Bay Area Air Quality Management District

375 Beale Street, Suite 600
San Francisco, CA 94105
(415) 771-6000

Permit Evaluation
and
Statement of Basis
For
the Initial
MAJOR FACILITY REVIEW PERMIT

for

Ameresco Half Moon Bay, LLC
Facility # B7040

Facility Address:
12310 San Mateo Road
Half Moon Bay, CA 94019

Mailing Address:
111 Speen Street, Suite 410
Framingham, MA 01701

Application Engineer: Davis Zhu
Site Engineer: Davis Zhu

Application No: 21226

June 2020

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PERMIT EVALUATION AND STATEMENT OF BASIS

for

INITIAL MAJOR FACILITY REVIW PERMIT

(INITIAL TITLE V PERMIT)

Ameresco Half Moon Bay LLC
Plant # B7040
Application # 21226

A. Background

This facility is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, Part 70 of Title 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review because it is a major facility as defined by BAAQMD Regulation 2-6-212. It is a major facility because it has the "potential to emit," as defined by BAAQMD Regulation 2-6-218, more than 100 tons/year of a regulated air pollutant. This facility will be permitted to emit more than 100 tons/year of carbon monoxide (CO). Therefore, this facility is required to have an MFR permit pursuant to Regulation 2-6-301.

Major Facility Operating permits (Title V permits) must meet specifications contained in 40 CFR Part 70 as contained in BAAQMD Regulation 2, Rule 6, Major Facility Review (MFR). The permits must contain all "applicable requirements" (as defined in BAAQMD Regulation 2-6-202), monitoring requirements, recordkeeping requirements, and reporting requirements. The permit holders must submit reports of all monitoring at least every six months and compliance certifications at least every year.

In the Bay Area, state and District requirements are also applicable requirements and are included in the permit. These requirements can be federally enforceable or non-federally enforceable. All applicable requirements are contained in Sections I through VI of the permit.

Each facility in the Bay Area is assigned a facility identifier that consists of a letter and a 4-digit number. This identifier is also considered to be the identifier for the permit. The identifier for this facility is B7040.

This facility submitted its initial Title V permit application on October 27, 2009. Although the Authority of Construct for this new landfill gas energy recovery facility (Application Number 12649) was issued on August 27, 2007, the Permit to Operate was not issued until February 5, 2013.

This evaluation included an analysis of applicability determinations for all sources. The review also included an assessment of all monitoring in the permit for sufficiency to determine compliance.

B. Facility Description

Ameresco Half Moon Bay, LLC (Facility # B7040) is a new landfill gas energy recovery facility that is located in Half Moon Bay, CA on property that is owned by Browning-Ferris Industry of California, Inc., Ox Mountain Sanitary Landfill (OMSL), Facility # A2266.[1] Ameresco Half Moon Bay's equipment is located in the northeastern section of the OMSL landfill property, adjacent to the OMSL flare station. The Ameresco Half Moon Bay equipment includes six internal combustion engines (Source 1 through 6), a gas treatment system (S-7), a LFG Condensate Solvent Tank (S-8) and a waste gas flare (A-8). Initial operation began in October 2008.

The Ameresco Half Moon Bay receives landfill gas collected from the Ox Mountain Sanitary Landfill,[2] processes this landfill gas to remove contaminants, and recovers the energy in this gas by burning it in internal combustion engines that power electrical generators. The gas cleaning system and energy recovery operations are discussed in detail below.

Gas Cleaning System:

Landfill gas contains numerous contaminants such as: siloxanes, chlorinated and fluorinated compounds, hydrogen sulfide and other sulfur compounds. When landfill gas is combusted, these contaminants create particles and acid gases that can interfere with the proper functioning of internal combustion (IC) engines or damage engine parts. To extend the operating life of their engines and to minimize the risk of engine damage, Ameresco Half Moon Bay uses a pre-combustion gas cleaning system that will remove the most harmful contaminants from the landfill gas.

Landfill gas collected from the Ox Mountain Landfill will first be delivered to the S-7 Temperature Swing Adsorption (TSA) Gas Treatment System. During the gas cleaning phase of this operation, filters and condensers remove particles and water from the landfill gas, while the activated carbon beds remove siloxanes and many VOC contaminants from the gas. The clean landfill gas exiting the carbon beds (up to 4200 scfm) is delivered to the S-1 through S-6 IC engines for energy recovery.

However, the activated carbon beds have a limited adsorption capacity. When carbon has reached its adsorption capacity, the carbon must either be replaced or regenerated using a desorption

[1] Browning-Ferris Industry of California, Inc, owns and operates the Ox Mountain Sanitary Landfill (OMSL), which is an active municipal solid waste disposal site. The OMSL waste disposal facility has a separate owner and a separate SIC code from the Ameresco Half Moon Bay energy facility. Therefore, these sites are distinct facilities for the purposes of Title V applicability. The OMSL waste disposal facility is also subject to Title V, and it has a separate Title V Operating Permit, which was last amended on September 22, 2016. The Statement of Basis for the Title V Renewal Permit for Site # A2266 contains a detailed explanation of the Title V permit for the OMSL facility.

[2] Landfills generate a mixture of gases called landfill gas (LFG) via a biological waste decomposition process. Landfill gas contains about 50% methane and 45% carbon dioxide, with the balance being nitrogen, oxygen, and trace amounts of VOCs and sulfur compounds. Without controls, landfill gas seeps from the landfill surface resulting in significant VOC, toxic, and greenhouse gas emissions. Prior to the construction of the Ameresco energy facility, Browning-Ferris Industries of California, Inc., controlled the landfill gas emissions from the OMSL by using system of blowers and buried pipes to continuously extract landfill gas from the landfill and by burning this collected landfill gas in enclosed flares.

process to remove the adsorbed compounds from the carbon. For S-7, the carbon beds will be regenerated. Desorption is accomplished by heating the carbon beds and flushing the beds with clean landfill gas. The resulting waste gas stream from the carbon desorption phase of the process will be similar to landfill gas but may contain higher concentrations of certain organic compound contaminants.

This desorption phase waste gas stream will be abated by the A-8 Waste Gas Flare. Ameresco Half Moon Bay will own and operate this small - 12 MM BTU (HHV) per hour - enclosed flare. If necessary, the waste gas stream will be blended with a sufficient amount of collected (untreated) landfill gas to assure proper operation of A-8. This enclosed flare can burn up to 400 scfm of waste gas with a heat content of up to 500 BTU/scf.

The V3 Storage Tank (S-8) collects and stores the contaminated water that condenses in the TSA system during media regeneration/cleaning. The storage and transfer operations will emit small quantities of POCs and HAPs. VOCs emissions from S-8 are vented to the Waste Gas Flare (A-8) during absorption media regeneration.

Energy Recovery Operations:

Clean landfill gas from S-7 will be delivered to the S-1 through S-6 LFG-Fired IC Engines and Gensets, where it will be burned as fuel. The S-1 through S-6 engines are GE Jenbacher, Type 6, JGS 616 GS-L.L, 4-stroke lean burn (4SLB), 16-cylinder engines. Each engine has a maximum permitted heat input rate of 21.3 MM BTU (HHV) per hour, which is equivalent to burning 700 scfm of clean landfill gas with a heat content of 500 BTU/scf. Each IC engine has a maximum rated output of 2677 bhp. Each genset has a nominal power output of 1.9 MW (11.4 MW for the six gensets combined).

Emissions:

The maximum permitted emissions from this new facility are described in detail in the Engineering Evaluation for Application # 12649 (see Appendix C) and the Addendum Evaluation Report for the Permit to Operate (see Appendix D). The maximum permitted emission levels for this facility are summarized in Table 1.

Table 1. Maximum Permitted Emissions for Site #B7040

		CO tons/year	NO_x tons/year	SO_2 tons/year	POC tons/year	PM_{10} tons/year
S-1	LFG-Fired IC Engine	44.90	3.74	4.47	4.99	2.37
S-2	LFG-Fired IC Engine	44.90	14.97	4.47	4.99	2.37
S-3	LFG-Fired IC Engine	44.90	14.97	4.47	4.99	2.37
S-4	LFG-Fired IC Engine	44.90	14.97	4.47	4.99	2.37
S-5	LFG-Fired IC Engine	44.90	14.97	4.47	4.99	2.37
S-6	LFG-Fired IC Engine	44.90	14.97	4.47	4.99	2.37
S-7	TSA Gas Treatment System *	0	0	0	0	0
S-8	LFG Condensate Solvent Tank *	0	0	0	0	0
A-8	Waste Gas Flare	7.90	2.37	36.18	0.48	0.68
Total	Site # B7040 *	237.5	80.95	63.03	30.42	14.25

* Residual POC for S-7 and S-8 are reported under A-8. Total emissions include site-wide caps on CO and PM10.

C. Permit Content

The legal and factual basis for the permit follows. The permit sections are described in the order presented in the permit.

I. Standard Conditions

This section contains administrative requirements and conditions that apply to all facilities. If the Title IV (Acid Rain) requirements for certain fossil-fuel fired electrical generating facilities or the accidental release (40 CFR § 68) programs apply, the section will contain a standard condition pertaining to these programs. This permit does not include Title IV or accidental release provisions.

Many of these conditions derive from 40 CFR § 70.6, Permit Content, and BAAQMD Regulation 2-6-409, Permit Content, which dictate certain standard conditions that must be placed in the permit. The language that the District has developed for many of these requirements has been adopted into the BAAQMD Manual of Procedures, Volume II, Part 3, Section 4, and therefore must appear in the permit.

The standard conditions also contain references to BAAQMD Regulation 1 and Regulation 2. These are the District's General Provisions and Permitting rules.

Condition I.J has been added to clarify that the capacity limits shown in Table II-A are enforceable limits.

II. Equipment

This section of the permit lists all permitted or significant sources. Each source is identified by an S and a number (e.g., S-6).

Permitted sources are those sources that require a BAAQMD operating permit pursuant to BAAQMD Rule 2-1-302.

Significant sources are those sources that have a potential to emit of more than 2 tons of a "regulated air pollutant," as defined in BAAQMD Rule 2-6-222, per year or 400 pounds of a "hazardous air pollutant," as defined in BAAQMD Rule 2-6-210, per year. This facility has no unpermitted significant sources.

All abatement (control) devices that control permitted or significant sources are listed. Each abatement device whose primary function is to reduce emissions is identified by an A and a number (e.g., A-8). If a source is also an abatement device, such as when an engine controls VOC emission, it will be listed in the abatement device table but will have an "S" number. An abatement device may also be a source (such as a thermal oxidizer that burns fuel) of secondary emissions. If the primary function of a device is to control emissions, it is considered an abatement (or "A") device. If the primary function of a device is a non-control function, the device is considered to be a source (or "S").

The equipment section is considered to be part of the facility description. It contains information that is necessary for applicability determinations, such as fuel types, contents or sizes of tanks, etc. This information is part of the factual basis of the permit.

Each of the permitted sources has previously been issued either an authority to construct or a permit to operate pursuant to the requirements of BAAQMD Regulation 2, Permits. These permits are issued in accordance with state law and the District's regulations. The capacities in the permitted sources table are the maximum allowable capacities for each source, pursuant to Standard Condition I.J and Regulation 2-1-403.

The equipment list for this Title V Application has changed since the application was filed on October 27, 2009. The change was due to a new source (S-8) as described below.

- The following new equipment has been added to the equipment lists based on a District issued Permits to Operate: S-8 Tank V3: LFG Condensate Solvent Tank (Application # 27766). The Permit to Operate was issued July 16, 2018.

III. Generally Applicable Requirements

This section of the permit lists requirements that generally apply to all sources at a facility including insignificant sources and portable equipment that may not require a District permit. If a generally applicable requirement applies specifically to a source that is permitted or significant, the standard will also appear in Section IV and the monitoring for that requirement will appear in Sections IV and VII of the permit. Parts of this section apply to all facilities (e.g., particulate, architectural coating, odorous substance, and sandblasting standards). In addition, standards that apply to insignificant or unpermitted sources at a facility (e.g., refrigeration units that use more than 50 pounds of an ozone-depleting compound), are placed in this section.

Unpermitted sources are exempt from normal District permits pursuant to an exemption in BAAQMD Regulation 2, Rule 1. They may, however, be specifically described in a Title V permit if they are considered a significant source pursuant to the definition in BAAQMD Rule 2-6-239. This facility does not have any significant sources that do not have District permits.

IV. Source-Specific Applicable Requirements

This section of the permit lists the applicable requirements that apply to permitted or significant sources. These applicable requirements are contained in tables that pertain to one or more sources that have the same requirements. The order of the requirements is:

- District Rules
- SIP Rules (if any) are listed following the corresponding District Rules. SIP rules are District rules that have been approved by EPA for inclusion in the California State Implementation Plan. SIP rules are "federally enforceable" and a "Y" (yes) indication will appear in the "Federally Enforceable" column. If the SIP rule is the current District rule, separate citation

of the SIP rule is not necessary and the "Federally Enforceable" column will have a "Y" for "yes". If the SIP rule is not the current District rule, the SIP rule or the necessary portion of the SIP rule is cited separately after the District rule. The SIP portion will be federally enforceable; the non-SIP version will not be federally enforceable, unless EPA has approved it through another program.

- Other District requirements, such as the Manual of Procedures, as appropriate.
- Federal requirements (other than SIP provisions)
- BAAQMD permit conditions. The text of BAAQMD permit conditions is found in Section VI of the permit.
- Federal permit conditions. The text of Federal permit conditions, if any, is found in Section VI of the permit.

Section IV of the permit contains citations to all applicable requirements. The text of the requirements is found in the regulations, which are readily available on the District's or EPA's websites, or in the permit conditions, which are found in Section VI of the permit. All monitoring requirements are cited in Section IV. Section VII is a cross-reference between the limits and monitoring requirements. A discussion of monitoring is included in Section C.VII of this permit evaluation and statement of basis.

Complex Applicability Determinations:

The NSPS requirements for MSW Landfills (40 CFR Part 60, Subpart WWW) do not apply to the S-1 through S-6 LFG-Fired IC Engines or the S-7 TSA Gas Treatment System, because the landfill gas that is burned in these engines has been purchased from a separate entity: the Ox Mountain Sanitary Landfill owned and operated by the Browning-Ferris Industries of CA (BFI). BFI has satisfied the requirements of 40 CFR Part 60.752(b)(2)(iii) by routing the gas to a treatment system that processes the collected gas for subsequent sale or use.

The NSPS requirements for Stationary Spark Ignition Internal Combustion Engines (40 CFR Part 60, Subpart JJJJ) applies to new spark-ignited internal combustion engines that have a maximum power of 500 bhp or more if the engine was manufactured on or after July 1, 2007. The S-1 through S-6 engines at this facility were ordered in 2005 and have an original manufacture date of 2005. Therefore, Subpart JJJJ does not apply to these engines.

Formaldehyde is a Hazardous Air Pollutant (HAP). The Air District expects formaldehyde emissions resulting from incomplete combustion of gaseous fuel in the IC engines to be the largest source of HAP emissions for this site. Based on a 2009 source testing event at the Ameresco HMB facility, conducted on the S-1 IC Engine after control by the A-1 Oxidation Catalyst, the formaldehyde emission rate for S-1 was determined to be 0.0589 pounds per hour. For all six engines, which are each equipped with oxidation catalysts and should have similar emissions, the total annual formaldehyde emissions would be:

(0.0589 pounds/hour)*(8760 hours/year)*(6 engines) = 3096 pounds/year = 1.548 tons/year

Maximum potential formaldehyde emissions from the A-8 Waste Gas Flare are expected to be:
(4E-4 pounds/MM BTU)*(12 MM BTU/hour)*(8760 hrs/year)/(2000 pounds/ton) = 0.021 tons/year
Total facility-wide formaldehyde emissions are about 1.6 tons per year. Since the facility-wide PTE for formaldehyde will not exceed the major source threshold of 10 tons per year, this facility is

not a major source for HAP emissions. Therefore, the facility is considered an area source for HAP emissions.

The engines are subject to 40 CFR, Part 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE). The following criteria are used to determine the applicable requirements for these engines pursuant to Subpart ZZZZ:

- This facility is an area source of HAPs.
- The S-1 through S-6 engines at this facility commenced construction before June 12, 2006 and are therefore considered "existing" stationary RICE pursuant to Section 63.6590(a)(1)(iii), which defines "existing" stationary RICE for engines located at an area source of HAPs as engines that commenced construction before June 12, 2006.
- Each of the six engines at this site is larger than 500 bhp.
- Each of these engines is fired on landfill gas as defined in Section 63.6675,[3] and landfill gas makes up more than 10% of the fuel for these engines, on a heat input basis.

Existing stationary RICE located at an area source of HAPs are subject to 40 CFR Part 63.6603. Section 63.6603(a) states that these engines must comply with the requirements in Table 2d and any applicable operating requirements in Table 2b. Since these engines are fired on landfill gas, Part 13 of Table 2d applies. In accordance with Table 2d, Part 13, non-emergency RICE located at an area source that combust landfill gas are subject to the following requirements: oil and filter changes every 1440 hours or annually (whichever occurs first); inspect spark plugs, hoses and belts every 1440 hours or annually (whichever occurs first); and replace spark plugs hoses, and belts as necessary. Table 2b does not contain any CO emission limits or oxidation catalyst operating requirements for existing non-emergency landfill gas fired engines. This assessment is confirmed by EPA's Regulation Navigation Tool for the RICE NESHAP.

The operator must also meet the monitoring, operating, maintenance, reporting and record keeping requirements of Section 63.6625, Subparts (e), (h) and (j); Section 63.6605, Subparts (a) and (b); Section 63.6640, Subpart (a) and (e); Section 63.6655, Subparts (d) and (e); Section 63.6650, subpart (f), and Section 63.6660 Subparts (a), (b), and (c). The applicable sections of NESHAP are identified in Table IV-A.

V. Schedule of Compliance

A schedule of compliance is required in all Title V permits pursuant to BAAQMD Regulation 2-6-409.10 which provides that a major facility review permit shall contain the following information and provisions:

"409.10 A schedule of compliance containing the following elements:

10.1 A statement that the facility shall continue to comply with all applicable requirements with which it is currently in compliance;

[3] Section 63.6675 states: "*Landfill gas* means a gaseous by-product of the land application of municipal refuse typically formed through the anaerobic decomposition of waste materials and composed principally of methane and CO_2."

10.2 A statement that the facility shall meet all applicable requirements on a timely basis as requirements become effective during the permit term; and

10.3 If the facility is out of compliance with an applicable requirement at the time of issuance, revision, or reopening, the schedule of compliance shall contain a plan by which the facility will achieve compliance. The plan shall contain deadlines for each item in the plan. The schedule of compliance shall also contain a requirement for submission of progress reports by the facility at least every six months. The progress reports shall contain the dates by which each item in the plan was achieved and an explanation of why any dates in the schedule of compliance were not or will not be met, and any preventive or corrective measures adopted."

Since the District has not determined that the facility is out of compliance with an applicable requirement, the schedule of compliance for this permit contains only sections 2-6-409.10.1 and 2-6-409.10.2.

The BAAQMD Compliance and Enforcement Division has conducted a review of the compliance record of this facility and has determined that the Ameresco Half Moon Bay has been in intermittent compliance since the Permit to Operate issuance date February 5, 2013. The Compliance and Enforcement Divisions has noted no evidence of on-going non-compliance and no recurring pattern of violations that would warrant consideration of a compliance schedule.

VI. Permit Conditions

During the Title V permit development, the District has reviewed the existing permit conditions, deleted the obsolete conditions, and, as appropriate, revised the conditions for clarity and enforceability. Each permit condition is identified with a unique numerical identifier, up to five digits.

While the District has authority to revise the existing permits and is doing so here concomitantly with the Title V process, it also has authority to supplement the terms of existing permits through the Title V process itself. When necessary to meet Title V requirements, additional monitoring, recordkeeping, or reporting has been added to the permit.

All changes to existing permit conditions are clearly shown in "strike-out/underline" format in the proposed permit. When the permit is issued, all 'strike-out" language will be deleted; all "underline" language will be retained.

The existing permit conditions are derived from previously issued District Authorities to Construct (A/C) or Permits to Operate (P/O). Permit conditions may also be imposed or revised as part of the annual review of the facility by the District pursuant to California Health and Safety Code (H&SC) § 42301(e), through a variance pursuant to H&SC § 42350 et seq., an order of abatement pursuant to H&SC § 42450 et seq., or as an administrative revision initiated by District staff. After issuance of the Title V permit, permit conditions will be revised using the procedures in Regulation 2, Rule 6, Major Facility Review.

Conditions that are obsolete or that have no regulatory basis have been deleted from the permit.

The regulatory basis is listed following each condition. The regulatory basis may be a rule or regulation. The District is also using the following terms for regulatory basis:

- BACT: This term is used for a condition imposed by the APCO to ensure compliance with the Best Available Control Technology in Regulation 2-2-301.
- Cumulative Increase: This term is used for a condition imposed by the APCO that limits a source's operation to the operation described in the permit application pursuant to BAAQMD Regulation 2-1-403.
- Offsets: This term is used for a condition imposed by the APCO to ensure compliance with the use of offsets for the permitting of a source or with the banking of emissions from a source pursuant to Regulation 2, Rules 2 and 4.
- PSD: This term is used for a condition imposed by the APCO to ensure compliance with a Prevention of Significant Deterioration permit pursuant to Regulation 2, Rule 2.

