

Engineering Evaluation
SOMA Environmental Engineering Inc., Plant No. 19396
Application No. 22586

Background

SOMA Environmental Engineering, Inc. has applied for a modification to an existing authority to construct for a Portable Soil Vapor Extraction Unit (Application No. 15435, P/O issued on 04/19/2007). The facility previous received a permit under A/N 19214 as they were within 1000 ft of a public school. The facility has accepted a reduced pounds per year of emissions of benzene as Regulation 2, Rule 5 trigger levels have been reduced for this compound. In addition, previously the thermal oxidizer combustion calculations were not calculated, so this application also includes the emissions from the abatement equipment.

This portable soil vapor extraction unit consists of a regenerative vacuum blower (S-1) with a maximum capacity of 250 scfm. Soil vapor and Groundwater will be extracted with vapor abatement achieved by thermal oxidation, catalytic oxidation or carbon adsorption. Groundwater will be treated by liquid phase carbon or disposed offsite. The thermal oxidizer will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. Emission monitoring for operation of the equipment will be conducted according to established Source Test methodology. Procedures are outlined in the conditions.

In accordance with Regulation 2-1-413, the District may issue “a single portable permit which will allow the source to operate anywhere in the District, provided the APCO approves the permit, and the source meets the definition of portable equipment set forth in Section 2-1-220.”

Operating conditions will be worded to ensure that the requirements, and any expressed emission limits of that section are satisfied, through proper notification, source testing and recordkeeping practices. Regarding emission limits, those of primary concern are the 10 tons per year limit for criteria pollutants, as well as the emission rates corresponding to the acceptable risk level as per Regulation 2-5.

For Portable Equipment per Regulation 2-1-220.4: “ The equipment is not operated within 1000 feet of the outer boundary of any K-12 school site, unless the applicable notice requirements of Health and Safety Code Section 42301.6 have been met.”

This location is within 1,000 feet of the outer boundary of St. Timothy Catholic School. For this operation, as the facility is within 1000 ft, they are required to apply for a permit application to amend the permit conditions and to conduct public notification per Regulation 2-1-412. There are no other K-12 schools within ¼ mile of this source. A Public Notice was prepared and sent out to the home address of the students of the school and to each address within a radius of 1,000 feet of the source.

Emission Calculations

This portable soil vapor extraction unit has an existing Authority to Construct (A/N 15435). Emission Calculations from A/N 15435 are as follow:

For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year within an inlet concentration corresponding to the initial soil concentration level. Generalized assumptions follow:

- * Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
- * Molecular weight of TPHg = 100 g/mole (value for "weathered gasoline"). Molecular weight of Benzene = 78 g/mole.
- * Influent values based on operational parameters of equipment: influent rate = 250 scfm (maximum); maximum influent concentration = 6000 ppmv POC, 90 ppmv benzene (assuming benzene is 1.5% of TPHg concentration); destruction efficiency = 98.5% for throughout.

Emissions of Precursor Organics:

$$6,000E-6 * 250 \text{ ft}^3 * 1440 \text{ min} * 28.32 \text{ l} * 1 \text{ mole} * 100 \text{ g} * 1 \# * (1 - 0.985) = 8.4 \text{ \#/day (abated)}$$

min 1 day 1 ft³ 24.15 l mole 454 g

Emissions of Toxic Air Contaminants {benzene}:

$$90E-6 * \frac{250 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32 \text{ l}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15 \text{ l}} * \frac{78 \text{ g}}{1 \text{ mole}} * \frac{1 \#}{454 \text{ g}} * (1 - 0.985) = \mathbf{1.0E-1 \#/\text{day}}$$
 (abated)

Combustion Calculations: for Thermal Oxidizer

Emission Factors are Taken From AP-42 Table 1.5-1 Emission Factors for LPG Combustion, Chapter 1.5 Liquefied Petroleum Gas Combustion: RACT emissions for NOx is 0.20 lb/MMBTU and RACT emissions for CO is 0.80 lb/MMBTU. Facility is complying with RACT requirements per April 13, 1999 District Policy.

	Fuel Input Table 1.5-1	Table 1.5-1
NOx	13.0 lb/1000 gal	0.1421 lb/MMBTU
CO	7.5 lb/1000 gal	0.0820 lb/MMBTU
POC	1.0 lb/1000 gal	0.0109 lb/MMBTU
PM10	0.7 lb/1000 gal	0.0077 lb/MMBTU

MMBTU/hr	0.191	
hours/yr	8760.000	
hours/day	24.000	
fuel rate gal/hr	2.083	2.087431694

Table 1.5-1 Emission Factors for LPG Combustion- (Propane Emission Factors)

	lb/1000 gal	lb/MMBTU	lbm/hr	lbm/yr	tons/yr	lbm/day
POC	1	0.010928962	0.002087	18.28590164	0.009143	0.050098361
NOX	13	0.142076503	0.027137	237.7167213	0.1188584	0.651278689
CO	7.5	0.081967213	0.015656	137.1442623	0.0685721	0.375737705
PM-10	0.7	0.007650273	0.001461	12.80013115	0.0064001	0.035068852
S02	9.58E-06	1.04724E-07	2E-08	0.000175219	8.761E-08	4.80053E-07

