

Engineering Evaluation
1515 California Street
1515 California Street, San Francisco, CA 94109-4109
Plant No. 24955
Application No. 31081
Project Description: Sub-Slab Depressurization System

Background

On behalf 1515 California Street, Geokinetics Inc. has applied for a Permit to Operate for the following equipment:

S-1 Sub-Slab Depressurization System
Fantech FR160 Blower, Maximum 160 CFM
Abated by:

A-1 Two-200 pounds Granulated Activated Carbon (GAC) vessels in series.

S-1 will operate at 1515 California Street, San Francisco, CA 94109-4109. This is not considered an Overburdened Community (OBC).

The applicant has operated a passive Sub-Slab Depressurization (SSD) system since 2017 and is now applying to permit a more recently installed active SSD system. The active system started operations in August 2022. Fees pursuant to Regulation 3-310 have been paid.

The system consists of an SSD venting system, and one blower under a four-story building, to actively vent volatile organic compounds (VOC) and prevent them from entering the building. The blower operates continuously with a maximum outflow of 160 CFM. The system is abated by two granulated activated carbon vessels with a capacity of 200 pounds each one and with an abatement efficiency of 90% by weight. Previous subsurface assessments identified residual contamination from a former dry-cleaning facility between 1935 and 2010 at the Site. Chlorinated Volatile Organic Compounds (CVOCs) associated with the dry cleaner were identified as the constituent of concern in soil, soil gas, and groundwater. Tetrachloroethene (PCE) was the primary contaminant of concern along with its degradation byproducts.

The property is improved with a four-story building over a partial basement. There is a ground floor common area, three ground floor commercial spaces, and three floors of residential apartments over the common area and commercial spaces that are categorized as Single Residence Occupancy Tourist licensed rooms. The San Francisco Department Environmental Health (SFDEH) is the lead environmental oversight agency for the Site, as part of the ongoing remediation of subsurface impacts associated with the former site use. The SFDEH has required the structure at this Site to incorporate active sub-slab mitigation and depressurization measures.

VOC expected emissions were based on laboratory results from samples taken at the site in June 28, 2023.

The applicant will be required to provide written notification at the start of the operation and to stay below the acute and chronic trigger levels of Regulation 2-5. Procedures are outlined in the permit conditions 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.

Emission Calculations

Initial 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)
- Toxic Air Contaminants (TAC) emissions will be based on soil vapor data submitted with this application.
- The organic flow rate of 160 cfm per two blowers as agreed upon by the applicant.
- The system will be abated by GAC vessels with an abatement efficiency of 90% by weight.

Table 1. SSD System Emissions for S-1						
Pollutant	CAS #	Unabated Emissions				
		Inlet Conc. (ug/m³)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
Tetrachloroethene (PCE)	127-18-4	6790	4.1E-03	9.8E-02	3.6E+01	0.018
Trichloroethene (TCE)	79-01-6	14.5	8.7E-06	2.1E-04	7.6E-02	0.000
Acetone	67-64-1	18	1.1E-05	2.6E-04	9.4E-02	0.000
Benzene	71-43-2	0.613	3.7E-07	8.8E-06	3.2E-03	0.000
Carbon disulfide	75-15-0	0.507	3.0E-07	7.3E-06	2.7E-03	0.000
Carbon tetrachloride	56-23-5	0.8	4.8E-07	1.1E-05	4.2E-03	0.000
Chloroform	67-66-3	2.08	1.2E-06	3.0E-05	1.1E-02	0.000
Cyclohexane	110-82-7	1.55	9.3E-07	2.2E-05	8.1E-03	0.000
cis-1,2-Dichloroethene	156-59-2	0.896	5.4E-07	1.3E-05	4.7E-03	0.000
Ethanol	64-17-5	35.6	2.1E-05	5.1E-04	1.9E-01	0.000
Ethylbenzene	100-41-4	0.832	5.0E-07	1.2E-05	4.4E-03	0.000
Trichlorofluoromethane	75-69-4	1.37	8.2E-07	2.0E-05	7.2E-03	0.000
Dichlorodifluoromethane	75-71-8	3.17	1.9E-06	4.6E-05	1.7E-02	0.000
1,2-Dichlorotetrafluoroethane	76-14-2	2.48	1.5E-06	3.6E-05	1.3E-02	0.000
n-Hexane	110-54-3	1.32	7.9E-07	1.9E-05	6.9E-03	0.000
Methylene Chloride	75-09-2	0.646	3.9E-07	9.3E-06	3.4E-03	0.000
2-Butanone (MEK)	78-93-3	2.9	1.7E-06	4.2E-05	1.5E-02	0.000
2-Propanol	67-63-0	32.4	1.9E-05	4.7E-04	1.7E-01	0.000
Styrene	100-42-5	0.825	4.9E-07	1.2E-05	4.3E-03	0.000
Tetrahydrofuran	109-99-9	28.2	1.7E-05	4.1E-04	1.5E-01	0.000
Toluene	108-88-3	16.5	9.9E-06	2.4E-04	8.7E-02	0.000
1,2,4-Trimethylbenzene	95-63-6	0.589	3.5E-07	8.5E-06	3.1E-03	0.000
2,2,4-Trimethylpentane	540-84-1	7.24	4.3E-06	1.0E-04	3.8E-02	0.000
Xylenes, <i>total</i>	1330-20-7	4.52	2.7E-06	6.5E-05	2.4E-02	0.000

