CO, thereby triggering a RACT analysis and notice of proposed action. This action will be published in a newspaper of general circulation within Clark County, consistent with AQR Section 12.4.3.2(a)(3) and 12.1.5.3.

Applicable Regulations:

The candlestick flare and desulfurization system control device at Republic are applicable to AQRs 4, 5, 6, 8, 9, 12, 13, 14, 25, 26, 40, and 43.

Republic is subject to 40 CFR 60 Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills. The source commenced construction of a MSWL on or after May 30, 1991. The source is subject to 40 CFR 60.18 – General Control Device and Work Practice Requirements b through f. The source is also subject o 40 CFR 63 Subpart AAAA – National Emission Standards for Hazardous Air Pollutants: Municipal Solid Waste Landfills given that the source is subject to 40 CFR 60 Subpart WWW.

Control Technology

<u>The proposed action exceeded the minor NSR significance level for CO and SO_x as defined in AQR 12.4.2.1. Per AQR 12.4.3.2, the source is required to install controls that satisfy RACT for CO and SO_x. The source proposed an analysis for all criteria pollutants, which satisfied the level of control required for this permitting action.</u>

<u>Flare Controls Analysis</u>

PM_{10} Analysis:

Review of the EPA RBLC database and industry standards determined that the only PM_{10} control method identified for candlestick flares combusting LFG is proper maintenance of the flare, including monitoring for the presence of the flames, LFG flow rate, 0% opacity, and percent methane in LFG. Therefore, Republic Services proposes to implement proper maintenance and operation.

NO_x Analysis:
Per EPA's RBLC and industry standards there are four potential control technologies to control NO_x emissions as proposed for the open flare.

1. Proper maintenance and operation, including monitoring for the presence of a flame, operational temperature, the LFG flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the LFG.
2. Staged Combustion
3. Add-on controls such as Low NO_x/Ultra Low NO_x burners/Selective Catalytic Reduction (SCR), etc.
4. Enclosed Flare

<u>Discussion of Technical Feasibility</u>:

1. Proper maintenance and operation, including monitoring for the presence of a flame, operational temperature, the landfill gas flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the landfill gas.

Per John Zink Company, LLC, it is not technically feasible to regulate the temperature of an open flare. After review of the RBLC database and industry standards, it has been determined that proper maintenance and operation (not including the regulation or operation of the operational temperature of the flare) has been used and demonstrated effective on similar size flares. Therefore, this technology is considered to be technically feasible.

2. Staged Combustion

Since combustion occurs in the open with candlestick flares, staging of combustion is not feasible. Also, since the flame temperature is relatively low in candlestick flares, staged combustion, if it were feasible, would not likely achieve additional reductions in NO_x emissions. This technology is not considered technically feasible and is not evaluated any further.

3. Add-on controls such as Low NO_x/Ultra Low NO_x burners/Selective Catalytic Reduction (SCR), etc.

A search of the EPA RBLC failed to reveal the use of add-on NO_x control technology on candlestick flares. In addition, two leading flare vendors, John Zink Company and NOA, Inc. have stated that neither is aware of any installation where add on technology has been applied to open flares. Add-on technologies are not considered technically feasible and therefore, are not evaluated any further.

4. Enclosed Flare

Enclosed flares can be used to lower NO_x emissions. The use of an enclosed flare is a technically feasible control technology.

Ranking the Controls Technologies by Control Effectiveness:
Remaining control alternatives not eliminated are ranked in order of most effective.

1. Enclosed Flare
2. Proper maintenance and operation, including monitoring for the presence of a flame, the LFG flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the LFG.

Economic Impact:
NO_x emission factors supplied John Zink Company for both the proposed candlestick flare (0.068 lb/MMBtu) and an enclosed flare (0.06 lb/MMBtu) were used in the economic impact evaluation. In addition, John Zink Company provided estimated capital cost of a typical candlestick flare and a quote for an enclosed flare. Based on a flare capacity of 1,400 scfm and the information provided by Jon Zink Company, the cost per ton of NO_x removed by an enclosed flare versus a candlestick flare is $71,347/ton of NO_x removed.

