

Application #25949
Engineering Evaluation for a Portable SVE Unit
Plant #22257, Frey Environmental, Inc.

Background

Frey Environmental has applied for an Authority to Construct a Portable Soil Vapor Extraction Unit at various gasoline-contaminated sites within the District. Soil vapor extraction (SVE) will be accomplished by means of a regenerative vacuum blower, S-1 with a maximum operating capacity of 150 scfm. The unit will be abated by a Carbon Adsorption Unit, consisting of two 2,000 pound activated carbon vessels, in series. The liquid condensate from the SVE unit will be collected in 55 gallon drums and transported offsite for recycling.

In accordance with District 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 imposed to ensure that the requirements and any expressed emission limits of that section are satisfied through proper notification, source testing, and recordkeeping practices. The applicant will be required to provide written notification at the start of each of remediation project.

The proposed operation will emit volatile organic compounds (VOC), a criteria pollutant, and these organic emissions will include several toxic air contaminant (TAC) compounds, which are components of gasoline. Therefore, the emission limits of primary concern are the 10 ton per year limit on criteria pollutants for portable equipment, as well as TAC emission rates to limit project risk levels per District Regulation 2, Rule 5. Control of the VOC and TAC emissions will be achieved through carbon adsorption and monitored by measurement of both the influent and effluent VOC concentrations from the carbon vessels with a portable flame-ionization detector (OVA-FID) on a schedule reflecting loading rates and predicted carbon life. To ensure proper operation of equipment and verify attainment of steady-state conditions, carbon performance will be monitored daily for the first five days. Frey Environmental request a change of the monitoring schedule based on measured influent concentrations and calculated carbon loading. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent issuance of District approval.

The proposed location of the first remediation project is 599 South VanNess Avenue in San Francisco, which is within 1,000 feet of the outer boundary of St. Charles Borromeo School, located at 3250 18th Street in San Francisco. As such, this application triggers the public notification requirements in the CA Health and Safety Code and District Regulation 2-1-412.

Emission Calculations

For a conservative estimate of VOC emissions, it is assumed that the system will be operated for the entire year with an influent concentration equal to 3,100 ppmv, which is the highest measured value from analysis of the site samples at the first proposed site and based on the maximum processing capacity of the equipment. Note that this is the highest concentration from a single test well, but the actual process stream will be drawn from a number of wells and therefore the overall concentration in the gas stream to be treated will be much less. The Applicant has indicated that no projects exceeding this level of VOC contamination will be undertaken and permit conditions will be imposed to enforce this permitted limit.

The emission calculations have been based on the following data:

- * Standard conditions: Pressure = 1 atm; Temperature = 70°F; 1 mole occupies 24.15 liters.
- * Molecular weight of TPHg = 102 g/mole (value for "weathered gasoline").
- * Molecular weight of benzene = 78.11 g/mole

Application #25949,
 Plant #22257, Frey Environmental, Inc.

- * Influent rate of 150 scfm (maximum)
- * Maximum VOC influent concentration 3,100 ppmv
- * TAC concentrations: Benzene 0.7 ppmv Toluene 0.7 ppmv, Ethylbenzene 0.7 ppmv, MTBE 1.1 ppmv, Xylene 0.7 ppmv
- * Destruction/Control efficiency = 97% by weight.

Criteria Pollutants:

Emissions of Volatile Organic Compounds:

$$3,100E-6 * \frac{150 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32 \text{ l}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15 \text{ l}} * \frac{102 \text{ g}}{\text{mole}} * \frac{1 \#}{454 \text{ g}} * (1 - 0.97) = 5.29 \text{ \#/day, average (abated)}$$

$$\text{Annual Average VOC Emissions} = 19,931 \text{ lbs/yr} = 0.965 \text{ tons/yr}$$

TACs:

Emissions of Benzene:

$$0.7E-6 * \frac{150 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32 \text{ l}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15 \text{ l}} * \frac{78.11 \text{ g}}{\text{mole}} * \frac{1 \#}{454 \text{ g}} * (1 - 0.97) = 9.15E-4 \text{ \#/day (abated)}$$

The emissions have been calculated in the attached spreadsheet for each TAC compound and summarized below:

Soil Vapor Extraction System

Abatement Device:

