

DRAFT Engineering Evaluation
Gracie Jiu-Jitsu Redwood City
701 Arguello Street, Redwood City, California 94063
Plant No. 25201 (Site No. E5201)
Application No. 31685
Project Description: Soil Vapor Extraction System

Background

On behalf of Gracie Jiu-Jitsu Redwood City, Roux Associates, Inc. has applied for an Authority to Construct for the following equipment:

- S-1 Soil Vapor Extraction System**
Vacuum Blower Make: AirTech, Model: 3BA150, Maximum 200 CFM
Abated by A-1, Activated Carbon Vessels, and A-2, Potassium Permanganate Vessels

- A-1 Activated Carbon Vessels**
Two (2) Parallel series of two (2) 200-LBS Activated Carbon Vessels, Four (4) total
Make: Mako Industries, Model: Mako-55

- A-2 Potassium Permanganate Vessels**
One (1) Parallel series of one (1) 200-LBS Potassium Permanganate Vessels, Two (2) total
Make: Hydrosil, Model: HS-600

The site is located in a single-story commercial building that is currently operating as a single-tenant martial arts studio, but was previously divided into three individual tenant spaces. One of the former tenants was occupied by a dry cleaner. Environmental investigations of the site have identified the presence of chlorinated volatile organic compounds (CVOC) and petroleum hydrocarbons in the soil, soil vapor, and groundwater beneath the site. The most recent lab analysis of the soil at the site was conducted in December 2021. To remediate the contamination, Roux Associates has proposed to install S-1, Soil Vapor Extraction system.

S-1 will include a maximum 200-cfm vacuum blower to remove volatile organic compounds (VOC). Contaminated soil vapor will be routed through two (2) parallel series of three (3) adsorption vessels to remove VOCs before reaching the atmosphere through a stack located on the roof. Each parallel series of adsorption vessels will include two (2) 200-lbs activated carbon vessels and one (1) 200-lbs potassium permanganate vessel. S-1 will be located within 1,000 ft of a K-12 school and is subject to a public notice.

Procedures are outlined in the conditions found below. Effluent volatile organic compound (VOC) concentrations will be monitored with a flame-ionization detector (FID) on a schedule reflecting current loading rates and predicted carbon capacity. Monitoring schedule changes will be allowed based on monitoring data collected.

Emission Calculations

Soil vapor data will be used to estimate precursor organic compound (POC), non-precursor organic compound (NPOC), and toxic air contaminant (TAC) emissions. It is assumed that the equipment can operate 24 hours a day, 365 days a year. The following are assumptions used to estimate emissions.

- Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15 Liters (or 386.8 ft³/lb-mol)
- The inlet concentration of pollutants corresponds to the maximum concentration found from lab analysis of soil vapor.
- Hydrocarbons will be abated by two (2) parallel series of adsorption vessels. Each series is comprised of two (2) 200-lb minimum activated carbon vessels, and one (1) potassium permanganate vessel. POC/NPOC cumulative emissions are based on a 2.6-ppmv total organic effluent concentration since the last threshold changeout level on the last adsorption vessel will be limited 2.6 ppmv, measured as methane.
- Toxic Air Contaminants (TAC) emissions will be based on soil vapor data submitted with this application.
- The organic influent flow rate of 200 scfm was used in the calculations.
- A minimum abatement efficiency of 90% was assumed in the calculations.

Table 1. Emissions Review for Soil Vapor Extraction System (S-1)

