

ENGINEERING EVALUATION

GeoRestoration, Inc

Plant No. 23035

Application No. 27156

BACKGROUND

GeoRestoration, Inc. has applied for an Authority to Construct (AC) and/or a Permit to Operate (PO) for the following soil remediation project:

S-1 Portable Soil Vapor Extraction System, 350 scfm vacuum blower, abated by a) A-1 or b) A-2 and A-3 in series;

A-1 SVE Abatement System – Portable SVE Abatement System, Electric Catalytic Oxidizer

A-2 SVE Abatement System – Two 200 lb Minimum Capacity Carbon Vessels in series; followed by A-3 only when chloride is detected

A-3 SVE Abatement System – One Vessel containing 540 lb of Granular Potassium Permanganate (KMnO₄) Media, Spectrum HS-600

The initial operation will be located at 125 S. San Tomas Aquino Road in Campbell, CA 95008.

Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1), with a maximum operating capacity of 350 scfm. The vacuum unit is also equipped with a water knockout vessel, inlet filter, dilution air valve, recirculation valve, and flow indicators. Vapor abatement will be achieved by three different means of abatement processes: A-1 Electric Catalytic Oxidation (Cat-Ox), A-2 Carbon Adsorption (Carbon), and, if chloride is detected, A-3 media impregnated with granular potassium permanganate. These will be applied according to equipment availability. The oxidizer will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. The carbon adsorption system will consist of two 200 pounds minimum capacity activated carbon vessels connected in series. The potassium permanganate media will serve as an extra level of abatement to remove any remaining chlorinated compounds that are not removed by A-2.

The applicant will be conditioned to provide written notification at the start of each phase of abatement. Emission monitoring for operation of the Cat-Ox will be conducted according to established Source Test methodology. Procedures are outlined in the conditions found at the end of this evaluation report. The carbon unit influent and effluent VOC concentrations will be monitored with a portable flame-ionization detector (OVA-FID) on a schedule reflecting current loading rates and predicted Carbon capacity. To ensure proper operation of equipment and verify attainment of steady-state conditions, Carbon performance will be monitored daily initially. GeoRestoration may elect to change their 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 receipt of District approval.

The SVE system S-1 is located within 1,000 feet of the nearest K-12 school and is therefore subject to the public notification requirement of Regulation 2-1-412.

EMISSIONS CALCULATION

For a conservative estimate of annual emissions, we shall assume that the system is operated for the entire year with 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 24.15 L
- Molecular weight of Perchloroethylene (PCE) is 165.8 g/mol; Trichloroethylene (TCE) is 131.4 g/mol; and Vinyl chloride is 62.5 g/mol
- Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate = 350 scfm (maximum); maximum influent concentration = 410,000 µg/m³ PCE, 1,300 µg/m³ TCE, and 640 µg/m³ vinyl chloride; Carbon abatement efficiency = 98.5% throughout; KMnO₄ abatement efficiency = 90%.
- The annual emissions are calculated assuming 24 hours per day and 365 days per year of operation.

Emissions of Toxic Air Contaminants:

The influent and effluent Precursor Organic Compounds (POC) and Non-Precursor Organic Compounds (NPOC) emissions from each carbon vessel are typically monitored using a photo-ionization detector (PID) or a flame-ionization detector (FID). The effluent concentrations measured after the last carbon vessel are used to calculate the daily and annual emissions.

Perchloroethylene (PCE):

$$\frac{410,000 \mu\text{g}}{\text{m}^3} * \frac{1\text{g}}{1 \times 10^6 \mu\text{g}} * \frac{\text{m}^3}{35.32 \text{ft}^3} * \frac{350 \text{ft}^3}{\text{min}} * \frac{1440 \text{min}}{\text{day}} * \frac{1 \text{lb}}{454 \text{g}} * (1-0.985) = 0.193 \text{ lb/day (abated)}$$

$$0.193 \text{ lb/day} * 365 \text{ days/yr} = 70.445 \text{ lb/year (abated)} = 0.035 \text{ tons/year (abated)}$$

According to Table 2-5-1 in Reg 2-5, the chronic trigger level for PCE is 18 lb/year, and the acute (1-hr max) trigger level is 44 lb/hour.

Based on the SVE pilot test analytical results submitted, the maximum influent concentration for PCE is 410,000 µg/m³. This yields an annual PCE emission of 70.445 lb/year, which exceeds the PCE chronic trigger level listed in Table 2-5-1 of Regulation 2-5. The owner/operator has agreed to keep PCE emissions below the trigger level by monitoring the carbon performance on a daily basis. Therefore, PCE emissions will be conditioned not to exceed 17.8 lb/year.