Notes:

1. Influent data was obtained from the samples analyzed by Pace Analytical and included in the application submittal package. Samples were taken at the site in June 2023.
2. It is assumed that equipment will operate 24 hours a day, 365 days a year.
3. Per Regulation 1-234 and 40 CFR 51.100(s)(1), Acetone, Carbon Disulfide Dichlorodifluoromethane, Methylene Chloride, Tetrachloroethylene (PCE), and Trichlorofluoromethane have been determined to have negligible photochemical reactivity and is considered a Non-Precursor Organic Compounds (NPOC).

Table 2. SSD System Emissions for S-1						
Pollutant	CAS #	Abated Emissions				
		Abatement Efficiency (%)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
Tetrachloroethene (PCE)	127-18-4	90%	4.1E-04	9.8E-03	3.6E+00	0.002
Trichloroethene (TCE)	79-01-6	90%	8.7E-07	2.1E-05	7.6E-03	0.000
Acetone	67-64-1	90%	1.1E-06	2.6E-05	9.4E-03	0.000
Benzene	71-43-2	90%	3.7E-08	8.8E-07	3.2E-04	0.000
Carbon disulfide	75-15-0	90%	3.0E-08	7.3E-07	2.7E-04	0.000
Carbon tetrachloride	56-23-5	90%	4.8E-08	1.1E-06	4.2E-04	0.000
Chloroform	67-66-3	90%	1.2E-07	3.0E-06	1.1E-03	0.000
Cyclohexane	110-82-7	90%	9.3E-08	2.2E-06	8.1E-04	0.000
cis-1,2-Dichloroethene	156-59-2	90%	5.4E-08	1.3E-06	4.7E-04	0.000
Ethanol	64-17-5	90%	2.1E-06	5.1E-05	1.9E-02	0.000
Ethylbenzene	100-41-4	90%	5.0E-08	1.2E-06	4.4E-04	0.000
Trichlorofluoromethane	75-69-4	90%	8.2E-08	2.0E-06	7.2E-04	0.000
Dichlorodifluoromethane	75-71-8	90%	1.9E-07	4.6E-06	1.7E-03	0.000
1,2-Dichlorotetrafluoroethane	76-14-2	90%	1.5E-07	3.6E-06	1.3E-03	0.000
n-Hexane	110-54-3	90%	7.9E-08	1.9E-06	6.9E-04	0.000
Methylene Chloride	75-09-2	90%	3.9E-08	9.3E-07	3.4E-04	0.000
2-Butanone (MEK)	78-93-3	90%	1.7E-07	4.2E-06	1.5E-03	0.000
2-Propanol	67-63-0	90%	1.9E-06	4.7E-05	1.7E-02	0.000
Styrene	100-42-5	90%	4.9E-08	1.2E-06	4.3E-04	0.000
Tetrahydrofuran	109-99-9	90%	1.7E-06	4.1E-05	1.5E-02	0.000
Toluene	108-88-3	90%	9.9E-07	2.4E-05	8.7E-03	0.000
1,2,4-Trimethylbenzene	95-63-6	90%	3.5E-08	8.5E-07	3.1E-04	0.000
2,2,4-Trimethylpentane	540-84-1	90%	4.3E-07	1.0E-05	3.8E-03	0.000
Xylenes, total	1330-20-7	90%	2.7E-07	6.5E-06	2.4E-03	0.000