Pollutant	CAS	Pollutant Designation			Inlet Conc. (µg/m ³)	Unabated Emission Rates			
		POC	NPOC	TAC		Hourly (lbs/hr)	Daily (lbs/day)	Annual (lbs/yr)	Annual (tons/yr)
1,1-Dichloroethene	75-35-4	X		X	1.9	1.42E-06	3.41E-05	0.012	6.23E-06
2-Butanone	78-93-3	X		X	89	6.66E-05	1.60E-03	0.584	2.92E-04
2-Hexanone	591-78-6	X			13	9.73E-06	2.34E-04	0.085	4.26E-05
4-Methyl-2-Pentanone	108-10-1	X			2.5	1.87E-06	4.49E-05	0.016	8.20E-06
Acetone	67-64-1		X		110	8.23E-05	1.98E-03	0.721	3.61E-04
Benzene	71-43-2	X		X	11	8.23E-06	1.98E-04	0.072	3.61E-05
Carbon Disulfide	75-15-0	X		X	29	2.17E-05	5.21E-04	0.190	9.51E-05
cis-1,2-Dichloroethene	156-59-2	X			110	8.23E-05	1.98E-03	0.721	3.61E-04
Ethylbenzene	100-41-4	X		X	2.4	1.80E-06	4.31E-05	0.016	7.87E-06
Freon 12	75-71-8		X		2	1.50E-06	3.59E-05	0.013	6.56E-06
Isopropanol	67-63-0	X		X	400	2.99E-04	7.19E-03	2.623	1.31E-03
Methylene Chloride	75-09-2		X	X	11	8.23E-06	1.98E-04	0.072	3.61E-05
n-Hexane	110-54-3	X		X	33	2.47E-05	5.93E-04	0.216	1.08E-04
Tetrachloroethene	127-18-4		X	X	16,000	1.20E-02	0.29	104.9	0.052
Toluene	108-88-3	X		X	5	3.74E-06	8.98E-05	0.033	1.64E-05
trans-1,2-Dichloroethene	156-60-5		X		9.4	7.04E-06	1.69E-04	0.062	3.08E-05
Trichloroethene	79-01-6	X		X	100	7.48E-05	1.80E-03	0.656	3.28E-04
Vinyl chloride	75-01-4	X		X	210	1.57E-04	3.77E-03	1.377	6.88E-04

Table 1 (continued). Emissions Review for Soil Vapor Extraction System (S-1)

Pollutant	CAS	Pollutant Designation			Abatement Efficiency (%w/w)	Abated Emission Rates			
		POC	NPOC	TAC		Hourly (lbs/hr)	Daily (lbs/day)	Annual (lbs/yr)	Annual (tons/yr)
1,1-Dichloroethene	75-35-4	X		X	90%	1.42E-07	3.41E-06	1.25E-03	6.23E-07
2-Butanone	78-93-3	X		X	90%	6.66E-06	1.60E-04	0.058	2.92E-05
2-Hexanone	591-78-6	X			90%	9.73E-07	2.34E-05	8.52E-03	4.26E-06
4-Methyl-2-Pentanone	108-10-1	X			90%	1.87E-07	4.49E-06	1.64E-03	8.20E-07
Acetone	67-64-1		X		90%	8.23E-06	1.98E-04	0.072	3.61E-05
Benzene	71-43-2	X		X	90%	8.23E-07	1.98E-05	7.21E-03	3.61E-06
Carbon Disulfide	75-15-0	X		X	90%	2.17E-06	5.21E-05	0.019	9.51E-06
cis-1,2-Dichloroethene	156-59-2	X			90%	8.23E-06	1.98E-04	0.072	3.61E-05
Ethylbenzene	100-41-4	X		X	90%	1.80E-07	4.31E-06	1.57E-03	7.87E-07
Freon 12	75-71-8		X		90%	1.50E-07	3.59E-06	1.31E-03	6.56E-07
Isopropanol	67-63-0	X		X	90%	2.99E-05	7.19E-04	0.262	1.31E-04
Methylene Chloride	75-09-2		X	X	90%	8.23E-07	1.98E-05	7.21E-03	3.61E-06
n-Hexane	110-54-3	X		X	90%	2.47E-06	5.93E-05	0.022	1.08E-05
Tetrachloroethene	127-18-4		X	X	90%	1.20E-03	2.87E-02	10.49	5.25E-03
Toluene	108-88-3	X		X	90%	3.74E-07	8.98E-06	3.28E-03	1.64E-06
trans-1,2-Dichloroethene	156-60-5		X		90%	7.04E-07	1.69E-05	6.16E-03	3.08E-06
Trichloroethene	79-01-6	X		X	90%	7.48E-06	1.80E-04	0.066	3.28E-05
Vinyl chloride	75-01-4	X		X	90%	1.57E-05	3.77E-04	0.138	6.88E-05

Notes:

1. Influent data was obtained from lab data of soil vapor sampling performed at the site.
2. It is assumed that equipment will operate 24 hours a day, 365 days a year.