Trichloroethylene (TCE):

$$\frac{1,300 \mu\text{g}}{\text{m}^3} * \frac{1\text{g}}{1 \times 10^6 \mu\text{g}} * \frac{\text{m}^3}{35.32 \text{ft}^3} * \frac{350 \text{ft}^3}{\text{min}} * \frac{1440 \text{min}}{\text{day}} * \frac{1 \text{lb}}{454 \text{g}} * (1-0.985) = 0.001 \text{ lb/day (abated)}$$

$$0.001 \text{ lb/day} * 365 \text{ days/yr} = 0.365 \text{ lb/year (abated)} = \sim 0.000 \text{ tons/year (abated)}$$

Vinyl Chloride:

$$\frac{640 \mu\text{g}}{\text{m}^3} * \frac{1\text{g}}{1 \times 10^6 \mu\text{g}} * \frac{\text{m}^3}{35.32 \text{ft}^3} * \frac{350 \text{ft}^3}{\text{min}} * \frac{1440 \text{min}}{\text{day}} * \frac{1 \text{lb}}{454 \text{g}} * (1-0.90) = 0.002 \text{ lb/day (abated)}$$

$$0.002 \text{ lb/day} * 365 \text{ days/yr} = 0.734 \text{ lb/year (abated)} = \sim 0.000 \text{ tons/year (abated)}$$

There are no secondary emissions for the operation of electric catalytic oxidization and carbon adsorption system.

PLANT CUMULATIVE INCREASE

GeoRestoration at 125 S. San Tomas Aquino Road, Campbell, CA 95008 (Plant No. 23035) is a new facility. Therefore, The District’s database assumes zero existing emissions at the plant. Table 1 summarizes the cumulative criteria pollutant emissions that will result at Plant No. 23035 from the operation of S-1. NPOC emissions increase is not tracked in the District’s database but it is included below for reference purpose.

Table 1. Plant Cumulative Emissions Increase, Post 4/5/91

Pollutant	Existing Emissions, Post 4/5/91 (TPY)	New Increase with This Application (TPY)	Cumulative Emissions (TPY)
POC	0.000	~0.000	~0.000
NPOC	0.000	0.035	0.035

TOXICS HEALTH RISK SCREENING ANALYSIS (HRSA)

Per District Regulation, PCE, TCE, and vinyl chloride are Toxic Air Contaminants (TAC) as specified in Table 2-5-1 of Regulation 2-5. The owner/operator of S-1 will be required to perform daily Carbon monitoring and conduct monthly laboratory analysis to ensure that the annual emissions of the following TACs are below their respective chronic trigger levels.

Table 2. Estimated Toxics Emissions compared with Toxics Trigger Levels

Toxic Air Contaminant	Annual Emission (lb/yr)	Acute Trigger Level (lb/hr)	Chronic Trigger Level (lb/yr)	HRSA Required? (yes/no)
Tetrachloroethene (PCE)	< 18	4.4E+01	1.8E+01	No
Trichloroethylene (TCE)	0.365	none	5.4E+01	No
Vinyl Chloride	0.734	4.0E+02	1.4E+00	No

Based upon permit conditions proposed by the applicant, the facility would have PCE, TCE, and vinyl chloride emissions below the trigger levels listed in Regulation 2-5, Table 2-5-1. Therefore, the emissions of toxic air contaminants are not considered sufficient to warrant a Health Risk Screening Analysis.

NEW SOURCE REVIEW

Best Available Control Technology (BACT)

The proposed project will not emit 10.0 lbs or more per highest day for POC or NPOC and is therefore not required to implement BACT. For soil vapor extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of the Thermal/Catalytic Oxidizer will be conditioned to ensure attainment of the following required destruction efficiencies: ≥ 98.5% if inlet POC ≥ 2000 ppmv; ≥ 97% if inlet POC ≥ 200 ppmv to < 2000 ppmv; ≥ 90% if inlet POC < 200 ppmv. Operation of carbon vessels will be conditioned to ensure attainment of an outlet concentration not to exceed 10 ppmv POC. Offsets need not be imposed as the facility-wide POC emissions will not equal or exceed 10 tons/year.

California Environmental Quality Act (CEQA)

This project is considered to be ministerial under the District's proposed Regulation 2-1-311 and is therefore 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 9.2 of the Permit Handbook.

Compliance

District Rules and Regulations Applicable Requirements: Soil vapor extraction operations are subject to Regulation 8-47 (Air Stripping and Soil Vapor Extraction Operations). 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 an Electric Catalytic Oxidizer, or Carbon adsorption system, at all times of operation, which will achieve above 90% reduction efficiency.

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." The SVE unit meets the requirements of the Definition of Portable Equipment (Regulation 2-1-220).