Heating Value of LPG =	91,500	Btu/gal
MW of Sulfur	32	
PPM Sulfur	254	ppm
Sulfur lbm/ft ³	2.11062E-05	
Sulfur lbm/100 Ft ³	2.11E-07	
Sulfur grams/100 ft ³	9.58E-05	

Highest Daily Emissions = **8.45 lb/day**
Annual Average = **8.45 lb/day**
RFP = **1.51 tons/yr**

Toxics

A Toxic Risk Screen need not be prepared as the applicant has agreed to monitor emissions of benzene and determined the cumulative annual emissions. Annual emissions are conditioned to the toxic

trigger level of 3.8 pounds. Highest daily emissions are limited to 0.010 pounds per day. The equipment will most likely be operated at one location for only a short duration so this annual limit should not be difficult to meet. In accordance the District Regulation 2-5, the impact is then insignificant as emissions do not trigger a risk screen; therefore the Toxics Section has recommended the issuing of this A/C with a daily benzene emission limit of **0.010 #/day**, or annual limit of **3.8 #/year**.

New Source Review

This proposed project will emit over 10 lbs per highest day and is therefore required to implement BACT. It will be achieved in practice and so will be reflected in the permit conditions below. Offsets need not be imposed as annual emissions will not exceed 10 tons. This meets the requirements of the Definition of Portable Equipment (Regulation 2-1-220)

CEQA

The project is considered to be ministerial under the Districts proposed 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. 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 9.2 of the permit handbook.

Compliance

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through a Thermal Oxidizer, Catalytic Oxidizer, or Carbon adsorption system at all times of operation. The POC emissions will be vented through a Thermal/Cat Ox or Carbon adsorption system at all times of operation. Emissions of the thermal/cat oxidizer is in compliance with Reg 2-2-112 as RACT is being used RACT. RACT for NOx is 0.20 lb/MMBTU and for CO it is 0.8 lb/MMBTU. Emission factors were taken from AP-42 Table 1.5-1. In addition, the facility is complying with Reg 2-2-212, as cumulative emissions for the abatement device are included in plant emissions.

Recommendation

Recommend that a change of conditions be issued for sources:

S-1: Portable Dual Phase Extraction System consisting of a 250 max scfm vacuum blower, and ancillary equipment, abated by A-1, Thermal Oxidizer, Catalytic Oxidizer or Carbon adsorption.

Conditions:

Application 22586; Plant 19396: Source S-1, Portable Soil Vapor Extraction System

1. The operator of this source shall notify the District at least 3 days prior to start-up of operation at any new location. The notification shall include:
 - a. Application Number (22586, 19214, 15435) and Plant Number (19396, 18119)
 - b. Street address, including zip code, for the location where the equipment will be operated.
 - c. The name and telephone number of a contact person where the equipment will be operated.
 - d. The date of initial start-up and estimated duration of operations at that location.
 - e. The distance from the source to the outer boundary of the nearest K-12 school, or indication that the distance is greater than 1000 feet.

- In the event that the start-up is delayed less than 5 days, the operator may provide telephone notice of said change to the assigned Plant Engineer in the Permit Services Division. If the start-up is delayed more than 5 days, written notification must be resubmitted.
2. This equipment shall not remain at any single location for a period in excess of 12 consecutive months, following the date of initial operation except as allowed under Section 2-1-220.10. If this portable equipment remains at any fixed location for more than 12 months, the portable permit will automatically revert to a conventional permanent location permit and will lose its portability. [Basis: Regulation 2-1-220.2]
 3. This portable equipment, S-1, shall operate at all times in conformance with the eligibility requirements set forth in Regulation 2-1-220 for portable equipment.
 4. This equipment is not to be operated within 1000 feet of the outer boundary of any K-12 school. Such operation will require the submittal of an application for a revised permit to operate so that the applicable requirements of the California Health and Safety Code Section 42301.6 may be met. These notification requirements have been satisfied for operation at the 640 Broadway Street in Vallejo, California 94590 and for the 335 South Norfolk Street in San Mateo. [Basis: Regulation 2-1-220.4].
 5. The owner/operator shall not operate S-1 Portable SVE system for longer than 120 hours within 1000 feet of a school. To operate for longer than 120 hours, the Permit Holder must submit an application to the District so that proper notification of your intended operation can be made known to the affected public in advance of any continued usage of the equipment. [Basis: Regulation 2-1-412]
 6. This equipment shall be used exclusively for the removal of non-chlorinated volatile organic compounds associated with petroleum products from extracted soil vapor. This shall be demonstrated by onsite sampling required in condition 10 below.
 7. Precursor Organic Compound (POC) emissions from Source S-1 shall be abated by Abatement device A-1, Thermal Oxidizer, Catalytic Oxidizer or Carbon adsorption, during all periods of operation. Soil vapor flow rate shall not exceed 250 scfm. [Basis: Regulation 8-47-301.1,2]
 8. The POC abatement efficiency of abatement device A-1 shall be maintained at a minimum of 98.5% by weight for inlet POC concentrations greater than or equal to 2000 ppmv (measured as hexane). For inlet concentrations below 2000 ppmv and greater than or equal to 200 ppmv, a minimum abatement efficiency of 97% shall be maintained. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained. The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as hexane). In no event shall benzene emissions to the atmosphere exceed 0.06 pounds per day. Annual emissions of benzene shall not exceed 3.8 pounds per year.
 9. While operating as a thermal oxidizer, the minimum operating temperature of A-1 shall not be less than 1400 degrees Fahrenheit. While operating as a catalytic oxidizer, the minimum operating temperature of A-1 shall not be less than 600 degrees Fahrenheit.
 10. To determine compliance with Condition Number 8, the dual-mode oxidizer shall be equipped with continuous measuring and temperature recording instrumentation. The temperature data collected from the temperature recorder shall be maintained in a file which shall be available for District inspection for a period of at least 2 years following the date on which such data are recorded.

