

**SYNTHETIC MINOR OPERATING PERMIT  
EVALUATION REPORT  
CITY OF SANTA CLARA ALL PURPOSE LANDFILL  
PLANT NUMBER A3464  
APPLICATION NUMBER 16697**

## **BACKGROUND**

The City of Santa Clara has made application for a Synthetic Minor Operating Permit under the provisions of Regulation 2, Rule 6-230 for its landfill located at 5401 Lafayette Street, Santa Clara, California. This site is a closed Class III municipal waste disposal site which began accepting municipal water in 1961, last received solid waste in September 1993, and received final closure certification in September 1994. The current mass of the landfill is estimated to be approximately 5.5 million tons-in place.

The landfill has an existing landfill gas collection and control system consisting of 78 landfill gas extraction wells with an associated landfill gas flare. The landfill gas collection system was originally installed in 1988, and was replaced by the current system in 1995. An initial Title V permit for the plant was issued in 2003 (Application 2613).

The landfill gas collected by the landfill gas collection and control system was previously used to fuel an internal combustion engine for electricity generation. However, there is currently insufficient gas of adequate quality to meet the minimum requirements for operating this engine. The associated energy plant was permanently closed in 2005.

The applicant believes that the landfill is no longer a major source of emissions. On September 14, 2007, the applicant submitted an application for a Synthetic Minor Operating Permit, pursuant to Regulation 2, Rule 6-310, in conjunction with its request to be removed from Title V designation.

## **REQUIREMENTS FOR REMOVING A MUNICIPAL SOLID WASTE LANDFILL FROM TITLE V DESIGNATION**

In accordance with 40 CFR Part 60.752(d), a closed landfill is no longer subject to the Title V operating permit requirements if the landfill meets all of the gas collection and gas control system equipment removal criteria under 40 CFR Part 60.762(b)(2)(v). These criteria are:

- The landfill has been permanently closed (no longer actively accepting waste), and have submitted a closure report
- The landfill gas collection system must have been in operation for at least 15 years, and
- Calculated NMOC gas produced by the landfill must be less than 50 Mg per year for three consecutive tests

Although a site has to meet these equipment removal criteria in order to be removed from the Title V permitting requirements, the site does not actually have to shut down and remove the gas collection and control system in order to be removed from Title V permitting requirements. Since sites may be required to operate gas collection and control systems pursuant to state or local air district requirements, a landfill

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may continue to operate their gas collection and control systems after the requirement to do so under federal regulations has ended. As long as the site continues to meet these equipment removal criteria, Title V permitting is not required.

**COMPLIANCE WITH REQUIREMENTS FOR REMOVAL FROM TITLE V DESIGNATION**

The City of Santa Clara All-Purpose Landfill closed permanently in September 1994 (Attachment 1), and remains a closed landfill. It therefore meets the closure requirements of 40 CFR 60.752(b)(2)(v)(A).

The earliest official record of landfill operations on this site was issued on February 13, 1986, in the form of Solid Waste Facilities Permit No. 43-AO-0001, by the City of Santa Clara under its authority as cooperative Local Enforcement Authority for the city (Attachment 2). However, unofficial records from the operator indicate that the earliest wells were drilled on or about August 1, 1964.

A permit exists for the landfill with a landfill gas collection and control system dated 2/21/1990 (Attachments 3 and 4)<sup>1</sup>. This document is sufficient to demonstrate that the landfill has had a landfill gas collection and control system in place for at least 15 years.

The applicant performed approved Tier 2 landfill gas sampling and testing of the landfill gas emissions on August 30, 2007, December 5, 2007, and March 10, 2008, following the procedures outlined in 40 CFR Part 60.754(b). The latest test results (Attachment 5) show that the average NMOC emission rate is approximately 3.9 Mg/year. The landfill therefore meets the requirement that the calculated NMOC gas produced by the landfill be less than 50 Mg/year for three consecutive tests.

**SOURCES COVERED BY SYNTHETIC MINOR OPERATING PERMIT**

The permitted sources covered by this synthetic minor operating permit are listed below. There are no exempt sources at this facility.

- S 2           Municipal Solid Waste Landfill with Gas Collection System
- A -2           Landfill Gas Flare

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<sup>1</sup> Earliest permit is for Plant #1583, Pacific Recovery Corporation, which was initially the company which recovered the gas. The sources at P #1583 were transferred to P #3464 on 12/27/1993 (see Attachment 4). Plant #1583 was permanently closed on 9/22/2005.

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**EMISSIONS LIMITATIONS FOR MSW LANDFILL**

In order to be eligible for a synthetic minor permit, a site must either have a maximum potential to emit that is less than each Title V emission threshold (less than 95 tons/year of NO<sub>x</sub>, CO, POC, PM<sub>10</sub>, and SO<sub>2</sub>, less than 9 tons/year of any single hazardous air pollutant (HAP), and less than 23 tons/year of all HAPs combined) or must accept conditions limiting the site to less than these emissions thresholds (Regulation 2-6-423).

EPA has recently adopted Title V permitting thresholds for greenhouse gas (GHG) emissions that will become effective for all sites on July 1, 2011. Any site that has the potential to emit more than 100,000 tons/year of greenhouse gases (expressed as CO<sub>2</sub> equivalent tons/year and including biogenic CO<sub>2</sub>) will be deemed a major facility and required to obtain a Title V permit.

As shown by the following emissions calculations, this site does not have a potential to emit for any pollutant that exceeds any of the major facility emissions thresholds. Therefore, this site is not a major facility and may obtain a synthetic minor permit.

**EMISSION CALCULATIONS**

All emissions from the landfill are fugitive landfill gas from S-1 or collected landfill gas, abated by the A-2 landfill flare. Landfills are not one of the 28 source categories for which fugitive emissions must be included in Title V potential to emit (PTE) determinations. Since the emissions from the S-1 landfill are fugitive in nature, these emissions are not included in this site-wide PTE determination.