Capacity of Flare:	1,400 scfm
Heating Value of LFG:	500 Btu/scfm
Capacity of Flare:	700,000 Btu/minute or 0.70 MMBtu/minute
Annual Operation:	8,760

Table 13: NO_x Emissions per Flare Type

Type of Flare	NO_x Emission Factor (lb/MMBtu)	NO_x Emissions (tons/year)
Candle Stick Flare	0.068	12.52
Enclosed Flare	0.06	11.04

Tons NO_x removed by Enclosed Flare vs. Candlestick Flare:	1.47 tons
Capital costs of Candlestick Flare:	$105,000
Capital Costs of Enclosed Flare[1]:	$210,000
Cost per ton of NO_x removed by Enclosed Flare:	$71,347

[1]Costs provided by John Zink Company, LLC. John Zink Company LLC stated that the capital cost for an enclosed flare is approximately 2-3 times the capital cost of an enclosed flare. Costs for an enclosed flare are provided.

Based on this cost estimate, Republic believes the use of an enclosed flare is not economically feasible. This technology can be eliminated based on economic feasibility. The only remaining feasible technology is proper maintenance and operation including monitoring for the presence of a flame, the LFG flow rate to the flare, 0% opacity, and measuring the percent methane in the LFG.

Thus, the source will implement proper maintenance and operation for NO_x emissions.

CO Analysis:
Review of the EPA RBLC database and industry standards determined that the only control method identified for candlestick flares combusting LFG is good combustion practices, including proper maintenance and operation (not including the regulation and monitoring of the operational temperature of the flare). Republic proposes to implement the only identified control option of good combustion practices and proper maintenance and operation, including

monitoring for the presence of a flame, the LFG flow rate to the flare, zero percent (0%) opacity, and measuring the percent methane in the LFG as RACT for CO emissions for the proposed 1,400 scf LFG flare.

SO_x Analysis:
Review of the EPA RBLC database and industry standards identified the following potential control technologies for SO_2 control for the proposed LFG flare.

1. Desulfurization System/scrubbing for H_2S removal.
2. Proper maintenance and operation, including monitoring for the presence of a flame, operational temperature, landfill gas flow rate to the flare, zero percent opacity, and measuring the percent methane in the landfill gas.

After review of the RBLC database and industry standards, it has been determined that desulfurization/scrubbing for H_2S removal has been used and demonstrated to be effective on similarly sized flares. Therefore, the desulfurization system is considered to be technically feasible. For proper maintenance and operation, per the John Zink Company, LLC it is not technically feasible to monitor or regulate the temperature of an open flare. It has been determined that proper maintenance and operation (not including operational temperature) has been used and demonstrated effective and this technology is considered to be technically feasible.

The source is proposing to cease operation of the candlestick flare under the Contingency Scenario after one (1) year. The economic cost of using the desulfurization (LFG scrubbing) system is in Table 14:

Uncontrolled SO_2 emissions (no Desulfurization) = 242.83 tons/year
Controlled with Desulfurization (LFG scrubbing) = 18.40 tons/year

Table 14: Cost per Ton of SO_2 Removed

Control Technology	Control Efficiency	5 year Life Cycle Costs[1]	Cost Per Year	Cost per Ton of SO_2 Removed
Desulfurization (LFG Scrubbing)	92.2%	$3,045,182	$609,036	$2,714

[1]Capital and annual costs for desulfurization (LGF scrubbing) for hydrogen sulfide removal are based on the capital and annual costs provided by John Henderson at Cameron

The Contingency Scenario is based on using the candlestick flare for one (1) year without any sulfur control device. The source has based the scenario on only burning 55,857,359 cubic feet of LFG in total for one year, equivalent to the emissions that would have otherwise been required as a result of the RACT analysis for SO_x.

Uncontrolled SO_2 emissions (no Desulfurization) for 1 year = 18.40 tons/year
Controlled with Desulfurization (LFG scrubbing) for 1 year = 16.96 tons/year

Table 15: Contingency Scenario - Cost per Ton of SO_2 Removed

Control Technology	Control Efficiency	1 Year Life Cycle Costs[1]	Cost Per Year	Cost per Ton of SO_2 Removed
Desulfurization (LFG Scrubbing)	92.2%	$2,696,154	$2,696,154	$158,971

[1]Capital and annual costs for desulfurization (LGF scrubbing) for hydrogen sulfide removal are based on the capital and annual costs provided by John Henderson at Cameron.

Therefore, RACT for the control of SO_2 is a desulfurization system when used in the flaring of landfill gas. The operation of the flare without a desulfurization system is limited to 55,857,359 ft^3/yr of LFG at a rate of 1,400 scfm while meeting the requirements of 40 CFR 60 Subpart WWW. Once the desulfurization system is in place and operational, there are no limits on the throughput or timeframe for the 1,400 scfm flare.

