

[DFAFT] ENGINEERING EVALUATION

**Facility ID No. 22434
 Marin Coffee Roasters
 1551 South Novato Blvd, Novato, CA 94947
 Application No. 30121**

Background

Marin Coffee Roasters is applying for an Authority to Construct and Permit to Operate for the following equipment:

- S-2 Coffee Roaster**
Make: Probat, Model: P25-2,
Max Throughput Capacity: 55 lb/batch, 4 batches/hr, Max Firing Rate: 0.205 MMBtu/hr
abated by:
- A-2 Thermal Afterburner**
Make: Probat, Model: TR22/34V-350MC-60NB
Max Firing Rate: 1.5 MMBtu/hr

Equipment will be located at 1551 South Novato Blvd, Novato, Ca 94945. Marin Coffee Roasters has agreed to limit roaster operation at 40.25 lb/batch, 4 batches/hour, 6 hours/day, 4 days/week, 52 weeks/year with an annual roasting throughput limit of 200,928 lbs (100.464 tons) of green coffee.

Emissions Summary

Basis:

- Operation Hours: (6 hrs/day) *(4 days/week) * (52 weeks/yr) = 1248 hours/yr
- Maximum Daily & Yearly Throughput: (40.25 lb/batch)*(4 batch/hr)*(6 hrs/day) = 966 lb/day
 (966 lb/day) *(4 days/week) *(52 weeks/yr) = 200928 lb/yr = 100.464 tons/yr
- Roaster with Integrated Afterburner Firing Rate: 1.705 MMBtu/hr
- Total Fuel Throughput: 1.705 MMBtu/hr x (1248 hrs/yr) = 2127.84 MMBtu/yr
- Heat Capacity Natural Gas: 1,020 MMBtu/10⁶ ft³
- A-2 VOC Destruction Efficiency 90% by weight

Table 1. Emissions from Batch Roaster

Pollutant	Green Bean Throughput (TPY)	Emissions factor (lb/ton)	Emissions (lb/day)	Emissions (lb/yr)	Emissions (TPY)
NO _x	100.464	0.250	0.121	25.12	0.013
POC	100.464	0.047	0.023	4.72	0.002
CO	100.464	0.220	0.106	22.10	0.011
PM ₁₀ ¹	100.464	0.279	0.135	28.03	0.014
SO ₂	NA				
NPOC	NA				

Basis:

Emissions factors from source test, June 25, 2014 at Mountanos Brothers Coffee Company, (S-5), FID 21613, combines Batch Roasting and Natural Gas Combustion (*performed by Blue Sky Environmental*)

- NO_x: 0.25 lb/ton
- CO: 0.22 lb/ton

Emissions factors from EPA AP-42 (*Coffee Roasting Operations, Tables 9.13.2-1 / 9.13.2-2, Batch Roaster with Thermal Oxidizer*).

- POC: 0.047 lb/ton
- PM₁₀: 0.22 lb/ton (*Batch Roaster with Thermal Oxidizer 0.12 lb/ton filterable PM + Continuous Roaster with Thermal Oxidizer 0.1 lb/ton condensible PM*)
- PM₁₀: 0.059 lb/ton (*Green Coffee Bean Screening, Handling, and Storage System with Fabric Filter*)`

Table 2. Emissions from Natural Gas Combustion

Pollutant	Fuel Use Rate (MMBtu/yr)	Emissions factor (lb/MMBtu)	Emissions (lb/day)	Emissions (lb/yr)	Emissions (TPY)
NO _x	NA				
POC	NA				
CO	NA				
PM ₁₀	NA				
SO ₂	2127.84	0.00059	0.01	1.25	0.001
NPOC	2127.84	0.00225	0.02	4.79	0.002

Basis:

Emissions factors from EPA AP-42, Table 1.4-2 (small boilers <100 MMBtu/hr).