The only other source at this site is the A-2 landfill gas flare. The maximum heat input rate for A-2 is 40 MM BTU/hour. The PTE determination for this site is based on A-2 operating at 40 MM BTU/hour for 24 hours/day and 365 days/year (8760 hours/year). The maximum annual heat input rate is 350,400 MM BTU/year. Maximum potential emissions were determined based on emission limits and maximum expected emission factors. These factors are discussed in more detail below.

Based on data reported in 2011, the City of Santa Clara collected and burned 82,905 MM BTU/year of landfill gas in A-2, which is only 23.7% of maximum capacity. Since this landfill is closed and gas generation rates are declining, the gas collection rate is also expected to decline in the future. Therefore, maximum emissions from this site will be far less than the PTE reported below. Current 2011 emissions were determined using this reported gas collection rate and actual emission factors determined from source test data or other site-specific emission factor estimates.

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The total site-wide potential to emit (PTE) and current 2011 emissions, excluding fugitive emissions, are summarized in Table 1 and compared to the synthetic minor permit limits. As shown in Table 1, the site-wide PTE is less than the Regulation 2-6-423 synthetic minor permit limits.

Total Site-Wide Non-Fugitive Emissions from Site # 3464

	<b>Synthetic Minor Limit tons/year</b>	<b>Potential to Emit tons/year</b>	<b>Actual in 2011 tons/year</b>
CO	95.0	28.0	0.083
NO <sub>x</sub>	95.0	10.5	1.492
SO <sub>2</sub>	95.0	93.4	1.212
PM <sub>10</sub>	95.0	3.0	0.709
POC	95.0	2.6	0.005
HAPs <sup>(1)</sup>	23.0 / 9.0	7.0	0.026
CO <sub>2</sub> e <sup>(2)</sup>	90,000	35,983	8,504

- (1) Since the total HAP PTE is less than both the total HAP limit of 23.0 tons/year and the single HAP limit of 9.0 tons/year, a detailed list of individual HAP emissions is not necessary.
- (2) Pursuant to Regulation 2-6-423.2.2, the greenhouse gas emissions Synthetic Minor permit limit is 90% of the Title V permit threshold, or 90,000 tons/year CO<sub>2</sub> equivalent emissions.

CO and NO<sub>x</sub> Emission Factors:

In accordance with Condition # 2935, Parts 5 and 6, the emissions from A-2 are limited to:

- 0.16 pounds of CO per MM BTU and
- 0.06 pounds of NO<sub>x</sub> per MM BTU.

These limits were established through the District's NSR program. These emission factors are used to determine the PTE emissions from A-2.

Estimates of current CO and NO<sub>x</sub> emissions are based on the most recent source test for the landfill, performed on August 5, 2008. This source test measured average emissions of:

- <0.002 pounds of CO per MM BTU and
- 0.036 pounds of NO<sub>x</sub> per MM BTU.

The actual methane content in the landfill gas was 38.3% CH<sub>4</sub>, which is equivalent to a heat content of 388 BTU/scf.

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SO<sub>2</sub> Emission Factors:

In accordance with Condition # 2935, Part 7, the total reduced sulfur (TRS) content in the landfill gas at this site is currently limited to 1300 ppmv, expressed as H<sub>2</sub>S. Due to declining gas quality at this site, the District is proposing to reduce this limit in order to ensure compliance with Regulation 9-1-302 over the entire range of expected gas quality. The proposed new limit is 800 ppmv of TRS, expressed as H<sub>2</sub>S. For this analysis, the landfill gas is assumed to contain a minimum of 25% methane with a minimum heat content of 248.5 BTU/scf. Assuming all of the sulfur in the inlet landfill gas is converted to sulfur dioxide (SO<sub>2</sub>), the maximum potential emission rate is: 0.5329 pounds of SO<sub>2</sub> per MM BTU.

$$(800 \text{ ft}^3 \text{ TRS/MM ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ TRS}) / (248.5 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ SO}_2 / 1 \text{ lbmol SO}_2) * (64.059 \text{ lbs SO}_2 / 1 \text{ lbmol SO}_2) = 0.5329 \text{ lbs SO}_2 / \text{MM BTU}$$

In accordance with Condition # 2935, Part 7, this site measures the hydrogen sulfide content in the landfill gas on a quarterly basis. The facility reported that the highest measured value was 60 ppmv of H<sub>2</sub>S in 2006. The TRS concentration is no more than 1.2 times this H<sub>2</sub>S content or 72 ppmv of TRS. Current actual SO<sub>2</sub> emissions are based on this maximum measured TRS content and the 2006 average heat content of 407.5 BTU/scf.

$$(72 \text{ ft}^3 \text{ TRS/MM ft}^3 \text{ LFG}) / (407.5 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ TRS} / 1 \text{ lbmol TRS}) * (1 \text{ lbmol SO}_2 / 1 \text{ lbmol TRS}) * (64.059 \text{ lbs SO}_2 / 1 \text{ lbmol SO}_2) = 0.02925 \text{ lbs SO}_2 / \text{MM BTU}$$

PM<sub>10</sub> Emission Factors:

In accordance with EPA (AP-42 Chapter 2.4, Table 2.4-5), the PM10 emission rate from landfill gas fired flares is 17 pounds per million cubic feet of methane burned. This factor is converted to pounds/MM BTU below and will be used for both PTE and current 2011 emission calculations.

$$(17 \text{ lbs PM}_{10} / 1 \text{ MM ft}^3 \text{ CH}_4) / (997.65 \text{ MM BTU} / 1 \text{ MM ft}^3 \text{ CH}_4) = 0.01704 \text{ lbs PM}_{10} / \text{MM BTU}$$

POC Emission Factors:

Regulation 8-34-301.3 limits NMOC emissions from the flare exhaust to either (a) 30 ppmv of NMOC (measured as methane) at 3% O<sub>2</sub>, dry basis or (b) 98% NMOC control by weight. Due to the very low NMOC content in landfill gas at this site, the outlet NMOC concentration limit will result in higher NMOC emissions than the destruction efficiency limit. The outlet NMOC is assumed to be 100% POC. The equivalent lbs/MM BTU emission factor is calculated below and used for the POC PTE calculations. The landfill gas is assumed to contain 40% CH<sub>4</sub> with a heat content of 397.555 BTU/scf and a theoretical flue gas factor of 10,130 scf/MM BTU (at 0% excess O<sub>2</sub>).