During the initial Title V permit development, the District reviewed the existing permit conditions, deleted the obsolete conditions, and, as appropriate, added and revised the conditions for clarity and enforceability. When necessary to meet Title V requirements, additional monitoring, recordkeeping, or reporting requirements have been added to the permit.

The specific changes to the current permit conditions are explained below.

Currently, Condition # 25465 contains permit conditions that apply to IC engines, oxidation catalysts, SCR system, the gas treatment system, the waste gas flare, and facility-wide limits. To improve the clarity and readability of these permit conditions, the Air District has separated these permit conditions into three groups. Condition # 25465 will apply to the IC engines and their associated abatement devices as presented in Tables IV-A and IV-B. Condition # 26864 is a new facility-wide condition that applies to all combustion devices as presented in Tables IV-A, IV-B, and IV-C. Condition # 26865 is a new set of conditions for the gas treatment system and waste gas flare as presented in Table IV-C.

In addition to these changes, the Air District is including Condition # 26782, which applies to the S-8 LFG Condensate Tank, as presented in Table IV-D.

Condition # 25465

The Air District added the list of applicable sources and abatement devices to the description of this condition.

Part 1: This part describes the allowable fuels for the engines. Additional language was added to clarify additional sources of fuel for the engines that are allowed during start-up and shut-down events for either the engines or the gas treatment system. This clarifying language was requested by Ameresco for other similar facilities. Also, the basis for this part was clarified by citing the applicable regulation (Regulation 2-5-301) instead of using the term "TBACT."

Part 2: This part describes throughput limits for the engines. The format of this part was revised for consistency with other Title V permits but the landfill gas throughput limit and heat input limit remain the same. The monitoring requirements from former Part 13 were moved to this section and expanded upon for clarity. "Offsets" was added to the basis of

this part because these throughput limits support the limits on the amount of NOx offsets provided for this site as well as the Cumulative Increase for other pollutants.

Former Part 2: This part applied to the A-8 Waste Gas Flare and was moved to Condition # 26865, Part 3.

Part 3: This part identifies the CO emission limit for each engine. Under the Authority to Construct, the facility was required to install a CEM for CO and was allowed to average the CEM results over a 24-hour period. When the Permit to Operate (PO) was issued, the CEM requirement was removed and replaced with quarterly CO concentration monitoring and annual source testing. The testing times for these types monitoring procedures ranges from 15 minutes to 3 hours. It is not possible to obtain a 24-hour average for a test that lasts 3 hours or less. The averaging time for the limit should have been changed to "averaged over the test period" at the time that the final permit to operate was issued. The Air District is correcting this error now and is adding the equivalent CO concentration limit for comparison to CO concentration measured during the quarterly monitoring events. Cumulative Increase was added to the basis because these CO limits are used in conjunction with throughput rates to limit the annual CO emissions from these engines.

Part 4. This part identifies the NOx emission limit for the S-1 IC Engine. Under the Authority to Construct, the facility was required to install a CEM and was allowed to average the CEM results over a 24-hour period. When the Permit to Operate (PO) was issued, the CEM requirement was removed and replaced with quarterly NOx concentration monitoring and annual source testing. The testing times for these types monitoring procedures ranges from 15 minutes to 3 hours. It is not possible to obtain a 24-hour average for a test that lasts 3 hours or less. The averaging time for the limit should have been changed to "averaged over the test period" at the time that the final permit to operate was issued. The Air District is correcting this error now and is adding the equivalent NOx concentration limit for comparison to NOx concentration measured during the quarterly monitoring events. Offsets was added to the basis because this NOx limit is used in conjunction with throughput rates to limit the annual NOx emissions from this engine, and the facility provided offsets for the NOx emission increases at this site.

Part 5. This part identifies the NOx emission limit for the S-2 through S-6 IC Engines. This part had no averaging time for the limit. The Air District is making the averaging time consistent with Parts 3 and 4 and is adding the equivalent NOx concentration limit for comparison to NOx concentration measured during the quarterly monitoring events. Offsets was added to the basis because this NOx limit used in conjunction with throughput rates to limit the annual NOx emissions from these engines, and the facility provided offsets for the NOx emission increases at this site.

Part 6: This part limits start-up and shut-down periods for the engines. Editorial corrections were made.

Part 7: This part identifies the POC emission limits for the IC Engines. This part had no averaging time for the limit. The Air District is making the averaging time consistent with Parts 3 and 4 and is adding the equivalent POC concentration limit. The Air District clarified how annual testing for NMOC shall be used to determine POC emissions for comparison to

these limits. The Air District also added the applicable monitoring procedures under Regulation 8, Rule 34 and explained how the key parameter relates to POC emissions.

Part 8: This part limits sulfur content in the engine fuel. Annual testing is required in other parts for the sulfur dioxide emissions. The Air District is adding quarterly monitoring for the fuel sulfur content limit.

Part 9: This part requires the engines to each be abated by oxidation catalysts. The District added requirements to properly operate and maintain these catalysts.

Part 10: This part requires that engine S-1 be abated by a selective catalytic reduction system. The District clarified that this abatement requirement does not apply during start-up or shut-down periods and added requirements to properly operate and maintain the SCR system.

Former Part 11: These requirements apply to the A-8 Waste Gas Flare and were moved to Condition # 26865, Part 5.

Former Part 12: This facility-wide limit for CO emissions was moved to Condition #26864.

Former Part 13: This fuel heat content monitoring requirement was moved to Part 2.

Part 11: Former Part 14 was renumbered to Part 11. This is the annual source testing requirement for the engine. The Air District added detail to explain all tests needed. In addition, the District added testing for several toxic air contaminants that are likely to have the most impact on site-wide health risks. Also, the District added applicable regulations to the Basis.

Part 12: Former Part 15 was renumbered to Part 12. The District added applicable criteria to the Basis.

Condition # 26864

Part 1: This part limits facility-wide CO emissions. It was moved here from Condition # 25465, Part 12. This limit was adopted to avoid PSD.

Part 2: The District added these monitoring and record keeping requirements to demonstrate compliance with Part 1.

Condition # 26865

Part 1: The District added a missing throughput limit to the S-7 TSA Gas Treatment System that reflects the fuel usage limits for the engines in Condition #25465, Part 2.

Part 2: This part describes the gases that may be burned in the A-8 Flare and the abatement requirement for waste gases produced during carbon desorption at the gas treatment system. It clarifies the proper operating procedures for the gas treatment system and flare.

Part 3: This part limits heat input and gas throughput rates to A-8. This part was moved here from Condition # 25465, Part 2. The District added monitoring requirements for the flare heat input and gas throughput limits.

Part 4: The District added the applicable NMOC control requirement for the A-8 Flare from Regulation 8, Rule 34. This limit is also the BACT requirement for controlling the waste gases from S-7.

Part 5: This temperature limit is needed to ensure proper destruction of NMOC and toxic air contaminants during combustion of waste gases from S-7. It was moved here from Condition #25465, Part 11. The District added the associated monitoring requirements.

Part 6: The District added the NOx limit from Application # 12649, Table 2.

Part 7: The District added the NOx limit from Application # 12649, Table 2.

Part 8: The District added sulfur dioxide emission limits based on the Regulation 9, Rule 1, Section 302 limit.

Part 9: The District added monitoring requirements, including annual source testing, to demonstration compliance with the above waste gas emission limits. Annual testing of the A-8 Flare is required pursuant to Regulation 8-34-412. The District clarified the testing required to demonstrate compliance with other emission limits.

Part 10: The District added record keeping requirements to demonstrate compliance with the above limits and monitoring requirements for S-7 and A-8.

Part 11: The District added monitoring requirements for the treated landfill gas to demonstrate compliance with Part 8 and the TAC concentration limit assumptions that were used to demonstrate compliance with Regulation 2, Rule 5 project risk limits.

Condition # 26782

Part 2: The District corrected the Basis for this part.

VII. Applicable Limits and Compliance Monitoring Requirements

This section of the permit is a summary of numerical limits and related monitoring requirements for each source. The summary includes a citation for each monitoring requirement, frequency of monitoring, and type of monitoring. The applicable requirements for monitoring are completely contained in Sections IV, Source-Specific Applicable Requirements, and VI, Permit Conditions, of the permit.

Monitoring decisions are typically the result of balancing several different factors including: 1) the likelihood of a violation given the characteristics of normal operation, 2) degree of variability in the operation and in the control device, if there is one, 3) the potential severity of impact of an undetected violation, 4) the technical feasibility and probative value of indicator monitoring, 5) the economic feasibility of indicator monitoring, and 6) whether there is some other factor, such as a different regulatory restriction applicable to the same operation, that also provides some assurance of compliance with the limit in question.

These factors are the same as those historically applied by the District in developing monitoring for applicable requirements. It follows that, although Title V calls for a re-examination of all monitoring, there is a presumption that these factors have been appropriately balanced and incorporated in the District's prior rule development and/or permit issuance. It is possible that, where a rule or permit requirement has historically had no monitoring associated with it, no monitoring may still be appropriate in the Title V permit if, for instance, there is little likelihood of a violation. Compliance behavior and associated costs of compliance are determined in part by the frequency and nature of associated monitoring requirements. As a result, the District will generally revise the nature or frequency of monitoring only when it can support a conclusion that existing monitoring is inadequate.

NO_X Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
S-1 IC Engine S-2 IC Engine S-3 IC Engine S-4 IC Engine S-5 IC Engine S-6 IC Engine	BAAQMD 9-8-302.1	Waste Fuel Gas, Lean-Burn Engines $\leq$ 70 ppmv, dry basis @ 15% O_2	Quarterly Portable Analyzers
S-1 IC Engine S-2 IC Engine S-3 IC Engine S-4 IC Engine S-5 IC Engine S-6 IC Engine	BAAQMD Condition # 25465, Part 4 and 5	0.15 g/bhp-hr for S-1 0.6 g/bhp-hr for S-2 through 6	Annual Source Tests and Records
Waste Gas Flare (A-8)	BAAQMD Condition # 26865, Part 6	0.06 lb/MMBtu	Annual Source Tests and Records

NOx Discussion:

Maximum potential Nitrogen Oxides (NOx) emissions are calculated below for all combustion sources followed by a discussion of each applicable limit related to NOx emissions. Definitions of the terms used below are contained in the glossary.

The maximum potential NOx emission rate from all landfill gas combustion equipment is 80.947 tons/year. From Application # 12649, the engines were assumed to have a maximum annual use factor of 96.5% due to required maintenance and other expected down-time. A-8 does not operate continuously and was assumed to have a maximum annual use rate of 75% from Application # 12649. The average annual use factors are 83.9% for IC engines and 30% for the A-8 Flare. These annual use factors are averages of 6-year (2012-2017) operating data provided by the facility. NOx emission factors measured during recent source tests (Table 2) indicated the engines have been in compliance with emission limits set in Permit Condition 25465 Part 4 and 5 (0.15 g/bhp-hr for S-1, and 0.6 g/bhp-hr for other engines).

Table 2. Summary of NOx Data Measured During Recent Source Tests (g/bhp-hr)

Year	Oct. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016	Sep. 2017
S-1	0.14	0.108	0.104	0.114	0.116	0.13
S-2	0.50	0.453	0.411	0.520	0.486	0.49
S-3	0.45	0.437	0.391	0.386	0.500	0.49
S-4	0.52	0.370	0.485	0.440	0.479	0.44
S-5	0.44	0.427	0.491	0.444	0.500	0.46
S-6	0.47	0.450	0.427	0.424	0.487	0.46
A-8*	0.04	-	-	-	-	-

*A-8 Flare emission factor is in lb/MMBtu.

Potential to Emit for S-1 LFG-Fired IC Engine (1): 3.742 tons/year of NOx
Potential to Emit for S-2 LFG-Fired IC Engine (2): 14.967 tons/year of NOx
Potential to Emit for S-3 LFG-Fired IC Engine (2): 14.967 tons/year of NOx
Potential to Emit for S-4 LFG-Fired IC Engine (2): 14.967 tons/year of NOx
Potential to Emit for S-5 LFG-Fired IC Engine (2): 14.967 tons/year of NOx
Potential to Emit for S-6 LFG-Fired IC Engine (2): 14.967 tons/year of NOx
Potential to Emit for A-8 Waste Gas Flare (3): 2.370 tons/year of NOx

(1) Maximum potential annual NOx emissions from S-1 were determined based on the maximum possible operating rate, 96.5% annual operating factor and the maximum permitted NOx emission factor of 0.15 g/bhp-hr.

(0.15 g/bhp-hr)*(2677 bhp/hr)*(8760*0.965 hours/year)/(453.6 g/lb)/(2000 lbs/ton) = 3.742 tons/year of NOx

(2) Maximum potential annual NOx emissions from S-2 through S-6 were determined based on the maximum possible operating rate, 96.5% annual operating factor and the maximum permitted NOx emission factor of 0.60 g/bhp-hr.

(0.60 g/bhp-hr)*(2677 bhp/hr)*(8760*0.965 hours/year)/(453.6 g/lb)/(2000 lbs/ton) = 14.967 tons/year of NOx

(3) Maximum potential annual NOx emissions from the flare were determined based on the maximum permitted heat input rate of 79,000 million BTU/year which includes the 75% operating rate factor and the maximum permitted NOx emission factor of 0.06 lb/MMBtu:

(0.06 lb/MMBtu)(79,000 MM BTU/year)/(2000 lbs/ton) = 2.370 tons/year of NOx

Engines: The quarterly NOx monitoring requirement from Regulation 9, Rule 8 was added to the conditions along with the existing annual source testing requirement. These testing requirements and the associated record keeping requirements were clarified in the conditions.

Flare: The applicable NOx limit and an associated annual monitoring requirement were added to the conditions for A-8. Annual monitoring is appropriate for this because it has a low NOx PTE of 2.37 tons/year. Also, the District has imposed an annual source test requirement for NO_x limits for other landfill gas fired combustion equipment in other Title V permits. Annual source testing is a standard monitoring method for small waste gas flares.

CO Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
S-1 IC Engine S-2 IC Engine S-3 IC Engine S-4 IC Engine S-5 IC Engine S-6 IC Engine	BAAQMD 9-8-302.3	Waste Fuel Gas Engines: $\leq$ 2000 ppmv, dry basis @ 15% O_2	Quarterly Portable Analyzers
S-1 IC Engine S-2 IC Engine S-3 IC Engine S-4 IC Engine S-5 IC Engine S-6 IC Engine	BAAQMD Condition # 25465, Part 4 and 5	1.8 g/bhp-hr	Annual Source Tests and Records
Waste Gas Flare (A-8)	BAAQMD Condition # 26865, Part 7	0.2 lb/MMBtu	Annual Source Tests and Records
IC Engines (S-1 through S-6) and Waste Gas Flare (A-8)	BAAQMD Condition # 26864, Part 1	238 tons per Rolling 4-Quarter Period	Quarterly Monitoring, Calculations, and Records

CO Discussion:
Maximum potential Carbon Monoxide (CO) emissions are calculated below for all combustion sources followed by a discussion of each applicable limit related to CO emissions. Definitions of the terms used below are contained in the glossary. Although the sum of the CO PTE for all individual sources is 277 tons/year of CO, the site has accepted a cap on CO emissions to avoid federal PSD requirements. Thus, the site-wide PTE for CO is 238 tons/year.

Calculation of the Potential to Emit of CO includes the 96.5% annual use factors for IC engines and 75% annual use factor for the flare. Table 3 summarized source test CO emission factors during past 6 years. The data indicated the engines have been in compliance with emission limits set in Permit Condition 25465 Part 3 (1.8 g/bhp-hr for Source 1 through 6).

Table 3. Summary of CO Data Measured During Recent Source Tests (g/bhp-hr)

Year	Oct. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016	Sep. 2017
S-1	0.75	0.568	0.242	0.995	1.065	0.42
S-2	0.54	0.796	0.743	0.266	0.255	0.82
S-3	0.84	0.452	1.431	0.436	0.821	0.58
S-4	0.46	0.524	0.088	0.537	0.268	0.57
S-5	0.53	0.372	1.182	0.180	0.216	0.39
S-6	0.51	0.403	1.298	0.572	0.181	0.59
A-8*	0.49	-	-	-	-	-

*A-8 Flare emission factor is in lb/MMBtu.

Potential to Emit for S-1 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for S-2 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for S-3 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for S-4 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for S-5 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for S-6 LFG-Fired IC Engine (1): 44.901 tons/year of CO
Potential to Emit for A-8 Waste Gas Flare (2): 7.900 tons/year of CO

(1) Maximum potential annual CO emissions from the engines were determined based on the maximum possible operating rate, 96.5% annual operating factor and the maximum permitted CO Emission factor of 1.80 g/bhp-hr.

(1.80 g/bhp-hr)*(2677 bhp/hr)*(8760*0.965 hours/year)/(453.6 g/lb)/(2000 lbs/ton) = 44.901 tons/year of CO

(2) Maximum potential annual CO emissions from the flare were determined based on the maximum permitted heat input rate of 79,000 million BTU/year which includes the 75% operating rate factor and the maximum permitted CO emission factor of 0.20 lb/MMBtu:

(0.20 lb/MMBtu)(79,000 MM BTU/year)/(2000 lbs/ton) = 7.900 tons/year of CO

SO_2 Discussion:

SO_2 Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
IC Engines (S-1 through S-6) and Waste Gas Flare (A-8)	BAAQMD 9-1-301	Property Line Ground Level SO_2 Limits: $\leq$ 0.5 ppm for 3 minutes and $\leq$ 0.25 ppm for 60 minutes and $\leq$ 0.05 ppm for 24 hours	None
IC Engines (S-1 through S-6) and Waste Gas Flare (A-8)	BAAQMD 9-1-302	Exhaust Point Limit: $\leq$ 300 ppmv (dry) of SO_2	Quarterly Sulfur Analysis of Fuel and Waste Gas and Records

SO_2 Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
IC Engines (S-1 through S-6)	BAAQMD Condition #25465, Part 8	Exhaust Point Limit: ≤ 300 ppmv (dry) of SO2 And Fuel Sulfur Content: ≤ 150 ppmv of TRS measured as H2S	Quarterly Sulfur Analysis of Fuel and Records And Annual Source Test
Waste Gas Flare (A-8)	BAAQMD Condition #26865, Part 8	Exhaust Point Limits: ≤ 300 ppmv (dry) of SO_2	Annual Source Test

Maximum potential sulfur dioxide (SO_2) emissions are calculated below for all combustion sources followed by a discussion of each applicable limit related to sulfur dioxide emissions. Definitions of the terms used below are contained in the glossary.

Table 4. Summary of fuel TRS Data Measured during Recent Source Tests (ppm)

Year	Oct. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016	Sep. 2017
S-1	45.5	49.3	6.17	31.2	32.1	139
S-2	6.69	49.3	6.17	31.2	32.1	139
S-3	4.17	49.3	6.17	31.2	32.1	139
S-4	20.9	49.3	6.17	31.2	32.1	141
S-5	47.2	49.3	6.17	31.2	32.1	141
S-6	23.1	49.3	6.17	31.2	32.1	141
A-8[a]	5481	6585/3869	2021	103[b]	130.6[b]	-

a. Results presented here are from treated landfill carrier gas and TSA purge (scavenger) gas.
b. TRS in plant inlet as H_2S, before TSA gas treatment.

Potential to Emit Calculations for Landfill Gas Fired Combustion Equipment
(S-1, S-2, S-3, S-4, S-5, S-6 and A-8)

Source 1 through 6 are subject to a permit condition (BAAQMD Condition # 25465, Part 8) that limits the sulfur concentration in landfill gas to 150 ppmv (expressed as H_2S).

(150 ft^3 H_2S/1 MM ft^3 LFG)/(387 ft^3 H_2S/lbmol H_2S)*(1 lbmol SO_2/1 lbmol H_2S)*
(64.06 pounds SO_2/lbmol SO_2)/(500 MM BTU/MM ft^3 LFG) = 0.0497 lbs SO_2/MM BTU

Hourly emissions for each engine:
(0.0497 lbs/MM BTU)*(21.3 MM BTU/hr) =1.058 lbs SO_2/hour

S-1 through S-6:
(0.0497 lbs/MM BTU)*(21.3 MM BTU/hr)*(8760 hr/yr)*(0.965 annual factor)/(2000 lbs/ton)
= 4.474 tons/year SO_2 each

Regulation 9-1-301 limits ground level sulfur dioxide concentrations at the fence line. Compliance with Section 9-1-302 below is expected to ensure compliance with these ground level limits. Therefore, additional monitoring for the ground level limits is not necessary.