VOC Analysis
The flare provides a 98% reduction of VOCs just by the nature of combustion. Review of the EPA RBLC database and industry standards determined that the only VOC emission control method identified for candlestick flares combusting LFG is proper maintenance of the flare, including monitoring for the presence of the flames, LFG flow rate, 0% opacity, and percent methane in LFG. Therefore, Republic proposes to implement proper maintenance and operation.

Monitoring

1. The Permittee shall install, calibrate, maintain, and operate according to the manufacturer's specifications the following equipment on the open combustion flare *[40 CFR 60.756(c)]*:
   a. A heat sensing device, such as an ultraviolet beam sensor or thermocouple, at the pilot light or the flame itself to indicate the continuous presence of a flame.
   b. A device that records flow to or bypass of the flare:
      i. install, calibrate, and maintain a gas flow rate measuring device that shall record the flow to the control device at least every 15 minutes; or
      ii. secure the bypass line valve in the closed position with a car-seal or a lock-and key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the value is maintained in the closed position and that the gas flow is not diverted through the bypass line.

2. The Permittee shall monitor on a quarterly basis, the visible emissions from the flare (EU: G26) by employing 40 CFR 60 Appendix A, Method 22. The observation period is 2 hours and shall be used according to Method 22. *[40 CFR 60.18(f)(1)]*
3. The Permittee shall conduct on a quarterly basis, a heating value analysis (Btu content) on the landfill gas consistent with EPA approved methods (or equivalent) or a net heating value analysis of the combustion landfill gas as outlined in 40 CFR 60.18(f)(3). The concentration of methane in the landfill gas shall be determined by using 40 CFR 60 Appendix A: Method 3C. A minimum of three 30-minute Method 3C samples are determined. The measurement of other organic components, hydrogen, and carbon monoxide is not applicable. Method 3C may be used to determine the landfill gas molecular weight for calculating the flare gas exit velocity under 40 CFR 60.18(f)(4). *[40 CFR 60.18(f)(3) and 40 CFR 60.754(e)]*
4. The Permittee shall perform at least one visual emissions check on the open combustion flare (EU: G26) each day upon commencing operation, while operating to demonstrate compliance with the opacity limit. If the open combustion flare does not operate during the calendar quarter, then no observation of that unit shall be required. If visible emissions

are observed, then corrective actions shall be taken to minimize the emissions and, if practicable, the opacity of emissions shall be visually determined in accordance with 40 CFR 60 Appendix A: Reference Method 9. *[AQR 12.4.3.1(e)(10) and AQR 26]*

Testing

1. The Permittee shall use performance testing for the desulfurization system control device to demonstrate compliance of 92.2 percent control efficiency of H_2S reduction in landfill gas. *[AQR 12.4.3.1(a)(7)]*

Mitigation

1. The source has no Federal offset obligation.

Increment

Republic Services – Apex Waste Management Center is a major source in the Hydrographic Area 216 (Garnet Valley) that has applied for a minor modification. Permitted emission units include municipal solid waste landfill operations. Since minor source baseline dates for PM_{10} (December 31, 1980), NO_2 (January 24, 1991) and SO_2 (December 31, 1980) have been triggered, Prevention of Significant Deterioration (PSD) increment analysis is required.

DAQEM modeled the source using AERMOD to track the increment consumption. Stack data submitted by the applicant were used in the model. Five years (1999 to 2003) of meteorological data from the McCarran station and Desert Rock station were used in the model. United States Geological Survey (USGS) National Elevation Dataset (NED) was used to calculate elevations. Table 11 presents the results of the modeling.

Table 11: PSD Increment Consumption

Pollutant	Averaging Period	PSD Increment Consumption by the Source (μg/m^3)	Location of Maximum Impact	
			UTM X (m)	UTM Y (m)
SO_2	3-hour	23.86[1]	691820	4027161
SO_2	24-hour	5.96[1]	691485	4028356
SO_2	Annual	1.05	691485	4028356
PM_{10}	24-hour	28.26[1]	691536	4027155
PM_{10}	Annual	6.97	691536	4027155
NO_X	Annual	1.50	691521	4027959

[1]Modeled High 2nd High Concentration

Table 11 shows the location of the maximum impact and the potential PSD increment consumed by the source at that location. The impacts are below the PSD increment limits.

Public Notice

Public notice is required because the source has triggered the threshold of 50 tons per year for CO.