$$[30 * (20.9 / 17.9) \text{ ft}^3 \text{ NMOC} / 1 \text{E}6 \text{ ft}^3 \text{ flue at 0\% O}_2] * (10,130 \text{ ft}^3 \text{ flue at 0\% O}_2 / \text{MM BTU}) / (387.006 \text{ ft}^3 \text{ NMOC} / 1 \text{ lbmol NMOC}) * (16.043 \text{ lbs NMOC} / 1 \text{ lbmol NMOC}) = 0.0147 \text{ lbs NMOC} / \text{MM BTU} = 0.0147 \text{ lbs POC} / \text{MM BTU}$$

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From the August 2008 source test, the outlet NMOC concentration was not detected for any runs (<1 ppmv), and the emission rate was <0.001 lbs NMOC/MM BTU. The NMOC concentration in the landfill gas at this site was 55 ppmv as C1. Assuming the flare is achieving 98% control, the actual NMOC emission factor would be:

$$(55 \text{ ft}^3 \text{ NMOC/MM ft}^3 \text{ LFG}) / (388 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ NMOC/1 lbmol NMOC}) * (16.043 \text{ lbs NMOC/1 lbmol NMOC}) * (1.00 - 0.98) = 0.00012 \text{ lbs NMOC/MM BTU}$$

HAP Emission Factors:

Landfill gas contains small quantities of numerous HAPs such as toluene, benzene, methylene chloride, and vinyl chloride. Landfill gas flares will have residual emissions of these HAPs. In addition landfill gas flares emit secondary HAPs such as formaldehyde, which results from the combustion of methane, and acid gases such as hydrogen chloride and hydrogen fluoride that result from the combustion of halogenated compounds. As a worst case assumption, all of the NMOC in the flare exhaust is assumed to be HAPs, and the organic HAP emission factor is 0.01471 lbs/MM BTU.

Worst case emission rates for acid gases are determined based on AP-42 default concentrations for halogenated compounds and the assumption that all chloride and fluoride ions in landfill gas will be converted to HCl and HF, respectively. The AP-42 default concentrations result in a total of 127 ppmv of Cl ions and 37.4 ppmv of F ions. The default methane content for AP-42 is 55% with a heat content of 546.638 BTU/ft<sup>3</sup> at 70 °F.

$$(127 \text{ ft}^3 \text{ Cl/MM ft}^3 \text{ LFG}) / (546.638 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ Cl/lbmol Cl}) * (1 \text{ lbmol HCl/1 lbmol Cl}) * (36.461 \text{ lbs HCl/lbmol HCl}) = 0.02189 \text{ lbs HCl/MM BTU}$$

$$(37.4 \text{ ft}^3 \text{ F/MM ft}^3 \text{ LFG}) / (546.638 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ F/lbmol F}) * (1 \text{ lbmol HF/1 lbmol F}) * (20.006 \text{ lbs HF/lbmol HF}) = 0.00354 \text{ lbs HF/MM BTU}$$

The total HAP emissions rate is the sum of the organic and acid gas HAPs, which is: 0.04014 lbs/MM BTU.

For actual emissions, the same assumptions and calculation procedures will be used, except that site-specific analytical data will be used to determine the chlorine and fluorine concentrations in the gas. The measured concentrations are: 1610 ppmv of Cl and 973 ppbv of F in landfill gas with a heat content of 388 BTU/scf.

$$(1.610 \text{ ft}^3 \text{ Cl/MM ft}^3 \text{ LFG}) / (388 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ Cl/lbmol Cl}) * (1 \text{ lbmol HCl/1 lbmol Cl}) * (36.461 \text{ lbs HCl/lbmol HCl}) = 3.91\text{E-4 lbs HCl/MM BTU}$$

$$(0.973 \text{ ft}^3 \text{ F/MM ft}^3 \text{ LFG}) / (388 \text{ MM BTU/MM ft}^3 \text{ LFG}) / (387.006 \text{ ft}^3 \text{ F/lbmol F}) * (1 \text{ lbmol HF/1 lbmol F}) * (20.006 \text{ lbs HF/lbmol HF}) = 1.30\text{E-4 lbs HF/MM BTU}$$

Organic HAPs = NMOC = 1.18E-4 lbs/MM BTU

Total Actual HAPs = (3.91E-4 + 1.30E-4 + 1.18E-4) = 6.39E-4 lbs/MM BTU

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**Greenhouse Gas Emission Factors:**

Greenhouse gases (GHGs) from the flare are expressed as tons per year of carbon dioxide equivalent (CO<sub>2</sub>e). The components of GHGs are biogenic carbon dioxide, methane, and nitrous oxide. Methane and nitrous oxide contributions are multiplied by weighting factors of 21 and 310, respectively, to obtain CO<sub>2</sub>e emissions. The District's general emission factors for landfill gas flares will be converted to units of lbs/MM BTU and used to determine the GHG PTE. These factors assume that landfill gas contains 0.001% N<sub>2</sub>O, 55% CH<sub>4</sub>, 45% CO<sub>2</sub> and has a heat content of 546.638 BTU/scf. The factors assume that 99% of the methane is converted to CO<sub>2</sub> by the flare and that 76.8% of the N<sub>2</sub>O is oxidized by the flare.

$$\begin{aligned} \text{Default District Factors: } & 0.2280 \text{ lbs CH}_4/\text{Mscf}, 2.36\text{E-}4 \text{ lbs N}_2\text{O}/\text{Mscf}, 107.4073 \text{ lbs CO}_2/\text{Mscf} \\ \text{Total CO}_2\text{e} &= (0.2280*21) + (2.36\text{E-}4*310) + 107.4073 = 112.268 \text{ lbs/Mscf} \\ \text{Total CO}_2\text{e} &= (112.268 \text{ lbs/Mscf})/(1000 \text{ scf/Mscf})/(546.638 \text{ BTU/scf})*(1\text{E}6 \text{ BTU/MM BTU}) \\ &= 205.379 \text{ lbs/MM BTU} \end{aligned}$$