- VOC: $(5.5 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.00539 \text{ lb/MMBtu}$
- SO₂: $(0.6 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.000588 \text{ lb/MMBtu}$
- NPOC: $(2.3 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 0.00225 \text{ lb/MMBtu}$

Table 3. Cumulative Emission Increase

Pollutant	Application Emissions Total (lb/day)	Existing Emissions Post 4/5/91 (TPY)	Application Emissions (TPY)	Cumulative Emissions (TPY)
NO _x	0.121	0.000	0.013	0.013
POC	0.023	0.000	0.002	0.002
CO	0.106	0.000	0.011	0.011
PM ₁₀	0.135	0.000	0.014	0.014
SO ₂	0.006	0.000	0.001	0.001

Toxic Emissions from Roasting Operations and Natural Gas Combustion

Table 4. Toxic Air Contaminant Emissions

ROASTING OPERATIONS				NATURAL GAS COMBUSTION			Total
TAC	Green Bean Throughput (TPY)	Emission Factor (lb/ton)	Emission Rate (lb/yr)	Annual Fuel Use (MMBtu/yr)	Emission Factor (lb/MMBtu)	Emission Factor (lb/yr)	Emission Rate (lb/yr)
Acetaldehyde	100.464	0.00015	0.0151	NA			0.0151
Benzene	100.464	NA		2127.84	2.06E-06	0.0044	0.0044
Formaldehyde	100.464	0.0003	0.0301	2127.84	7.35E-05	0.1565	0.1866
Toluene	100.464	NA		2127.84	3.33E-06	0.0071	0.0071

Basis:

According to AP-42, Chapter 9.13.2, Coffee Roasting, the roaster is the main source of gaseous pollutants, including aldehydes and acrolein. However, the California Air Resources Board (CARB) has invalidated the source test method for acrolein. Until CARB approves a new test method and acrolein emissions are estimated from factors developed using the new test method, the District is not evaluating risk for acrolein. There are no California Air Toxics Emission Factors (CATEF) factors for the aldehydes from coffee roasting. The following two emissions factors are from a source test conducted June 25, 2014 at Mountanos Brothers Coffee Company, (S-5), FID 21613, Natural Gas Combustion (*performed by Blue Sky Environmental*). These two emissions factors include a 50% buffer for variability.

- Acetaldehyde: 0.00015 lb/ton
- Formaldehyde: 0.0003 lb/ton

Emissions factors from EPA AP-42, Table 1.4-3 (*Emissions Factors For Speciated Organic Compounds From Natural Gas Combustion*).

- Benzene: $(2.1E-03 \text{ lb/ MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 2.06E-06 \text{ lb/MMBtu}$
- Formaldehyde: $(7.5E-02 \text{ lb/ MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 7.35E-05 \text{ lb/MMBtu}$
- Toluene: $(3.4E-03 \text{ lb/MMscf}) / (1020 \text{ MMBtu}/10^6 \text{ ft}^3) = 3.33E-06 \text{ lb/MMBtu}$

Statement of Compliance

Regulation 1: General Provisions and Definitions

The facility is subject to Regulation 1, Section 301, which prohibits discharge of air contaminants resulting in public nuisance.

The facility is expected to comply with this requirement.

Regulation 2, Rule 1: Permits – General Requirements

California Environmental Quality Act (CEQA): District Regulation 2, Rule 1, Section 310 specifies that all proposed new and modified sources subject to District permit requirements must be reviewed in accordance with CEQA requirements, except for ministerial projects or projects exempt from CEQA under Section 2-1-312. The engineering review for this project requires only the application of standard permit conditions and standard emission factors in accordance with Permit Handbook Chapter 11.3: Coffee Roasting Operations.

Therefore, this application is ministerial and is exempt from CEQA review.

Public Notification: The public notification requirements of Regulation 2-1-412 apply to applications which result in any increase in toxic air contaminant or hazardous air contaminant emissions at facilities within 1,000 feet of the boundary of a K-12 school. This project is within 1000 feet of: Rancho Elementary School located at 1430 Johnson Street, Novato, CA 94947, Novato Early Intervention located at 1430 Johnson Street, Novato, CA 94947, Marin Oaks High School located at 720 Diablo Avenue, Novato, CA 94947, and Nova Education Center, located at 720 Diablo Avenue, Novato, CA 94947. An examination of Google Earth and relevant databases indicates that Rancho Elementary School and Novato Early Intervention are 0.17 miles (900 feet) from the facility. An examination of Google Earth and relevant databases indicates that Marin Oaks High School and Nova Education Center are 0.15 miles (792 feet) from the facility.