Permitting History

1. The last permit was issued on May 13, 2010.
2. Application for Modification 9 was received by DAQEM on February 16, 2010.
3. The application was assigned to the Air Quality Specialist on February 23, 2010.
4. The application was deemed complete on May 26, 2010.
5. The TSD and draft permit were submitted for review on June 2, 2010.
6. Supplemental information was submitted to DAQEM on August 9, 2010 that incorporates the desulfurization system into this Modification.
7. Supplemental information was submitted to DAQEM on September 13, 2010 to update the information for the Contingency Scenario.
8. Revised TSD and draft permit were submitted for review on September 14, 2010.

Attachments

MSWL LFG Flare with Desulfurization Processing

EU	Description	Flare Rate (MMBtu/hr)	LFG Flow (scfm)	EF	Pollutant	PTE	
						lbs/hr	tons/yr
G26	John Zink Candlestick (open) Flare	42.0	1,400 scfm and 735,840,000 ft^3/yr	0.034	**LFG FlarePM_{10} Total**	1.43	6.26
				0.034	**LFG Flare$PM_{2.5}$ Total**	1.43	6.26
				0.068	**LFG Flare NO_X Total**	2.86	12.51
				0.37	**LFG Flare CO Total**	15.54	68.07
				0.10	**LFG Flare SO_X Total**	4.31	18.87
				0.01	**LFG Flare VOC Total**	0.47	2.06
				6.0E-03	**LFG Flare HAP Total**	0.27	1.10
				2.0E-04	**LFG Flare TCS Total**	0.01	0.04

Contingency Scenario

MSWL LFG Flare without Desulfurization Processing [Limited to 105,120,000 ft^3/year]

EU	Description	Flare Rate (MMBtu/hr)	LFG Flow (scfm)	EF	Pollutant	PTE	
						lbs/hr	tons/yr
G26	John Zink Candlestick (open) Flare	42.0	1,400 scfm and 55,857,359 ft^3/yr	0.034	**LFG FlarePM_{10} Total**	1.43	0.48
				0.034	**LFG Flare$PM_{2.5}$ Total**	1.43	0.48
				0.068	**LFG Flare NO_X Total**	2.86	0.95
				0.37	**LFG Flare CO Total**	15.54	5.17
				0.10	**LFG Flare SO_X Total**	55.44	18.40
				0.01	**LFG Flare VOC Total**	0.47	0.16
				6.0E-03	**LFG Flare HAP Total**	0.27	0.08
				2.0E-04	**LFG Flare TCS Total**	0.01	0.01

Desulfurization System Calculations

Pollutant	Molecular Weight	Inlet Feed Gas			Treated Feed Gas			Bioreactor Vent	
		lb/hr	lb-mol/ hr	mol % (ppm)	lb/hr	lb-mol/ hr	mol % (ppm)	lbs/hr	tons/yr
H_2S	34.00	30.26	8.90E-01	7.13E-04	0.68	2.00E-02	1.50E-05	0.01	0.01
Benzene	78.114	1.11	1.42E-02	10.00	0.91	1.17E-02	8.00	0.20	0.86
Toluene	92.141	5.22	5.67E-02	40.00	4.54	4.93E-02	36.00	0.68	2.99
Xylenes	106.167	3.76	3.54E-02	25.00	3.22	3.03E-02	22.00	0.54	2.37
								1.43	**6.22**

Landfill Fugitive Emissions Calculations based on 2006 estimations

2006 Fugitive Emissions Limits from Landfill Gas		
Pollutants	**Maximum Emission based on 2006 Estimates**	
	lb/hour	**ton/year**
VOC (Including HAP, but not H_2S)	7.51	32.89
HAP (Not Including H_2S)	7.34	32.16
TCS (H_2S)	33.62	147.27

Modification 3 ATC/OP NEI Calculations

MODIFICATION 3 [ATC/OP] 12/29/2006						
	PM_{10}	**NOx**	**CO**	**SOx**	**VOC**	**HAP**
Total NEI (installing: EU: G23 & G24 and removed G11 & G13	0.20	7.58	0.06	3.04	0.12	0.01
Total PTE for Non-Fugitives	**322.76**	**106.65**	**31.88**	**172.28**	**10.73**	**0.43**