From the 2008 sources test, the inlet landfill gas to the flare contained 38.3% methane and 31.69% CO<sub>2</sub> with a heat content of 388 BTU/scf. The outlet methane emission rate was <0.001 lbs/MM BTU. If all of the methane was converted to CO<sub>2</sub> and combined with the CO<sub>2</sub> from the inlet gas, the outlet CO<sub>2</sub> emission rate would be:

$$\begin{aligned} & (0.3169 \text{ ft}^3 \text{ CO}_2/\text{ft}^3 \text{ LFG}) + (0.383 \text{ ft}^3 \text{ CH}_4/\text{ft}^3 \text{ LFG})*(1 \text{ ft}^3 \text{ CO}_2/1 \text{ ft}^3 \text{ CH}_4) \\ &= 0.6999 \text{ ft}^3 \text{ CO}_2/\text{ft}^3 \text{ LFG} \\ & (0.6999 \text{ ft}^3 \text{ CO}_2/\text{ft}^3 \text{ LFG})/(388 \text{ BTU}/\text{ft}^3 \text{ LFG})*(1\text{E}6 \text{ BTU/MM BTU})/ \\ & (387.006 \text{ ft}^3 \text{ CO}_2/\text{lbmol CO}_2)*(44.0098 \text{ lbs CO}_2/\text{lbmol CO}_2) = 205.133 \text{ lbs CO}_2/\text{MM BTU} \end{aligned}$$

$$\text{Total actual CO}_2 \text{ equivalent emissions are: } (0.001*21)+205.133 = 205.154 \text{ lbs CO}_2\text{e}/\text{MM BTU}$$

**STATEMENT OF COMPLIANCE**

This facility is in compliance with the applicable requirements of Regulation 2 Rule 6 to obtain a synthetic minor permit. City of Santa Clara All Purpose Landfill has voluntarily accepted federally enforceable permit conditions including throughput that will keep its potential to emit below the synthetic minor thresholds. The applicable District, State, and Federal rules are discussed below.

**BAAQMD Regulation 6, Rule 1:**

BAAQMD Regulation 6, Rule 1 applies to the A-2 Landfill Gas Flare. Section 305 prohibits visible emissions. Proper combustion of landfill gas will not result in any visible emissions. A-2 is expected to continue to comply with this requirement. Section 310 limits the grain loading in the exhaust to 0.15 grains/sdcf. The grain loading from A-2 is determined below from the maximum expected PM10 emission rate and landfill gas at 40% methane (397.555 BTU/scf and 10,130 sdcf/MM BTU.)

$$(0.01704 \text{ lbs/MM BTU})/(10130 \text{ sdcf/MM BTU})*(7000 \text{ grains/lb}) = 0.012 \text{ grains/sdcf}$$

The PM10 emission from A-2 are only 3.0 tons/year and the maximum expected outlet grain loading is less than 10% of the limit. Since emissions are low and the compliance margin is high, PM10 monitoring at A-2 is not justifiable.

**BAAQMD Regulation 8, Rule 34:**

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BAAQMD Regulation 8, Rule 34 applies to this landfill because the landfill contains more than 1,000,000 tons of decomposable materials and waste was last accepted at this landfill less than 30 years ago. The landfill is subject to Sections 301, 303, 304, and 305, and the flare is subject to Section 301.3.

Pursuant to the requirements of Regulation 8-34-301, this landfill is equipped with a continuously operating landfill gas collection and control system. Based on the results of the quarterly component monitoring events, the gas collection and control systems is operating in compliance with the Section 301.2 component leak limit (no more 1000 ppmv of methane at any component). The City of Santa Clara requested to reduce the component leak monitoring frequency to an annual basis; however, this request cannot be granted, because Regulation 8-34-503 requires quarterly monitoring for component leaks and does not give an option for a less stringent monitoring frequency.

Per Regulation 8-34-301.3, the flare is required to meet an NMOC outlet concentration limit of 30 ppmv of NMOC as C1 at 3% O<sub>2</sub>, dry basis or an NMOC destruction efficiency limit of 98% by weight. From the August 2008 source test, the measured NMOC outlet concentration was <2.3 ppmv at 3% O<sub>2</sub>, and A-2 was operating in compliance with Section 301.3.

Regulation 8-34-303 limits landfill surface leaks to no more than 500 ppmv as methane. The quarterly surface emissions monitoring demonstrates that this landfill is meeting this requirement. In accordance with Section 8-34-506, closed landfills may reduce this quarterly surface monitoring frequency to an annual basis, if no excesses of the limit have been detected in 3 consecutive quarters. The City of Santa Clara has requested that annual surface monitoring be allowed pursuant to Regulation 8-34-506.1-3, because no surface emission excesses have been detected in the last three quarters.

Regulation 8-34-304 establishes dates by which new gas collection systems must be operating. Since this landfill is closed and all areas have a gas collection system in place, there are no applicable installation requirements for this site. The gas collection system will be repaired and maintained as necessary to ensure proper operation.

Regulation 8-34-305 establishes wellhead limits for the landfill gas collection system components. All components will operation under negative pressure when the gas collection system is operating. No alternative wellhead standards have been approved for this site. The gas collection system components are expected to continue to comply with the wellhead temperature limit of 131 °F and the wellhead oxygen limit of 5% by volume. Regulation 8-34-505 requires monthly wellhead monitoring to demonstrate compliance with these wellhead standards.

Regulation 8-34-510 requires monthly monitoring for cover integrity. Although the City of Santa Clara requested to reduce their cover integrity monitoring frequency to a quarterly basis, this request cannot be granted because Regulation 8-34-510 does not allow a reduced monitoring frequency alternative.