Table 3. Organic Emissions Review for S-1					
Pollutant	Effluent Volumetric Concentration (ppmv)	Hourly Emission Rate (lb/hr)	Daily Emission Rate (lb/day)	Annual Emission Rate (lb/yr)	Annual Emission Rate (ton/yr)
POC	0.02	9.2E-06	2.2E-04	0.08	0.000
NPOC	1.02	4.1E-04	9.8E-03	3.57	0.002
Total VOC	1.05	4.2E-04	1.0E-02	3.7E+00	0.002

Notes:

1. POC and NPOC emissions are based on Table 2. The effluent volumetric concentrations are measured as methane.
2. The total VOC effluent volumetric concentration will be used as guide for carbon breakthrough monitoring in the conditions.
3. Annual emissions will be rounded up and used as limit in the permit conditions as follows: POC 0.1 lb/yr, NPOC 3.6 lb/yr. After rounding up.

Cumulative Increase

There aren't any other sources permitted within the facility. Cumulative increase accounts only for emissions in this application.

Table 4. Cumulative Increase			
Pollutant	Current Permitted Emissions, Post 4/5/1991 (ton/yr)	Application New Emissions Increase (ton/yr)	New Cumulative Increase (ton/yr)
NO _x	0.000	0.000	0.000
POC	0.000	0.000	0.000
CO	0.000	0.000	0.000
PM _{10/2.5}	0.000	0.000	0.000
SO ₂	0.000	0.000	0.000

Toxic Risk Screening

At the given rates in Table 5 and 6 below, emissions for all Toxic Air Contaminants (TAC) are below the Acute and Chronic Trigger Levels in Regulation 2-5, Table 2-5-1. Therefore, a Health Risk Assessment is not required.

The facility will be required to stay below the aforementioned limits throughout the operation of the project.

Table 5. Project Acute Emissions Review - Regulation 2-5				
Pollutant	CAS #	Hourly Emission Rate (lb/hr)	Acute Trigger Level (lb/hr)	Exceeds Acute Trigger Level?
Tetrachloroethene (PCE)	127-18-4	4.1E-04	4.4E+01	No
Trichloroethene (TCE)	79-01-6	8.7E-07	N/A	N/A
Benzene	71-43-2	3.7E-08	1.2E-02	No
Carbon disulfide	75-15-0	3.0E-08	2.7E+00	No
Carbon tetrachloride	56-23-5	4.8E-08	8.4E-01	No
Chloroform	67-66-3	1.2E-07	6.6E-02	No
Ethylbenzene	100-41-4	5.0E-08	N/A	N/A
n-Hexane	110-54-3	7.9E-08	N/A	N/A
Methylene Chloride	75-09-2	3.9E-08	6.2E+00	No
2-Butanone (MEK)	78-93-3	1.7E-07	5.8E+00	No
2-Propanol	67-63-0	1.9E-06	1.4E+00	No
Styrene	100-42-5	4.9E-08	9.3E+00	No
Toluene	108-88-3	9.9E-07	2.2E+00	No
Xylenes, <i>total</i>	1330-20-7	2.7E-07	9.7E+00	No

Table 6. Project Chronic Emissions Review - Regulation 2-5				
Pollutant	CAS #	Annual Emission Rate (lb/yr)	Chronic Trigger Level (lb/yr)	Exceeds Chronic Trigger Level?
Tetrachloroethene (PCE)	127-18-4	3.6E+00	1.4E+01	No
Trichloroethene (TCE)	79-01-6	7.6E-03	4.1E+01	No
Benzene	71-43-2	3.2E-04	2.9E+00	No
Carbon disulfide	75-15-0	2.7E-04	3.1E+04	No
Carbon tetrachloride	56-23-5	4.2E-04	1.9E+00	No
Chloroform	67-66-3	1.1E-03	1.5E+01	No
Ethylbenzene	100-41-4	4.4E-04	3.3E+01	No

n-Hexane	110-54-3	6.9E-04	2.7E+05	No
Methylene Chloride	75-09-2	3.4E-04	8.2E+01	No
2-Butanone (MEK)	78-93-3	1.5E-03	N/A	N/A
2-Propanol	67-63-0	1.7E-02	2.7E+05	No
Styrene	100-42-5	4.3E-04	3.5E+04	No
Toluene	108-88-3	8.7E-03	1.6E+04	No
Xylenes, <i>total</i>	1330-20-7	2.4E-03	2.7E+04	No