Regulation 9-1-302 limits the sulfur dioxide concentration in any exhaust gas to 300 ppmv of SO_2. Note that this limit is not referenced to any particular oxygen concentration, and therefore applies to the as measured conditions of the exhaust stream. Waste gas flare A-8 is subject to this rule. Assuming the landfill gas contains a minimum of 50% methane with a minimum heat content of 496.9 BTU/scf and an F-factor of 9826 dscf of flue gas at 0% O_2 per MM BTU, this sulfur concentration is equivalent to the following emission factor:

The exhaust gas from the waste gas flare typically contains 10%-15% oxygen. Assuming the flare exhaust stream contains 10% oxygen, the outlet SO_2 concentration from the flare will be no more than: (575 ppmv of SO_2 at O% O_2)*(20.9-10)/(20.9-0) = 300 ppmv of SO_2

(2750 ft3 H_2S/MM ft^3 LFG)*(1 ft^3 SO_2/1 ft^3 H_2S)/(496.9 MM BTU/MM ft3 LFG)/(0.009826 MM ft^3 flue/MM BTU) = 575 ft3 of SO_2/MM ft^3 flue gas at 0% oxygen = 575 ppmv of SO_2 at 0% oxygen

(2750 ft^3 H_2S/1 MM ft^3 LFG)/(387 ft^3 H_2S/lbmol H_2S)*(1 lbmol SO_2/1 lbmol H_2S)*
(64.06 pounds SO_2/lbmol SO_2)/(496.9 MM BTU/MM ft^3 LFG) = 0.916 lbs SO_2/MM BTU

Hourly emissions for A-8:
(0.916 lbs/MM BTU)*(12 MM BTU/hr) =10.992 lbs SO_2/hour

A-8:
(0.916 lbs/MM BTU)*(79,000 MM BTU/hr)/(2000 lbs/ton) = 36.182 tons/year SO_2

The maximum potential sulfur dioxide emission rate from all landfill gas combustion equipment is 63.029 tons/year.

Engines: BAAQMD Condition # 25465, Part 8: This permit condition limits the sulfur concentration in the landfill gas fuel delivered to the engines to 150 ppmv of TRS, expressed as H_2S dry, in order to meet new source review requirements for the S-1 through 6 IC Engines. Staff has proposed permit conditions (Condition # 25465, Part 8) that will require the engine fuel to be monitored for TRS content on a quarterly basis to ensure compliance with this landfill gas sulfur concentration limit. Since this fuel is produced from the gas treatment system, which removes sulfur as well as organic compounds, the fuel sulfur content is not expected to vary appreciably. Therefore, the proposed quarterly monitoring frequency is appropriate for demonstrating compliance with this limit.

Flare: BAAQMD Condition # 26865, Part 8: Regulation 9-1-302 limits the sulfur dioxide concentration in A-8 Flare exhaust gas to 300 ppmv of SO_2. It also describes the annual monitoring procedures that will demonstrate compliance with this limit. Annual monitoring is appropriate because the flare has a low annual operating rate of about 30%. In addition, Ox Mountain Landfill, the source of the landfill gas for this site, submitted an application in 2018 to install a H_2S treatment system in the header of the gas collection system. With this abatement system installed, sulfur contents in the waste gases delivered to A-8 flare should decline in future years.

POC Discussion:

POC Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
IC Engines (S-1 through S-6)	BAAQMD 8-34-301.4	≤ 120 ppmv of NMOC as CH_4 @ 3% O_2	Quarterly CO Monitoring and Annual Source Test and Records
IC Engines (S-1 through S-6)	BAAQMD Condition #25465, Part 7	≤ 0.20 g/bhp-hour POC and ≤ 40 ppmv of NMOC as CH_4 @ 15% O_2	Quarterly CO Monitoring and Annual Source Test and Records
Waste Gas Flare (A-8)	BAAQMD 8-34-301.3 And BAAQMD Condition #26865, Part 4	≥ 98% NMOC destruction or ≤ 30 ppmv of NMOC as CH_4 @ 3% O_2	Continuous Temperature Monitoring and Annual Source Tests and Records

Maximum potential POC emissions are calculated below for all combustion sources followed by a discussion of each applicable limit related to POC emissions. Definitions of the terms used below are contained in the glossary. POC emission factors measured during recent source tests (Table 5 and 6) indicated the engines have been in compliance with emission limits set in Permit Condition 25465 Part 7 (0.20 g/bhp-hr for S-1 through 6) and Regulation 8-34-301.3 and 8-34-301.4 (30 ppmv as CH_4 @ 3% O_2 for the flare and 120 ppmv as CH_4 @ 3% O_2 for the engines).

Table 5. Summary of POC Data Measured During Recent Source Tests (g/bhp-hr)

Year	Oct. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016	Sep. 2017
S-1	0.18	0.063	0.040	0.062	0.050	0.09
S-2	0.17	0.095	0.091	0.023	0.035	0.07
S-3	0.18	0.071	0.107	0.050	0.059	0.07
S-4	0.18	0.068	0.031	0.044	0.043	0.06
S-5	0.17	0.061	0.083	0.044	0.022	0.07
S-6	0.18	0.065	0.097	0.067	0.020	0.07
A-8	0.02	-	-	-	-	-

Table 6. Summary of POC Data Measured During Recent Source Tests (ppmv@ 3% O_2)

Year	Oct. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016	Sep. 2017
S-1	111	42	27.8	40.3	35.9	60.3
S-2	108.7	61.7	59.4	15.1	25.2	44
S-3	110.4	47.6	73.5	32.6	43.7	51.9
S-4	114.3	46.6	21.2	28.9	28.4	44.4
S-5	107.9	42.6	57.3	28.7	15.3	47.3
S-6	110.5	43.4	65.1	43	13.8	44.8
A-8	5.5	-	-	-	-	-

Potential to Emit Calculations for Landfill Gas Fired Combustion Equipment
(S-1, S-2, S-3, S-4, S-5, S-6 and A-8)

The waste flush gas will be abated by the A-8 TSA Waste Gas Flare, which can burn up to 12 MM BTU/hour or 400 scfm of waste gas at 50% methane. If necessary, this waste gas will be blended with a carrier gas (filtered Ox Mountain landfill gas) to ensure the flare has a sufficient inlet heat rate for the flare to run properly. However, worst case emissions will occur when the flare is burning waste flush gas alone. The A-8 Flare will meet the requirements of Regulation 8-34-301.3 by achieving either a minimum of 98% by weight destruction of the NMOC in the waste flush gas or by emitting no more than 30 ppmv of NMOC expressed as C_1 at 3% O_2 from the outlet of the flare. Maximum permitted emissions for S-7 abated A-8 will be based on the higher of the two allowable flare NMOC limits.

If the A-8 Flare is operating at maximum capacity on waste flush gas with the maximum expected NMOC content, the 98% by weight NMOC destruction efficiency limit is equal to an emission rate of 0.2 pounds/hour of NMOC, as calculated below.
(12 E6 BTU/hour)/(496.943 BTU/scf flush gas)*(10,000 scf NMOC/1E6 scf flush gas)/
(387.006 scf NMOC/lbmol NMOC)*(16.04 lbs NMOC/lbmol NMOC)*
(1.00-0.98 lbs NMOC emitted/lb NMOC) = 0.2 pounds/hour of NMOC emitted

If the A-8 Flare is operating at maximum capacity on waste flush gas, the 30 ppmv NMOC outlet concentration limit is equal to an emission rate of 0.167 pounds/hour of NMOC, as calculated below.
(12 MM BTU/hour)*(9605 sdcf flue gas at 0% O_2/MM BTU)*
[(20.95-0)/(20.95-3) scf flue gas at 3% O_2/scf flue gas at 0% O_2]*
(30 scf NMOC/1E6 scf flue gas at 3% O2)/(387.006 scf NMOC/lbmol NMOC)*
(16.04 lbs NMOC/lbmol NMOC) = 0.167 pounds/hour of NMOC emitted

The maximum permitted emission rate for precursor organic compounds (POC) is the higher of the two possible NMOC emission rate limits that were determined above. Due to the high inlet NMOC concentration in the waste flush gas, the 8-34-301.3 requirement to achieve 98% NMOC destruction efficiency results in the higher residual NMOC emission rate than the NMOC outlet concentration limit. Therefore, the maximum permitted POC emission rate from the A-8 Flare is 0.2 pounds/hour.

As discussed in the NSR application AN 26777, unabated POC emissions from S-8 LFG condensation tank is 0.35 lb/yr and will be vented to the A-8 flare for abatement. Abated POC emission from S-8 LFG condensation tank is negligible (2.63 E-06 ton per year).

The maximum potential POC emissions from all landfill gas combustion equipment are 30.591 tons/year.

Potential to Emit for S-1 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for S-2 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for S-3 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for S-4 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for S-5 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for S-6 LFG-Fired IC Engine (1):	4.989 tons/year of POC
Potential to Emit for A-8 Waste Gas Flare (2):	0.657 tons/year of NOx

(1) Maximum potential annual POC emissions from the engines were determined based on the maximum possible operating rate, 96.5% annual factor and the maximum permitted POC Emission factor of 0.2 g/bhp-hr.

(0.2 g/bhp-hr)*(2677 bhp/hr)*(8760*.965 hours/year)/(453.6 g/lb)/(2000 lbs/ton) = 4.989 tons/year of POC

(2) Maximum potential annual POC emissions from the flare were determined based on the maximum permitted operating rate, 75% annual factor, and the maximum permitted POC Emission factor of 0.2 lb/hr:

(0.2 lb/hr)*(8760 hours/year)*(75% annual use)/(2000 lbs/ton) = 0.657 tons/year of POC

Engines: BAAQMD Condition # 25465, Parts 7 and 12: As required by Regulation 8, Rule 34, NMOC emissions landfill gas fired IC engines should monitored by a key emission control system operating parameter. Since NMOC emissions typically follow the same trend as CO emissions, CO concentration will be used as the key operating parameter for these engines, and CO is monitored on a quarterly basis. Part 12 requires annual source testing for POC emissions.

Flare: BAAQMD Condition # 26865, Parts 4 and 5: As required by Regulation 8, Rule 34, flare temperature is monitored on a continuous basis to demonstrate that NMOC emissions are adequately controlled. This continuous monitoring requirement is reflected here. In addition, Part 9 requires annual source testing for POC emissions.

PM Discussion:

PM Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
IC Engines (S-1 through S-6) and Waste Gas Flare (A-8)	BAAQMD 6-1-301 and SIP 6-301	No darker than: Ringelmann No. 1 for periods of more than: 3 minutes in any hour	Visual Observation
IC Engines (S-1 through S-6) and Waste Gas Flare (A-8)	BAAQMD 6-1-302 and SIP 6-302	No more than: 20% opacity for periods of more than: 3 minutes in any hour	Visual Observation

PM Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
IC Engines (S-1 through S-6)	BAAQMD 6-1-310.1, BAAQMD 6-1-310.2, And SIP 6-310	$\leq$ 0.15 grains/dscf	Source Testing (every 5 years) and Records
Waste Gas Flare (A-8)	BAAQMD 6-1-310.1 And SIP 6-310	$\leq$ 0.15 grains/dscf	None

Maximum potential PM_{10} emissions are calculated below for any sources listed above that have a PM limit and no proposed monitoring for that limit.

Potential to Emit Calculations for Landfill Gas Fired Combustion Equipment
(S-1, S-2, S-3, S-4, S-5, S-6 and A-8)

Maximum potential annual PM_{10} emissions from the engines were determined based on the maximum possible operating rate, 96.5% annual factor and the maximum permitted PM_{10} emission factor of 0.095 g/bhp-hr.
S-1, S-2, S-3, S-4, S-5, and S-6:
(0.095 g/bhp-hr)*(2677 bhp/hr)*(8760*.965 hours/year)/(453.6 g/lb)/(2000 lbs/ton)
= 2.370 tons/year of PM_{10} each (2150 kg/year per engine)

PM10 emissions from 6 IC engines:
2.370 tons/year * 6 = 14.219 tons/year

PM Emission calculations for A-8 are based on emission factor from AP-42 Table 2.4-5 (17 pounds per million cubic feet of methane in the equation below), and the maximum capacities of the flare.
(17 pounds PM_{10}/MM ft^3 CH4)*(0.50 MM ft^3 CH_4/MM ft^3 LFG)/(496.943 MM BTU/MM scf)
= 0.017 lbs/MM BTU

A-8:
(0.017 lbs/MM BTU)*(79,000 MM BTU/yr)/(2000 lbs/ton) = 0.676 tons/year PM_{10}
(or 613 kg/year)

From Application # 12649 in Appendix C, the maximum potential particulate emissions from all landfill gas combustion equipment combined are 14.25 tons/year of PM_{10}.

BAAQMD Regulation 6-1-301 for Landfill Gas Fired Combustion Equipment (S-1, S-2, S-3, S-4, S-5, S-6, and A-8): Visible particulate emissions are normally not associated with combustion of gaseous fuels, such as natural gas or landfill gas. Maximum potential emissions from all landfill gas combustion equipment are 14.9 tons/year of PM_{10}. Since particulate emissions are not substantial and violations of Ringelmann 1.0 limit are not expected, periodic monitoring for the Ringelmann limit would not be appropriate for the combustion equipment.

BAAQMD Regulation 6-1-310 for Landfill Gas Fired Combustion Equipment (S-1, S-2, S-3, S-4, S-5, S-6, and A-8): BAAQMD Regulation 6-1-310.1 limits Total Suspended Particulate

(TSP) emissions from any source to 0.15 grains per dry standard cubic foot (gr/dscf) of exhaust volume. Sources with a PTE of more than 1000 kg/year are subject to BAAQMD Regulation 6-1-310.2. Since these engines have a PTE of 2150 kg/year, these engines are subject to 6-1-310.2 and the testing requirements in 6-1-504. The A-8 Flare has a PTE less than 1000 kg/year; therefore, 6-1-310.2 does not apply.

Using the applicable AP-42 emission factors and the maximum landfill gas methane content (60% CH_4), the maximum PM_{10} emission rates from these devices are determined below:

S-1 through 6 IC Engines with a total of 12.365 tons/year of PM_{10} emissions:
(0.095 g PM_{10}/bhp-hr)(2677 bhp) /(453.6 g/lb) /(667 scf LFG/min)*(60 min/hr) *(7000 grains/pound)*/(5.5279 ft^3 flue gas, dry, 0% O_2/ft^3 LFG) = 0.018 grains/dscf @ 0% O_2

A-8 Landfill Gas Flare with a maximum of 0.268 tons/year of PM_{10} emissions:
(17 pounds PM_{10}/1E6 ft^3 CH_4)*(7000 grains/pound)*(0.60 ft^3 CH_4/ft^3 LFG)/
(5.5279 ft^3 flue gas, dry, 0% O_2/ft^3 LFG) = 0.013 grains/dscf @ 0% O_2

For the engines, the new testing requirement of once every five years was found to be appropriate for devices emitting 2000-8000 kg/year during the recent rule amendments.

The compliance margin with the Regulation 6-310 limit are: 11.5:1 for the flare. Periodic monitoring for compliance with this limit would not be appropriate for this small waste gas fired flare, because the Regulation 6-1-310.1 grain-loading limit is far above any expected PM emissions and particulate emissions from the device are low.

VIII. Test Methods

This section of the permit lists test methods that are associated with standards in District or other rules. It is included only for reference. In most cases, the test methods in the rules are source test methods that can be used to determine compliance but are not required on an ongoing basis. They are not applicable requirements.

If a rule or permit condition requires ongoing testing, the requirement will also appear in Section IV of the permit.

IX. Permit Shield:

The District rules allow two types of permit shields. The permit shield types are defined as follows: (1) A provision in a major facility review permit that identifies and justifies specific federally enforceable regulations and standards are not applicable to a source or group of sources, or (2) A provision in a major facility review permit that identifies and justifies specific federally enforceable applicable requirements for monitoring, recordkeeping and/or reporting which are subsumed because other applicable requirements for monitoring, recordkeeping, and reporting in the permit will assure compliance with all emission limits.

The second type of permit shield is allowed by EPA's "White Paper 2 for Improved Implementation of the Part 70 Operating Permits Program." The District uses the second type of

permit shield for all streamlining of monitoring, recordkeeping, and reporting requirements in Title V permits. The District's program does not allow other types of streamlining in Title V permits.

No permit shields were requested by the applicant.

X. Revision History:

This section of the permit summarizes each revision to the permit. The District is adding this initial Title V application in Section X.

XI. Glossary

This section of the permit defines and explains acronyms, abbreviations, and other terms that are used in this permit.

D. ALTERNATE OPERATING SCENARIOS

No alternate operating scenario has been requested for this facility.

E. COMPLIANCE STATUS

An August 2, 2018 office memorandum from the Director of Compliance and Enforcement, to the Director of Engineering, presents a review of the compliance record of Ameresco Half Moon Bay, LLC (Site # B7040). This review was initiated as part of the District evaluation of an application for an initial Title V permit and is contained in Appendix A.

The Compliance and Enforcement Division staff has reviewed the compliance history for Ameresco Half Moon Bay, LLC for the period from 4/10/2013 through 7/17/2018. Most recently, the owner certified that all equipment was operating in compliance on November 14, 2019. The Compliance and Enforcement Division staff found no on-going non-compliance and no recurring pattern of violations.

The Compliance and Enforcement Division staff reviewed the compliance history for this site from April 1, 2013 through July 17, 2018. During this period, activities known to the District include:

- The District issued 7 Notices of Violation. One violation was issued for A-7 SCR system abating S-1 engine was not operating for a short period of time. One violation was issued because the site had temperature excursions in A-8 flare for 15 days and failed to report the occurrence to the District within 96 hours. Another violation indicated that the site failed to meet their minimum combustion zone temperature limits on their flare for a period of time. The facility corrected this problem and there have been no temperature excursions since December 30, 2014. One violation was issued because the site was unaware they were subject to the leak detection and repair (LDAR) landfill operating requirements, and subsequently failed to perform quarterly testing required by District Regulation 8-34. All the violations have achieved compliance.
- The District received no air pollution complaints alleging Ameresco Half Moon Bay, LLC as the source of odors.

- The facility is not operating under an Enforcement Agreement, a Variance, or an Order of Abatement.

The Compliance and Enforcement Division has determined that for the periods reviewed, Ameresco Half Moon Bay, LLC was in intermittent compliance. However, there is no evidence of on-going non-compliance and no recurring pattern of violations that would warrant consideration of a Title V permit compliance schedule.

F. DIFFERENCES BETWEEN THE APPLICATION AND THE PROPOSED PERMIT

The initial Title V permit application was submitted on October 27, 2009, the Authority of Construct was issued on August 24, 2007. The Permit to Operate was issued on February 5, 2013. This version is the basis for constructing the proposed Title V permit. Revisions were made to Initial Title V Application #21226 as a result of changes at the facility that were made pursuant to NSR Application #27766. Differences between the application and the proposed permit include the following:

A Permit to Operate was issued for S-8 LFG Condensate Solvent Tank on 7/13/2018.

In addition to the changes discussed above, the District proposed modifications to the permit conditions for the equipment at this facility after the authority to construct was first issued and after the permits to operate were issued. All permit condition modifications are discussed in detail in Section C of this document.

APPENDIX A

BAAQMD COMPLIANCE REPORT

COMPLIANCE & ENFORCEMENT DIVISION

Inter-Office Memorandum

August 2, 2018

TO: DAVIS ZHU – AIR QUALITY ENGINEER, ENGINEERING

FROM: ED GIACOMETTI – SAQS, COMPLIANCE & ENFORCEMENT

SUBJECT: REVIEW OF COMPLIANCE RECORD OF:

AMERESCO HALF MOON BAY, LLC; SITE #B7040

Background

This review was initiated as part of the District evaluation of an application by AMERESCO HALF MOON BAY, LLC (AMERESCO) for a Title V Permit. It is standard practice of the Compliance and Enforcement Division to undertake a compliance record review in advance of a renewal of a Title V Permit. The purpose of this review is to assure that any non-compliance problems identified during the prior five-year permit term have been adequately addressed, or, if non-compliance persists, that a schedule of compliance is properly incorporated into the Title V permit compliance schedule. In addition, the review checks for patterns of recurring violation that may be addressed by additional permit terms. Finally, the review is intended to recommend, if necessary, any additional permit conditions and limitations to improve compliance.

AMERESCO is a landfill gas-to-electricity power plant located in Half Moon Bay, CA. AMERESCO can produce approximately 11.4 Megawatts of electricity using landfill gas.

Compliance Review

Compliance records were reviewed for the time period from 4/10/2013 through 7/17/2018. The results of this review are summarized as follows.

1. Violation History

Staff reviewed AMERESCO Annual Compliance Certifications and found no ongoing non-compliance and no recurring pattern of violations.

Staff also reviewed the District compliance records for the review period. During this period AMERESCO activities known to the District include:

District-issued 4 Notice of Violations:

NOV#	Regulation	Date Occur	Date Issued	# of Days	Comments	Disposition
A52289A	2-1-307	2/8/13	4/10/13	1	SCR not operating	Resolved
A52289B	2-6-426.2	2/8/13	4/10/13	1	Annual cert. not submitted	Resolved
A53908A	2-6-307	2/8/13	10/8/14	1	Flare temp. excursions 2/8/13-3/15/14	Resolved
A53908B	1-523.3	2/8/13	10/8/14	1	Late Reporting	Resolved
A53955A	8-34-503	10/21/08	9/30/14	0	No quarterly testing	NFA
A53955B	8-34-501.6	10/21/08	9/30/14	0	No records	NFA
A53969A	2-6-307	12/30/14	1/7/16	1	Temp. excursion > 1% deviation allowance	Resolved

NOV A52289 indicated that for a short period of time, the site was not operating their selective catalytic reduction (SCR) unit on one of their engines, which is required to abate NOx. Additionally, NOV A52289 indicated that the site failed to submit their annual compliance certifications from 2010 to 2012, pursuant to Title V Authority to Construct (A/C) operating conditions. NOV A53908 indicated that the site had temperature excursions for 15 days and failed to report the occurrence to the District within 96 hours. NOV A53955 indicated that the site was unaware they were subject to leak detection and repair (LDAR) landfill operating requirements, and subsequently failed to perform quarterly testing required by District Regulation 8-34. The site inevitability was cited for failure to have records pertaining these tests. The NOV was determined to need No Further Action (NFA) upon performing tests and achieving compliance. NOV A53969 indicated that the site failed to meet their minimum combustion zone temperature limits on their flare for a period of time. There have been no temperature excursions since December 30, 2014. All the above violations have achieved compliance.