BAAQMD Regulation 9, Rule 1:

Regulation 9-1-302 limits the SO<sub>2</sub> emissions in the flare exhaust to 300 ppmvd. Previously, the District established a permit condition limit on the total reduced sulfur content (TRS) in the inlet landfill gas (1300 ppmv of TRS, expressed as H<sub>2</sub>S) to prevent the flare from exceeding this outlet SO<sub>2</sub> limit. For this analysis, the landfill gas at this site was assumed to contain 45% methane. The landfill gas quality at this site has been declining, and landfill gas quality impacts the ratio between inlet TRS concentration and outlet SO<sub>2</sub> concentration. As a result of the declining gas quality at this site, the District is proposing to revise this inlet TRS limit to ensure compliance with the 9-1-302 outlet SO<sub>2</sub> concentration limit at the lowest possible gas quality. Typically, landfill gas flares require a minimum inlet methane content of at least 25% in order to operate properly. At 25% methane, the heat content is 248.5 BTU/scf and the flue gas factor is 11,640 scdf of flue gas at 0% O<sub>2</sub> per MM BTU.



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$$(300 \text{ ft}^3 \text{ SO}_2/1\text{E}6 \text{ ft}^3 \text{ flue gas})*(11,640 \text{ ft}^3 \text{ flue gas/MM BTU})*(248.5 \text{ MM BTU/MM ft}^3 \text{ LFG})* \\ (1 \text{ ft}^3 \text{ H}_2\text{S}/1 \text{ ft}^3 \text{ SO}_2) = 867.8 \text{ ft}^3 \text{ H}_2\text{S/MM ft}^3 \text{ LFG}$$

The landfill gas sulfur content above (867.8 ppmv of TRS) is equivalent to 0.578 lbs SO<sub>2</sub>/MM BTU. However, the SO<sub>2</sub> emission rate must be no greater than 0.5422 lbs/MM BTU to ensure that total SO<sub>2</sub> emissions from the site do not exceed the 95 tons/year synthetic minor threshold.

As shown below, a limit of 800 ppmv of TRS (expressed as H<sub>2</sub>S) in the inlet landfill gas will ensure that the Regulation 9-1-302 outlet concentration limit is not exceeded over the entire range of expected gas quality, and it will also ensure that site-wide SO<sub>2</sub> emissions do not exceed 95 tons/year.

SO<sub>2</sub> emission factor:

$$(800 \text{ ft}^3 \text{ H}_2\text{S/MM ft}^3 \text{ LFG})*(1 \text{ ft}^3 \text{ SO}_2/1 \text{ ft}^3 \text{ H}_2\text{S})/(248.5 \text{ MM BTU/MM ft}^3 \text{ LFG})/ \\ (387.006 \text{ ft}^3 \text{ SO}_2/1 \text{ lbmol SO}_2)*(64.059 \text{ lbs SO}_2/1 \text{ lbmol SO}_2) = 0.5329 \text{ lbs SO}_2/\text{MM BTU}$$

For landfill gas at 25% methane:

$$(800 \text{ ft}^3 \text{ H}_2\text{S/MM ft}^3 \text{ LFG})*(1 \text{ ft}^3 \text{ SO}_2/1 \text{ ft}^3 \text{ H}_2\text{S})/(248.5 \text{ MM BTU/MM ft}^3 \text{ LFG})/ \\ (11,640 \text{ sdcf flue/MM BTU})*(1\text{E}6 \text{ sdcf flue}/1 \text{ MM sdcf flue}) = 277 \text{ ppmv of SO}_2 \text{ at } 0\% \text{ O}_2$$

For landfill gas at 40% methane:

$$(800 \text{ ft}^3 \text{ H}_2\text{S/MM ft}^3 \text{ LFG})*(1 \text{ ft}^3 \text{ SO}_2/1 \text{ ft}^3 \text{ H}_2\text{S})/(397.6 \text{ MM BTU/MM ft}^3 \text{ LFG})/ \\ (10,130 \text{ sdcf flue/MM BTU})*(1\text{E}6 \text{ sdcf flue}/1 \text{ MM sdcf flue}) = 199 \text{ ppmv of SO}_2 \text{ at } 0\% \text{ O}_2$$

The highest measured inlet sulfur content was 60 ppmv of H<sub>2</sub>S in 2006. As a worst case estimate, TRS is assumed to be 20% higher than the measured H<sub>2</sub>S, which results in a maximum actual TRS concentration of 72 ppmv. In 2006, the methane content in the inlet landfill gas was 41%, which is equal to a heat content of 407.5 BTU/scf and a flue gas factor of 10,070 sdcf flue gas/MM BTU. The equivalent outlet concentration for this 2006 gas is:

$$(72 \text{ ft}^3 \text{ H}_2\text{S/MM ft}^3 \text{ LFG})*(1 \text{ ft}^3 \text{ SO}_2/1 \text{ ft}^3 \text{ H}_2\text{S})/(407.5 \text{ MM BTU/MM ft}^3 \text{ LFG})/ \\ (10,070 \text{ sdcf flue/MM BTU})*(1\text{E}6 \text{ sdcf flue}/1 \text{ MM sdcf flue}) = 18 \text{ ppmv of SO}_2 \text{ at } 0\% \text{ O}_2$$

The outlet concentration based on maximum measured fuel sulfur content is only 6% of the limit. The City of Santa Clara has requested to reduce the current quarterly fuel sulfur content monitoring requirement to an annual monitoring frequency. Since the actual sulfur content is far below the limit and the sulfur content does not vary significantly, annual testing should be sufficient to demonstrate compliance with this limit.

CARB Regulations:

A new state regulation that is intended to control greenhouse gas emissions, Methane Emissions from Municipal Solid Waste Landfills (CCR Title 17, Sections 95460-95476), applies to the landfill at this site because it accepted municipal solid waste after January 1, 1977 and none of the exemptions in Section 95462 are applicable. The current average heat input rate for landfill gas collected from this site is 9.5 MM BTU/hour. Since this heat input rate exceeds 3.0 MM BTU/hour, this landfill is expected to be subject to the landfill gas collection and control requirements and all related limits, monitoring, and record keeping requirements.