Modification 4 ATC/OP NEI Calculations

MODIFICATION 4 [ATC/OP]						
	PM_{10}	NOx	CO	SOx	VOC	HAP
Aggregate Processing (Process A)	20.60	0.00	0.00	0.00	0.00	0.00
Generators [EU: A200-A204]	2.19	65.47	25.26	1.68	4.28	2.31
Soil Treatment (Process W)	0.88	0.00	0.00	0.00	2.78	0.00
Industrial Waste (Process W)	11.02	0.00	0.00	0.00	0.19	0.00
Paved Haul Road (Process W)	0.97	0.00	0.00	0.00	0.00	0.00
MSWL (Process W)	220.58	43.25	5.93	174.55	2.81	1.00
Total PTE for Non-Fugitives for Mod 4	**256.24**	**108.72**	**31.19**	**176.23**	**10.06**	**3.31**
Total PTE for Non-Fugitives for Mod 3	**322.76**	**106.65**	**31.88**	**172.28**	**10.73**	**0.43**
Total NEI for Non-Fugitives	**-66.52**	**2.07**	**-0.69**	**3.95**	**-0.67**	**2.88**

Modification 6 ATC NEI Calculations

NEI FOR MODIFICATION 6 [ATC] 2/27/09						
	PM_{10}	NOx	CO	SOx	VOC	HAP
Installation of EU: G25	0.21	4.33	0.83	1.03	0.33	0.02
Removal of EU: G12 Actual Emissions	0.29	4.24	0.91	0.06	0.37	0.05
Total NEI for Mod 6	**-0.08**	**0.09**	**-0.08**	**0.97**	**-0.04**	**-0.03**

Modification 6 ATC MSWL Calculations

MSWL Total for Modification 6 [ATC] 2/27/2009						
	PM_{10}	NOx	CO	SOx	VOC	HAP
MSWL (Process W) Total for Mod 4	220.58	43.25	5.93	174.55	2.81	1.00
Total NEI for Non-Fugitives Mod 6	**-0.08**	**0.09**	**-0.08**	**0.97**	**-0.04**	**-0.03**
NEW MSWL (Process W) Total for Mod 6	220.50	43.34	5.85	175.52	2.77	0.97

Modification 6 ATC Calculations

MODIFICATION 6 [ATC] 2/27/2009						
	PM_{10}	NOx	CO	SOx	VOC	HAP
Aggregate Processing (Process A)	20.60	0.00	0.00	0.00	0.00	0.00
Generators [EU: W200-W204]	2.19	65.47	25.26	1.68	4.28	2.31
Soil Treatment (Process W)	0.88	0.00	0.00	0.00	2.78	0.00
Industrial Waste (Process W)	11.02	0.00	0.00	0.00	0.19	0.00
Paved Haul Road (Process W)	0.97	0.00	0.00	0.00	0.00	0.00
MSWL (Process W) for Mod 6	220.50	43.34	5.85	175.52	2.77	0.97
Total PTE for Non-Fugitives for Source	**256.16**	**108.81**	**31.11**	**177.20**	**10.02**	**3.28**

Modification 8 ATC NEI Calculations

MSWL Total for Modification 6 [ATC] 2/27/2009						
	PM_{10}	NOx	CO	SOx	VOC	HAP
NEW MSWL (Process W) Total for Mod 6	220.50	43.34	5.85	175.52	2.77	0.97
Total NEI for Non-Fugitives Mod 8	**0.00**	**0.00**	**0.00**	**0.00**	**0.10**	**0.01**
NEW MSWL (Process W) Total for Mod 8	220.50	43.34	5.85	175.52	2.87	0.98

Modification 8 ATC PTE Calculations

MODIFICATION 8 [ATC] 2/27/2009							
	PM_{10}	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Aggregate Processing (Process A)	20.60	0.00	0.00	0.00	0.00	0.00	0.00
Generators [EU: W200-W204]	2.19	65.47	25.26	1.68	4.28	2.31	0.00
Soil Treatment (Process W)	0.88	0.00	0.00	0.00	2.78	0.00	0.00
Industrial Waste (Process W)	11.02	0.00	0.00	0.00	0.19	0.00	0.00
Paved Haul Road (Process W)	0.97	0.00	0.00	0.00	0.00	0.00	0.00
MSWL (Process W) Mod 8	220.50	43.34	5.85	175.52	2.87	0.98	0.00
Total PTE for Non-Fugitives for Source	**256.16**	**108.81**	**31.11**	**177.20**	**10.12**	**3.29**	**0.00**
Fugitive Emissions from Landfill Gas	**0.00**	**0.00**	**0.00**	**0.00**	**32.89**	**32.16**	**147.27**