Table 2. Organic Emissions Review –Soil Vapor Extraction System

Pollutant	Effluent Volumetric Concentration (ppmv CH4)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
POC	0.15	7.54E-05	1.81E-03	0.66	0.0003
NPOC	2.43	1.21E-03	0.029	10.58	0.005
Total Organics	2.6	1.28E-03	0.031	11.24	0.006

Cumulative Increase

Table 3. Cumulative Increase			
Pollutant	Current Permitted Emissions, Post 4/5/1991 (ton/yr)	Application New Emissions Increase (ton/yr)	New Cumulative Increase (ton/yr)
POC	0.000	0.000	0.000

Toxic Risk Screening

A project is subject to Regulation 2, Rule 5 if emissions of toxic air contaminants (TAC) exceed any acute or chronic trigger levels in Table 2-5-1 of Regulation 2-5. There are no related sources at this facility within the 5-year lookback period. Therefore, the project review of TAC emissions will include only the emissions from S-1. Table 4 provides a summary of the project TAC emissions.

Table 4. Project Toxic Air Contaminant Emissions						
Pollutant	CAS #	Hourly Emission Rate (lb/hr)	Acute Trigger Level (lb/hr)	Annual Emission Rate (lb/yr)	Chronic Trigger Level (lb/yr)	Exceeds Acute or Chronic Trigger Level?
1,1-Dichloroethene	75-35-4	1.42E-07		1.25E-03	2.70E+03	No
2-Butanone	78-93-3	6.66E-06	5.80E+00	5.84E-02		No
Benzene	71-43-2	8.23E-07	1.20E-02	7.21E-03	2.90E+00	No
Carbon Disulfide	75-15-0	2.17E-06	2.70E+00	1.90E-02	3.10E+04	No
Ethylbenzene	100-41-4	1.80E-07		1.57E-03	3.30E+01	No
Isopropanol	67-63-0	2.99E-05	1.40E+00	2.62E-01	2.70E+05	No
Methylene Chloride	75-09-2	8.23E-07	6.20E+00	7.21E-03	8.20E+01	No
n-Hexane	110-54-3	2.47E-06		2.16E-02	2.70E+05	No
Tetrachloroethene	127-18-4	1.20E-03	8.80E+00	1.05E+01	1.40E+01	No
Toluene	108-88-3	3.74E-07	2.20E+00	3.28E-03	1.20E+04	No
Trichloroethene	79-01-6	7.48E-06		6.56E-02	4.10E+01	No
Vinyl chloride	75-01-4	1.57E-05	8.00E+01	1.38E-01	1.10E+00	No
1,1-Dichloroethene	75-35-4	1.42E-07		1.25E-03	2.70E+03	No
2-Butanone	78-93-3	6.66E-06	5.80E+00	5.84E-02		No

As shown in Table 4, TAC emissions from S-1 are not expected to exceed any applicable acute or chronic trigger level. Therefore, S-1 is not subject to the requirements of Regulation 2, Rule 5.

Offsets

Pursuant to Regulation 2-2-302, offsets must be provided for any new or modified source at a facility that emits, or is permitted to emit, more than 10 tons per year of precursor organic compounds (POCs) or nitrogen oxides (NO_x). Furthermore, pursuant to Regulation 2-2-303 offsets must be provided for any

new or modified source at a major facility with a cumulative increase that exceeds 1.0 ton per year of PM₁₀, PM_{2.5}, or sulfur dioxide (SO₂).