The landfill will be required to operate the gas collection system continuously pursuant to Section 95464(b)(1)(A), except during maintenance, repairs, and temporary shutdowns as allowed pursuant to Section 95454(e).

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Landfill gas collection system components upstream of the blower must be operated under vacuum (Section 95464(c)). Monthly wellhead monitoring is required (Section 95469(c)) to demonstrate compliance with this requirement.

Any landfill gas collection system components downstream of the blower that are intended to be operated under positive pressure have a component leak limit of 500 ppmv, measured as methane (Section 95464(b)(1)(B)). Section 95469 requires quarterly leak checks to demonstrate compliance with this limit.

The enclosed flare must meet the requirements in Section 95464(b)(2), including compliance with a methane destruction efficiency of at least 99% by weight. Compliance with this limit is demonstrated by annual source testing. The flare must also be operated within the temperature range established during the initial source test and this temperature and landfill gas flow rate must be monitored continuously per Section 95469(b)(1).

Section 95465 contains the two landfill surface emission standards: the instantaneous surface emission limit is 500 ppmv as methane; the integrated surface emission limit is 25 ppmv as methane for each grid. Section 95469(a) requires quarterly surface monitoring to demonstrate compliance with these standards. Since this landfill is closed, monitoring may be conducted on an annual basis instead, if no exceedances have been detected in four consecutive quarters.

Many of the requirements in this CARB rule are the same as or similar to the existing requirements in the District rule. The new or more stringent limits are: 99% methane destruction at the flare, a 500 ppmv component leak limit instead of 1000 ppmv, and the 25 ppmv integrated surface emission standard. This closed landfill is expected to comply with these new requirements.

**Federal GHG Emissions Reporting Requirements:**

In accordance with 40 CFR Part 98.2 and Table A-3, GHG emissions reporting is required for MSW landfills that generate methane in amounts equivalent to 25,000 metric tons per year or more of CO<sub>2</sub>e. Based on the global warming potential of methane (21), this 25,000 metric tons/year CO<sub>2</sub>e threshold is equal to a methane generation rate of 1190.5 metric tons/year of methane generated (1312.3 short tons/year of CH<sub>4</sub> generated). According to the LANDGEM results submitted by the applicant, the methane generation rate in 2010 is 3543 metric tons/year. Therefore, this site is expected to be subject to these GHG emissions reporting requirements. GHG emissions must be reported for the landfill, as calculated pursuant to the procedures in 40 CFR Part 98, Subpart HH, and for the landfill gas flare, as calculated pursuant to the procedures in 40 CFR, Part 98, Subpart C.

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**NEW SYNTHETIC MINOR OPERATING PERMIT CONDITIONS**

The new Synthetic Minor Operating Permit Condition will incorporate all of the District requirements as set out in the original Title V condition. In addition, the new condition will add provisions to ensure that the facility will continue to meet the requirements set out in 40 CFR Part 60.752(d) to avoid designation as a Title V facility.

All existing permit conditions will be replaced with the following new synthetic minor permit conditions. Changes from the existing conditions are shown in strike-out and underline format.

**Condition # 2935**

SYNTHETIC MINOR OPERATING PERMIT

City of Santa Clara  
5401 Lafayette Street, Santa Clara, CA 95050  
Applications #16697  
Plant #3464

Sources and Abatement Devices:

S-2, Closed Landfill with Landfill Gas Collection System  
A-2, Landfill Gas Flare

This facility, Site # A3464, has a synthetic minor operating permit. This operating permit covers all equipment existing at this facility as of permit issuance, including exempt sources. The sources and abatement devices are listed above.

The following conditions establish the federally enforceable permit terms to ensure that this plant is classified as a Synthetic Minor Facility under District Regulation 2, Rule 6, Major Facility Review, and ensure that it is not subject to the permitting requirements of Title V of the Federal Clean Air Act as amended in 1990 and 40 CFR Part 70. All applications submitted by the applicant and all modifications to the plant's equipment after issuance of the synthetic minor permit must be evaluated to ensure that the facility will not exceed the synthetic minor general limits below, and that sufficient monitoring, recordkeeping, and reporting requirements are imposed to ensure enforceability of the limits.

Any revision to a condition establishing this plant's status as a Synthetic Minor Facility or any new permit term that would limit emissions of a new or modified source for the purpose of maintaining the facility as a synthetic minor, must undergo the procedures specified by Rule 2-6, section 423. The basis for the synthetic minor conditions is an emission limit for regulated air pollutants of 95 tons per year, an emission limit of 90,000 tons per year for greenhouse gases (on a CO2 equivalent basis), an emission limit for a single hazardous air pollutant of 9 tons per year, and an emission limit for a combination of hazardous air pollutants of 23 tons per year.

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Any District conditions that do not establish this facility as a synthetic minor are marked with an asterisk. There are no such conditions at this time. The facility must comply with all conditions, regardless of asterisks, and must comply with all District requirements for new and modified sources regardless of its status as a synthetic minor.

1. In no event shall the emissions from this site exceed any of the emission limits listed below. The owner/operator shall demonstrate compliance with these emission limits by complying with all emission limits, monitoring procedures, and record keeping requirements identified in Parts 4-14 below. (Basis: Regulation 2-6-423)

NOx	95 tons/year
CO	95 tons/year
POC	95 tons/year
PM10	95 tons/year
SO2	95 tons/year
Any Single HAP	9 tons/year
Combination of HAPs	23 tons/year
CO2e	90,000 tons/year

2. The landfill at this facility is closed. The owner/operator shall not accept any solid waste at this landfill, shall not dispose of any waste materials at this landfill, and shall not re-use any waste materials in a manner consistent with disposal at the landfill. (Basis: 40 CFR Parts 60.752(d)(2) and 60.752(b)(2)(v)(A))