This initial operation site for this project is located less than 1,000 feet from the nearest K-12 school and is therefore subject to the public notification requirements of Regulation 2-1-412. A public notice was prepared and sent to all addresses within 1,000 feet of the SVE system and parents and guardians of students of the following school(s):

The Harker School Lower Division
4300 Bucknall Road,
San Jose, CA 95130

PERMIT CONDITIONS

COND ID 26050 -----

1. The owner/operator of this source (S-1) 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 number 27156 and Plant number 23035.
 - 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 assigned Plant Engineer in the Engineering Division. If the start-up is delayed more than 5 days, written notification must be resubmitted. [Basis: Regulation 2-1-220]

2. The owner/operator shall not allow this equipment to 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 the owner/operator will lose the portability of this permit. [Basis: Regulation 2-1-220.2]
3. The owner/operator shall operate this portable equipment S-1, at all times in conformance with eligibility requirements set forth in Regulation 2-1-220 for portable equipment. [Basis: Regulation 2-1-220]

4. The owner/operator shall not operate this equipment within 1000 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. This will require the submittal of an application for a revised permit to operate. [Basis: Regulation 2-1-220.4]
5. The owner/operator shall abate the SVE system with A-1 Electric Catalytic Oxidizer exclusively for removal of non-chlorinated volatile organic compounds associated with petroleum products from extracted soil vapor. This shall be demonstrated by onsite sampling required in part 10 below. [Basis: Regulation 2-5]
6. The owner/operator shall abate the Precursor Organic Compounds (POC) and Non-Precursor Organic Compounds (NPOC) emissions from Source S-1 by A-1, Electric Catalytic Oxidizer, or A-2, at least two (200 lbs minimum capacity) Activated Carbon Vessels followed by A-3 Vessel with media impregnated with KMnO₄ during all periods of operations. Start-up and subsequent operation of each abatement device shall take place only after written notification of operation has been received by the District's Engineering Division. Soil vapor flow rate shall not exceed 350 scfm. [Basis: Cumulative Increase, Regulation 8-47-301.1, and 302]
7. The owner/operator shall operate A-1 Electric Catalytic Oxidizer such that the POC abatement efficiency 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 by the owner/operator. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained by the owner/operator. 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 equal or exceed 3.8 pounds per year for Source S-1. The average daily emissions of benzene shall not exceed 0.01 pounds per day. In no event shall ethylbenzene emissions to the atmosphere equal or exceed 43 pounds per year for S-1. The average daily emission of ethylbenzene shall not exceed 0.118 pounds per day. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
8. The owner/operator shall not operate A-1 Electric Catalytic Oxidizer below a minimum operating temperature of less than 600 degrees Fahrenheit. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
9. To determine compliance with part 8, the owner/operator shall equip the A-1 Electric Catalytic Oxidizer with continuous measuring and temperature recording instrumentation. The owner/operator shall collect and maintain the temperature data from the temperature recorder 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. [Basis: Regulation 1-523]
10. To determine compliance with parts 5 and 7, within ten days after start-up of the electric catalytic oxidizer, the owner/operator of this source shall:
 - a. Analyze inlet gas stream to determine the flow rate and concentration of POC present, and any chlorinated compounds.
 - b. Analyze exhaust gas to determine the flow rate, and the concentration of benzene, ethylbenzene and POC present.
 - c. Calculate the benzene and ethylbenzene emission rates in pounds per day based on the exhaust flow rate, if necessary, to demonstrate compliance with part 7.
 - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with part 7, the POC concentration shall be reported as hexane.

- e. Submit to the District's Engineering 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, 8020, and 8010, or their equivalent to determine the concentrations of POC, benzene, ethylbenzene and chlorinated compounds.

[Basis: Cumulative Increase, Regulation 2-5, TBACT]

- 11. The owner/operator of this source shall maintain the following records for each month of operation of the catalytic oxidizer:

- a. Days and hours of operation.
- b. Each emission test, analysis or monitoring results logged-in for the day of operation they were taken.
- c. Analysis results for any catalyst plugs removed from the bed to determine remaining life of the catalyst.

Such records shall be retained and made available for inspection by the District for at least two years following the date the data is recorded. [Basis: Reg. 1-523]

- 12. The owner/operator shall abate chlorinated volatile organic compounds from S-1 with A-2 Activated Carbon Vessels and A-3 Vessel containing media impregnated with KMnO₄. [Basis: Cumulative Increase]

- 13. During the operation of the A-2 and A-3, the owner/operator of this source shall meet the following emission limits:

Compounds	Emission limits (pounds per year)
Perchloroethylene	17.8
Trichloroethylene	53.8
Vinyl Chloride	1.3

- 14. To demonstrate compliance with Part 13, within ten days after start-up of the A-2 and A-3, the owner/operator shall conduct the monitoring described in this part and in Parts 15, 16, and 19 and shall follow the carbon replacement procedures in Parts 17, 18, and 20.