The facility is not expected to have a PTE greater than 10 tons per year of POC or NO_x, nor is the facility a major facility of PM₁₀, PM_{2.5}, and SO₂. Therefore, the requirements of Regulations 2-2-302 and 2-2-303 do not apply.

Best Available Control Technology (BACT)

In accordance with Regulation 2-2-301, Best Available Control Technology (BACT) is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxides (SO₂), particulate matter less than 10 micrometer (PM₁₀) and particulate matter less than 2.5 micrometer (PM_{2.5}).

NPOC and POC emissions are expected to be below 10 lb/day. Therefore, a BACT review is not required.

California Environmental Quality Act (CEQA)

This project is classified as ministerial under the District Regulation 2-1-311, because the engineering review for this project requires only the application of standard emission factors and established formulas as specified in Chapter 9.2 of the District's Permit Handbook. This review follows objective procedures and applies standard permit conditions; and therefore, the review of this project is not discretionary as defined by CEQA. Since this project is ministerial, it is not subject to CEQA review requirement of Regulation 2-1-310, and no further CEQA analysis is required.

Statement of Compliance

Regulation 8, Rule 47 – Air Stripping & Soil Vapor Extraction Operations

Based on the information submitted, this operation is expected to meet the 90% control requirement of Regulations 8-47-301 and 8-47-302. Emissions will be vented through a carbon and potassium permanganate adsorption system at all times of operation.

Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAPS) are not triggered.

Public Notification (Regulation 2-1-412)

S-1 is located in an overburdened community (OBC) but does not require an HRA, so an OBC public notice is not required. However S-1 will be located within 1,000 feet of the outer boundary of Sequoia High School and Orion Alternative School. Therefore, this application is subject to the public notification requirements of Regulation 2-1-412 due to an increase in toxic emissions. A public notice will be sent to all parents of students of the above-mentioned school(s) and all residents within 1,000 feet of the facility. There will be a 30-day public comment period.

Permit Conditions**Permit Condition #27806**

1. During all periods of operation, the owner/operator shall abate the precursor organic compound (POC)/non-precursor organic compound (NPOC) emissions from the Soil Vapor Extraction system (S-1) with the Activated Carbon Vessels (A-1) and Potassium Permanganate Vessels (A-2), consisting of two (2) parallel series of adsorption vessels that each contain a minimum of two (2) 200 lb activated carbon vessels, followed by one (1) 200 lb potassium permanganate vessel. The influent vapor flow rate shall not exceed 200 scfm. In no event shall the toxic air contaminant (TAC) emissions to the atmosphere from S-1 exceed the trigger levels listed in District Regulation 2-5, Table 2-5-1. [Basis: Regulations 8-47-301 and 8-47-302 and Toxics].
2. Upon initial start-up, the owner/operator shall take air samples from S-1 for laboratory analysis using EPA Method TO-15. The air samples shall be taken at the following locations:
 - a. At the inlet to the parallel series of adsorption vessels, before the vapor stream is split.
 - b. At the outlet of each carbon vessel that is last in series prior to venting to each potassium permanganate vessel.
 - c. At the outlet of the parallel series of adsorption vessels, after the vapor streams are combined, and prior to venting to the atmosphere.

The owner/operator shall use the results from the laboratory report to calculate TAC emissions emitted to the atmosphere, using the maximum design flowrate of S-1. The owner/operator shall submit the laboratory report and calculated TAC emissions within 21 days of the initial startup, to demonstrate compliance with Parts 1, 6 and 7 of this condition. [Basis: Regulation 2-1-403]