2. Complaint History

The District did not receive any air pollution complaints alleging AMERESCO as the source.

3. Reportable Compliance Activity

Reportable Compliance Activity (RCA), also known as "Episode" reporting, is the reporting of compliance activities involving a facility as outlined in District Regulations and State Law. Reporting covers breakdown requests, indicated monitor excesses, pressure relief device releases, inoperative monitor reports and flare monitoring.

Within the review period, the District received **16** notifications (temperature excursion, gas control valve malfunctions and data collection systems errors) for RCA's. Two of the RCA's were determined to be in violation. NOV A53908 and NOV A53969 were issued for RCA 06R77 and RCA 06T02, respectively, both due to a temperature excursion. There are 4 remaining RCA's (07F38, 07F39, 07F52, 07H13) which are currently pending.

4. Enforcement Agreements, Variances, or Abatement Orders

There were no enforcement agreements, variances, or abatement orders for AMERESCO over review period.

Conclusion

Following the review of all available facility and District compliance records from 4/10/2013 to 7/17/2018, the District's Compliance and Enforcement Division has determined that AMERESCO was in intermittent compliance from the initial permit period through the present. AMERESCO has demonstrated no evidence of ongoing non-compliance and no recurring pattern of violations that would warrant consideration of a Title V permit compliance schedule for this facility.

APPENDIX B

GLOSSARY

ACT
Federal Clean Air Act

AP-42
An EPA Document "Compilation of Air Pollutant Emission Factors" that is used to estimate emissions for numerous source types. It is available electronically from EPA's website at: http://www.epa.gov/ttn/chief/ap42/index.html

APCO
Air Pollution Control Officer: Head of Bay Area Air Quality Management District

ARB
Air Resources Board

ASTM
American Society of Testing and Materials

ATC
Authority to Construct

ATCM
Airborne Toxic Control Measure

BAAQMD
Bay Area Air Quality Management District

BACT
Best Available Control Technology

BARCT
Best Available Retrofit Control Technology

Basis
The underlying authority which allows the District to impose requirements.

C1
An organic chemical compound with one carbon atom, for example: methane

C3
An organic chemical compound with three carbon atoms, for example: propane

C5
An organic chemical compound with five carbon atoms, for example: pentane

C6
An organic chemical compound with six carbon atoms, for example: hexane

CAA
The federal Clean Air Act

CAAQS
California Ambient Air Quality Standards

CAPCOA
California Air Pollution Control Officers Association

CARB
California Air Resources Board (same as ARB)

CCR
California Code of Regulations

CEC
California Energy Commission

CEQA
California Environmental Quality Act

CEM
A "continuous emission monitor" is a monitoring device that provides a continuous direct measurement of some pollutant (e.g. NOx concentration) in an exhaust stream.

CFR
The Code of Federal Regulations. 40 CFR contains the implementing regulations for federal environmental statutes such as the Clean Air Act. Parts 50-99 of 40 CFR contain the requirements for air pollution programs.

CH4 or CH_4
Methane

CIWMB
California Integrated Waste Management Board

CO
Carbon Monoxide

CO2 or CO_2
Carbon Dioxide

Cumulative Increase
The sum of permitted emissions from each new or modified source since a specified date pursuant to BAAQMD Rule 2-1-403, Permit Conditions (as amended by the District Board on 7/17/91) and SIP Rule 2-1-403, Permit Conditions (as approved by EPA on 6/23/95). Used to determine whether threshold-based requirements are triggered.

District
The Bay Area Air Quality Management District

E6, E9, E12
Very large or very small number values are commonly expressed in a form called scientific notation, which consists of a decimal part multiplied by 10 raised to some power. For example, 4.53E6 equals (4.53) x (10^6) = (4.53) x (10x10x10x10x10x10) = 4,530,000. Scientific notation is used to express large or small numbers without writing out long strings of zeroes.

EL
Emission limit

EPA
The federal Environmental Protection Agency.

Excluded
Not subject to any District regulations.

Federally Enforceable, FE
All limitations and conditions which are enforceable by the Administrator of the EPA including those requirements developed pursuant to 40 CFR Part 51, subpart I (NSR), Part 52.21 (PSD), Part 60 (NSPS), Part 61 (NESHAPs), Part 63 (MACT), and Part 72 (Permits Regulation, Acid Rain), including limitations and conditions contained in operating permits issued under an EPA-approved program that has been incorporated into the SIP.

FID
Flame Ionization Detector

FP
Filterable Particulate as measured by BAAQMD Method ST-15, Particulate.

FR
Federal Register

GLM
Ground Level Monitor

Grain
1/7000 of a pound

HAP
Hazardous Air Pollutant. Any pollutant listed pursuant to Section 112(b) of the Act. Also refers to the program mandated by Title I, Section 112, of the Act and implemented by 40 CFR Part 63.

H2S or H_2S
Hydrogen sulfide

H2SO4 or H_2SO_4
Sulfuric Acid

H&SC
Health and Safety Code

Hg
Mercury

HHV
Higher Heating Value. The quantity of heat evolved as determined by a calorimeter where the combustion products are cooled to 60F and all water vapor is condensed to liquid.

LFG
Landfill gas

LHV
Lower Heating Value. Similar to the higher heating value except that the water produced by the combustion is not condensed but retained as vapor at 60°F.

Long ton
2200 pounds

Major Facility
A facility with potential emissions of: (1) at least 100 tons per year of regulated air pollutants, (2) at least 10 tons per year of any single hazardous air pollutant, and/or (3) at least 25 tons per year of any combination of hazardous air pollutants, or such lesser quantity of hazardous air pollutants as determined by the EPA administrator.

MFR
Major Facility Review. The District's term for the federal operating permit program mandated by Title V of the Federal Clean Air Act and implemented by District Regulation 2, Rule 6.

MOP
The District's Manual of Procedures.

MSDS
Material Safety Data Sheet

MSW
Municipal solid waste

MTBE
Methyl tertiary-butyl ether

MW
Molecular weight

N2 or N_2
Nitrogen

NA
Not Applicable

NAAQS
National Ambient Air Quality Standards

NESHAPS
National Emission Standards for Hazardous Air Pollutants. See in 40 CFR Parts 61 and 63.

NMHC
Non-methane Hydrocarbons (Same as NMOC)

NMOC
Non-methane Organic Compounds (Same as NMHC)

NO2 or NO_2
Nitrogen Dioxide

NOx or NO_x
Oxides of nitrogen.

NSPS
Standards of Performance for New Stationary Sources. Federal standards for emissions from new stationary sources. Mandated by Title I, Section 111 of the Federal Clean Air Act, and implemented by 40 CFR Part 60 and District Regulation 10.

NSR
New Source Review. A federal program for pre-construction review and permitting of new and modified sources of pollutants for which criteria have been established in accordance with Section 108 of the Federal Clean Air Act. Mandated by Title I of the Federal Clean Air Act and implemented by 40 CFR Parts 51 and 52 and District Regulation 2, Rule 2. (Note: There are additional NSR requirements mandated by the California Clean Air Act.)

O2 or O_2
Oxygen

Offset Requirement
A New Source Review requirement to provide federally enforceable emission offsets for the emissions from a new or modified source. Applies to emissions of POC, NOx, PM10, and SO2.

Phase II Acid Rain Facility
A facility that generates electricity for sale through fossil-fuel combustion and is not exempted by 40 CFR 72 from Titles IV and V of the Clean Air Act.

POC
Precursor Organic Compounds

PM
Particulate Matter

PM10 or PM_{10}
Particulate matter with aerodynamic equivalent diameter of less than or equal to 10 microns

PSD
Prevention of Significant Deterioration. A federal program for permitting new and modified sources of those air pollutants for which the District is classified "attainment" of the National

Air Ambient Quality Standards. Mandated by Title I of the Act and implemented by both 40 CFR Part 52 and District Regulation 2, Rule 2.

Regulated Organic Liquid
"Regulated organic liquids" ae those liquids which require permits, or which are subject to some regulation, when processed at a liquid-handling operation. For example, refinery marine terminals, regulated organic liquids are defined as "organic liquids" in Regulation 8, Rule 44.

RCRA
Resource Conservation and Recovery Act

RWOCB
Regional Water Quality Control Board

S
Sulfur

Short ton
2000 pounds

SIP
State Implementation Plan. State and District programs and regulations approved by EPA and developed in order to attain the National Air Ambient Quality Standards. Mandated by Title I of the Act.

SO2 or SO_2
Sulfur dioxide

SOCMI
Synthetic Organic Compound Manufacturing Industry

TAC
Toxic Air Contaminant (as identified by CARB)

THC
Total Hydrocarbons (NMHC plus methane) (same as TOC)

Therm
100,000 British Thermal Units

Title V
Title V of the federal Clean Air Act. Requires a federally enforceable operating permit program for major and certain other facilities.

TOC
Total Organic Compounds (NMOC plus methane, same as THC)

TPH
Total Petroleum Hydrocarbons

TRMP
Toxic Risk Management Plan

TRS
Total Reduced Sulfur, which is a measure of the amount of sulfur-containing compounds in a gas stream, typically a fuel gas stream, including, but not limited to hydrogen sulfide. The TRS content of a fuel gas determines the concentration of SO_2 that will be present in the combusted fuel gas, since sulfur compounds are converted to SO_2 by the combustion process.

TSP
Total Suspended Particulate

TVP
True Vapor Pressure

VOC
Volatile Organic Compounds

Units of Measure:

atm	=	atmospheres
bbl	=	barrel of liquid (42 gallons)
bhp	=	brake-horsepower
btu	=	British Thermal Unit
BTU	=	British Thermal Unit
°C	=	degrees Centigrade
cfm	=	cubic feet per minute
dscf	=	dry standard cubic feet
°F	=	degrees Fahrenheit
ft^3	=	cubic feet
g	=	grams
gal	=	gallon
gpm	=	gallons per minute
gr	=	grains
hp	=	horsepower
hr	=	hour
in	=	inches
kW	=	kilowatts
lb	=	pound
lbmol	=	pound-mole
in	=	inches
max	=	maximum
m^2	=	square meter
m^3	=	cubic meters
min	=	minute
mm	=	million

Units of Measure:

MM	=	million
MM BTU	=	million BTU
M cf	=	one thousand cubic feet
MMcf	=	million cubic feet
Mg	=	mega grams
MW	=	megawatts
ppb	=	parts per billion
ppbv	=	parts per billion, by volume
ppm	=	parts per million
ppmv	=	parts per million, by volume
ppmw	=	parts per million, by weight
psia	=	pounds per square inch, absolute
psig	=	pounds per square inch, gauge
scf	=	standard cubic feet
scfm	=	standard cubic feet per minute
sdcf	=	standard dry cubic feet
sdcfm	=	standard dry cubic feet per minute
yd	=	yard
yd^3	=	cubic yards
yr	=	year

APPENDIX C

Engineering Evaluation
Permit Application No. 12649

Final Engineering Evaluation

Authority to Construct
and
Prevention of Significant Deterioration
(PSD) Permit

Ameresco Half Moon Bay, LLC
Landfill Gas-to-Energy Facility
at the
Ox Mountain Landfill
Half Moon Bay, California

Bay Area Air Quality Management District
Permit Application Number 12649

August 2, 2007

Donald Van Buren, P.E.
Senior Air Quality Engineer

Application # 12649 Ameresco Half Moon Bay Landfill Gas-to-Energy Facility

Contents

Application # 12649 Ameresco Half Moon Bay Landfill Gas-to-Energy Facility

I. Background

This is the Bay Area Air Quality Management District (BAAQMD) Final Engineering Evaluation of Authority to Construct and federal Prevention of Significant Deterioration (PSD) Permit for the Amere Half Moon Bay, LLC, Landfill Gas-to-Energy Facility at the Ox Mountain Landfill in Half Moon B California. Ameresco Half Moon Bay, LLC (Ameresco) intends to purchase and burn landfill gas (LFG spark-ignited reciprocating internal combustion engines to produce electrical power for sale. T Ameresco facility will have a total nominal generating capacity of 11.4 MW. The existing landfill gas fla will remain under the ownership of the landfill and may be used to prevent excess landfill gas from be released uncontrolled into the atmosphere.

The project includes six GE Jenbacher JGS 616 GS-L.L gensets; each genset includes a GE Jenbac model J 616 GS-E22 engine rated at 2677 bhp that drives a generator to produce approximately 1.9 M Each engine is abated by a CO oxidation catalyst and one engine is abated by a Selective Catal Reduction (SCR) system. Since these catalytic abatement devices have not been successfully used LFG fired engines, the BAAQMD is providing limited flexibility in this permit for engines to be opera without being abated by these additional controls. Ameresco is installing a landfill gas treatment systen remove moisture and contaminants, especially including volatile siloxanes that accelerate catalyst failu A small flare is being included as part of the landfill gas treatment system and is being permitted a separate source.

This report describes how the facility will comply with applicable federal, state, and BAAQMD regulatio including the Best Available Control Technology and emission offset requirements of the District N Source Review regulation. Permit conditions necessary to ensure compliance with applicable rules a regulations are also included. This document includes a health risk assessment that estimates the imp of the project emissions on public health, and a PSD air quality impact analysis to demonstrate that project will not interfere with the attainment or maintenance of applicable ambient air quality standards.

Because the Preliminary Engineering Evaluation documented the preliminary decision of the Air Pollu Control Officer (APCO) to issue a PSD permit, a public notice was issued on August 3, 2006 to satisfy requirements of BAAQMD Regulation 2-2-405. The public inspection and comment period ended September 11, 2006.

Comments were received directly from the United States Environmental Protection Agency (US EPA) a from the United States Fish and Wildlife Service (Service) via the US EPA. A US EPA comment let dated September 7, 2006, is included in Appendix G. All comments were addressed in an inte evaluation submitted to the US EPA on October 2, 2006, and therefore included in this Final Enginee Evaluation.

The US EPA also consulted with the Service on the impacts of the proposed project on the Federa listed threatened California red-legged frog (*Rana aurora draytonii*) and the Federally-listed endange San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). The Service additionally examined potential impacts of the project on the flight path of the Federally-listed threatened marbled murr (*Brachyrampus marmoratus marmoratus*). The results of the consultation and an acceptance of recommendations are discussed further in Section IV, Statement of Compliance, Part 5, New Sou Review (Regulation 2, Rule 2, PSD). The Service's Biological Opinion for the proposed project, da May 11, 2007 and amended June 12, 2007, is provided in Appendix F.

II. Project Description

1. Permitted Equipment

Ameresco Half Moon Bay, LLC (Ameresco) has entered into an agreement to both purchase landfill from the Ox Mountain Landfill, District Plant Number 2266, located at 12310 San Mateo Road in H Moon Bay and to site a landfill gas to energy facility at the landfill. Ameresco submitted this applicatio

Application # 12649 Ameresco Half Moon Bay Landfill Gas-to-Energy Facility

request an Authority to Construct and Permit to Operate for 6 new IC Engine-Gensets that will burn landfi gas and produce electricity. Some electricity will be used on-site, but most electricity will be sold for of site use. The proposed IC Engine-Gensets are described below.

Source 1 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A1 Selective Catalyti Reduction System, Miratech CBL ACIS 20 for NO_x abatement, and A2 Oxidation Catalys Miratech IQ-34-20 for CO abatement

Source 2 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A3 Oxidation Catalys Miratech IQ-34-20 for CO abatement

Source 3 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A4 Oxidation Catalys Miratech IQ-34-20 for CO abatement

Source 4 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A5 Oxidation Catalys Miratech IQ-34-20 for CO abatement

Source 5 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A6 Oxidation Catalys Miratech IQ-34-20 for CO abatement

Source 6 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MI BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A7 Oxidation Catalys Miratech IQ-34-20 for CO abatement

The specific engine model for these sources is GE Jenbacher model J 616 GS-E22 engine. Sources through 6 will initially be operated with the abatement devices described above and their removal i conditionally allowed in this evaluation.

Landfill gas (LFG) will be delivered to Ameresco's Plant # 17040 from the Ox Mountain Landfill, Plant 2266, and processed in a custom LFG Treatment System prior to being used as a fuel. The LF Treatment System includes water separators, particulate filters, gas compressors, chillers and a G Jenbacher TSA activated carbon filter system (for the removal of volatile organic silicon compounds fror the LFG). The activated carbon in the LFG Treatment System will be regenerated in-place with the flus gas being incinerated by a flare identified as Source 7 described below:

Source 7 Flare, Perennial Energy, Model EGFS-12-400, 400 scfm LFG, 12 MM BTU/hr

The applicant has agreed to make a reasonable attempt to abate the emissions from each engine with th abatement devices identified above. Ameresco will be required to abate these engines unless th catalysts fail prematurely. This permit evaluation conditionally allows the removal of one or more of th abatement devices. This permit evaluation limits Siloxane content in LFG when a catalyst abates an engine. If all catalysts are removed from service, Siloxane content in LFG will not be regulated s Ameresco may remove Source 7 Flare from service and remove the GE Jenbacher TSA activated carbo filter system from the LFG Treatment System.

The Ox Mountain Landfill is currently abated by landfill gas flares. The landfill operator is retaining thos flares and those flares are not the responsibility of Ameresco.

2. Equipment Operating Scenarios

Application # 12649 Ameresco Half Moon Bay Landfill Gas-to-Energy Facility

There are at least two diverse equipment-operating scenarios that could be evaluated. The equipment-operating scenario that is used to project maximum emissions assumes operation without any postcombustion NO_x and CO catalytic abatement plus operation of a new landfill gas flare.

Another possible and desirable equipment operating scenario includes operating the six IC engines with one abated for NO_x reduction and all six abated for CO reduction. This option could be expanded to consider operation with some of the catalysts removed or operation with reduced abatement efficiency or limited initial operation without abatement. Since this equipment operating scenario results in lower maximum annual emissions than the above scenario, it is not further evaluated.

Ameresco has requested that each engine be permitted to operate at full load for 96.5% of the year. Each engine needs some downtime for maintenance. Ameresco has also requested that its flare be permitted to operate at an annual average firing rate of 75% of full fire, which is 12 million BTU per hour. Additionally, Ameresco has requested that PM10 emissions be limited to 14.25 tons in any consecutive 12-month period. The following projected operating scenario was used to calculate maximum annual air pollutant emissions from the new engines and flare:

8,453.4 hours (96.5% of 8,760 hours) per year of baseload (100% load) operation for each engine without catalytic abatement
an average flare firing rate of 75% of 12 MM BTU/hr of LFG for 8,760 hours per year
PM10 emissions be limited to 14.25 tons in any consecutive 12-month period

This operating scenario assumes that the one flare has toxic air contaminant emissions representative of a landfill gas flare. Since the flare will also incinerate toxic air contaminants adsorbed by the GE Jenbacher TSA activated carbon filter system, flare toxic air contaminant emissions could be slightly higher than calculated. However, from a project perspective, this is still a conservative assumption since: (1) calculated engine toxic air contaminant emissions are not being reduced even though more contaminants are going to a flare, and (2) concentrated contaminants incinerated at the flare will be destructed at a higher rate than contaminants incinerated in an engine.

III. Emissions

1. Subject to NSR for BACT

Engines:
Ameresco reported that the maximum fuel consumption rate for each proposed engine is 21.3 MM BTU/hour of landfill gas at 50% methane. All District calculations are based on landfill gas containing 50% methane. The proposed operating times for each engine are 24 hours/day, 365 days/year and 96.5% availability, resulting in maximum heat input rates of 511.2 MM BTU/day per engine and 180,057 MM BTU/year per engine. For landfill gas at 50% methane, the maximum landfill gas throughput rates are 1.008 MM scf per day per engine and 355 MM scf per year per engine.

Flare:
Ameresco reported that the maximum fuel consumption rate for the proposed flare is 400 scfm and 12 MM BTU/hour. All District calculations are based on landfill gas containing 50% methane. The proposed operating times for this flare are 24 hours/day, 365 days/year and 75% annual average firing rate. For calculation purposes, the average composition of the gas to the flare is assumed to be identical to that of the LFG, resulting in maximum heat input rates of 288 MM BTU/day and 78,840 MM BTU/year. For landfill gas at 50% methane, the maximum landfill gas throughput rates are 0.576 MM scf per day and 157.7 MM scf per year.

All emission calculations are based on the maximum LFG throughput rates listed above and the maximum permitted emission rates discussed below. Detailed maximum criteria emissions are shown in Tables 1 and 2 for engines and the flare, respectively. The emission calculation formulas follow each table. Project criteria pollutant emissions are summarized in Table 3.