3. NMOC gas emissions from this landfill, as determined in accordance with 40 CFR Part 60.754(b), shall not exceed 50 Mg/year. To demonstrate compliance with this requirement, the owner/operator shall maintain records of the total amount of landfill gas collected from the landfill on an annual basis and shall maintain records of all NMOC concentration measurements made for the landfill gas collected from this site. (Basis: 40 CFR Parts 60.752(d)(2) and 60.752(b)(2)(v)(C))

14. The owner/operator shall ensure that all collected landfill gas is vented to the Landfill Gas Flare, A-2, and/or one or more of the 3 Ameresco microturbines, S-1, S-2, and S-3 (Plant #19158). The owner/operator shall ensure that raw landfill gas is not vented to the atmosphere, except for unavoidable landfill gas emissions that occur during collection system installation, maintenance, or repair, which is performed in compliance with Regulation 8, Rule 34, Sections 113, 117, or 118, and for inadvertent component or surface leaks that do not exceed the limits specified in Sections 8-34-301.2 or 8-34.303. (Basis: Regulation 8-34-301)

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25. The owner/operator shall ensure that the landfill gas collection system, described in subpart 25a below, is operated continuously as defined in Regulation 8-34-219. Wells, collectors, and adjustment valves shall not be shut off, disconnected, or removed from operation without written authorization from the APCO, unless the owner/operator complies with all applicable requirements of Regulation 8, Rule 34, Sections 113, 117, and 118.

The owner/operator shall apply for and receive a Change of Conditions from the District before altering the landfill gas collection system described in subpart 25a below. Increasing or decreasing the number of wells or collectors, or significantly changing the length of collectors, or the locations of wells or collectors are alterations that are subject to this requirement. Adding or modifying risers, laterals, or header pipes are not subject to this requirement. The authorized number of landfill gas collection system components is the baseline count listed below, plus any components added and minus any components decommissioned pursuant to subpart 25b below, as evidenced by start-up/shut-down notification letters to the District.

a. The owner/operator has been issued a Permit to Operate for the landfill gas collection system components listed below, which includes all start-up/shut-down notifications submitted through ~~July 10, 2007~~ April 20, 2009. Well and collector locations, depths, and lengths are as described in Permit Application 14392. Total ~~Required~~ Number of Vertical Wells: 78

b. The owner/operator is authorized to make the landfill gas collection system component alterations listed below. Specific details regarding well alterations are described in Permit Application 17787.

	Minimum	Maximum
Install/relocate vertical wells	0	5
Replace vertical wells	0	5
Decommission vertical wells	0	5

~~Wells installed, relocated, replaced, or shutdown pursuant to subpart 2b shall be added to or removed from subpart 2a in accordance with the procedures identified in Regulations 2-6-414 or 2-6-415. The owner/operator shall maintain records of the decommissioning date for each well that is shutdown and the initial operation date for each new or relocated well.~~

(Basis: Regulations 2-1-301, 8-34-301.1, 8-34-304, 8-34-305, ~~and 2-6-413~~)

36. The owner/operator shall ensure that the heat input to the A-2 Landfill Gas Flare does not exceed 960 million BTU per day and does not exceed 350,400 million BTU per year. In order to demonstrate compliance with this part, the owner/operator shall calculate and

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record, on a monthly basis, the maximum daily and total monthly heat input to the flare based on

- a. the landfill gas flow rate recorded pursuant to subpart ~~4013~~ below,
- b. the average methane concentration in the landfill gas based on the most recent source test, and
- c. a high heating value of 1013 BTU per cubic foot of methane at 60 degrees F. (Basis: Regulation 2-1-301)

47. The minimum combustion zone temperature for the flare shall be equal to the average combustion zone temperature determined during the most recent complying source test minus 50 degrees F, providing that the minimum combustion zone temperature is not less than 1400 degrees F. ~~Effective March 6, 2003, the~~ owner/operator shall ensure that the combustion zone temperature of the A-2 Landfill Gas Flare is maintained at a minimum of 1400 degrees F, averaged over any three-hour period. If a source test demonstrates compliance with all applicable requirements at a different temperature, the APCO will, upon request, revise this minimum temperature limit ~~in accordance with the administrative permit amendment procedures identified in Regulation 2-6-413.~~ (Basis: ~~Toxic Risk Management Policy and Regulations 2-5 and 8-34-301.3~~)
58. The owner/operator shall ensure that the emissions of nitrogen oxides (NO<sub>x</sub>) from the A-2 Landfill Gas Flare do not exceed 46 ppmv at 3% O<sub>2</sub>, dry. This limit is equivalent to the 0.06 lb/MMBTU NO<sub>x</sub> emission factor provided by the manufacturer in the initial permit application for the flare. (Basis: Cumulative Increase)
69. The owner/operator shall ensure that the emissions of carbon monoxide (CO) from the A-2 Landfill Gas Flare do not exceed 201 ppmv at 3% O<sub>2</sub>, dry. This limit is equivalent to the 0.16 lb/MMBTU CO emission factor provided by the manufacturer in the initial permit application for the flare. (Basis: Cumulative Increase)
710. The owner/operator shall ensure that the total reduced sulfur compounds in the collected landfill gas (measured as hydrogen sulfide) are monitored as a surrogate for monitoring sulfur dioxide in the control system's exhaust. The concentration of total reduced sulfur compounds in the collected landfill gas ~~may shall~~ not exceed ~~1300-800~~ ppmv (dry), expressed as H<sub>2</sub>S. In order to demonstrate compliance with this part, the owner/operator shall measure the total sulfur content (as hydrogen sulfide) in collected landfill gas on a quarterly an annual basis using a draeger tube. Compliance may be established by either measurement of H<sub>2</sub>S in landfill gas at the inlet to the flare using a draeger tube, or by laboratory analysis on collected landfill gas for sulfur compounds. The landfill gas sample shall be taken from the main landfill gas header. If using a draeger tube for gas analysis, the owner/operator shall follow the manufacturer's recommended procedures for using the draeger tube and interpreting the results. ~~The owner/operator shall conduct the~~