11. To determine compliance with Condition 7, within 24 hours after start-up of the thermal/catalytic oxidizer at any new location, and within 24 hours of conversion from thermal to catalytic mode at an existing location, the operator of this source shall:
 - a. Analyze the inlet gas to determine the vapor flow rate and concentration of POC present.
 - b. Analyze exhaust gas to determine the flow rate, and the concentration of benzene and POC present.
 - c. Calculate the benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The soil vapor flow rate shall be decreased, if necessary, to demonstrate compliance with Condition 7.
 - d. Calculate the POC abatement efficiency based on the inlet and outlet gas sampling analysis. For the purpose of determining compliance with condition 7, the POC concentration shall be reported as hexane.
 - e. Submit to the District's Permit Services Division the test results and emission calculations within one month from the testing date. Samples shall be analyzed according to modified EPA test methods 8015 and 8021 or their equivalent to determine the concentrations of POC and benzene.

12. Within 30 days from the completion of each treatment operation at a given location, the operator of this source shall provide the assigned Plant Engineer in the Permit Services Division with a summary showing the following information:
 - a. The dates and total number of days that the equipment was at that location and the dates, and total number of days that the equipment was operated at that location.
 - b. A summary of the abatement efficiency and benzene emission rate as determined and reported in the start-up sampling report required by condition 10e above.
 - c. The results of any additionally performed emission test, analysis, or monitoring result logged in for the day of operation they were taken.
 - d. The total throughput of contaminated soil vapor processed by S-1 at that location (indicated in cubic feet).
 - e. The total emissions of benzene at that location based on the sampling results required by conditions 10 above (indicated in pounds).

13. During operation of the Activated Carbon Vessels, the operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
 - a. At the inlet to the second to last Carbon vessel in series.
 - b. At the inlet to the last Carbon vessel in series.
 - c. At the outlet of the Carbon vessel that is last in series prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a Carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purposes of these permit conditions.

14. These monitor readings shall be recorded in a monitoring log at the time they are taken. The monitoring results shall be used to estimate the frequency of Carbon change-out necessary to maintain compliance with conditions number 15 and 16, and shall be conducted on a daily basis. The operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the operator prior to a change to the monitoring schedule.

15. The second to last Carbon vessel shall be immediately changed out with unspent carbon upon breakthrough, defined as the detection at its outlet in excess of the higher of the following limits:
 - a. 10 % of the inlet stream concentration to the carbon bed.
 - b. 10 ppmv (measured as hexane).

16. The last Carbon vessel shall be immediately changed out with unspent Carbon upon detection at its outlet of 10 ppmv or greater (measured as hexane).
17. The operator of this source shall maintain the following information for each month of operation of the Activated Carbon Vessels:
 - a. Hours and time of operation.
 - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
 - c. The number of Carbon vessels removed from service.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [basis: Reg.523]

18. Within 30 days after the end of every calendar year, the operator of this source shall provide the assigned Plant Engineer in the Permit Services Division a year end summary showing the following information:
 - a. The location(s) at which the equipment was operated including the dates operated at each location.
 - b. The total throughput of contaminated soil vapor for the previous four quarters (indicated in cubic feet).
 - c. The total benzene emissions for the previous four quarters (indicated in pounds).

[Basis: Regulation 1-523]

19. The operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Permit to Operate. All measurements, records and data required to be maintained by the operator shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
20. Any non-compliance with these conditions shall be reported to the Compliance and Enforcement Division at the time that it is first discovered. The submittal shall detail the corrective action taken and shall include the data showing the exceedance as well as the time of occurrence.

by _____ date _____
Irma Salinas
Senior Air Quality Engineer