Total Flow Rate

Destruction efficiency:

150 scfm

Efficiency 97.0%

150 ft³/min

Residual 3.0%

	Influent vapor concentration [ppmv]	Unabated Emission [lb/day]	Abated Emission [lb/day]	Abated Emission [lb/yr]	Exceeds Acute or Chronic Trigger Levels? (Yes/No)	Abated Emission [lb/hr]
Benzene	0.7	0.0306	0.00092	0.335	No	3.82E-05
Toluene	0.7	0.0361	0.00108	0.395	No	4.51E-05
Ethyl benzene	0.7	0.0416	0.00125	0.455	No	5.20E-05
Xylenes	0.7	0.0416	0.00125	0.455	No	5.20E-05
MTBE	1.1	0.0543	0.00163	0.594	No	6.78E-05

Cumulative Increase

The District tracks increases in emissions from each permitted facility. Since this is a new operation, there are no existing cumulative emissions. Since the equipment is portable, the criteria pollutant emission increase charged for this operation will be the maximum permitted emissions allowed at any single location, summarized below:

P#22257, Cumulative Emission Increases

Pollutant	Existing Total, tpy	Project Increase, tpy	New Total, tpy
PM10	0	0	0
VOC	0	0.965	0.965
NOx	0	0	0
SO2	0	0	0
CO	0	0	0

California Environmental Quality Act (CEQA) Requirements, District Regulation 2, Rule 1

District Regulation 2, Rule 1, Section 310 specifies that all proposed new and modified sources subject to District permit requirements must be reviewed in accordance with CEQA requirements, except for ministerial projects or projects exempt from CEQA under Section 2-1-312. The project is considered to be ministerial under Regulation 2-1-311. The engineering review for this project requires only the application of standard permit conditions and standard emission factors as outlined in Chapter 9.2 of the permit handbook and therefore is not discretionary as defined by CEQA. This project is therefore is not subject to CEQA review.

New Source Review, District Regulation 2, Rule 2

Per Regulation 2, Rule 2, Best Available Control Technology (BACT) is triggered if the maximum criteria pollutant emissions will be 10 pounds per day or more. The proposed project will not emit over 10 pounds of VOC per highest day and is therefore not subject to BACT review.

The VOC emission offset requirements are specified in District Regulation 2, Rule 2, Section 302. VOC offsets are required for facilities which are permitted to emit more than 10 tons per year. Since annual emissions from portable equipment may not exceed 10 tons per year, VOC offsets are not required for this operation.

The Prevention of Significant Deterioration (PSD) requirements in District Regulation 2, Rule 2, Section 304 apply to major facilities which emit more than 100 tons per year for specified source categories or 250 tons per year for unlisted source categories. Since this operation may not emit more than 10 tons per year, the PSD requirements do not apply. There are no federal NSPS, NESHAP, or MACT regulations that apply to soil vapor extraction operations.

Health Risk Assessment Requirements, District Regulation 2, Rule 5

The District's regulation concerning toxic air contaminant (TAC) emissions is codified in Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants. All TAC emissions from new and modified sources are subject to risk assessment review, if emissions of any individual TAC exceed either the acute or chronic emission thresholds defined in Table 2-5-1. Gasoline contains the TACs - benzene, toluene, ethyl benzene, xylenes, and methyl tert-butyl ether, so emissions of these compounds will occur during remediation of a gasoline-contaminated site. To quantify the expected level of TAC emissions, sampling and testing of the site has been performed.

Sampling of site contamination shows that TAC emissions from this site will not exceed any of the risk screening trigger levels in Table 2-5-1. The emission threshold levels listed in Table 2-5-1 are levels below which the resulting health risks are not expected to cause, or contribute significantly to, adverse health effects. Based on site test data for the first site, the benzene emissions would be less than 1 pound in 12 months, if the operation occurred for a full year. The equipment is expected to be operated at this location for only 4 months, so emissions at this location are expected to be significantly less than the trigger level. Since emissions of all TACs from the proposed project are less than the levels in Table 2-5-1, a Health Risk Screening Analysis has not been required for this project. In accordance with Table 2-5-1, the project impact is considered insignificant since emissions do not trigger a risk screen.