3. During operation of A-1 and A-2, the owner/operator shall monitor with a 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 parallel series of adsorption vessels, before the vapor stream is split.
 - b. At the inlet to each carbon vessel that is last in the parallel series.
 - c. At the outlet of each carbon vessel that is last in the parallel series, prior to venting to the potassium permanganate vessels.
 - d. At the outlet of the potassium permanganate vessels, after the vapor streams are combined, and prior to venting to the atmosphere.[Basis: Regulations 1-523 and 2-1-403]
4. The owner/operator shall conduct monitoring on a daily basis in accordance with Part 3 of this condition. The owner/operator shall record these monitor readings in a monitoring 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 1, 5, 6 and 7 of this condition. The owner/operator may reduce the monitoring frequency in accordance with the following schedule if monitoring readings of the effluent are shown to be below the below noted volumetric concentration thresholds:

- a. If the owner/operator can demonstrate two (2) weeks of consecutive daily monitoring readings lower than 1.3 ppmv, measured as methane, the monitoring frequency may be reduced to weekly.
 - b. After the monitoring frequency has been reduced to weekly, if the owner/operator can demonstrate one (1) month of consecutive weekly monitoring readings lower than 1.3 ppmv, measured as methane, the monitoring frequency may be reduced to once every two (2) weeks.
 - c. After the monitoring frequency has been reduced to once every two (2) weeks, if the owner/operator can demonstrate one (1) month of consecutive bi-weekly readings lower than 1.3 ppmv, measured as methane, the monitoring frequency may be reduced to monthly.
 - d. If any subsequent results from monitoring exceed 1.3 ppmv, measured as methane, the owner/operator shall revert to daily monitoring. If monitoring reverts back to daily, the owner/operator may reduce the monitoring frequency in accordance with Parts 4(a) through (c) of this condition.
[Basis: Cumulative Increase, Toxics, and Regulations 1-523 and 2-1-403]
5. The second to last carbon vessel in each series 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 methane).
[Basis: Cumulative Increase and Regulations 1-523 and 2-1-403]
6. The last carbon vessel shall be immediately changed out with unspent carbon upon detection at its outlet of 2.6 ppmv or greater (measured as methane). [Basis: Cumulative Increase and Regulations 1-523 and 2-1-403]
7. The potassium permanganate vessel shall be immediately changed out with unspent potassium permanganate upon breakthrough, defined as the detection of vinyl chloride at its outlet in excess of the following limit:
- a. 10% of the pre-abatement device inlet stream concentration of vinyl chloride.
[Basis: Regulation 8-47-301]
8. The owner/operator shall maintain the following information for each month of operation:
- 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 and/or potassium permanganate vessels removed from service.
 - d. Total throughput of soil vapor from source S-1 in standard cubic feet.
- Such records shall be retained and made available for inspection by the District for two (2) years following the date the data is recorded. [Basis: Recordkeeping]
9. The owner/operator shall report any noncompliance with these conditions to the Compliance and Enforcement Division at the time that it is first discovered. The owner/operator shall detail the

corrective action taken and include the data showing the exceedance as well as the time of occurrence in the submittal. [Basis: Regulation 2-1-403]

10. 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 condition. All measurements, records and data required to be maintained by the operator shall be retained for at least two (2) years following the date the data is recorded. [Basis: Regulation 1-523]

Upon final completion of the remediation project, the operator shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Regulation 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/Permit to Operate for the equipment listed below. However, the proposed source will be located within 1,000 feet of at least one school, which triggers the public notification requirements of District Regulation 2-1-412. 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/Permit to Operate for the following source:

- S-1 Soil Vapor Extraction System**
Vacuum Blower Make: AirTech, Model: 3BA150, Maximum 200 CFM
Abated by A-1, Activated Carbon Vessels, and A-2, Potassium Permanganate Vessels
- A-1 Activated Carbon Vessels**
Two (2) Parallel series of two (2) 200-LBS Activated Carbon Vessels, Four (4) total
Make: Mako Industries, Model: Mako-55
- A-2 Potassium Permanganate Vessels**
One (1) Parallel series of one (1) 200-LBS Potassium Permanganate Vessels, Two (2) total
Make: Hydrosil, Model: HS-600

By: _____



Date: 10/17/22

Cameron Fee
Air Quality Engineer I