A public notice was prepared and sent to all addresses within 1000 feet of the coffee roaster and parents and guardians of students of (please list the school names here). The public comment period lasted from (start date) to (end date). At the end of the comment period, there were (number of comments received via email) written comments and (number of voice mails received) voicemails received. All comments were in opposition/support to the project. **The District responded to each comment and informed them that the District was proposing to approve the project because, for a project that satisfies the District's Toxic Risk Rule (Regulation 2, Rule 5) and meets all other applicable District regulations, the District was obligated to grant an Authority to Construct and does not have the authority to deny a project solely based on public opposition.**

Regulation 2, Rule 2: Permits – New Source Review

Best Available Control Technology (BACT): Per Regulation 2, Rule 2, Section 301 BACT is required for new or modified sources with potential emissions of 10.0 pounds per day or more of POC, NPOC, NO_x, PM₁₀, or SO₂.

Referencing Table 3, the coffee roaster will not emit more than 10 lbs/day of any criteria pollutant, therefore, is not subject to BACT requirements.

Emission Offsets: Under Section 2-2-302, POC and NO_x emission offsets are required for new or modified sources at a facility which emits or will be permitted to emit 10 tons per year or more on a pollutant specific basis.

Since the facility does not have the potential to emit more than 10 tons per year of NO_x or POC emissions, the facility is not subject to NO_x or POC offsets.

Since the facility will not have the potential to emit more than 100 tons per year of any criteria pollutant, the facility is not a "Major Facility" as defined in Regulation 2-2-217 and is not subject to PM10 or SO2 offsets under Regulation 2-2-303.

Prevention of Significant Deterioration (PSD):

Under this application this facility will not have the potential to emit more than 100 tons per year of any criteria pollutant, therefore this facility is not a "Major Facility" as defined in Regulation 2-1-203 and is not subject to PSD permitting requirements under Regulation 2-2-304.

Regulation 2, Rule 5: Permits – New Source Review of Toxic Air Contaminants

Health Risk Assessment: The District's regulation concerning toxic air contaminant emissions is codified in Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants (TAC). The TAC emissions from new and modified sources are subject to risk assessment review, if the emissions of any individual TAC exceed either the acute or chronic emission thresholds defined in Table 2-5-1.

Based on the trigger levels listed in Regulation 2, Rule 5, Table 2-5-1, the proposed emissions from the operation of S-2 listed in Table 5 do not exceed any chronic or acute trigger levels. No health risk assessment is required for this application.

Table 5. Toxic Air Contaminants HRSA Determination

TAC	CAS Number	Total Chronic Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	Exceeds Chronic Trigger	Total Acute Emissions (lb/hr)	Acute Trigger Level (lb/hr)	Exceeds Acute Trigger
Acetaldehyde	75-07-0	1.51E-02	2.90E+01	No	1.21E-05	1.00E+00	No
Benzene	71-43-2	4.38E-03	2.90E+00	No	3.51E-06	6.00E-02	No
Formaldehyde	50-00-0	1.87E-01	1.40E+01	No	1.50E-04	1.20E-01	No
Toluene	108-88-3	7.09E-03	1.20E+04	No	5.68E-06	8.20E+01	No

For each TAC, the projected toxic emission rate is less than 2% of the chronic trigger level. Since toxic emissions are far below the trigger level, source testing to verify compliance with these limits is not necessary.

Regulation 6, Rule 1: Particulate Matter – General Requirements

Section 301 prohibits for more than 3 minutes per hour, visible emissions as dark or darker than Ringelmann 1 or equivalent opacity. This facility is expected to comply with this standard. Section 305 prohibits emissions of visible particles from causing a nuisance on property other than the operators.

This operation is expected to comply with this standard.

Section 6-1-310 limits particulate emissions to 0.15 grains/dscf of exhaust gas volume. From the Permit Handbook we use the following equation: $Q_{dry} = Q_{act}[(68 + 460)/(T_{act} + 460)](1 - \%H_2O)$. At 11.5% weight fraction of water vapor the exhaust gas flow from the coffee roaster thermal oxidizer is 95.64 dscfm at 68°F (350.0 acfm at 1250°F). At this flow rate, the estimated grain loading for the coffee roasting process is calculated as follows:

$$[(0.279 \text{ lb } PM_{10}/\text{ton}) * (161 \text{ lb/hr}) / (2000 \text{ lb/ton})] * [(7000 \text{ grains/lb}) / (60 \text{ min/hour}) / (95.64 \text{ dscf/min})] = 0.02740 \text{ grains/dscf.}$$

This particulate weight emission complies with the Regulation 6-310 requirement that no operations may exceed a particulate weight emission of 0.15 grains/dscf.