The annual TAC emissions have been conditioned to the toxic trigger level for benzene of 3.8 pounds, since benzene has the lowest trigger level of the TACs expected from remediation of gasoline-contaminated sites. Daily benzene emissions are limited to 0.01 pounds per day. Permit conditions will be imposed to prohibit operation of this equipment at future sites if projected TAC emissions exceed the trigger levels in Table 2-5-1.

Compliance

Based on the information submitted, this operation is expected to comply with District Regulation 8-47-301, Emission Control Requirements, Specific Compounds. The POC emissions will be vented through a carbon adsorption system at all times of operation. Operating conditions have been imposed to ensure that the equipment meets the criteria regarding portability pursuant to District Regulation 2-1-220. Criteria pollutants are not expected to exceed 10 tons per year, and emissions of toxic substances will be less than the trigger levels in Table 2-5-1.

This project is within 1,000 feet from the nearest K-12 school and is therefore subject to the public notification requirements of Regulation 2-1-412. The Applicant indicated that St. Charles Borromeo School, located at 3250 18th Street, is within 1,000 feet of the project location. If public notice requirements are triggered, all schools within a ¼ mile radius and all residences within 1,000 feet must also be notified of the proposed project. There is one additional school located within ¼ mile of the proposed operation, Marshall Elementary, located at 1575 15th Street.

Conditions

1. The owner/operator of S-1, Portable Dual Phase Extraction System, shall provide written notification to the Engineering Division at least 3 days prior to start-up of operation at any new location. The notification shall include:
 - a. Application #25949 and Plant #22257.
 - 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 1500 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 Engineering Division. If the start-up is delayed more than 5 days, written notification must be resubmitted. [basis: Reg. 2-1-220]
2. The owner/operator shall ensure that S-1 is operated at all times in conformance with the eligibility requirements set forth in Regulation 2-1-220 for portable equipment. [basis: Reg. 2-1-220]
3. The owner/operator shall ensure S-1 does not remain at any single location for a period exceeding 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: Reg. 2-1-220]
4. The owner/operator shall ensure that S-1 is not operated within 1,000 feet of the outer boundary of any K-12 school, unless the applicable requirements of the California Health and Safety Code Section 42301.6 have been met. In order to operate within 1,000 feet of the outer boundary of any K-12 school, the owner/operator must submit an application for a revised Permit to Operate, meet the public notification requirements, and be issued a revised Permit to Operate. The public notification requirements have been satisfied for operation at 599 South VanNess Avenue in San Francisco. [basis: Reg. 2-1-220.4]

5. The owner/operator shall ensure that this equipment is used exclusively for the removal of non-chlorinated volatile organic compounds (VOC) associated with petroleum products from extracted soil vapor. Total VOC concentration in the soil vapor shall not exceed 3,100 ppmv (measured as C₆). This shall be demonstrated by onsite sampling required in Part 13 below. [basis: Cumulative Increase]
6. The owner/operator shall ensure that the emissions from Source S-1 are abated by abatement device A-1, Carbon Adsorption Unit, consisting of two Activated Carbon Vessels, each 2,000 pound minimum carbon capacity, in series, during all periods of operation. The owner/operator shall operate the S-1 such that the flow rate from S-1 does not exceed 150 standard cubic feet per minute. [basis: Cumulative Increase, Reg. 8-47-301]
7. The owner/operator shall ensure that that benzene emissions to the atmosphere do not exceed 0.01 pounds per day, and annual emissions of benzene do not exceed 3.8 pounds per year. The owner/operator shall also ensure the VOC abatement efficiency of abatement device A-1 is maintained at the levels defined below:
 - a. For inlet VOC concentrations greater than or equal to 2000 ppmv (measured as C₆): 98.5% by weight, minimum.
 - b. For inlet VOC concentrations below 2000 ppmv and greater than or equal to 200 ppmv (measured as C₆): 97% by weight, minimum.
 - c. For inlet VOC concentrations below 200 ppmv (measured as C₆): 90% by weight, minimum.The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as C₆). [basis: Cumulative Increase, Reg. 2-5, Reg. 8-47-301]
8. During operation of A-1, Carbon Adsorption Unit, the owner/operator shall monitor daily 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 Activated Carbon Vessel in series.
 - b. At the inlet to the last Activated Carbon Vessel in series.
 - c. At the outlet of the Activated 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. For the purpose of these permit conditions, concentrations measured with the carbon filter tip in place shall be considered methane. [basis: Cumulative Increase, Reg. 8-47-301]
9. The owner/operator shall record the monitor readings from Part 8 in a log at the time they are taken. The owner/operator shall use the monitoring results to estimate the frequency of carbon change-out necessary to maintain compliance with Parts 10 and 11 on a daily basis. The owner/operator may request a change in monitoring schedule based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels, by submittal of such request and measurements taken at the site during operation of the source to the District. Written approval by the District's Engineering Division must be received by the owner/operator prior to changing the monitoring schedule. [basis: Cumulative Increase, Reg. 8-47-301]
10. The owner/operator shall immediately change out the second to last Activated Carbon Vessel with unspent carbon upon breakthrough. Breakthrough is defined as the detection at its outlet of the higher of the following:
 - a. 10 % of the inlet stream concentration to the carbon bed.
 - b. 10 ppmv (measured as hexane).[basis: Cumulative Increase, Reg. 8-47-301]

