

**DRAFT**  
**ENGINEERING EVALUATION REPORT**  
**FORMER RICHARD'S AUTO SERVICE**  
**PLANT NUMBER 23196**  
**APPLICATION NUMBER 27391**

**1495 Hays Street**  
**San Leandro, CA 94577**

**Background**

On behalf of Mr. Richard Kwan, owner of Former Richard's Auto Service, Stratus Environmental, Inc. has applied to obtain an Authority to Construct and a Permit to Operate for Dual Phase extraction system powered by natural gas fired generator set at the above referenced gasoline contaminated site in San Leandro, CA. The soil vapor extraction system consists of a liquid ring blower and ancillary to extract both groundwater and soil vapor. The extracted soil vapor and groundwater will be separated and treated individually. Soil vapor will be treated by a natural gas fired thermal/catalytic oxidizer, while the groundwater will be treated via carbon vessels and organic clay filter before discharging into the sewer. No emissions are expected from the treatment of groundwater.

Emission monitoring for operation of the soil vapor extraction system will be conducted according to established Source Test methodology. Procedures are outlined in the permit conditions.

The application covers the following sources:

- S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm (or equivalent), abated by A-1.**
- S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L, 2015 yr, 70 hp, abated by A-2.**
- A-1 Thermal/ Catalytic Oxidizer, Mako TCAT, 400 cfm capacity, 0.5 MMBTU/hr, natural gas.**
- A-2 NSCR or 3-way catalyst, DC45-3MD.**

**Emission Calculations**

- S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm (or equivalent), abated by A-1.**

For a conservative estimate of yearly emissions, it is assumed that the system is operated for an entire year at a maximum flow rate and within an effluent concentrations corresponding to the initial soil vapor concentration at detection limits because none of them were detected.

**Basis:**

- \* Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C
- \* Effluent flow rate = 400 cfm (max.)
- \* Effluent concentrations:
  - TPHg (gasoline range organics) = <15 mg/cu.m.= <15 ug/L (detection limit)
  - Benzene = <0.15 mg/cu.m = < 0.15 ug/L (detection limit)

MTBE = < 0.15 mg/cu.m = < 0.15 ug/L (detection limit)  
 Toluene = < 0.15 mg/cu.m = < 0.15 ug/L (detection limit)  
 Ethylbenzene = < 0.15 mg/cu.m = < 0.15 ug/L (detection limit)  
 Xylene = < 0.15 mg/cu.m = < 0.15 ug/L (detection limit)

**Emissions, lb/day = ug/L\*cfm\*1440 min/day\*28.32 L/cf\*E-6g/ug\*1 lb/454 g**

Emissions are calculated using the above equation and the basis.

Precursor organic compounds (POC) or TPHg = 15 ug/L\*400 cfm\*1440 min/day\*28.32 L/cf\*  
 E-6 g/ug\*1 lb/454 g  
 = 0.54 lb/day  
 = 196.7 lb/yr @365 days/yr  
 = 0.1 ton/yr (tpy)

**Toxics Emissions:**

Benzene = 0.0054 lb/day  
 = 0.0002 lb/hr  
 = 1.96 lb/yr @365 days/yr  
 MTBE = 0.0054 lb/day  
 = 1.96 lb/yr @365 days/yr  
 Toluene = 0.0054 lb/day  
 = 0.0002 lb/hr  
 = 1.96 lb/yr @365 days/yr  
 Ethylbenzene = 0.0054 lb/day  
 = 1.96 lb/yr @365 days/yr  
 Xylene = 0.0054 lb/day  
 = 0.0002 lb/hr  
 = 1.96 lb/yr @365 days/yr

**A-1 Thermal/ Catalytic Oxidizer, Mako TCAT, 400 cfm capacity, 0.5 MMBTU/hr, natural gas.**

The thermal/catalytic oxidizer is a natural gas fired unit. Emissions are calculated on the basis of the rating, operation schedule, and emission factors taken from US EPA AP-42, 7/98, Chapter 1.4.

1. Rating = 0.5 MMBTU/hr;
2. Natural gas usage based on average gross heating value of 1020 BTU/cu.ft. = 490 cu.ft./hr

| Pollutant | Emission factor, lb/MM cu.ft. | Lb/hr  | Lb/day | Ton/yr |
|-----------|-------------------------------|--------|--------|--------|
| PM10      | 7.6                           | 0.0037 | 0.09   | 0.017  |
| NOx       | 100                           | 0.05   | 1.2    | 0.22   |
| CO        | 84                            | 0.042  | 1.0    | 0.18   |
| POC       | 11                            | 0.0055 | 0.13   | 0.02   |
| SO2       | 0.6                           | 0.0003 | 0.007  | 0.001  |

**S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L,  
2015 yr, 70 hp, abated by A-2.  
A-2 NSCR or 3-way catalyst, DC45-3MD.**

Emissions are calculated on the basis of the emission factors provided by the manufacturer (EPA certified) for NO<sub>x</sub> (oxides of nitrogen), CO (carbon monoxide), POC (precursor organic compounds), and AP-42 for SO<sub>2</sub> (sulfur dioxide), PM-10 (particulate matter), prime engine rating of 0.563 MMBTU/hr (70 hp equivalent), and 8760 operating hours in a year. Refer to the attached spreadsheet for emission calculations. Emission factors for the toxic compounds are taken from the CARB database of "California Air Toxics Emissions Factors" (CATEF) for natural gas fired 4 stroke rich burn IC engines <650 hp.