- a. Analyze inlet gas stream to determine the flow rate and concentrations of POC and NPOC present.
- b. The owner/operator shall conduct the portable analyzer monitoring described in Parts 15 and 16 on a daily basis.
- c. The owner/operator shall conduct a laboratory analysis on the exhaust from the last vessel in series (prior to venting to atmosphere) on a monthly basis, with EPA test method TO15, or an equivalent District approved test method. The laboratory analysis shall include the concentration of each emitted toxic air contaminant, including the materials listed in Part 13.
- d. Calculate perchloroethylene, trichloroethylene, and vinyl chloride emissions in pounds per year using lab analysis concentration and flow rate data to demonstrate compliance with Part 13. The soil vapor flow rate shall be decreased, if necessary, to demonstrate compliance with Part 13.
- e. Submit to the District's Engineering Division the initial test results and emission calculations within one month from the testing date.

[Basis: Cumulative Increase, Regulation 2-5, TBACT]

- 15. During the operation of the A-2 Activated Carbon Vessels, the owner/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 vessel containing media impregnated with KMnO₄.

When using a 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. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

16. 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 17 and 18, and shall be conducted on a daily basis. The owner/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. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
17. The owner/operator shall immediately change out the second to last Carbon vessel 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).[Basis: Cumulative Increase, Regulation 2-5, TBACT]
18. The owner/operator shall immediately change out the last Carbon vessel with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane). [Basis: Cumulative Increase, Regulation 2-5, TBACT]
19. The owner/operator shall monitor for breakthrough of vinyl chloride at A-3 to determine when the media needs to be replaced. The owner/operator shall use the sampling results to determine the frequency of change-out necessary to maintain compliance with Part 13. Laboratory sampling shall be conducted on a weekly basis. Daily monitoring shall be conducted with a Draeger tube or a District approved equivalent calibrated for vinyl chloride with a detection limit range of approximately 0.5 to 30 ppmv. Samples will also be sent for laboratory analysis, if the Draeger tube or District approved equivalent readings exceed 2 ppmv for effluent from the vessel containing media impregnated with KMnO₄. The owner/operator of S-1 may propose for District review, based on actual sampling results taken at the site during operation of the source, that the sampling schedule be changed based on the decline in vinyl chloride emissions and/or the demonstrated breakthrough rates of the vessel containing media impregnated with KMnO₄. Written approval by the District's Engineering Division must be received by the owner/operator prior to a change to the sampling schedule. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
20. The owner/operator of A-3 shall change out the media impregnated with KMnO₄ with unspent media impregnated with KMnO₄ upon breakthrough, defined as the detection at the outlet of the higher of the following based on sample laboratory analysis:
 - a. 10% of the inlet stream vinyl chloride concentration to the vessel.
 - b. 2 ppmv or greater of vinyl chloride.[Basis: Cumulative Increase, Regulation 2-5, TBACT]

21. The owner/operator of this source shall maintain the following information for each month of operation of the Activate Carbon Vessels (A-2) and Vessel containing KMnO4 (A-3):

- 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.
- d. Replacement of media in the A-3 vessel.

Such records shall be retained and made available for inspection by the District for at least two years following the date the data is recorded. [Basis: Regulation 1-523]

22. Within 30 days from the completion of each treatment operation at a given location, the owner/operator of this source shall provide the assigned Permit Engineer in the Engineering 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 POC and NPOC emission rates as determined and reported in the start-up sampling report required by condition 10e or 14 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 POC, NPOC, and materials listed in part 13 at that location based on the sampling results required by parts 10, 14 and 19 above.

[Basis: Regulation 1-523]

23. Within 30 days after the end of every calendar year, the owner/operator of this source shall provide the assigned Permit 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: Regulation 1-523]

24. 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. The owner/operator shall maintain and retain all measurements, records and data required for at least two years following the date the data is recorded. [Basis Regulation 1-523]

25. 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 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: Cumulative Increase, Regulation 2-5, TBACT]

26. Upon completion of the final remediation project, the owner/operator of Source S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Regulation 2-1-403]

End of Conditions

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 1,000 feet of at least one school, which triggers the public notification requirements of 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 and/or a Permit to Operate for the following source:

- S-1 Portable Soil Vapor Extraction System, 350 scfm vacuum blower, abated by a) A-1 or b) A-2 and A-3 in series;**
- A-1 SVE Abatement System – Portable SVE Abatement System, Electric Catalytic Oxidizer**
- A-2 SVE Abatement System – Two 200 lb Minimum Capacity Carbon Vessels in series; followed by A-3 Only when chloride is detected**
- A-3 SVE Abatement System – One Vessel containing 540 lb of Granular Potassium Permanganate (KMnO₄) Media, Spectrum HS-600**

Prepared by: _____ **Date:** _____
Ying Yu, Air Quality Technician