11. The owner/operator shall immediately change out the last Activated Carbon Vessel with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane). [basis: Cumulative Increase, Reg. 8-47-301]
12. The owner/operator shall maintain the following information for each Activated Carbon Vessel every month of A-1 operation:
 - a. Hours and time of operation.
 - b. Each emission test, analysis, and monitoring results logged in for the day of operation they were taken.
 - c. The number of Activated Carbon Vessels removed from service.
 - d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.The owner/operator shall retain and make available for inspection by the District such records for two years following the date the data is recorded. [basis: Reg. 1-523, Reg. 8-47-501]
13. To determine compliance with Part 7, within ten days after start-up at a new location, the owner/operator of S-1 shall:
 - a. Analyze inlet gas stream to determine the flow rate and concentration of VOC present.
 - b. Analyze exhaust gas to determine the flow rate, and the concentration of benzene and VOC present.
 - c. Calculate the benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The owner/operator shall decrease the soil vapor flow rate from S-1, if necessary, to demonstrate compliance with Part 7.
 - d. Calculate the VOC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with Part 7, the owner/operator shall report the VOC concentration as hexane.
 - e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. The owner/operator shall analyze samples according to modified EPA Test Methods 8015 and 8020 or their equivalent to determine the concentrations of VOC and benzene.[basis: Cumulative Increase, Reg. 2-5]
14. Within 30 days from the completion of each treatment operation at a given location, the owner/operator shall provide the assigned Plant Engineer in the Engineering Division with a summary of 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 Part 13 above.
 - c. The results of any additional 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 Part 13 above.[basis: Cumulative Increase, Reg. 1-523, Reg. 2-1-220, Reg. 8-47-501]
15. Within 30 days after the end of every calendar year, the owner/operator shall provide the assigned Plant Engineer in the Engineering 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: Cumulative Increase, Reg. 1-523, Reg. 8-47-501]

16. The owner/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 shall be retained for at least two years following the date upon which the data is recorded. [basis: Cumulative Increase, Reg. 1-523, Reg. 8-47-501]
17. The owner/operator shall report any non-compliance with these conditions 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.** [basis: Cumulative Increase, Reg. 2-1-403]

Recommendation

The District has reviewed the material contained in the permit application for the proposed project and has made a preliminary determination that the project is expected to comply with all applicable requirements of District, state, and federal air quality-related regulations. The preliminary recommendation is to issue an Authority to Construct for the equipment listed below. However, the proposed source will be located within 1000 feet of a school, which triggers the public notification requirements of District Regulation 2-1-412.6. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that the District initiate a public notice and consider any comments received prior to taking any final action on issuance of an Authority to Construct for the following source:

S-1, Portable Dual Phase Extraction System, Frontier Environmental Services Model DVT LRP, consisting of a liquid ring vacuum blower, 150 scfm maximum capacity, and ancillary equipment
Abated by A-1, Carbon Adsorption Unit, Carbon Resources V-2000, consisting of two 2,000 lb minimum activated carbon vessels, in series.

And Letter of Exemption for the following:

Enclosed Storage Drums less than 260 gallons exempt per 2-1-123.1 and 2-1-123.2

by _____
Tamiko Endow, Air Quality Engineer

Date _____