Modification 9 ATC NEI Calculations

MSWL Total for Modification 9 [ATC] 2/27/2009							
	PM_{10}	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
NEW MSWL (Process W) Total for Mod 8	220.50	43.34	5.85	175.52	2.87	0.98	**0.00**
Total NEI for Non-Fugitives Mod 9	**6.26**	**12.52**	**68.07**	**18.40**	**8.29**	**7.33**	**0.05**
NEW MSWL (Process W) Total for Mod 9	**226.76**	**55.86**	**73.92**	**193.92**	**11.16**	**8.31**	**0.05**

Modification 9 ATC NEI Calculations

MODIFICATION 9 [ATC] 2/27/2009							
	PM_{10}	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Aggregate Processing (Process A)	20.60	0.00	0.00	0.00	0.00	0.00	0.00
Generators [EU: W200-W204]	2.19	65.47	25.26	1.68	4.28	2.31	0.00
Soil Treatment (Process W)	0.88	0.00	0.00	0.00	2.78	0.00	0.00
Industrial Waste (Process W)	11.02	0.00	0.00	0.00	0.19	0.00	0.00
Paved Haul Road (Process W)	0.97	0.00	0.00	0.00	0.00	0.00	0.00
MSWL (Process W) Mod 9	226.76	55.86	73.92	193.92	11.16	8.31	0.05
Total PTE for Non-Fugitives for Source	**262.42**	**121.33**	**99.18**	**195.60**	**18.41**	**10.62**	**0.05**
Fugitive Emissions from Landfill Gas	**0.00**	**0.00**	**0.00**	**0.00**	**32.89**	**32.16**	**147.27**

Modification 9 ATC Contingency Scenario
NEI Calculations

Contingency Scenario without Desulfurization System							
MSWL Total for Modification 9 [ATC] 2/27/2009							
	PM_{10}	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
NEW MSWL (Process W) Total for Mod 8	220.50	43.34	5.85	175.52	2.87	0.98	**0.00**
Total NEI for Non-Fugitives Mod 9	**0.90**	**0.90**	**1.79**	**34.69**	**0.16**	**0.16**	**0.01**
NEW MSWL (Process W) Total for Mod 9	**221.40**	**44.24**	**7.64**	**210.21**	**3.03**	**1.14**	**0.01**

Modification 9 ATC Contingency Scenario
PTE Calculations

MODIFICATION 9 [ATC] 2/27/2009							
	PM_{10}	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Aggregate Processing (Process A)	20.60	0.00	0.00	0.00	0.00	0.00	0.00
Generators [EU: W200-W204]	2.19	65.47	25.26	1.68	4.28	2.31	0.00
Soil Treatment (Process W)	0.88	0.00	0.00	0.00	2.78	0.00	0.00
Industrial Waste (Process W)	11.02	0.00	0.00	0.00	0.19	0.00	0.00
Paved Haul Road (Process W)	0.97	0.00	0.00	0.00	0.00	0.00	0.00
MSWL (Process W) Mod 9	221.40	44.24	7.64	210.21	3.03	1.14	0.01
Total PTE for Non-Fugitives for Source	**257.06**	**109.71**	**32.90**	**211.89**	**10.28**	**3.45**	**0.01**
Fugitive Emissions from Landfill Gas	**0.00**	**0.00**	**0.00**	**0.00**	**32.89**	**32.16**	**147.27**

395_M09: Attachment 4								
5 year NEI Look Back								
	PM_{10}	$PM_{2.5}$	NOx	CO	SOx	VOC	HAP	TCS (H_2S)
Modification 3 PTE Non-Fugitives: Issued 12/2006	322.76	12.35	106.65	31.88	172.28	10.73	0.43	0.00
Modification 4, Revision 1 NEI:	-66.52	0.00	2.07	-0.69	3.95	-0.67	2.88	0.00
Modification 6 NEI	-0.08	-0.08	0.09	-0.08	0.97	-0.04	-0.03	0.00
Modification 8 NEI	0.00	0.00	0.00	0.00	0.00	0.10	0.01	0.00
Modification 9 NEI	**6.26**	**6.26**	**12.52**	**68.07**	**18.40**	**8.29**	**7.33**	**0.05**
Total NEI [5 year look back]	**-60.34**	**6.18**	**14.68**	**67.30**	**23.32**	**7.26**	**10.19**	**0.05**
Source: Modification 9 PTE	262.42	18.53	121.33	99.18	195.60	18.41	10.62	0.05