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Table 1. Summary of Maximum Criteria Pollutant Emissions from Sources 1 through 6, IC Engines

	Emission Factor, g/bhp-hr	Maximum concentration in LFG as S_1	IC Engine Emissions, lbs/hr	IC Engine Emissions, lbs/day	IC Engine Emissions, tons/yr	Emissions for 6 IC Engines, lbs/hr	Emissions for 6 IC Engines, lbs/day	Emissions for 6 IC Engines, tons/yr
NO_x (as NO_2)	0.60		3.54	84.98	14.97	21.25	509.90	89.80
CO	2.1		12.39	297.44	52.38	74.36	1784.67	314.30
POC (as CH_4)	0.20		1.18	28.33	4.99	7.08	169.97	29.93
NPOC					0.05			0.29
SO_2		150 ppm	1.05	25.14	4.43	6.28	150.83	26.56
PM10 without flare	0.10		0.59	14.16	2.49	3.54	84.98	14.97 (note)
PM10 with flare	0.095		0.56	13.46	2.37	3.36	80.73	14.22 (note)

Note: PM10 emissions from engines plus flare limited to 14.25 tons in any consecutive 12-month period. See Table 3.

Engine Emission Calculations for Table 1:

For NO_x, CO, POC and PM10:
Single engine emissions, lbs/hr = emission factor in g/bhp-hr * 2677 bhp/453.6 g/lb
Single engine emissions, lbs/day = 24 * Single engine emissions, lbs/hr
Single engine emissions, tpy = 0.965 utilization factor * 365 * Single engine emissions, lbs/day/2000 lbs/ton
Emissions for six engines = Single engine emissions * 6

For SO_2:
Single engine emissions, lbs/hr = (150 parts S/1,000,000 parts LFG) * 700 scfm LFG * 60 min/hr * 64.06 lbs SO_2/lb mole SO_2 / 385.3 scf/lb-mole
Single engine emissions, lbs/day = 24 * Single engine emissions, lbs/hr
Single engine emissions, tpy = 0.965 utilization factor * 365 * Single engine emissions, lbs/day/2000 lbs/ton
Emissions for six engines = Single engine emissions * 6

For NPOC:
Single engine emissions, tpy = NPOC emissions from Table for TACs for 6 engines in lbs/yr divided by (6 engines 2000 lbs/ton)
Emissions for six engines, tpy = NPOC emissions from Table for TACs for 6 engines in lbs/yr / 2000 lbs/ton

Table 2. Summary of Flare Criteria Pollutant Emissions

	Emission Factors	Maximum Concentration in LFG or exhaust as noted	Flare Emissions, lbs/hr	Flare Emissions, lbs/day	Flare Emissions, tons/year
NO_x (as NO_2)	0.060 lbs/million BTU		0.72	17.28	2.37
CO	0.20 lbs/million BTU		2.40	57.60	7.88
POC (as CH_4)		30 ppmv as CH_4 in exhaust	0.15	3.54	0.48
NPOC					0.08
SO_2		150 ppmv in LFG as S_1	0.60	14.36	1.97
PM10	17 lbs/million scf CH_4 in LFG		0.20	4.90	0.67 (note)

Note: PM10 emissions from engines plus flare limited to 14.25 tons in any consecutive 12-month period. See Table 3.

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Flare Emission Calculations:

For NO_x and CO:
Flare emissions, lbs/hr = Emission Factor in lbs/MM BTU/hr * 12 MM BTU/hr
Flare emissions, lbs/day = 24 * Flare emissions, lbs/hr
Flare emissions, tpy = 0.75 utilization factor * 365 * Flare emissions, lbs/day/2000 lbs/ton

For SO_2:
Flare emissions, lbs/hr = (150 parts S/1,000,000 parts LFG) * 400 scfm LFG * 60 min/hr * 64.06 lbs SO_2/lb-mole SO_2 / 385.3 scf/lb-mole
Flare emissions, lbs/day = 24 * Flare emissions, lbs/hr
Flare emissions, tpy = 0.75 utilization factor * 365 * Flare emissions, lbs/day/2000 lbs/ton

For POC:
Flare emissions, lbs/hr = (30 parts as CH_4/1,000,000 parts exhaust) * Dry Exhaust flow in lb-moles/hr at 3% oxygen * MW CH_4/lb-mole CH_4
Flare emissions, lbs/day = 24 * Flare emissions, lbs/hr
Flare emissions, tpy = 0.75 utilization factor * 365 * Flare emissions, lbs/day/2000 lbs/ton
Flare input = 400 scfm LFG at 50% CH_4 and 50% inert by volume.
Lb-moles/hr of CH_4 = 400 scfm LFG * 50%/100% * 60 min/hr/385.3 cf/lb-mole = 31.14456268
Lb-moles of O_2 required per lb-mole of CH_4 = 2
Lb-moles/hr of O_2 = 2 * lb-moles/hr of CH_4 = 62.28912536
Lb-moles of CO_2 from combustion = Lb-moles of CH_4
Lb-moles/hr of N_2 = 79.05 N2/20.95 O_2 * lb-moles/hr of O_2 = 235.0336687
Dry Exhaust flow in lb-moles/hr at 0% oxygen = Lb-moles/hr of inerts in LFG + lb-moles/hr of CO_2 from combustion + lb-moles/hr of N_2 =297.323
Dry Exhaust flow in lb-moles/hr at 3% oxygen = Lb-moles/hr of exhaust at 0 % O_2 * 1.03 = 306.242

For NPOC:
Flare emissions, tpy = NPOC emissions from Table for TACs for flare in lbs/yr divided by 2000 lbs/ton

For PM10:
Flare emissions, lbs/hr = Emission factor from AP-42 in lbs/MM scf CH_4 * 400 scfm LFG * 50% CH_4 by vol/100% LFG * 60 min/hr/ 1000000
Flare emissions, lbs/day = 24 * Flare emissions, lbs/hr
Flare emissions, tpy = 0.75 utilization factor * 365 * Flare emissions, lbs/day/2000 lbs/ton

Table 3. Summary of Maximum Criteria Pollutant Emissions from the Project

	Six engines, pounds/day	Six engines, tons/year	Flare, pounds/day,	Flare, tons/year,	Project, pounds/day	Project, tons/year
NO_x (as NO_2)	510	89.80	17.28	2.37	527	92.17
CO	1785	314.30	57.60	7.88	1842	322.19
POC (as CH_4)	170	29.93	3.54	0.48	174	30.42
NPOC		0.29		0.08		0.37
SO_2	151	26.56	14.36	1.97	165	28.53
PM10 without flare	85	14.97	0	0	84.98	14.97 (note)
PM10 with flare	81	14.22	4.900	0.67	86	14.89 (note)

Note: Ameresco has agreed to be limited to emitting 14.25 tons of PM10 in any consecutive 12-month period.

Nitrogen Oxides (NO_x) Emission Limit:

Engines:
Ameresco has agreed that unabated NO_x emissions be limited to 0.60 grams/bhp-hour. The engine manufacturer indicated that the engines would comply with this emission limit. Ameresco has also agreed

that the NO_x emissions for the one engine abated by SCR be limited to 0.15 grams/bhp-hour. Since the SCR is conditionally removable if the technology does not prove out on landfill gas, NO_x emissions are calculated not assuming the use of the SCR (on the one engine).

Flare:
Ameresco has agreed that NO_x emissions be limited to 0.060 lb/MM BTU. The flare manufacturer provided a guarantee for this emission limit.

Carbon Monoxide (CO) Emission Limit:

Engines:
Ameresco has agreed that unabated CO emissions be limited to 2.1 grams/bhp-hour. The engine manufacturer indicated that the engines would comply with this emission limit. Ameresco has also agreed that the CO emissions for the engines abated by catalytic oxidation be limited to 0.52 grams/bhp-hour. Since oxidation catalysts are conditionally removable if the technology does not prove out on landfill gas, CO emissions are not calculated assuming the use of an oxidation catalysts on one, some or all six engines.

Flare:
Ameresco has agreed that CO emissions be limited to 0.20 lb/MM BTU. The flare manufacturer provided a guarantee for this emission limit.

Precursor Organic Compounds (POC) Emission Limit:

Engines:
Ameresco has agreed that unabated POC emissions be limited to 0.20 grams/bhp-hour in order to meet the NMOC exhaust standard from a landfill gas control device other than a flare. The engine manufacturer indicated that the engines would comply with this emission limit. NMOC emissions from landfill gas engines are also limited by Regulation 8-34-301.4. The NMOC limit is EITHER a minimum of 98% by weight NMOC destruction efficiency or a maximum outlet concentration of 120 ppmv NMOC, expressed as methane at 3% O_2, dry basis, and the unabated POC emissions cannot exceed the higher of these. Ameresco has not requested that the POC emissions for the engines abated by oxidation catalysts be lowered but the District expects about a 50% reduction (to 0.1 grams/bhp-hour). Since oxidation catalysts are conditionally removable if the technology does not prove out on landfill gas, POC emissions are not calculated assuming the use of an oxidation catalysts on one, some or all six engines.

Flare:
NMOC emissions from the landfill gas flare are limited by Regulation 8-34-301.3. The NMOC limit is EITHER a minimum of 98% by weight NMOC destruction efficiency or a maximum outlet concentration of 30 ppmv NMOC, expressed as methane at 3% O_2, dry basis. Ameresco has requested that POC emissions from the flare be limited to 0.014 lb/MM BTU (0.17 lb/hr). Since the flare manufacturer has guaranteed POC flare emissions to be less than 30 ppm as C1, flare emissions have been recalculated independently for this limit and a POC emission limit of 0.012 lb/MM BTU (0.15 lb/hr) has been applied.

Non-Precursor Organic Compounds (NPOC) Emission Limit:

Engines:
The NPOC emission limit is the sum of the abated emission rates that were calculated for individual NPOCs using the higher of the emissions based on LFG composition with 93% destruction or CATEF emission factors. (See the TAC Emissions section below for a more detailed explanation.) The following compounds are NPOCs: methylene chloride, perchloroethylene, chlorodifluoro-methane, dichlorodifluoromethane, dichlorofluoromethane, fluorotrichloromethane, 1,1,1-trichloro-ethane and 1,1,2,2-tetrachloroethane. The NPOC emission (after combustion) was determined to be 585 pounds per year.

Flare:

The NPOC emission limit is the sum of the abated emission rates that were calculated for individual NPOCs listed above for engines using the higher of the emissions based on LFG composition with 98% destruction or CATEF emission factors. (Again, see the TAC Emissions section below for a more detailed explanation.) The NPOC emission (after combustion) was determined to be 159 pounds per year.

Sulfur Dioxide (SO_2) Emission Limit:

Engines and Flare:
The typical RACT limit for landfill gas flares is a landfill gas sulfur content limit of 150 ppmv (expressed as H_2S). There is not currently a BACT limit for landfill gas flares. The 150 ppmv is also the BACT limit for landfill gas fired gas turbines. Assuming the landfill gas contains 50% methane and all sulfur in the landfill gas is converted to SO_2, this limit is equal to 0.05 pounds SO_2/MM BTU. The current BAAQMD BACT limit listed in the BACT/TBACT Handbook for engines is 0.3 grams SO_2/bhp-hour, which is equivalent to 0.08 pounds/MM BTU for the proposed engine. Since the typical RACT landfill gas sulfur content limit is lower than the applicable BAAQMD BACT Handbook limit, the proposed engine will be limited to the landfill gas sulfur content limit of 150 ppmv.

Particulate Matter (PM10) Emission Limit:

Engines:
Ameresco has requested that unabated PM10 emissions be limited to 0.095 grams/bhp-hour with the above described LFG Treatment System but be limited to 0.10 grams/bhp-hour with the above described LFG Treatment System excluding the GE Jenbacher TSA activated carbon filter system. Ameresco has represented that it has source test data to support the engines emitting less than 0.10 grams/bhp-hour with untreated LFG and that Ameresco expects even lower PM10 emissions with the use of the LFG Treatment System including the GE Jenbacher TSA activated carbon filter system. Since the GE Jenbacher TSA activated carbon filter system is conditionally removable, PM10 emissions are calculated using the 0.10 grams/bhp-hour emission factor with the use of the LFG Treatment System *excluding* the GE Jenbacher TSA activated carbon filter system and using the 0.095 grams/bhp-hour emission factor with the with the use of the LFG Treatment System *including* the GE Jenbacher TSA activated carbon filter system. (Siloxane limits are only imposed when one or more engines are abated by SCR and/or oxidation catalyst(s).)

Flare:
According to AP-42 (fifth edition), Chapter 2.4 (November 1998), page 2.4-15, the particulate emission rate for a LFG fired flare is 17 pounds/MM dscf of methane. This emission rate is equivalent to 0.20 pounds PM_{10}/hr.

2. Subject to NSR for TAC

The emission rates for toxic air contaminants (TACs) are based on:

a. Site-specific landfill gas concentration measurements provided by the applicant and the typical destruction efficiencies achieved by landfill gas fired engines (86.1% for non-halogenated species and 93.0% for halogenated species) and flares (98% minimum for non-halogenated and halogenated species) from Chapter 2.4 of AP-42.
b. California Air Resources Board's California Air Toxic Emission Factor (CATEF) database for LFG combustion in IC engines and flares. The CATEF median emission factor was used if it was higher than the corresponding factor in part (a). The emission factors for metals were not used since the emission factors are based on a few source tests with metals below the detection level. CARB did provide specific instructions on its website to *not* use any acrolein emission factor.
c. Secondary emissions of hydrogen chloride assuming all chlorine compounds found in the landfill gas are converted to HCl.

d. CATEF database for lead emissions from LFG combustion in a boiler. This was the only CATEF emission factor for lead emissions from LFG combustion in any device so the emission factor was used to calculate emissions from engines and the flare.

Emission rates and calculations are summarized in Table 4. If the emission of a TAC was calculated two ways, the higher emission rate was used in the risk analysis. However, all metal emissions based on CATEF emission factors were not used in the risk analysis since the emission factors are based on a few source tests with metals below the detection level. Several TACs were emitted above the annual risk screen trigger levels in Table 2-5-1 of District Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants. More detailed spreadsheets are attached in Appendix A.

Table 4. Summary of Toxic Air Contaminant Emissions from the Project

CAS No.	Toxic Air Contaminant	Emissions for Six engines in lbs/yr	Flare Emissions in lbs/yr	TAC Chronic Trigger Level in lbs/yr
71-55-6	1,1,1-Trichloroethane (methyl chloroform)	5.2E-01	1.4E1	3.9E4
79-34-5	1,1,2,2-Tetrachloroethane	9.9E-01	2.1E-2	3.2E0
75-34-3	1,1-Dichloroethane (ethylidene dichloride)	2.6E+00	1.64E1	1.1E2
75-35-4	1,1-Dichloroethane (vinylidene chloride)	5.7E-01	1.2E-2	2.7E3
107-06-2	1,2-Dichloroethane (ethylene dichloride)	1.2E+01	8.18E0	8.9E0
78-87-5	1,2-Dichloropropane (propylene dichloride)	6.7E-01	1.4E-2	na
67-63-0	IPA	3.7E+02	3.9E0	2.7E5
107-13-1	Acrylonitrile	2.1E+00	3.39E2	6.4E-1
71-43-2	Benzene	2.1E+02	1.54E1	6.4E0
75-25-2	Bromodichloromethane	2.0E+01	4.2E-1	na
75-15-0	Carbon disulfide	4.9E+00	5.2E-2	3.1E4
56-23-5	Carbon tetrachloride	9.1E-01	3.17E0	4.3E0
108-90-7	Chlorobenzene	3.8E+00	6.26E0	3.9E4
46-358-1	Carbonyl sulfide	8.0E+00	8.5E-2	na
75-45-6	Chlorodifluoromethane	1.2E+01	2.5E-1	1.9E6
75-00-3	Chloroethane	2.9E+00	6.1E-2	1.2E6
67-66-3	Chloroform	4.7E-01	4.19E0	3.4E1
74-87-3	Chloromethane	4.7E+00	9.9E-2	na
106-46-7	Dichlorobenzene	1.3E+03	2.8E1	1.6E1
75-71-8	Dichlorodifluoromethane	7.2E+01	1.5E0	na
75-43-4	Dichlorofluoromethane	1.1E-01	2.2E-3	2.7E4
75-09-2	Methylene chloride	3.5E+00	1.42E2	1.8E2
64-17-5	Ethanol	9.8E+02	1.0E1	na
100-41-4	Ethylbenzene	7.6E+02	8.1E0	7.7E4
106-93-4	Ethylene dibromide	1.1E+00	2.3E-2	2.6E0
75-69-4	Fluorotrichloromethane	3.6E+00	7.7E-2	2.7E4

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110-54-3	Hexane	5.5E+03	5.9E1	2.7E5
2148-87-8	Hydrogen Sulfide	3.2E+03	3.4E1	3.9E2
7439-92-1	Lead	1.2E+01	8.9E-1	1.3E1
7439-97-6	Mercury	3.3E-01	2.4E-2	5.6E-1
78-93-3	MEK	6.0E+02	6.3E0	3.9E4
108-10-1	MIK	5.9E+01	6.2E-1	na
127-18-4	Perc	3.2E+01	6.9E-1	3.0E1
108-88-3	Toluene	1.2E+04	4.9E2	1.2E4
79-01-6	TCE	1.1E+01	4.64E0	9.1E1
75-01-4	Vinyl chloride	9.4E+00	5.61E0	2.4E0
	Xylenes	1.6E+03	4.94E1	2.7E4
7647-01-0	HCl	3.34E+03	3.11E4	3.5E2
83-32-9	Acenaphthene	3.83E-01	na	na
208-96-8	Acenaphthylene	1.73E-01	na	na
120-12-7	Anthracene	3.30E-01	na	na
56-55-3	Benzo(a)anthracene	4.39E-01	7.24E-02	See PAHs
50-32-8	Benzo(a)pyrene	6.82E-01	1.18E-02	See PAHs
205-99-2	Benzo(b)fluoranthene	6.94E-01	2.57E-02	See PAHs
191-24-2	Benzo(g,h,i)perylene	6.05E-01	1.18E-02	na
207-08-9	Benzo(k)fluoranthene	8.78E-01	1.18E-02	See PAHs
218-01-9	Chrysene	7.20E-01	9.35E-02	See PAHs
53-70-3	Dibenz(a,h)anthracene	4.07E-02	1.18E-02	See PAHs
206-44-0	Fluoranthene	1.38E+00	na	na
86-73-7	Fluorene	1.12E+00	na	na
50-00-0	Formaldehyde	1.48E+03	3.74E+03	3.0E0
193-39-5	Indeno(1,2,3-cd)pyrene	2.71E-01	1.18E-02	See PAHs
91-20-3	Naphthalene	3.88E+01	5.61E+00	5.3E0
85-01-8	Phenanthrene	4.26E+00	na	na
129-00-0	Pyrene	2.62E+00	na	na
	PAHs as Benzo(a)pyrene			1.1E-2
123-91-1	1,4-Dioxane		1.70E+01	2.4E1
75-07-0	Acetaldehyde		1.05E+01	6.4E1
7664-39-3	HF		2.22E+04	5.4E2
192-97-2	Benzo(e)pyrene		1.17E-02	na

3. Plant Cumulative Increase:

Since this is a new facility, the cumulative emission increases for this application and this facility are identical and as presented above in Table 3 using the higher of the two annual emission rates for PM10. Since this facility will emit more than 10 tons/year of POC and more than 10 tons/year of NO_x, offsets are required as discussed under Statement of Compliance.

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IV. STATEMENT OF COMPLIANCE

1. CEQA Requirements (Regulation 2, Rule 1):

According to the applicant, the CEQA review for this project is being handled by the San Mateo County Planning Department, the local lead agency for this project. San Mateo County filed a Notice of Exemption on May 1, 2006. The applicant submitted CEQA related information using our form "Appendix H." A copy of the Notice of Exemption and "Appendix H" is in Appendix D. This project, therefore, satisfies the District's CEQA requirements by meeting the District CEQA exemption in Regulation 2-1-312.9

2. Public Notification Requirements (Regulation 2, Rule 1):

The project is over 1000 feet from the nearest school and is therefore not subject to the public notification requirements of Regulation 2-1-412.

3. New Source Review (Regulation 2, Rule 2, BACT:)

Engines:
As shown in Table 1, the proposed emissions of NO_x, CO, POC, SO_2, and PM10 from each IC Engine will each exceed 10 pounds per highest day. Therefore, BACT is required for each of these pollutants. As discussed in Permit Applications # 3821, # 6875, # 9220, #9222 and #9851 for new landfill gas fired IC engines at other facilities, the current BACT requirements are as follows in Table 5 below.