Regulation 9, Rule 1: Inorganic Gaseous Pollutants – Sulfur Dioxide

The coffee roaster is subject to and will comply with Regulation 9, Rule 1, "Inorganic Gaseous Pollutants, Sulfur Dioxide," by restricting fuel use to natural gas only. Based on the following calculation, combustion of natural gas is expected to produce a SO₂ concentration of less than 1 ppmv:

$$SO_2 \text{ ppmv} = [(0.00057 \text{ lb/MMBtu}) * (385.5 \text{ ft}^3 \text{ SO}_2/\text{lb mol SO}_2)] / [(1 \text{ ft}^3 \text{ SO}_2/10^6 \text{ scft}^3 \text{ flue}) * ((20.9)/(20.9 - 3)) * (64.0588 \text{ lb SO}_2/\text{lb mol SO}_2) * (8710 \text{ scft}^3 \text{ flue/MMBtu})] = 0.338 \text{ ppmv at } 3\% \text{ O}_2$$

The combustion of natural gas meets the requirement of a maximum outlet concentration of 300 ppmv of SO₂ as specified in Regulation 9, Rule 1-302.

NSPS/NESHAPS

This source is not subject to any NSPS or NESHAP requirements.

Permit Conditions

Permit Condition #27305

1. The owner/operator shall not roast more than 200,928 lbs (100.464 tons) of green coffee beans at Coffee Roaster S-2 in any consecutive 12-month period.
[Basis: Cumulative Increase]
2. The owner/operator shall not use more than 2128 therms of natural gas at S-2 and A-2 combined during any consecutive twelve-month period.
[Basis: Cumulative Increase]
3. The owner/operator shall abate S-2 Coffee Roaster at all times while operating by A-2 Incinerator.
[Basis: Cumulative Increase]
4. The owner/operator shall maintain a minimum furnace temperature of 1200 °F at A-2 Incinerator whenever coffee beans are being roasted at S-2 Coffee Roaster.
[Basis: Regulation 2-1-403]
5. The owner/operator shall ensure that the A-2 Incinerator is equipped with a temperature-measuring device capable of continuously measuring and recording the temperature in the incineration zone when roasting. This device shall be accurate to within 10 degrees Fahrenheit (°F) and shall be maintained in accordance with manufacturer's recommendations. These temperature monitors shall be used to determine compliance with the temperature requirements in Part 4.
[Basis: Regulation 1-521]
6. The owner/operator shall not emit from any source for a period or periods aggregating more than three minutes in any hour, a visible emission which is as dark or darker than No. 1.0 on the Ringelmann Chart or of such opacity as to obscure an observer's view to an equivalent or greater degree.
[Basis: Regulation 6-1-301]
7. The owner/operator shall not exceed the following limits while operating S-2 Coffee Roaster and A-2 Incinerator:
NOx. 0.036 lb/MMBtu
CO. 0.031 lb/MMBtu
POC. 0.047 lb/ton of beans roasted
Formaldehyde. 0.0003 lb/ton of beans roasted
Acetaldehyde. 0.00015 lb/ton of beans roasted
[Basis: Cumulative Increase, BACT]

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8. To demonstrate compliance with the above conditions, the owner/operator shall maintain the following records and provide all of the data necessary to evaluate compliance with the above conditions, including the following information:
 - a. Monthly records of the quantity of green coffee beans roasted at S-2 Coffee Roaster.
 - b. Monthly records of natural gas usage.
 - c. Monthly usage records shall be totaled for each consecutive 12-month period.
 - d. Records of continuous temperature measurements of the exhaust stack whenever S-2 Coffee Roaster is roasting coffee beans.

All records shall be retained onsite for two years from the date of entry and made available for inspection by District staff upon request. These record-keeping requirements shall not replace the record keeping requirements contained in any applicable District Regulations.
[Basis: Cumulative Increase]

Recommendation

The proposed 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 subject to **Permit Condition # 27305**:

S-2 Coffee Roaster

Make: Probat, Model: P25-2,

Max Throughput Capacity: 55 lb/batch, 4 batches/hr, Max Firing Rate: 0.205 MMBtu/hr abated by:

A-2 Thermal Afterburner

Make: Probat, Model: TR22/34V-350MC-60NB

Max Firing Rate: 1.5 MMBtu/hr

Jeffrey Cleary
Air Quality Engineer

Date