Emission Factors:

PM10 = 9.5E-03 lb/MMBTU/hr  
CO = 0.36 g/kw-hr = 0.0269 g/bhp-hr = 0.074 lb/MMBTU/hr  
NO<sub>x</sub>+ POC = 0.92 g/kw-hr = 0.686 g/hp-hr  
NO<sub>x</sub> = (95%)(NO<sub>x</sub>+THC) = 0.652 g/bhp-hr = 0.179 lb/MMBTU/hr  
POC = (5%)(NO<sub>x</sub>+POC) = 0.0343 g/bhp-hr = 0.009 lb/MMBTU/hr  
SO<sub>2</sub> = 5.58 E-04 lb/MMBTU/hr  
Operating hours = 8760/yr

Emissions (Ref: attached spreadsheet)

PM10 = 46.85 lb/yr  
= 0.13 lb/day @365 days/yr  
= 0.023 tpy

CO = 364.96 lb/yr  
= 1.0 lb/day @365 days/yr  
= 0.183 tpy

NO<sub>x</sub> = 882.8 lb/yr  
= 2.42 lb/day @365 days/yr  
= 0.442 tpy

POC = 44.39 lb/yr  
= 0.12 lb/day @365 days/yr  
= 0.02 tpy

SO<sub>2</sub> = 2.9 lb/yr  
= 0.008 lb/day  
= 0.002 tpy

### Emission Summary

In the table below is the summary of emissions from the project:

| Pollutant | S-1, tpy | S-2, tpy | A-1, tpy | Total, tpy |
|-----------|----------|----------|----------|------------|
| POC       | 0.1      | 0.02     | 0.02     | 0.14       |
| NOx       |          | 0.442    | 0.22     | 0.662      |
| CO        |          | 0.183    | 0.18     | 0.363      |
| PM10      |          | 0.023    | 0.017    | 0.04       |
| SO2       |          | 0.002    | 0.001    | 0.003      |

### Plant Cumulative Increase

POC = 0.140 tpy  
 NOx = 0.662 tpy  
 CO = 0.363 tpy  
 PM10 = 0.040 tpy  
 SO2 = 0.003 tpy

### Toxics Emissions and Health Risk Screening Analysis

#### S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm ( or equivalent), abated by A-1.

Benzene, Ethylbenzene, MTBE, Toluene, and Xylene are the toxic compounds expected to be emitted from the operation and their emissions are shown below. Emissions of toxic compounds are below the toxic trigger levels given in the Table 2-5-1 of Regulation 2-5. Therefore, a health risk screening analysis is not required.

| Toxic Compound | Emission, lb/hr | Acute Trigger level, lb/hr | Emission, lb/yr | Chronic Trigger level, lb/yr |
|----------------|-----------------|----------------------------|-----------------|------------------------------|
| Benzene        | 0.0002          | 2.9                        | 1.96            | 3.8                          |
| Ethylbenzene   |                 |                            | 1.96            | 43                           |
| Xylene         | 0.0002          | 49                         | 1.96            | 2.7E+4                       |
| MTBE           |                 |                            | 1.96            | 210                          |
| Toluene        | 0.0002          | 82                         | 1.96            | 1.2E+4                       |

#### S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L, 2015 yr, 70 hp, abated by A-2.

The engine-generator set will emit toxic compounds such as benzene, formaldehyde, PAH, 1,3 butadiene, etc.. Emissions of 1,3- Butadiene, Benzene, and Formaldehyde (Ref: attached spreadsheet) exceed the respective chronic toxic trigger levels given in the Table 2-5-1 of Regulation 2, Rule 5. Therefore, a toxic risk screening analysis is required.

A health risk screening analysis (interoffice memo dated 12/24/2015) was completed for toxic air contaminant emissions from both sources, S-1 & S-2. Results indicate the maximum cancer risk of 12 in a

million and the maximum chronic hazard index of 0.23. In accordance with the District's Regulation 2, Rule 5, the sources are not in compliance with the risk requirements. In order to reduce the cancer risk to no more than 10 in a million, the applicant shall consider reducing operation of the natural gas-fired engine generator to no more than 7,350 hours per year, or increase the stack height from 5 feet to at least 12 feet, provided the engine meets the current toxic best available technology (TBACT) requirements for POC. The engine is a rich burn engine. TBACT for POC for rich burn engine is 0.069 g/hp-hr as per District's BACT/TBACT Workbook. (Document #96.3.2). The engine's POC emission factor of 0.0343 g/hp-hr complies with the TBACT requirements.