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~~first draeger tube test no later than 3 months after the issue date of the MFR Permit and quarterly thereafter. (Basis: Regulations 9-1-302, 2-6-423)~~

811. In order to demonstrate compliance with Regulation 2-1-301 and Regulation 8, Rule 34, Sections 301.3 and 412, the owner/operator shall conduct a District-approved sources test annually on Landfill Gas Flare A-2. At a minimum, the annual source test shall determine the following:
- a. landfill gas flow rate to the flare (dry basis);
  - b. concentrations (dry basis) of carbon dioxide (CO<sub>2</sub>), nitrogen (N<sub>2</sub>), oxygen (O<sub>2</sub>), ~~total hydrocarbons (THC)~~, methane (CH<sub>4</sub>), and total non-methane organic compounds (NMOC) in the landfill gas;
  - c. concentrations (dry basis) of sulfur compounds in the landfill gas from laboratory analysis, if testing for SO<sub>2</sub> in flare stack gas is not performed;
  - ~~ed.~~ stack gas flow rate from the flare (dry basis);
  - ~~de.~~ concentrations (dry basis) of NO<sub>x</sub>, CO, ~~THC~~, CH<sub>4</sub>, NMOC, and O<sub>2</sub> in the flare stack gas;
  - ~~f.~~ concentration (dry basis) of SO<sub>2</sub> in the flare stack gas, if laboratory analysis for sulfur compounds in landfill gas is not performed;
  - eg. the ~~THC~~, CH<sub>4</sub>, and NMOC destruction efficiencies achieved by the flare; and
  - ~~fh.~~ the average combustion temperature in the flare during the test period.
- Annual source tests shall be conducted ~~no sooner than 9 months and no later than 12~~ twelve months after the previous source test. ~~The Source Test Section of the District shall be contacted to obtain approval of the owner/operator shall obtain approval from the District's Source Test Section for all source testing procedures at least 14 days in advance of each source test. The Source Test Section shall be notified of the scheduled test date at least 7 days in advance of each source test. The source test report shall be submitted to the Compliance and Enforcement Division and to the Source Test Section within 45 days of the test date. Within 45 days of test completion, a comprehensive report of the test results shall be submitted to the Manager of the District's Source Test Section for review and disposition.~~ (Basis: Cumulative Increase, Toxic Risk Management Policy, Regulations 2-5, 2-1-301, ~~Regulations 8-34-301.3 and 8-34-412~~)

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912. The owner/operator shall conduct a characterization of the landfill gas concurrent with the annual source test required by part 811 above. The landfill gas sample shall be drawn from the main landfill gas header. The owner/operator shall ensure that the landfill gas is analyzed for ~~all organic compounds listed in the most recent version of EPA's AP-42 Table 2.4-1, excluding acetone.~~ the following compounds:

- 1,1-Dichloroethane (Ethylene Chloride),
- Benzene,
- Carbon Tetrachloride,
- Chlorobenzene,
- Chloroethane,
- Dichloromethane (Methylene Chloride),
- Ethanol,
- Ethylbenzene,
- Hexane,
- Methyl Ethyl Ketone,
- Methyl Isobutyl Ketone,
- Perchloroethylene (Tetrachloroethylene),
- Toluene,
- Trichloroethylene,
- Vinyl Chloride, and
- Xylenes

All concentrations shall be reported on a dry basis. ~~The test report shall be submitted to the Compliance and Enforcement Division and the Source Test Section within 45 days of the test date.~~ The District shall be notified of the scheduled test date at least 7 days in advance of each source test. Within 45 days of test completion a comprehensive report of the test results shall be submitted to the Manager of the District's Source Test Section for review and disposition. After conducting three annual landfill gas characterization tests, the owner/operator may request removal of specific compounds from the list of compounds to be tested for if the compounds have not been detected, have no significant impact on the cancer risk determination for the site, and have no significant impact on the hazard index determination for the site. (Basis: ~~Toxic Risk Management Policy and Regulations 2-5, 8-34-412~~)

1013. In order to demonstrate compliance with the above conditions, the owner/operator shall maintain the following records in a District-approved logbook:
- a. Record the operating times and the landfill gas flow rate to the A-2 Landfill Gas Flare on a daily basis. Summarize these records on a monthly basis. Calculate and record the heat input to A-2, pursuant to part 36 above.
  - b. Maintain continuous records of the combustion zone temperature for the A-2 Landfill Gas Flare during all hours of operation.



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- c. Maintain records of all test dates and test results performed to maintain compliance with parts ~~7, 8, and 9~~ 10, 11, and 12 above, or to maintain compliance with any applicable rule or regulation.

All records shall be maintained on site or shall be made readily available to District staff upon request for a period of at least ~~5~~ five years from the date of entry. These recordkeeping requirements do not replace any recordkeeping requirements contained in any other applicable rule or regulation.

(Basis; Cumulative Increase, Regulations 2-1-301, 2-6-501, 8-34-301, and 8-34-501)

- ~~114.~~ The owner/operator ~~must~~ shall submit the annual report required under Regulation 8-34-411 ~~in two semi-annual increments concurrently with the annual source test required under part 11 above.~~ The reporting period for the first increment of the Regulation 8-34-411 annual report that is submitted subsequent to the issuance of the MFR Permit for this site shall cover the period from December 1, 2002 through August 31, 2003. This first increment report shall be submitted by September 30, 2003. The reporting periods and report submittal due dates for all subsequent increments of the Regulation 8-34-411 report shall be synchronized with the reporting periods and report submittal due dates for the semi-annual MFR Permit monitoring reports that are required by Section I.F. of the MFR Permit for this site. At a minimum, this annual report must contain all operating records required under Regulation 8-34-501. (Basis: Regulations 8-34-411, 8-34-501, 8-34-503, 8-34-505, 8-34-506, 8-34-507, 8-34-508, 8-34-509 and 40 CFR Part 63.1980(a))

By: \_\_\_\_\_  
Catherine S. Fortney  
Air Quality Engineer II

Date: \_\_\_\_\_