Table 5. 2006 BACT Requirements for Landfill Gas Fired IC Engines

Pollutant	BACT(1)	Typical Technology	BACT(2)	Typical Technology
POC	ND	NS	120 ppmv of NMOC (as CH_4) at 3% O_2 or 98% by weight removal of NMOC	Lean Burn Technology (compliance with Regulation 8-34-301.4)
NO_x	0.6 g/bhp-hr	Lean Burn Technology	0.6 g/bhp-hr	Lean Burn Technology
SO_2	NS	Fuel Gas Treatment with ≥ 80% S removal	LFG: 150 ppmv of S (as H_2S) in LFG [DiGas: 0.3 g/bhp-hr]	No Control for LFG or [Addition of Iron Salts to Digester Sludge]
CO	2.1 g/bhp-hr	Lean Burn Technology	2.1 g/bhp-hr	Lean Burn Technology
PM10	ND	NS	NS	Fuel Gas Pretreatment

BACT(1) - BACT that is Technologically Feasible/Cost Effective
BACT(2) - BACT that is Achieved in Practice
ND – not determined
NS – not specified

NO_x BACT Limit: The applicant proposed to meet the District's BACT(2) limit for NO_x of 0.60 grams (as NO_2)/bhp-hour. Since this is a vendor guaranteed emission rate, S1 through S6 are expected to comply with this limit. The applicant has proposed the installation of an SCR unit on one engine to reduce NO_x emissions to 0.15 g/bhp-hr. This technology has not been successfully demonstrated on an engine fueled solely with LFG. However, if successfully demonstrated at this facility, it will establish a new BACT(1) and BACT(2). Since the successful operation has not been demonstrated, Ameresco may request approval to increase the abated emissions level if the SCR performance results in NO_x emissions above 0.15 g/bhp-hr and/or Ameresco may request approval to remove the SCR unit if it fails before 12,000 hours of operation. The District is also allowing limited operation without the SCR unit during initial startup and SCR unit maintenance. The applicant is initially installing the LFG System including the GE Jenbacher TSA, which will remove volatile siloxanes. This system must successfully remove siloxanes or the SCR unit (and oxidation catalysts discussed below) will likely prematurely fail by becoming "glass" coated. The addition of a TSA unit to treat LFG for an IC engine has not been attempted elsewhere in the US. The applicant

has represented that the use of activated carbon without regeneration would be too expensive and that also has not been done on LFG in the US.

CO BACT Limit: The applicant proposed to meet the District's BACT(2) limit for CO of 2.1 grams/bhp-hour. Since this is the vendor guaranteed emission rate, S1 through S6 are expected to comply with this limit. The applicant has also proposed the installation of an oxidation catalyst on each engine to reduce CO emissions to 0.52 g/bhp-hr. This technology has not been successfully demonstrated on an engine fueled solely with LFG. However, if successfully demonstrated at this facility, it will establish a new BACT(1) and BACT(2). Since the successful operation has not been demonstrated, Ameresco may request approval to increase the abated emissions level if the oxidation catalysts performance results in CO emissions above 0.52 g/bhp-hr and/or Ameresco may request approval to remove the oxidation catalysts if fails prematurely. The District is also allowing limited operation without an oxidation catalyst during initial startup and oxidation catalyst maintenance.

POC BACT Limit: The District's BACT(1) limit listed in Document # 96.2.1 is 0.6 grams POC/bhp-hour (which is the same as the CARB recommended limit). However, this proposed engine must comply with Regulation 8-34-301.4, which limits NMOC emissions to either a minimum destruction efficiency of 98% by weight or a maximum outlet concentration of 120 ppmv of NMOC (as methane) at 3% oxygen, dry basis. The NMOC emissions from landfill gas fired IC engines are essentially all POCs. The Regulation 8, Rule 34 limit is equivalent to approximately 0.20 grams NMOC/bhp-hour (or 0.20 grams POC/bhp-hour). Since the BACT(1) limit is less stringent than the current regulatory limit, this POC BACT limit is not applicable for landfill gas fired engines. The Regulation 8-34-301.4 limit has been effective since July 1, 2002, and numerous IC engines have met it. Therefore, the Regulation 8-34-301.4 limit constitutes a BACT(2) "achieved in practice" emission limit. Since the 0.20 grams POC/bhp-hour is a vendor guaranteed emission rate, S1 through S6 are expected to comply with this limit. The oxidation catalysts installed to reduce emissions of CO should also reduce emissions of POC but the applicant has not quantified any reduction at this time.

SO_2 BACT Limit: The District's BACT(2) limit listed in Document # 96.2.1 is 0.3 grams SO_2/bhp-hour, which was based on using iron salts in digester sludge to reduce H_2S content in the digester gas. This limit is not appropriate for landfill gas fired engines. From the District's BACT/TBACT Workbook Document # 89.3.1 (June 1999) for landfill gas fired gas turbines, an appropriate BACT(2) emission limit for landfill gas fired combustion equipment is a landfill gas sulfur content limit of 150 ppmv of sulfur (expressed as H_2S). The Ox Mountain Landfill is the source of LFG for the proposed project. Sampling and analysis of the LFG yielded a sulfur content of 120 ppmv or less total reduced sulfur with essentially all the sulfur present as H_2S. Therefore, the engines are expected to comply with the BACT(2) limit of 150 ppmv of sulfur in the landfill gas.

PM10 BACT Limit: Particulate emissions due to landfill gas combustion are typically similar to PM10 emissions from natural gas combustion. Minimizing the sulfur content of the fuel and the use of a fuel pretreatment system (filters and condensate knock-out pots) have been sufficient to satisfy PM10 BACT(2) for landfill gas combustion equipment. The applicant has requested an emission limit of 0.095 grams PM10/bhp-hour with the use of the LFG Treatment System including GE Jenbacher TSA unit and an emission limit of 0.10 grams PM10/bhp-hour with the use of the LFG Treatment System excluding the GE Jenbacher TSA unit. The engine vendor has guaranteed the latter PM10 emission rate and the applicant believes that the additional fuel gas treatment will reduce PM10 emission rates even more. If the SCR unit and CO oxidation catalysts fail excessively, we will not require that the GE Jenbacher TSA unit remain in service. Hence, we will accept as PM10 BACT the initial requested emission limit of 0.10 grams PM10/bhp-hour with the with the use of the LFG Treatment System *excluding* the GE Jenbacher TSA unit and 0.095 grams PM10/bhp-hour with the use of the LFG Treatment System *including* GE Jenbacher TSA unit.

Flare:

NO_x RACT Limit: In accordance with Regulation 2-2-112, NO_x is a secondary pollutant from the flare and subject to a RACT (Reasonably Available Control Technology) limit rather than a BACT limit. The current

RACT limit for a LFG flare is 0.060 pounds of NO_x per MM BTU/hr and the flare vendor has provided this as a guaranteed emission rate.

CO RACT Limit: In accordance with Regulation 2-2-112, CO is a secondary pollutant from the flare and subject to a RACT limit. The current RACT limit for a LFG flare is 0.20 pounds of CO per MM BTU/hr and the flare vendor has provided this as a guaranteed emission rate.

POC BACT Limit: The proposed flare must comply with Regulation 8-34-301.3, which limits NMOC emissions to either a minimum destruction efficiency of 98% by weight or a maximum outlet concentration of 30 ppmv of NMOC (as methane) at 3% oxygen, dry basis. The NMOC emissions from a LFG flare are essentially all POCs. Since the applicant is requesting the vendor guarantee of 30 ppmv of NMOC (as methane) at 3% oxygen, dry basis, as a limit and since the maximum daily emissions are less than 10 pounds, BACT is not triggered for the flare.

SO_2 RACT Limit: In accordance with Regulation 2-2-112, SO_2 is a secondary pollutant from the flare and subject to a RACT limit. The sulfur limit of 150 ppmv of sulfur (expressed as H_2S) in LFG for engines is also considered to be a RACT limit for a landfill gas flare. The Ox Mountain Landfill is the source of LFG for the proposed project. Sampling and analysis of the LFG yielded a sulfur content of 120 ppmv or less total reduced sulfur with essentially all the sulfur present as H_2S. Therefore, the engines are expected to comply with the RACT limit of 150 ppmv of sulfur in the landfill gas.

PM10 RACT Limit: In accordance with Regulation 2-2-112, PM10 is a secondary pollutant from the flare and subject to a RACT limit. Emissions are calculated based on an AP-42 emission factor for a LFG flare and since the maximum daily emissions are less than 10 pounds, RACT is not triggered for the flare.

4. New Source Review (Regulation 2, Rule 2, Offsets)

Because the cumulative increase for POC of 30.42 tpy is greater than 10 tons/year of POC but less than 35 tons/year, offsets will be provided by the Small Facility Banking Account at an offset ratio of 1 to 1.

Because the cumulative increase for NO_x of 92.17 tpy is greater than 35 tons/year, offsets must be provided at an offset ratio of 1.15 to 1 for a total of 106.00 tpy. The applicant has demonstrated that the minimum cost of NO_x offsets is $20,000 per ton of NO_x, which is above the threshold of $17,500 used by the APCO to determine that emission reduction credits are not "reasonably available." Consistent with Section 42314 of the California Health and Safety Code, which allows an exemption for resource recovery projects if offsets are not reasonable available, the applicant will not be required to provide offsets. The APCO will provide the offsets from the Small Facility Banking Account.

5. New Source Review (Regulation 2, Rule 2, PSD)

Since this facility will be permitted to emit more than 250 tons/year of a regulated air pollutant, CO, it is a major facility subject to PSD. Pursuant to District Regulation 2-2-414.1, the applicant has submitted a modeling analysis that adequately estimates the air quality impacts of the Ameresco Half Moon Bay, LLC Landfill Gas-to-Energy Facility at the Ox Mountain Landfill. The applicant's analysis was based on EPA-approved models and was performed in accordance with District Regulation 2-2-414. The District reviewed the modeling analysis and has prepared a report to summarize its findings.

Pursuant to District Regulation 2-2-414.2, the District has found that the modeling analysis has demonstrated that the allowable emission increases from the Facility, in conjunction with all other applicable emissions, will not cause or contribute to a violation of applicable ambient air quality standards for CO and NO_2 or an exceedance of any applicable PSD increment.

Pursuant to District Regulation 2-2-417, the applicant has submitted an analysis of the impact of the proposed source and source-related growth on visibility, soils, and vegetation. The entire PSD air quality impact analysis and the District review are contained in Appendix C.

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Because the maximum-modeled project impacts, as shown in Table 6, for 1-hour average CO did not exceed the significance level for air quality impacts per District Regulation 2-2-313, further analysis to determine if the corresponding ambient air quality standard will be exceeded per District Regulation 2-2-414 is not required. Table 7 summarizes the applicable ambient air quality standards, the maximum background concentrations, and the contribution from the proposed facility. As shown in Table 7, the worst-case 8-hour average CO and the 1-hour and annual average NO_2 will not cause or contribute to an exceedance of the California and/or National ambient air quality standard for 8-hour average CO and the 1-hour and annual average NO_2, as appropriate. A PSD Increment Consumption analysis was performed for annual average NO_2 and the results are shown in Table 8.

TABLE 6
Maximum predicted ambient impacts of proposed project ($\mu g/m^3$)
[Overall maximum in bold type]

Pollutant	Avg. Time	ISCST3 Modeled Impact	Significant Air Quality Impact Level
CO	1-hour 8-hour	**1323** **581**	2000 500
NO_2	1-hour annual	**378**[a] **6.2**[b]	19 1.0

[a] For 1-hour NO_2 it is conservatively assumed all NO_x is NO_2
[b] The EPA default annual ambient NO_2/NO_x ratio of 0.75 was used to adjust from NO_x to NO_2

TABLE 7
California and national ambient air quality standards and ambient air quality levels from the proposed project($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Background	Maximum project impact	Maximum project impact plus maximum background	California Standard	National Standard
CO	8-hour	2,412	581	2,993	10,000	10,000
NO_2	1-hour annual	64 7.5	191 6.2	255 13.7	470 —	— 100

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TABLE 8
Maximum modeled increment consumption for NO_2

Averaging Period	Maximum modeled increment consumed($\mu g/m^3$)	Class II Increment($\mu g/m^3$)
annual	6.5	25

The results of the PSD air quality impact analysis indicate that the proposed project would not interfere with the attainment or maintenance of applicable national ambient air quality standards for CO and NO_2. Again, this analysis was based on EPA approved models and calculation procedures and was performed in accordance with Section 414 of the District's NSR Rule.

Pursuant to District Regulation 2-2-306, a non-criteria pollutant PSD analysis is required for sulfuric acid mist emissions if the proposed facility will emit H_2SO_4 at rates in excess of 38 pounds per day and 7 tons per year. A permit condition is proposed to require periodic source testing to quantify H_2SO_4 emissions. If the total facility emissions ever exceed 7 tons per year, then the applicant must utilize air dispersion modeling to determine the impact (in $\mu g/m^3$) of the sulfuric acid mist emissions.

Also pursuant to District Regulation 2-2-306, a non-criteria pollutant PSD analysis is not required for lead emissions. Lead emissions were calculated to be 13 pounds per year for the proposed facility, which is well under the 0.6 tons per year PSD trigger.

The review of a PSD permit application must be "coordinated with the broad environmental reviews under" the National Environmental Policy Act (quoting 40 CFR § 52.21(s)). During its review of the draft preliminary engineering evaluation, the US EPA consulted with the United States Fish and Wildlife Service (Service) on the impacts of the proposed project on the Federally-listed threatened California red-legged frog (*Rana aurora draytonii*) and the Federally-listed endangered San Francisco garter snake (*Thamnophis sirtalis tetrataenia*). The Service additionally examined the potential impacts of the project on the flight path of the Federally-listed threatened marbled murrelet (*Brachyrampus marmoratus marmoratus*). The Service worked with Ameresco via its consultants in this endeavor. Major reports submitted for Ameresco included a "Final Habitat Assessment for the Ox Mountain Landfill Gas Generation Project" dated December 2006 and a "Project Description and Proposed Avoidance and Minimization Measures for the Ameresco Gas-to-Energy Project at the Ox Mountain Landfill, Half Moon Bay, San Mateo County, CA" letter dated March 19, 2007.

The Service issued a final Biological Opinion on May 11, 2007, and an amendment to the final Biological Opinion on June 12, 2007. Included are Reasonable and Prudent Measures ("RPMs") that are necessary and appropriate to minimize incidental take of the California red-legged frog and the San Francisco garter snake. The Service concluded that the proposed project, with the protective measures and conditions specified in the Biological Opinion, is not likely to jeopardize the continued existence of these two listed species. The Service further concluded that the project is not likely to adversely affect the marbled murrelet. Ameresco subsequently amended its PSD permit application to include a commitment to implement all the RPMs, the terms and conditions, and the notification requirements contained in the Biological Opinion, as amended. These sections of the Biological Opinion have been added by reference as Part 26 of the BAAQMD permit conditions. In a letter dated June 13, 2007, the US EPA authorized the BAAQMD issuance of the PSD permit.

The Biological Opinion plus amendment are included in Appendix E. The US EPA approval letter is included in Appendix F. The Ameresco letter dated June 13, 2007 with a commitment to implement the RPMs, terms and conditions, and the notification requirements in the Biological Opinion, as modified, is included in Appendix G.

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6. Toxics New Source Review (Regulation 2, Rule 5 and MACT)

Regulation 2, Rule 5: Pursuant to District Regulation 2, Rule 5, Section 401, a Health Risk Screening Analysis (HRSA) is required for a proposed facility if emission equal or exceed any trigger levels in Table 2-5-1. As shown in Table 4, the proposed emissions of some toxic air contaminants exceed their respective trigger levels. Since the applicant did not submit a HRSA, the District performed the HRSA. For this proposed facility, the maximum increased carcinogenic risk is 1.0 in a million, the maximum chronic hazard index is 0.044, and the maximum acute hazard index is 0.268. The proposed facility complies with the source limits for carcinogenic risk and chronic hazard index in Section 301 and the project limits for carcinogenic risk, chronic hazard index and acute hazard index in Section 302. A TBACT analysis was not required as part of this analysis. The HRSA report is in Appendix B.

MACT: Total HAP emissions from this facility will not exceed 10 tons/year of any single HAP or 25 tons/year for all HAPs combined. Therefore, this facility is not considered to be a major facility for HAP emissions, and Regulation 2-2-317 does not apply.

7. Major Facility Review (Regulation 2, Rule 6):

This facility is a major facility of regulated air pollutants or HAPs. Therefore, Regulation 2, Rule 6 does apply to this facility and a Major Facility Review permit application is required to be submitted within one year of becoming subject to Regulation 2, Rule 6, when the potential to emit a regulated air pollutant exceeds 100 tons per year. Ameresco will be required to submit a Title V application within one year of startup of any of Sources 1 through 6 IC Engines.

8. Other Applicable District Rules and Regulations

Regulation 6:
The Sources 1 through 6 IC Engines and Source 7 Flare are expected to comply with the Ringelmann 1 limit of Regulation 6-301 because they should have no visible emissions. The grain-loading rate from LFG fired engines and flare are expected to be less than the Regulation 6-310 limit of 0.15 grains/dscf.

Regulation 8, Rule 34 "Solid Waste Disposal Sites":
Since Sources 1 through 6, IC Engines and Source 7 Flare will be using landfill gas as a fuel and the source of this landfill gas is subject to Regulation 8, Rule 34, then Sources 1 through 7 must comply with any applicable requirements of Regulation 8, Rule 34. The applicable emission limit for the flare is Regulation 8-34-301.3 (minimum of 98% by weight destruction of NMOC or maximum outlet concentration of 30 ppmv of NMOC as methane at 3% oxygen. The applicable emission limit for the engines is Regulation 8-34-301.4 (minimum of 98% by weight destruction of NMOC or maximum outlet concentration of 120 ppmv of NMOC as methane at 3% oxygen). The proposed project is designed to comply with these limits. The Permit Holder will monitor the landfill gas flow rate to Sources 1 through 6 plus Source 7 to comply with Regulation 8-34-508. The Permit Holder will be required to submit a monitoring proposal for compliance with Regulation 8-34-507 (continuous temperature monitor and recorder) and 509 (key emission control system operating parameter monitoring requirements) prior to initial operation of Sources 1 through 7. The Permit Holder will maintain all records required by Regulation 8-34-501.2, 501.3, 501.4, 501.10, 501.11, and 501.12.

Regulation 9, Rule 1:
Regulation 9-1-302 limits sulfur dioxide in the exhaust from Sources 1 through 7 to 300 ppmv. With a landfill gas sulfur content limit of 150 ppmv, the exhaust from these sources will comply with the 300 ppmv limit. Since these sources will comply with Regulation 9-1-302, they are also expected to comply with the ground level SO_2 limits of Regulation 9-1-301.

Regulation 9, Rule 2:
The proposed project will emit about 3,200 pounds/year of hydrogen sulfide (H_2S) based on an 86.1 percent destruction efficiency for Sources 1 through 6 IC Engine and a 98 percent destruction efficiency

for Source 7 Flare. At this emission rate, Sources 1 through 7 are expected to comply with Regulation 9-2-301 (30 ppb H_2S over 60 minutes and 60 ppb H_2S over 3 minutes).

Regulation 9, Rule 8:
The Sources 1 through 6 IC Engine are also subject to Regulation 9, Rule 8. Since these engines will only be burning waste derived fuel gases (no fossil fuels), Regulation 9-8-301 is not applicable. Regulation 9-8-302.2 only applies to rich burn engines and is therefore not applicable. These IC Engines are subject to Regulation 9-8-302.1, which limits NO_x emissions to 140 ppmv at 15% O_2, and Regulation 9-8-302.3, which limits CO emissions to 2000 ppmv at 15% O_2. The BACT limits for NO_x and CO are far below the Regulation 9, Rule 8 limits. Sections 330 and 331 (concerning standby emergency engines) are not applicable.

9. MSW Landfill NSPS and NESHAP Requirements:

Since Ameresco Half Moon Bay, LLC is a separate owner/operator from the generator of the LFG (Ox Mountain Landfill), the MSW Landfill NSPS and NESHAP requirements do not apply to Ameresco's proposed use of the Ox Mountain's LFG as a fuel for Sources 1 through 7. However, these sources will meet all applicable federal control and monitoring requirements by complying with Regulation 8, Rule 34.

V. PERMIT CONDITIONS

The proposed conditions for Sources 1 through 7 are listed below.

Condition ID # 23672
For: Sources 1 through 6 IC Engine-Genset and Source 7 Flare for LFG Treatment System

1. Sources 1 through 6 IC Engine-Genset shall be fired exclusively on landfill gas from the Ox Mountain Landfill. The landfill gas throughput to Sources 1 through 6 shall not exceed 355 million standard cubic feet per engine (expressed as 50% methane) during any consecutive 12-month period. Source 7 Flare shall be fueled with landfill gas from the Ox Mountain Landfill to incinerate the flush gas from the LFG Treatment System. The landfill gas throughput to Source 7 shall not exceed 157.7 million standard cubic feet (expressed as 50% methane) during any consecutive 12-month period. (Basis: Regulation 2-5-301 and Cumulative Increase)

2. District approved flow meters, to measure the total landfill gas flow rate into each Source 1 through 6 IC Engine and Source 7 Flare, shall be installed prior to any operation and shall be maintained in good working condition. (Basis: Regulation 8-34-508 and Cumulative Increase)

3. The concentration of total reduced sulfur compounds in the landfill gas burned at Sources 1 through 7 shall not exceed 150 ppmv, expressed as H_2S. (Basis: BACT and Cumulative Increase)

4. Except as further limited by Part 22, Nitrogen Oxide (NO_X) emissions from each of the IC engines, Sources 1 through 6, shall not exceed 0.60 grams of NO_X (calculated as NO_2) per brake-horsepower-hour. (Basis: BACT and Cumulative Increase)

5. Nitrogen Oxide (NO_X) emissions (calculated as NO_2) from Source 7 Flare shall not exceed 0.060 lbs/MM BTU. (Basis: RACT and Cumulative Increase)

6. Except as further limited by Part 22, Carbon Monoxide (CO) emissions from each of the IC engines, Sources 1 through 6, shall not exceed 2.1 grams of CO per brake-horsepower-hour. (Basis: BACT and Cumulative Increase)

7. Carbon Monoxide (CO) emissions from Source 7 Flare shall not exceed 0.20 lbs/MM BTU. (Basis: RACT and Cumulative Increase)

8. Precursor Organic Compound (POC) emissions from each of the IC engines, Sources 1 through 6, shall not exceed 0.20 grams of POC per brake-horsepower-hour. Sources 1 through 6 IC Engine shall also comply with either the non-methane organic compound (NMOC) destruction efficiency requirements or the NMOC outlet concentration limit specified in Regulation 8-34-301.4. (Basis: Regulation 8-34-301.4, BACT, and Cumulative Increase).

