

**DRAFT**  
**Engineering Evaluation**  
**Chevron Environmental Management Company**  
**Plant No. 21947; Application No. 25427**

**706 Harrison Street, Oakland, CA 94607**

ARCADIS U.S., Inc. on behalf of Chevron Environmental Management Company has applied for an Authority to Construct and Permit to Operate for the following equipment:

**S-1 Soil Vapor Extraction System – 300 scfm vacuum blower abated by A-1 SVE Abatement System consisting of Electric Catalytic Oxidizer or a Carbon Adsorption, two (200 lbs minimum capacity) Activated Carbon Vessels connected in series.**

### **Background**

ARCADIS U.S., Inc. on behalf of Chevron Environmental Management Company has applied for an authority to construct for soil remediation system location at 706 Harrison Street in Oakland. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1) with a maximum capacity of 300 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 two different means of abatement processes: electric catalytic oxidation and carbon adsorption. 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 pound minimum capacity activated carbon vessels connected in series.

The applicant will be conditioned to provide written notification at the start of each phase of abatement. Emission monitoring for operation of the electric Cat-Ox will be conducted according to established source test methodology. Procedures are outlined in the conditions found below. The carbon unit influent and effluent volatile organic compound (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 for the first five days. Chevron Environmental Management Company may then 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.

This source is located within 1,000 feet of a school: Lincoln Elementary School, 225 11th Street, Oakland, CA 94607; therefore, this application requires Public Notification per District's Regulation 2-1-412. In addition, Oakland Charter High School, located at 345 12<sup>th</sup> Street, Oakland, CA 94607 and 321 10<sup>th</sup> Street, Oakland, CA 94607 are within one-quarter mile of the source and will be included in Public Notification.

### **Emission Calculations**

#### S-1 Soil Vapor Extraction System – 300 scfm vacuum blower

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 24.15 L
- \* 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 and applicant supplied soil vapor test results: influent rate 300 scfm throughout; maximum influent concentration = 1100 ppmv VOC, 30 ppmv benzene; destruction efficiency = 97% throughout.

#### **Emissions of Precursor Organics:**

$$1100E-6 * \frac{300 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32L}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15L} * \frac{100g}{\text{mole}} * \frac{1 \text{ lb}}{454g} * (1 - 0.97) = \mathbf{3.682 \text{ lb/day}} \text{ (abated)}$$

**Emissions of Toxic Air Contaminants (benzene):**

$$30E-6 * \frac{300 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32L}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15L} * \frac{78g}{\text{mole}} * \frac{1 \text{ lb}}{454g} * (1 - 0.97) = \mathbf{0.078 \text{ lb/day}} \text{ (abated)}$$

<b>Highest Daily Emissions</b>	=	<b>3.682 lb/day</b>
<b>Annual Average</b>	=	<b>3.682 lb/day</b>
	=	<b>0.672 tons/yr</b>

Secondary Emissions:

From District's Permit Handbook Chapter 9.2:

Reasonably Available Control Technology (RACT) for thermal oxidation:

NOx = 0.2 lb/MMBTU

CO = 0.8 lb/MMBTU

The unabated POC emission is 3.682 lb/ day/ (1-0.97) = 122.73 lb/day.

We will assume that the compound burned is toluene, because its molecular weight is similar to molecular weight of TPH.

The Heat of Combustion of Toluene is 17,601 BTU/lb.

The annual emission from the proposed oxidizer (90,000 BTU/hr)

NOx and CO emission factors from AP-42. 5<sup>th</sup> ed., Chapter 1.4 Natural Gas Combustion will be used.

$$Es = F \times B \times H$$

Where:

Es = Annual emissions for abatement device (lbs/yr)

F = Emission Factor of Criteria Pollutant (lb/MMBTU)

B = Maximum Firing Rate of Burner in Abatement Device (MMBTU/hr)

H = Maximum Number of Hours the oxidizer will operate = (24 hr/day x 365 day/yr = 8760 hrs/yr)

Pollutant	Emission Factor (F) [lb/MMBTU]	Maximum Firing Rate (B) [MMBTU/hr]	Hours (H) [hrs]	Annual Emission (Es) [lb/yr]
NOx	0.2	0.09	8760	157.68
CO	0.8	0.09	8760	630.72

The annual emission from the proposed carbon adsorption system

There are no secondary emissions for the operation of carbon adsorption system.