The applicant was given option to comply with the risk requirements. The applicant responded with the proposal to increase the stack height to 12 feet and thereby the project will be in compliance with the District's Regulation 2, Rule 5.

### **Best Available Control Technology (BACT)**

#### **S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm ( or equivalent), abated by A-1.**

BACT requirements of Regulation 2-2-301 are not triggered for POC emissions less than 10 lb per highest day for S-1.

#### **S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L, 2015 yr, 70 hp, abated by A-2.**

BACT requirements of Regulation 2-2-301 are not triggered for NOx, CO, POC, SO2, and PM-10 emissions less than 10 lb per highest day for S-2.

**2-2-301 Best Available Control Technology Requirement:** An applicant for an authority to construct or a permit to operate shall apply BACT to any new or modified source:

301.1 Which results in an emission from a new source or an increase in emissions from a modified source and which has the potential to emit 10.0 pounds or more per highest day of precursor organic compounds (POC), non-precursor organic compounds (NPOC), nitrogen oxides (NOx), sulfur dioxide (SO2), PM10 or carbon monoxide (CO). BACT shall be applied for any of the above pollutants which meets both criteria.

*(Amended 6/15/94; 10/7/98; 5/17/00)*

### **Offsets**

Offsets requirements of Regulation 2-2-302 are not triggered for facility wide or permitted POC and NOx emissions < 10 tpy.

### **California Environmental Quality Act (CEQA)**

The project is considered to be ministerial under the Districts 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 evaluated in accordance with Permit Handbook Chapter 9.2 for S-1 and Chapter 2.3.2 for S-2.

## Statement of Compliance

### **S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm ( or equivalent), abated by A-1.**

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 a thermal/ catalytic oxidizer at all times of operation.

**8-47-301 Emission Control Requirement, Specific Compounds:** Any air stripping and soil vapor extraction operations which emit benzene, vinyl chloride, perchloroethylene, methylene chloride and/or trichloroethylene shall be vented to a control device which reduces emissions to the atmosphere by at least 90 percent by weight.

**8-47-302 Organic Compounds:** Any air stripping and soil vapor extraction operations with a total organic compound emission greater than 15 pounds per day shall be vented to a control device which reduces the total organic compound emissions to the atmosphere by at least 90 percent by weight.

Requirements of Prevention of Significant Deterioration (PSD), New Source Performance Standards (NSPS), and National Emissions Standards for Hazardous Air Pollutants (NESHAP) are not triggered for S-1.

### **S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L, 2015 yr, 70 hp, abated by A-2.**

Based on the information submitted, the generator set is expected to be in compliance with Regulation 9-8-301, emission limits for NO<sub>x</sub> and CO, and Ringelmann No. 2 limitation of regulation 6-1-303.1.

#### **9-8-301 Emission Limits - Spark-Ignited Engines Powered by Fossil Derived Fuels:**

Effective January 1, 1997, a person shall not operate a stationary internal combustion engine fired exclusively on fossil derived fuels, unless the following emission limits are met:

301.1 Rich-Burn Engines: Nitrogen oxide (NO<sub>x</sub>) emissions shall not exceed 56 ppmv as corrected to 15% oxygen, dry basis. Effective January 1, 2012, nitrogen oxide (NO<sub>x</sub>) emissions shall not exceed 25 ppmv as corrected to 15% oxygen, dry basis.

301.3 Carbon monoxide (CO) emissions shall not exceed 2000 ppmv as corrected to 15% oxygen, dry basis.

**6-1-303 Ringelmann No. 2 Limitation:** A person shall not emit for a period or periods aggregating more than three minutes in any hour, a visible emission which is as dark or darker than No. 2 on the Ringelmann Chart, or of such opacity as to obscure an observer's view to an equivalent or greater degree, nor shall said emission, as perceived by an opacity sensing device in good working order, where such device is required by District regulations, be equal to a greater than 40% opacity, from the following sources:

303.1 Internal combustion engines of less than 25 liters (1500 in<sup>3</sup>) displacement, or any engine used solely as a standby source of motive power

#### **NSPS:**

The engine-generator set is subject to 40 CFR Part 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines per section 60.4230(a)(4)(iii). The gen-set was

manufactured after July 1, 2008. The engine is EPA certified and therefore meets the requirements of Subpart JJJJ.