9. Precursor Organic Compound (POC) emissions from Source 7 Flare shall not exceed 0.15 lb/hr at a firing rate of 12 MMBTU/hr. Source 7 Flare shall also comply with either the non-methane organic compound (NMOC) destruction efficiency requirements or the NMOC outlet concentration limit specified in Regulation 8-34-301.3. (Basis: Regulation 8-34-301.3, BACT, and Cumulative Increase).

10. PM10 emissions from Sources 1 through 6 IC Engine shall not exceed 0.095 grams of PM10 per brake-horsepower-hour when Source 7 Flare is a permitted source and 0.10 grams of PM10 per brake-horsepower-hour if the permit for Source 7 Flare is surrendered. (Basis: BACT, Cumulative Increase and Regulation 6-310, 501 and 502)

11. PM10 emissions from Source 7 Flare shall not exceed 0.20 pounds per any hour. (Basis: Cumulative Increase and Regulation 6-310, 501 and 502)

12. The Permit Holder shall:
    a. Install and operate continuous emission monitors (CEMS) for Source 1 IC Engine to monitor continuously the emissions of NO_x, CO and O_2. CEMS shall comply with the provisions of Volume V of the Manual of Procedures and Regulation 1-522, Continuous Emission Monitoring and Procedures.
    b. Monitor at least quarterly CO and NO_x emissions from each Source 2 through 6 using a portable analyzer approved by the APCO.

    (Basis: Regulations 1-521 and 2-1-403, BACT, cumulative increase)

13. At least 60 days prior to initial operation of IC engines, Sources 1 through 6, the Permit Holder shall submit an updated monitoring plan identifying how Sources 1 through 6 plus Flare, Source 7, will comply with Regulation 8-34-507 (continuous temperature monitor and recorder) and 509 (key emission control system operating parameter monitoring requirements). This plan shall be submitted to the Engineering Division, referenced to Application # 12649, and shall include the following information:
    a. Identify one or more key emission control system operating parameters that will be monitored on a routine basis (between annual source tests) to demonstrate on-going compliance with the NMOC limit in Regulation 8-34-301.4.
    b. Specify the expected operating ranges for each key parameter (minimum, typical, and maximum), and identify the minimum and/or maximum operating rate that will ensure the engine is complying with the NMOC limit.
    c. Propose a monitoring frequency for each key parameter (i.e. continuous, daily, weekly, or monthly).
    d. Provide descriptions, specifications, and locations for each type of monitoring device that will be used, and identify all analysis methods and/or test methods that will be used (if the proposed monitoring procedure involves a chemical analysis or test procedure).
    f. Describe how the key parameter minimum/maximum operating rate will be either identified or verified during the initial compliance demonstration source test.

    The specific key parameter(s), minimum and/or maximum operating rates, type and location of monitors, and monitoring frequency will be added to this part and Part 16 via an administration permit amendment after the District has received the results of the initial compliance demonstration source test. (Basis: Regulation 8-34-507 and 509)

14. The Permit Holder shall submit a Major Facility Review permit application within twelve months of becoming subject to Regulation 2-6, which shall be deemed to be the startup of any of the IC engines, Sources 1 through 6. (Basis: Regulation 2-6-404.1)

15. Source and project health risk shall remain in compliance with Regulation 2-5-301 and 302, as appropriate. If a landfill gas analysis or source test indicates that any of the toxic air contaminant emission rates listed below will be or have been exceeded, the Permit Holder shall submit within 30 days of receiving the test results all information necessary for the District to conduct an updated risk screening analysis for this project.

Toxic Air Contaminant	Emissions in pounds per consecutive 12-months from	
	Total of Sources 1 through 6	Source 7
Acrylonitrile	na	339
Benzene	388	15
Dichlorobenzene	1300	28
Formaldehyde	1480	3740
Specified PAHs	0.95	0.04

The polycyclic aromatic hydrocarbons (PAHs) listed below shall be considered to be Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds as Benzo[a]pyrene-equivalents.

Benzo[a]anthracene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Dibenz[a,h]anthracene
Indeno[1,2,3-cd]pyrene

(Basis: Regulation 2-5-501)

16. In order to demonstrate compliance with Parts 3 through 11 above and/or Parts 18 and 22a and b below, as appropriate, and Regulations 8-34-301.4, 9-8-302.1, and 9-8-302.3, the Permit Holder shall ensure that a District approved source test is conducted within 60 days of initial start-up of the Sources 1 through 6 IC Engine-Genset or within 30 days following the initial commissioning period allowed by Part 22c and annually thereafter. The Source Test Section of the District shall be contacted to obtain their approval of the source test 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 within 45 days of the test date. The initial and annual source tests shall determine or report the following:
    a. landfill gas flow rate to each IC Engine and Flare (at standard conditions);
    b. concentrations (dry basis) of carbon dioxide (CO_2), nitrogen (N_2), oxygen (O_2), methane (CH_4), and non-methane organic compounds (NMOC) in the landfill gas burned by each IC Engine and Flare;
    c. exhaust gas flow rate from each IC Engine and Flare (dry basis);
    d. concentrations (dry basis) and mass flow of NO_x, CO, NMOC, PM10, O_2, SO_2, SO_3, and H_2SO_4 in the exhaust gas from each IC Engine and Flare;
    e. concentration (dry basis) of benzene, dichlorobenzene, formaldehyde and specified PAHs in the exhaust from each IC Engine and Flare, and benzene, dichlorobenzene, formaldehyde and specified PAHs emission rates in units of pounds/MM scf of landfill gas burned (during initial compliance demonstration test and once every four years thereafter)
    f. NMOC destruction efficiency achieved by each IC Engine and Flare; and
    g. minimum, maximum, and average rates for each key emission control system operating parameter (identified per Part 13) during the test period.

(Basis: BACT, Cumulative Increase, Regulations 2-5-501, 6-310, 501 and 502, 8-34-301.4 and 412, 9-8-302.1 and 302.3)

17. In order to demonstrate compliance with Parts 3, 15 and 16b above, the Permit Holder shall ensure that a landfill characterization analysis is conducted concurrently with the initial compliance demonstration test and at least once every four years thereafter. The landfill gas shall be analyzed for each of the compounds identified in Parts 15 and 16b and for the following reduced sulfur

compounds: hydrogen sulfide, methyl mercaptan, ethyl mercaptan, carbon disulfide, and dimethyl sulfide. The Source Test Section of the District shall be contacted to obtain their approval of the source test procedures and analysis methods 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 laboratory report shall be submitted to the Compliance and Enforcement Division along with the source test report required by Part 16, within 45 days of the test date. (Basis: BACT, Cumulative Increase, Regulation 2-5-501, and AB-2588 Air Toxics Hot Spots Act)

18. The Permit Holder shall not allow cumulative combined emissions from Sources 1 through 6, IC Engines, plus Source 7, Flare, to exceed any of the following limits:

	Pounds per hour	Pounds per day	Tons per consecutive 12-month period
a. NO_x (as NO_2)	22.0	527	92.17
b. CO	76.8	1842	322.19
c. POC	7.23	174	30.42
d. PM10	3.57	85	14.25
e. SO_2	6.88	165	28.53

(Basis: PSD, Offsets, Cumulative Increase)

19 The Permit Holder shall maintain the following records in a District approved logbook:
- a. Dates and times of all startups and shutdowns of Sources 1 through 6 and the reason for each shutdown;
- b. On a monthly basis, record the total landfill gas flow rate to Sources 1 through 7 (corrected to standard conditions and 50% methane) for the month and for the previous 12-month period. Show any calculations needed to report the flow rate measured pursuant to Part 2 in units of standard cubic feet at 50% methane;
- c. On a monthly basis, record the [minimum/maximum] [key operating parameter] measured pursuant to Part 13.
- d. On a monthly basis, record the operating time, in hours, for each of Sources 1 through 7 for the month and the previous 12-month period.
- e. Maintain records of all compliance demonstration test results and laboratory analyses.
- f. Mass emissions of NO_x, CO and PM10 from each of the Sources 1 through 7 and from the sources combined, both on a monthly basis and for the previous consecutive 12-month period. Emissions shall be determined using CEMs data for Source 1 for NO_x and CO and emission factors derived from the most recent source test and the throughput information required under Part 19b above for NO_x and CO for Sources 2 through 7 and PM10 emissions from Sources 1 through 7..

All records shall be kept on site and shall be made available to the District staff upon request. All records shall be retained for at least 5 years from the date of entry. (Basis: BACT, Cumulative Increase, AB-2588 Air Toxics Hot Spots Act, and Regulations 2-5-501, 6-501 and 502, 8-34-501.2, 501.4, 501.10, 501.11, and 501.12)

Additional Abatement Conditions

20. The District acknowledges that the selective catalytic reduction (SCR) and oxidation catalyst abatement technology has not been commercially proven as working on landfill gas fired IC engines. Therefore:
- a. If the technologies fail to meet the NO_x and CO emission limits as specified in Part 22 and as measured by source tests and CEMS or PEMS, as appropriate, the District upon request by the Permit Holder will review the operating data to determine if it is appropriate to allow to the reasonable satisfaction of the APCO an alternative (higher) permitted emission rate(s) not to exceed the respective limits specified in Parts 4 and 6.
- b. If the technologies fail to continuously meet the NO_x and CO emission limits as specified in Part 22 and as measured by source tests and CEMS or PEMS, as appropriate, due to a Permit Holder perceived premature catalyst failure(s), the District upon request by the Permit Holder will review the operating data to determine if premature catalyst failure has occurred. Premature catalyst failure shall be defined as necessary first-time catalyst replacement (and specific by

type of catalyst for Source 1) with less than 12,000 hours of service and shall be determined on a source-by-source basis for Sources 1 through 6. Catalyst failure deemed by the APCO to be due to landfill gas not meeting the specifications in Parts 3 and 24 or deemed by the APCO to be due to improper catalyst design or fabrication or maintenance shall not constitute premature catalyst failure.

i. If the APCO concurs that premature catalyst failure has occurred, the APCO will allow the Permit Holder to permanently remove the catalyst(s) which has failed.
ii. If the APCO does not concur that premature catalyst failure has occurred, the APCO will continue to require that the Permit Holder maintain and operate the catalyst(s) subject to Part 22.

c. The District shall allow operation above the NO_x and CO emission limits as specified in Part 22, but not to exceed the respective limits specified in Parts 4 and 6, while the District evaluates a request for relief per Part 20a or Part 20b above.

(Basis: BACT)

21. Operation of any of Sources 1 through 6 for 12,000 hours without catalyst replacement (but allowing replacement of a "Guard Bed" upstream of the catalyst) shall demonstrate that the catalytic abatement technology is technologically feasible on a landfill gas fired IC engine.
(Basis: BACT)

22. Except if modified by Part 20 above, Sources 1 through 6 shall be conditionally abated as follows:
a. Source 1 shall be abated by a SCR system that reduces NO_x to not exceed 0.15 g/bhp-hr; and
b. Sources 1 through 6 shall each be abated by an oxidation catalyst that reduces CO to not exceed 0.52 g/bhp-hr; and
c. This abatement is not required during an initial commissioning period for each source not to exceed 60 days; and
d. This abatement is not required during a period following catalyst failure but prior to catalyst replacement provided this period does not exceed 30 days
(Basis: BACT)

23. Ammonia slip shall not exceed 10 ppmvd at 15% O_2 for Source 1 when being abated by a SCR system.
(Basis: Regulation 2-5, BACT)

24. Whenever one or more of Sources 1 through 6 are being abated by a SCR system and/or an Oxidation Catalyst, the Permit Holder shall fuel all Sources 1 through 6 with landfill gas that continuously meets either of the following specifications:
a. At least 90% of volatile organic silicon compounds have been removed from the landfill gas by the Permit Holder; or
b. Concentration of volatile organic silicon compounds does not exceed 0.55 ppmv, dry basis, as Si.
(Basis: BACT)

25. The Permit Holder shall demonstrate compliance with Part 24 at least quarterly. The Source Test Section of the District shall be contacted to obtain their approval of the source test procedures and analysis methods 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 laboratory report shall be submitted to the Compliance and Enforcement Division along with the source test report required by Part 16, within 45 days of the test date. (Basis: BACT, Cumulative Increase)

26. Ameresco has committed to implementing all of the Reasonable and Prudent Measures ("RPMs"), the terms and conditions, and the notification requirements contained in the final Biological Opinion dated May 11, 2007, and signed by Cay C. Goude, Acting Field Supervisor of the Coast-Bay Delta Branch of the U.S. Fish and Wildlife Service in response to the U.S. Environmental Protection Agency's request for consultation under Section 7 of the Federal Endangered Species Act for the proposed Ameresco Half Moon Bay, LLC Landfill Gas-to-Energy project; as such has been amended

in the June 12, 2007 letter from Cay C. Goude to Gerado C. Rios. All notifications required to be submitted shall also be sent to the Compliance and Enforcement Division of the BAAQMD. Any failure to successfully implement all of these RPMs, terms and conditions, and notification requirements shall be communicated to the U.S. Environmental Protection Agency and U.S. Fish and Wildlife Service, as appropriate, and to the Compliance and Enforcement Division of the BAAQMD. (Basis: PSD)

VI. RECOMMENDATION

The APCO has concluded that the proposed Ameresco Half Moon Bay, LLC Landfill Gas-to-Energy Facility at the Ox Mountain Landfill in Half Moon Bay, California, which is composed of the sources listed below, will comply with all applicable federal, state, and District rules and regulations. Therefore, the APCO will be issuing an Authority to Construct and a federal PSD Permit for the Ameresco Half Moon Bay Facility that is composed of the following sources that will be subject to the permit conditions and BACT and offset requirements discussed previously.

Source 1 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A1 Selective Catalytic Reduction System, Miratech CBL ACIS 20 for NO_x abatement, and A2 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 2 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A3 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 3 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A4 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 4 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A5 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 5 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A6 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 6 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in^3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A7 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

Source 7 Flare, Perennial Energy, Model EGFS-12-400, 400 scfm LFG, 12 MM BTU/hr

Approved by:

Jack P. Broadbent
Executive Officer/Air Pollution Control Officer
Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

APPENDIX D

Addendum Evaluation Report
for Permit Application No. 12649

ADDENDUM EVALUATION REPORT
Ameresco Half Moon Bay LLC
Application #12649 - Plant #17040 (Site #B7040)
12310 San Mateo Road
Half Moon Bay, CA 94019

I. BACKGROUND AND SUMMARY

Ameresco has 6 engines that are on A/C status pending evaluation of CEMS data to set Permit to Operate emission limits for oxides of nitrogen (NO_X) and carbon monoxide (CO). This is the first landfill gas to energy (LGTE) project used for demonstrating the effectiveness of NO_X and CO controls. This is an addendum to the evaluation report written by Don Van Buren who issued the Authority to Construct (A/C) permit on August 24, 2007. Specific details on the initial permitting of the project are in Mr. Van Buren's evaluation report based on the Authority to Construct.

Ameresco Half Moon Bay's A/C was for the following equipment:

S-1 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A7 Selective Catalytic Reduction System, Miratech CBL ACIS 20 for NOx abatement, and A1 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-2 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A2 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-3 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A3 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-4 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A4 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-5 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW nominal power output, abated by A5 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-6 IC Engine-Genset, GE Jenbacher JGS 616 GS-L.L, 6090 in3 displacement, 2677 bhp, 21.3 MM BTU/hour, burning landfill gas, 1.9 MW

nominal power output, abated by A6 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-7 Flare, Perennial EGSF-12-400, 12 MMBTU/hour

After the A/C was issued, the flare was changed to a John Zink Enclosed ZTOF Flare System, 12 MMBTU/hour. The flare will be classified at an abatement device (A-8).

Their system also includes a fuel cleanup system before the landfill gas (LFG) is burned in the engines, which reduce among other things volatile organic silicon compounds. The removal of these compounds reduces build up at the engines and poisoning of the catalyst. Less engine build up allows major engine maintenance to be delayed.

The engines have the following initial operation dates:

Source 1	1/16/09
Source 2	10/29/08
Source 3	10/27/08
Source 4	10/25/08
Source 5	10/23/08
Source 6	10/21/08

S-1 is monitored with a continuous emissions monitoring system (CEMS). The review of the emission data shows that the SCR and oxidation catalyst are effective in reducing NO_X and CO emissions, respectively. Based on this evaluation, the CEMS will no longer be required. Compliance will be checked by the monitoring requirements in the rule and verified with periodic source tests.

II. EMISSIONS AND EMISSION CONTROLS

Minute CEMS data was evaluated from July 2010 to April 2011 from Source 1. Swings in emissions were cleaned-up by zeroing out emissions data up to 1 hour for startup and shutdown. During periods of an inoperative monitor, the emissions were assumed to be at the limit. See attached emission graphs.

SCR control

Ameresco uses a urea-based SCR system. NO_X data shows 99.3% compliance with the proposed limit of 0.15 g/bhp-hr averaged over 24 hours. When the SCR is functioning properly, the controls reduce the NO_X emissions at or below the limit. It appears that 0.7% of the time, the SCR system was not functioning properly when NO_X levels would be above the standard. The most likely reason is several reported events of malfunction of the urea injection system. There have been no reports of problems with the catalyst. There is no evidence that the problems with the urea injection system are a result of the engines burning landfill gas. When SCR is operating, the control system effectively reduces NO_X emissions to meet 0.15 g/bhp-hr averaged over 24 hours.

CO Oxidation Catalyst

CO data shows 100% compliance with the proposed limit of 1.8 g/bhp-hr averaged over 24 hours. The District had initially proposed a limit of between 1 and 1.2. The facility observed engine build-up over time causing a creep of the CO emission levels. The facility suspects that the ash content of the lubricating oil is contributing to the engine deposits. The facility would periodic decoke the engines as the CO emission levels approached 0.8 to 1.0 to attempt to meet the demonstration level of 0.52. To give the engine a reasonable period of operation prior to the maintenance, we settled on a CO limit of 1.8. In addition, it is possible that the CO catalyst was not sized for the amount of flow. Future projects may lead to lowering the CO limit.

Emissions

The emissions were initially assumed to be uncontrolled for PSD permitting purposes because the controls in the demonstration project were unproven. The following table shows the NO_X and CO emissions estimated in the A/C.

	Emission Factor, g/bhp-hr	IC Engine Emissions, tons/yr	Emissions for 6 IC Engines, tons/yr
NO_x (as NO_2)	0.6	14.97	89.80
CO	2.1	52.38	314.30

Revised emission levels based on P/O limits

	Emission Factor, g/bhp-hr	Emissions, tons/yr/engine	Emissions for 6 IC Engines, tons/yr
NO_x (as NO_2)	0.15	3.74	
NO_x (as NO_2)	0.6	14.97	
NO_x - total			78.58
CO	1.8		269.4*

*Facility proposed to cap CO emissions 5% below the PSD trigger level of 250 tons per year (237.5 tons per year).

Cumulative Increase

Since the emissions controls are deemed effective and emission limits are set, the following table is the adjusted cumulative increase for this project.

Material	A/C, tpy	P/O, tpy
NOx	92.17	89.95
CO*	322.19	237.5
SOx	28.53	28.53
POC	30.42	30.42
PM10	14.89	14.89

80.95

*The CO limit is based on a facility-wide emission cap.

III. BEST AVAILABLE CONTROL TECHNOLOGY

The Authority to Construct permit was issued as a demonstration project of using SCR and CO oxidation catalyst to abate NO_X and CO emissions from landfill gas-fired engines. As discussed in Part II of this report, the emission controls for engines using landfill gas have been deemed effective.

As they are achieved in practice, the BACT2 levels for NO_X and CO are 0.15 and 1.8 grams per brake horsepower-hour, respectively.

IV. STATEMENT OF COMPLIANCE

The owner/operator is expected to continue to be in compliance with all requirements identified in the 2007 evaluation report. When the A/C was issued, PSD was triggered for CO emissions. The emissions were based on uncontrolled emissions. Since the owner/operator has agreed to cap CO emissions for Sources 1 through 6 at 237.5 tons per year, the emissions are below the level where a PSD permit is required. The District plans to send a letter to EPA indicating that this facility is no longer a PSD facility.