**Toxics**

Under the trigger levels as per Regulation 2-1-316, the emissions of toxic substances (Benzene) are considered sufficient to warrant a Risk Screen Analysis. Benzene trigger = 0.01 lb/day. A Health Risk Screen was performed for this application to determine the risk to the maximally exposed industrial and residential receptors. The ISCST3 air dispersion models were used to estimate the pollutant concentrations in the area surrounding the site for a unit emission rate. It was determined that benzene emissions as calculated above corresponded to a risk of 0.7 in a million to the maximally exposed industrial receptor. This emission rate would result in maximum risk of 10 in a million to the maximally exposed residential receptor. This source is unlikely to cause an acute risk for benzene emissions, as the hourly trigger for benzene is 2.9 pounds per hour. In accordance with the District's Regulation 2-5, the impact is then insignificant, since this risk is within the threshold of 10 in a million as required for sources implementing TBACT; therefore, the Toxics Section has recommended the issuing of this A/C with a Benzene emission limit of 0.078 lb/day.

For Soil Vapor Extraction operations, TBACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of the catalytic oxidizer will be conditioned to ensure attainment of the following required destruction efficiencies:  $\geq 98.5\%$  if inlet POC  $\geq 2000$ ;  $\geq 97\%$  if inlet POC  $\geq 200$  to  $< 2000$  ppmv;  $\geq 90\%$  if inlet POC  $< 200$  ppmv. Operation of the carbon vessels will be conditioned to ensure attainment of an outlet concentration not to exceed 10 ppmv POC.

### **New Source Review**

This proposed project will emit over 10 pounds per highest day and is therefore 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 catalytic oxidizer will be conditioned to ensure attainment of the following required destruction efficiencies:  $\geq 98.5\%$  if inlet POC  $\geq 2000$ ;  $\geq 97\%$  if inlet POC  $\geq 200$  to  $< 2000$  ppmv;  $\geq 90\%$  if inlet POC  $< 200$  ppmv. Operation of the carbon vessels will be conditioned to ensure attainment of an outlet concentration not to exceed 10 ppmv POC. Offsets need not be imposed as annual emissions will not exceed 10 tons.

### **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. This project is in compliance with Chapters 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 – Reduce emission by at least 90 percent by weight. The POC emissions will be vented through an electric catalytic oxidizer, or a carbon adsorption system at all times of operation.

### **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. 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: Soil Vapor Extraction System consisting of a 300 max scfm vacuum blower, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either an Electric Catalytic oxidizer, or at least two (200 lb minimum capacity) carbon adsorption vessels arranged in series.

### **Conditions:**

1. The owner/operator shall abate the Precursor Organic Compound (POC) emissions from Source S-1 by A-1, SVE Abatement System, consisting of either an Electric Catalytic Oxidizer, or two (200 lbs minimum capacity) Activated Carbon Vessels during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. The owner/operator shall operate the sources such that the soil vapor flow rate from S-1 shall not exceed 300 scfm.  
[Basis: Cumulative Increase, Regulation 8-47-301 and 302, TBACT]
2. 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 the owner/operator emit benzene emissions to the atmosphere exceeding 0.078 pounds per day. [Basis: Cumulative Increase, Regulation. 2-5, TBACT]

3. While operating the Electric Catalytic Oxidizer, the owner/operator shall not operate A-1 below a minimum operating temperature of 600 degrees Fahrenheit. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
4. To determine compliance with part 3, 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]
5. To determine compliance with part 3, 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.
  - 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 owner/operator shall decrease the soil vapor flow rate, if necessary to demonstrate compliance with part 2.
  - d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with part 2, the owner/operator shall report the POC 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 POC and benzene.[Basis: Cumulative Increase, Regulation 2-5, TBACT]
6. The owner/operator of this source shall maintain the following records for each month of operation of the Electric 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. 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 years following the date the data is recorded. [Basis: Regulation 1-523]

7. The owner/operator shall use a portable analyzer to take NOx and CO emission reading during the start-up. The result shall be submitted to the Engineering Division within 30 days of start-up.
8. During operation of the 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 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 purpose of these permit conditions. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

9. 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 11 and 12, 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 owner/operator prior to a change to the monitoring schedule. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
10. 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 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, Regulation 2-5, TBACT]
11. 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]
12. The owner/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.
  - 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 years following the date the data is recorded. [Basis: Regulation 1-523]

13. 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]
14. 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 Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the owner/operator shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
15. Upon final completion of the remediation project, the operator of Sources S-1 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

by \_\_\_\_\_ date \_\_\_\_\_

Flora Chan  
Air Quality Engineer