### **NESHAP:**

Former Richard Auto Service is a part of a retail/commercial complex and therefore the engine is considered an area source for the purpose of NESHAP (Subpart ZZZZ) applicability. Since the engine meets the requirements of 40 CFR part 60 subpart JJJJ and 40 CFR part 63 subpart ZZZZ (section 63.6590(c)(1)), no further requirements of subpart ZZZZ apply.

Requirements of PSD are not triggered for S-2.

### **Public Notification, Schools**

The project is located within 1000 feet of the nearest K-12 school, St. Leander School, and therefore is subject to the public notice requirements of Regulation 2-1-412. A public notice will be distributed to the parents and guardians of the students of the schools within ¼ mile of the project and to all the addresses within 1000 feet of the project.

### **Permit Conditions**

**S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm (or equivalent), abated by A-1.**

**A-1 Thermal/ Catalytic Oxidizer, Mako TCAT, 400 cfm capacity, 0.5 MMBTU/hr, natural gas.**

1. The owner/operator shall abate the Volatile Organic Compound (VOC) emissions from Source S-1 by A-1, SVE Abatement System, consisting of a Thermal/Catalytic Oxidizer 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 source such that the soil vapor flow rate from S-1 shall not exceed 400 scfm.  
[Basis: Cumulative Increase, Regulation 8-47-301 and 302, TBACT]
2. The owner/operator shall operate A-1, Thermal/ Catalytic Oxidizer such that the VOC abatement efficiency shall be maintained at a minimum of 98.5% by weight for inlet VOC 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 VOC concentrations are shown to be less than 10 ppmv (measured as hexane). In no event shall the owner/operator emit any toxic compounds emissions to the atmosphere above the toxic trigger levels given in the table 2-5-1 of the District Regulation 2-5.  
[Basis: Cumulative Increase, Regulation. 2-5, TBACT]
3. While operating in the Thermal Oxidizer mode, the owner/operator shall not operate A-1 below a minimum operating temperature of less than 1400 degrees Fahrenheit. While operating in the Catalytic Oxidizer mode, 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, Thermal/ 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 Thermal/Catalytic Oxidizer, the owner/operator of this source 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 toxic compounds and VOC present.
  - c. Calculate the toxic compounds emission rates 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 VOC 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 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 toxic compounds.

[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 Thermal or 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 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]
8. 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]
9. Upon final completion of the remediation project, the owner/operator of Source S-1 shall notify the Engineering Division within two weeks of decommissioning the operation.  
[Basis: Cumulative Increase, Regulation 2-5, TBACT]

**S-2 Natural Gas Engine Generator Set, General Motors, Industrial Powertrain Vortec 4.3L, 2015 yr, 70 hp, abated by A-2.**

**A-2 NSCR or 3-way catalyst, DC45-3MD.**

1. The owner/operator shall fire the generation set, S-2, exclusively with natural gas or equivalent.



- [basis: cumulative increase, Regulation 9-8-301.1]
2. The owner/operator shall abate the generation set, S-2, by A-2, NSCR, at all times of operation.  
[basis: Regulation 9-8-301.1]
  3. The owner/operator shall ensure that the generation set does not exceed the following emission limits:
    - a. NO<sub>x</sub> (oxides of nitrogen) = 0.652 g/hp-hr (25 ppmv@15% Oxygen dry basis)
    - b. CO (carbon monoxide) = 0.269 g/hp-hr (28 ppmv@15% Oxygen dry basis)
    - c. POC (precursor organic compounds) = 0.0343 g/hp-hr (6 ppmv@15% Oxygen dry basis)[basis: Cumulative increase; NSPS; TBACT for POC; Regulation 9-8-301]
  4. The owner/operator shall equip the generation set with fuel flow meter, which record fuel usage.  
[basis: Record keeping]
  5. The owner/operator shall perform quarterly testing with a District approved portable analyzer for NO<sub>x</sub>, CO, POC and Oxygen to demonstrate compliance with Part 3, and District Regulation 9-8-301.  
[basis: Regulations 9-8-301, 9-8-503]
  6. The owner/operator shall maintain the following records in a District-approved log for at least 2 years and shall make them available to the District staff upon request:
    - a. monthly total hours of operation for the generator set
    - b. monthly fuel usage at the generator set
    - c. quarterly monitoring reports for NO<sub>x</sub>, CO, POC and Oxygen.[basis: Regulation 9-8-502, Record keeping]

## Recommendations

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 the District, State, and federal air-quality related regulations. The preliminary recommendation is to issue an Authority to Construct for the sources listed below. However, the sources will be located within 1000 feet of a K-12 school, which triggers the public notification requirements of the District Regulation 2-1-412. After the comments are received and reviewed, the District will make a final determination on the permit.

- S-1 Dual Phase Soil Vapor Extraction System – Liquid Ring Blower; Mako TCAT 400 cfm (or equivalent), abated by A-1.**
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