V. CONDITIONS

Condition #25465

1. The owner/operator shall fire Sources 1 through 6 exclusively on landfill gas fuel, not to exceed 355 million standard cubic feet per engine or an equivalent heat content of 180,000 million BTUs per engine during any consecutive 12-month period. (Basis: TBACT, Cumulative Increase)

2. The owner/operator shall abate any landfill gas not used at Sources 1 through 6 with A-8, Flare, where the landfill gas fuel usage is not to exceed 158 million standard cubic feet or an equivalent heat content of 79 million BTUs during any consecutive 12-month period. (Basis: Cumulative Increase)

3. The owner/operator shall not allow emissions from each of Sources 1 through 6 to exceed 1.8 grams of carbon monoxide (CO) per brake-horsepower-hour averaged over a 24-hour period, except during start-up and shutdown periods. (Basis: BACT)

4. The owner/operator shall not allow emissions from Source 1 to exceed 0.15 grams of nitrogen oxide (NO_X, calculated as NO_2) per brake-horsepower-hour averaged over a 24-hour period, except during start-up and shutdown periods. (Basis: BACT)

5. The owner/operator shall not allow emissions from each of Sources 2 through 6 to exceed 0.60 grams of NO_X calculated as NO_2 per brake-horsepower-hour, except during start-up and shutdown periods. (Basis: Cumulative Increase)

6. The owner/operator shall not exceed one (1) hour for start-up or one (1) hour for shutdown. (Basis: Cumulative Increase)

7. The owner/operator shall not allow emissions from each of Sources 1 through 6 to exceed 0.20 grams of precursor organic compound (POC) per brake-horsepower-hour averaged over a three-hour period. Note: This requirement is equivalent to NMOC emission rate less than 120 ppmv at the outlet, dry basis, expressed as methane, corrected to 3% oxygen. (Basis: Cumulative Increase)

8. The owner/operator shall not allow the concentration of total reduced sulfur compounds in the landfill gas fuel burned at Sources 1 through 6 and A-8 to exceed 150 ppmv, expressed as H_2S. (Basis: BACT, Cumulative Increase)

9. The owner/operator shall abate CO emissions from Sources 1 through 6 with CO Oxidation Catalyst, A-1 through A-6, respectively. (Basis: BACT)

10. The owner/operator shall abate NO_X emissions from Source 1 with an SCR System (A-7, Selective Catalytic Reduction System). (Basis: BACT)

11. When landfill gas is combusted at A-8, the owner/operator shall operate A-8 with a minimum combustion zone temperature of 1400 degrees F, averaged over a 3-hour period. (Basis: Cumulative Increase)

12. The owner/operator shall not exceed the combined CO emissions from Sources 1 through 6 and A-8 to exceed 238 tons during any consecutive 12-month period. (Basis: Cumulative Increase)

13. To demonstrate compliance with Part 1, if the basis for compliance is the heat content of the fuel, the owner/operator shall install and maintain a gas chromatograph (GC) monitor that measures the heat content of the landfill gas fuel at a minimum of once per month. (Basis: Cumulative Increase)

14. To demonstrate compliance with Parts 3, 4, 5, 7, 8, the owner/operator shall conduct a District-approved source test at least every 12 months from the date of the last successful test with an initial source test conducted within 60 days from the issuance of the Permit to Operate. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section prior to conducting any tests.

    The owner/operator shall comply with all applicable testing requirements as specified in Volume IV of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section, in writing, of the source test protocols and projected test dates at least 7 days prior to testing. The results shall be submitted within 45 days of the test date. (Basis: Cumulative Increase)

15. The owner/operator shall maintain the following records:
    a. Dates and times of startups and shutdowns of Sources 1 through 6 and the reason for each shutdown;
    b. Dates and time of any maintenance activity to Sources 1 through 6, the fuel cleanup system and emission control equipment, A-1 through A-8, including the reason, description of the activity and any corrective actions;
    c. For each of Sources 1 through 6 and A-8, the monthly landfill gas flow rate, corrected to standard conditions or the heat content of the landfill gas fuel burned;
    d. Any calculations needed to report the flow rate or heat content measured pursuant to Parts 1 and 2 in units of standard cubic feet or million BTU, respectively;
    e. Monthly operating time, in hours, for each of Sources 1 through 6;
    f. Where applicable, rolling 12-month totals of the landfill gas fuel flow rate, landfill gas fuel heat content and operating time for each source specified in this part; and
    g. Any compliance demonstration information (e.g. monitoring data, source tests).

    The owner/operator shall keep all records onsite and available to the District staff upon request with a retention of at least 5 years from the date of entry. (Basis: Recordkeeping)

VI. RECOMMENDATIONS

Permit Issuance

I recommend Permits to Operate be issued to the Ameresco Half Moon Bay with Permit Condition #25465 for:

S-1 IC Engine-Genset, abated by A7 Selective Catalytic Reduction System, Miratech CBL ACIS 20 for NOx abatement, and A1 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-2 IC Engine-Genset, abated by A2 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-3 IC Engine-Genset, abated by A3 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-4 IC Engine-Genset, abated by A4 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-5 IC Engine-Genset, abated by A5 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

S-6 IC Engine-Genset, abated by A6 Oxidation Catalyst, Miratech IQ-34-20 for CO abatement

A-8 Flare, John Zink Enclosed ZTOF Flare System, 12 MMBTU/hour

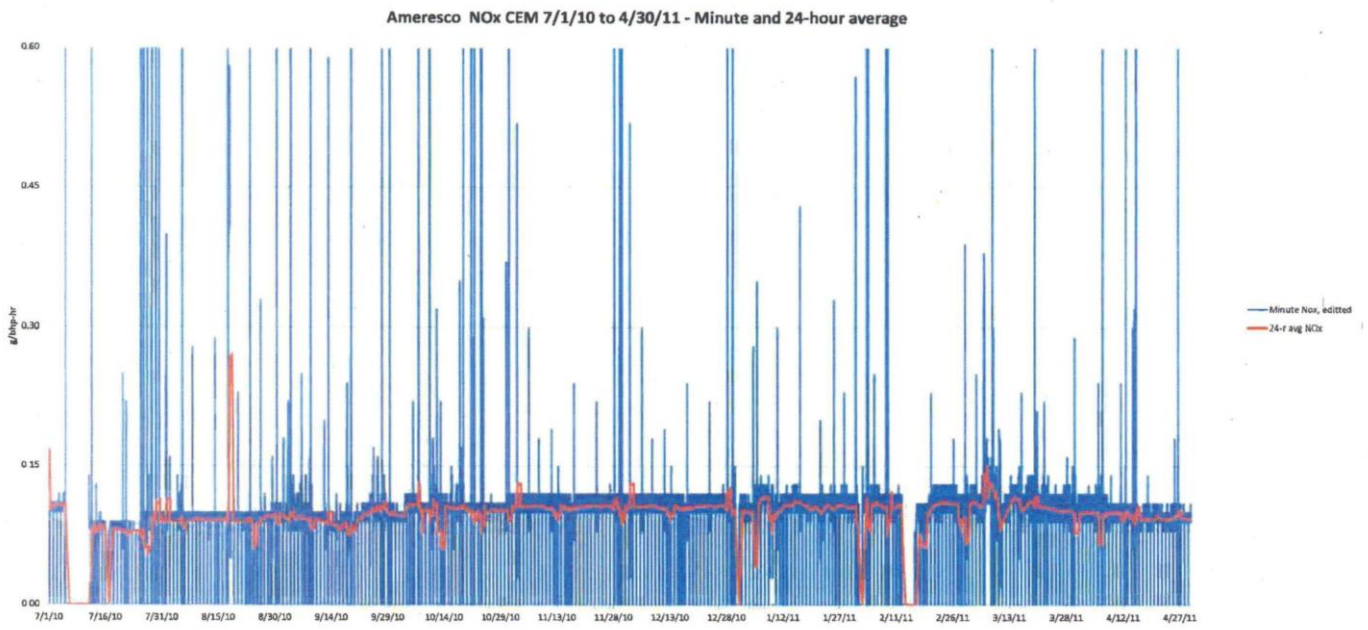
BACT Determination

Staff recommends adoption of new BACT2 requirements for engines that burn landfill gas to produce electricity since SCR and oxidation catalyst have been deemed achieved in practice for reducing engine emissions of NO_X and CO, respectively. The emission limits for NO_X and CO are 0.15 and 1.8 grams per brake horsepower-hour averaged over 24-hours, respectively.

Fred Tanaka

Fred Tanaka
Air Quality Engineer
Engineering Division

Date: 2/4/2013


Ameresco NOx CEM 7/1/10 to 4/30/11 - Minute and 24-hour average
g/bhp-hr
0.60
0.45
0.30
0.15
0.00
7/1/10
7/16/10
7/31/10
8/15/10
8/30/10
9/14/10
9/29/10
10/14/10
10/29/10
11/13/10
11/28/10
12/13/10
12/28/10
1/12/11
1/27/11
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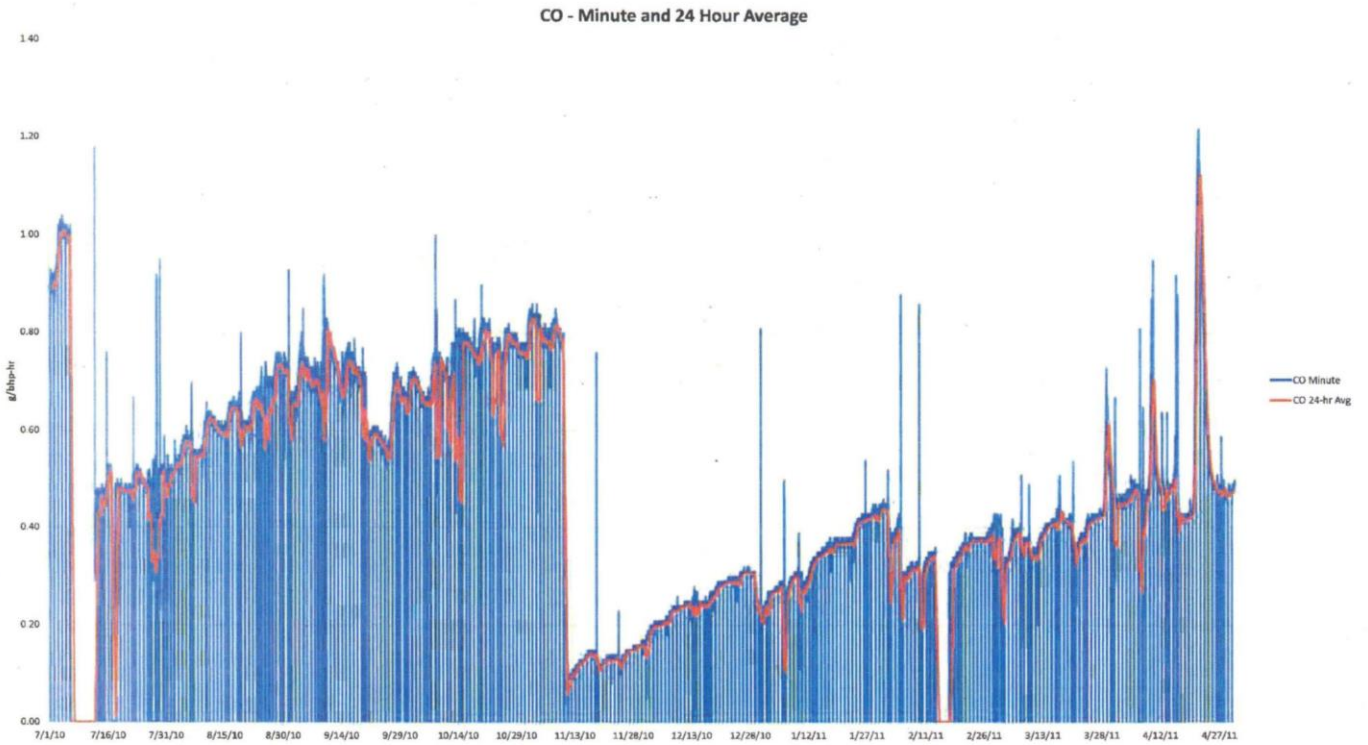
3/28/11
4/12/11
4/27/11
Minute Nox, edited
24-r avg NOx


CO - Minute and 24 Hour Average
g/bhp-hr
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
7/1/10
7/16/10
7/31/10
8/15/10
8/30/10
9/14/10
9/29/10
10/14/10
10/29/10
11/13/10
11/28/10
12/13/10
12/28/10
1/12/11
1/27/11
2/11/11
2/26/11
3/13/11
3/28/11
4/12/11
4/27/11
CO Minute
CO 24-hr Avg

APPENDIX E

Engineering Evaluation Report for Permit Application No. 27766

Engineering Evaluation
Ameresco Half Moon Bay, LLC, Plant # 17040
Application Number 27766
12310 San Mateo Road, Half Moon Bay, CA 94019

BACKGROUND

Ameresco Half Moon Bay, LLC has applied for an Authority to Construct/Permit to Operate for an aboveground LFG condensate solvent tank (Tank V3) for the S-7 TSA gas treatment regeneration cycle:

S-8 Tank V3: LFG Condensate Solvent Tank, Fixed Roof, 500 gallons capacity

The V3 storage tank S-8 collects and stores the contaminated water that condenses in the TSA system during media regeneration/cleaning. The 500-gallon, cylindrical tank is constructed of stainless steel and installed horizontally in a concrete vault. The air headspace vapors in S-8 are hard piped back the TSA system, VOCs vented from the tank are vented to the TSA Flare (A-8) during absorption media regeneration.

EMISSION CALCULATIONS

The calculation for S-8 along with the basis is presented as follows:
Basis:

1. Operating conditions: Pressure = 1 atm; Temperature = 70 ^{0}F (21.1 ^{0}C, 530 ^{0}R);
2. Compounds detected include 1,4 dichlorobenzene, ethylbenzene and toluene. Molecular Weight (MW) of 1,4 dichlorobenzene = 147.004 g/gmole, MW of ethylbenzene = 106.167 g/gmole, MW of toluene = 92.14 g/gmole.
3. Measured compounds concentrations: 2900 mg/l (ppm) 1,4 dichlorobenzene, 5000 mg/l (ppm) ethylbenzene, and 3200 mg/l (ppm) toluene;
4. VOC = 1.35% by weight
5. Throughput = 5000 gal/year, 0.57 gal/hour
6. Flare abatement efficiency = 98.5%

Per the Raoult's Law for ideal solutions, we assume that the concentration of a contaminant in the vapor phase is proportional to the mole fraction of that contaminant in the liquid times its vapor pressure.

Table 1. Unabated POC Emissions from S-8

Compounds	Molecular Weight (g/g-mole)	Weight % Composition (Mass basis)	Saturated Vapor Pressure (psia)	Moles/Kg solvent (g-mole)	Vapor Mole Fraction (%)	Actual Vapor Pressure (psia)	Yi	Unabated Hour Average Emission Rate (lb/hr)	Unbated Annual Average Emission Rate (lb/yr)
H2O	18.015	98.65%	0.363	0.05476	0.997748	0.362183	0.024645		
1,4 dichlorobenzene	147.004	0.35%	0.025	2.39E-05	0.000435	0.0000109	7.4E-07	8.04E-07	0.0070
Ethylbenzene	106.167	0.61%	0.193	5.73E-05	0.001043	0.000201	1.37E-05	1.49E-05	0.1304
Toluene	92.14	0.39%	0.425	4.24E-05	0.000773	0.000329	2.24E-05	2.43E-05	0.2128
Total VOC								0.00004	0.350

As shown in Table 1, with air in the headspace (the tank is vented into the flare), the pressure in the headspace is 1 atm (14.696 psi). VOC mole fraction in the headspace ($Yi_{1,4\ dichlorobenzene} + Yi_{\ ethylbenzene}$

+ Yi $_{toluene}$) is 0.000037.

$$M_{VOC} = \frac{(14.696\ psi * \frac{5000\ gal}{year} * \frac{7.48052\ ft3\ vapor}{gal})}{\frac{10.731\ psi\ ft3}{lbmol\ R} * 530\ R}$$ *0.000037 = 96.65 lbmols/year * 0.000037 = 0.0036 lbmols VOC/yr

= 0.35 lb VOC/year

$$M_{VOC} = \frac{(14.696\ psi * \frac{0.57\ gal}{hour} * \frac{7.48052\ ft3\ vapor}{gal}}{\frac{10.731\ psi\ ft3}{lbmol\ R} * 530\ R} * 0.000037$$ = 0.0l1 lbmols/hr *0.000037 = 4.06E-7 lbmol VOC/hr

= 0.00004 lb VOC/hr

Unabated emissions of 1,4 dichlorobenzene, $M_{1,4\ dichlorobenzene}$ = 8.04E-07 lb/hr = 0.0070 lb/yr; unabated emissions of ethylbenzene, $M_{ethylbenzene}$ = 1.49E-05 lb/hr = 0.1304 lb/yr; Unabated emissions of toluene, $M_{toluene}$ = 2.43E-05 lb/hr = 0.2128 lb/yr.

Table 2. Abated POC Emissions from S-8

	concentration [ppm]	Unabated Emission [lb/hour]	Unabated Emission [lb/year]	Abated Emission [lb/hr]	Abated Emission [lb/yr]	Abated Emission [ton/yr]	Chronic Trigger Level [lb/yr]	Acute Trigger Level [lb/hr]	HRA required?
1,4 dichlorobenzene	2900	8.04E-07	0.0070	1.21E-08	1.05E-04	5.25E-08	7.2	NA	NO
Ethylbenzene	5000	1.49E-05	0.1304	2.24E-07	1.96E-03	9.78E-07	33	N/A	NO
Toluene	3200	2.43E-05	0.2128	3.65E-07	3.19E-03	1.60E-06	12000	82	NO
	Total POC	0.00004	0.350	6.00E-07	5.25E-03	2.63E-06			

Plant Cumulative Increase

Table 3 presents the cumulative increase from S-8:

Table 3. Cumulative Emission Increase

Pollutant	Existing (ton/yr)	New Increase with this application (ton/yr)	Total (ton/yr)
POC	30.420	0.000	30.420
NOx	89.950	0.000	89.950
CO	237.5	0.000	237.5
PM	14.890	0.000	14.890
SO2	28.530	0.000	28.530

COMPLIANCE DETERMINATION

Regulation 1: General Provisions and Definitions

The facility is subject to Regulation 1, Section 301, which prohibits discharge of air contaminants resulting in public nuisance. The facility is expected to comply with this requirement.

Regulation 2-1: General Requirements

Authority to Construct/ Permit to Operate

S-8 is subject to requirements of Regulation 2-1-301 and 302 (Authority of Construct/Permit to Operate) since the top phase contains more than 1% of VOC by weight.

> **2-1-123 Exemption, Liquid Storage and Loading Equipment:** The following equipment is exempt from the requirements of Sections 2-1-301 and 302, provided that the source does not require permitting pursuant to Section 2-1-319.
> 123.2 Tanks, vessels and pumping equipment used exclusively for the storage or dispensing of any aqueous solution which contains less than 1 percent (wt) organic compounds. Tanks and vessels storing the following materials are not exempt.
> 2.6 More than one liquid phase, where the top phase contains more than one percent VOC (wt).

CEQA

The project is considered to be ministerial under the Districts CEQA Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors and therefore is not discretionary as defined by CEQA. This project is in compliance with Chapter 4 of the permit handbook.

Public Notification

The public notification requirements of Regulation 2-1-412 apply to applications which result in any increase in toxic air contaminant or hazardous air contaminant emissions at facilities within 1,000 feet of the boundary of a K-12 school. The District's database found that the nearest K-12 school is 2.89 miles (15259 feet) from the facility, therefore, the public notice requirements in Regulation 2-1-412 do not apply.

Regulation 2, Rule 2: Permits – New Source Review

BACT

This proposed project will not emit over 10 lbs per highest day and is therefore not required to implement BACT.

Offsets

Offsets are not applicable for this application, as abated POC emission increase from S-8 is minimal (2.63E-06 ton per year).

Toxics

1,4 dichlorobenzene, ethylbenzene and toluene are listed in the Toxic Air Contaminants (TACs) list of Regulation 2-5, Table 2-5-1. With abatement of 98.5%, none of the compounds' abated emission exceed the trigger levels of Table 2-5-1. Therefore, no risk screen analysis is required.

Regulation 8-5: Storage of Organic Liquids

As shown in Table 1, S-8 is not subject to requirements of Regulation 8-5 since the vapor pressure is less than 0.5 psia.

8-5-117 Limited Exemption, Low Vapor Pressure: The provisions of this rule, except for
Section 8-5-307.3, shall not apply to tanks storing organic liquids with a true vapor pressure of less than or equal to 25.8 mm Hg (0.5 psia) as determined by Sections 8-5-602 or 604.

Federal Requirements:

Prevention of Significant Deterioration, New Source Performance Standards, and National Emissions Standards for Hazardous Air Pollutants are not triggered.

Condition #26782, setting out the operating conditions and recordkeeping requirements for operations at Source S-8 shall be made part of the source's authority to construct/permit to operate.

RECOMMENDATION

The proposed project is expected to comply with all applicable requirements of District, State, and Federal air quality related regulations. I recommend the District to issue a Permit to Operate for the following equipment subject to Condition # 26782:

S-8 Tank V3: LFG Condensate Solvent Tank, Fixed Roof, 500 gallons capacity

_____ _____

Davis Zhu Date
Air Quality Engineer

COND# 26782----------

1. The owner/operator of S-8 shall not exceed the following throughput limits during any consecutive twelve-month period:
LFG condensate: 5000 Gallons
(Basis: Cumulative Increase)

2. To determine compliance with the above parts, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above parts, including the following information:
a. Quantities of each type of liquid stored at this source on a monthly basis.
b. If a material other than those specified in Part 1 is stored, POC and toxic component contents of each material used; and mass emission calculations to demonstrate compliance with Part 2, on a monthly basis;
c. Monthly throughput and/or emission calculations shall be totaled for each consecutive twelve-month period.
All records shall be retained on-site for two years, from the date of entry, and made available for inspection by District staff upon request. These recordkeeping requirements shall not replace the recordkeeping requirements contained in any applicable District Regulations. (Basis: Cumulative Increase; Toxics)