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 for S-1. Therefore, BACT 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 Soil Vapor Extraction of the District's Permit Handbook. This project does not trigger BACT or TBACT and is not subject to the health risk assessment requirements of Regulation 2, Rule 5. 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 2-1-243 Public Notice. Prior to approving an application for an authority to construct or permit to operate, a public notice, fully describing the potential emissions, shall be prepared for the following cases:

- (i) A new or modified source located within 1000 feet of the outer boundary of a K-12 school site and which results in the increase in emissions of any substance into the ambient air which has been identified by the California Air Resources Board or the APCO as a toxic air contaminant or a hazardous air contaminant or which is on the list required to be prepared pursuant to subdivision (a) of Section 25532 or Section 44321 subsections(a) to (f) inclusive of the Health and Safety Code.
- (ii) A new or modified source located within an Overburdened Community as defined in Section 2-1-243 and for which a Health Risk Assessment is required pursuant to Section 2-5-401

This project is not located within an Overburdened Community and triggered a Health Risk Assessment. However, the project is located within 1,000 feet from the K-12 schools below, therefore, is subject to the Public Notice requirements.

-Redding Elementary School, 1421 Pine St, San Francisco, CA 94109

-Spring Valley Science School, 1451 Jackson St, San Francisco, CA 94109

Regulation 8-47-301, any soil vapor extraction operation which emits benzene, vinyl chloride, tetrachloroethene, methylene chloride, and/or trichloroethene shall be vented to a control device which reduces emissions to the atmosphere by at least 90 percent by weight. The facility has installed two GAC vessels to abate emissions with an efficiency that meets this section's requirement.

Regulation 8-47-501 Recordkeeping. The facility is required to keep the pertinent records per condition #100138 pursuant to Regulation 8-47-501.

Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAPS) do not apply to this project.

Permit Conditions

Permit Condition #100138 for S-1

1. The influent vapor flow rate shall not exceed 160 scfm from the blower of S-1. [Basis: Cumulative Increase, Regulation 2-5].
2. The owner/operator shall abate the precursor organic compound (POC)/non-precursor organic compound (NPOC) emissions from the soil vapor extraction systems with the Activated Carbon Vessels (A-1) during all periods of operation as follows:

S-1 shall be abated by A-1, consisting of a minimum of two (2) 200 lb activated carbon vessels in series.
[Basis: Regulations 8-47-301 and 8-47-302 and Regulation 2-5].
3. In no event shall the rest of 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].
4. The owner/operator shall not emit from S-1 more than 0.1 pounds of precursor organic compounds (POC) and 3.6 pounds of non-precursor organic compounds (NPOC) per 12-month consecutive period. [Basis: Cumulative Increase]
5. 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 first carbon vessel in series.
 - b. At the outlet of the carbon vessel that is last in series prior to venting to the atmosphere.
[Basis: Regulation 2-1-403, Regulation 8-47-301].
6. 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, 3, and 4 of this condition. [Basis: Regulation 2-1-403, Regulation 2-5].

7. During operation of A-1, 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 second to last carbon vessel in series.
 - b. At the inlet to the last carbon vessel in series.
 - c. At the outlet of the last carbon vessel in series, prior to venting to the atmosphere.[Basis: Regulations 1-523 and 2-1-403]
8. 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 through 6 of this condition and shall be conducted on a daily basis.
 - a. If the owner/operator can demonstrate one (1) month of consecutive daily monitoring readings where the sum of monitoring results of S-1 is lower than 0.5 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 of S-1 is lower than 0.5 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 where the monitoring results of S-1 is lower than 0.5 ppmv, measured as methane, the monitoring frequency may be reduced to monthly.

If any subsequent results from monitoring where the sum of monitoring results of S-1 exceed 0.5 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 9(a) through (c) of this condition.

[Basis: Cumulative Increase, Toxics, and Regulations 1-523 and 2-1-403]

9. 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. 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]

10. 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]

11. 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]
12. 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]

End of Conditions

Recommendation

The Air 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 1,000 feet of a K-12 school which triggers the public notification requirements of Regulation 2-1-412. After the comments are received from the public and reviewed, the Air District will make a final determination on the permit.

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

S-1 Sub-Slab Depressurization System
Fantech FR160 Blower, Maximum 160 CFM
Condition No. 100138
Abated by:

A-1 Two-200 pounds Granulated Activated Carbon (GAC) vessels in series.

By Isis Virrueta, AQ Engineer I
July 2023