Draft Engineering Evaluation
Facility No. 203555
Barking Dog Roasters – Smastad Coffee
981 Broadway, Sonoma, CA 95476
Application No. 706209

Background

Barking Dog Roasters is currently permitted to operate an existing coffee roaster (A/N 8033) at 18133 Hwy 12, Sonoma, CA 95476 (Plant #15605). They have applied for an Authority to Construct (AC) and Permit to Operate (PO) the existing roasting equipment at their new location, 981 Broadway, Sonoma, CA 95476.

S-1 Coffee Roaster
Make: Probat, Model: L12,
Max Throughput Capacity: 104 lb/hr, Max Firing Rate: 0.096 MMBtu/hr

*To be optionally abated by***:**

A-1 Wet Scrubber
Make: VortX, Model: 450 Ecofilter

Barking Dog Roasters proposed to operate the coffee roaster 12 hours/day, 1 day/week, and 52 weeks/year with an annual roasting throughput limit of 64,896 lbs (32.448 tons) of green coffee. The maximum hourly TAC emissions and maximum daily emissions for criteria pollutants are calculated using the maximum capacity 104 lb/hr to determine if HRA and BACT are triggered. At the time of this review, the Bay Area Air Quality Management District ("District", "Air District", or "BAAQMD") is not aware either of any applicable air quality regulation that would require the applicant to operate the proposed wet scrubber or of any emissions which can be attributed to the operation of the proposed wet scrubber; therefore, abatement device A-1 will be permitted to operate on a strictly voluntary basis. No emission reduction efficiencies are attributed to A-1 in this evaluation, and A-1 is considered an exempt device for District permitting purposes.

Barking Dog Roasters has claimed qualification for Small Business Certification.

Emissions Summary

Basis:

- Operation Hours: (12 hrs/day) × (1 days/week) × (52 weeks/yr) = 624 hrs/yr
- Maximum Throughput,
  Daily: (104 lb/hr) × (12 hrs/day) = 1248 lb/day
  Yearly: (1248 lb/day) × (1 days/week) × (52 weeks/yr) = 64,896 lb/yr = 32.448 tons/yr
- Roaster Firing Rate: = 0.096 MMBtu/hr
- Total Fuel Throughput: 0.096 MMBtu/hr x (624 hrs/yr) = 59.904 MMBtu/yr
- Heat Capacity Natural Gas: 1,050 MMBtu/10^6 ft^3

Criteria pollutant originate from source S-1, batch roasting [1] and gas combustion [2]. A summary of the emissions from batch roasting and gas combustion is given in Table 1.

Table 1. Emissions from Roasting Operation and Natural Gas Combustion for Source S-1

Pollutant	Roasting Operation			Natural Gas Combustion			Total
	Green Bean Throughput (TPY)	Emission Factor [1] (lb/ton)	Emission Rate (lb/yr)	Fuel Usage (MMscf/yr)	Emission Factor (lb/MMscf)	Emission Rate (lb/yr)	Emission Rate (lb/yr)
NO_X	N/A			5.71E-02	100.0	5.71	5.71
POC	32.448	0.86	27.91				27.91
CO	32.448	1.5	48.67				48.67
PM_{10}	32.448	0.279	9.05				9.05
$PM_{2.5}$	32.448	0.279	9.05				9.05
SO_2	N/A			5.71E-02	0.6	3.42E-02	3.42E-02
Methane	N/A			5.71E-02	2.3	1.31E-01	1.31E-01

[1] PM_{10}: 0.279 lb/ton
   a. 0.22 lb/ton (*Batch Roaster with Thermal Oxidizer 0.12 lb/ton filterable PM + Continuous Roaster with Thermal Oxidizer 0.1 lb/ton condensable PM*)
   b. 0.059 lb/ton (*Green Coffee Bean Screening, Handling, and Storage System with Fabric Filter*)

$PM_{2.5}$: Conservatively assumed to be equal to PM_{10}
POC: 0.86 lb/ton (*Batch Roaster*)
CO: 1.5 lb/ton (*Continuous Roaster*)

Toxic Emissions for Risk Screening

Both coffee roasting and gas combustion produce TAC emissions. According to Chapter 9.13.2 of AP-42, 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 Air District is not evaluating risk for acrolein. There are no California Air Toxic Emission Factors (CATEF) factors for the aldehydes from coffee roasting. However, source testing was performed at Peet's Coffee and Tea, Inc. and the toxic emission factors for Acetaldehyde and Formaldehyde derived from the testing data are used in this calculation. [3]

BAAQMD Toxic Air Contaminant (TAC) Emission Factor Guideline (Appendix A, Default TAC Emission Factors for Specific Source Categories, Table A-1.1), dated August 2020, was referenced for the roaster's natural gas TAC emission factors. [4]

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[1] Emission factors (batch roaster) for emissions of particulate and organics are taken from AP-42 Table 9.13.2-1 and Table 9.13.2-2. When values are not available for batch roasters, the most conservative value from the table is used.

[2] NO_X, SO_2, and NPOC (Methane) emission factors are taken from AP-42 Table 1.4-1/1.4-2, for small boilers (<100 MMBtu/hr).

[3] Source testing performed at Peets Coffee and Tea, Inc (Permit Handbook).
[4] August 2020 report by the Air District titled: BAAQMD TAC Emission Factor Guidelines Appendix A https://www.baaqmd.gov/~/media/files/ab617-community-health/facility-risk-reduction/documents/tac_emission_factor_guidance_appendixa_august_2020-pdf.pdf?la=en

Table 2. TAC Emissions from Roasting Operation and Natural Gas Combustion, for S-1							
TAC	Roasting Operation			Natural Gas Combustion			Total
	Green Bean Throughput (TPY)	Emission Factor (lb/ton)	Emission Rate (lb/yr)	Fuel Usage (MMBtu/yr)	Emission Factor (lb/MMBtu)	Emission Rate (lb/yr)	Emission Rate (lb/yr)
Acetaldehyde	32.448	0.0005	0.0162	59.904	4.22E-06	0.0003	0.0165
Acrolein				59.904	2.65E-06	0.0002	0.0002
Arsenic				59.904	1.96E-07	0.0000	0.0000
Benzene				59.904	7.84E-06	0.0005	0.0005
Beryllium				59.904	5.88E-09	0.0000	0.0000
Cadmium				59.904	1.08E-06	0.0001	0.0001
Copper				59.904	8.33E-07	0.0000	0.0000
Ethylbenzene				59.904	9.31E-06	0.0006	0.0006
Formaldehyde	32.448	0.0008	0.0260	59.904	2.17E-04	0.0130	0.0390
n-Hexane				59.904	6.18E-06	0.0004	0.0004
Lead				59.904	4.90E-07	0.0000	0.0000
Manganese				59.904	3.73E-07	0.0000	0.0000
Mercury				59.904	2.55E-07	0.0000	0.0000
Naphthalene				59.904	5.98E-07	0.0000	0.0000
Nickel				59.904	2.06E-06	0.0001	0.0001
PAH (as benzo(a) pyrene equivalent)				59.904	6.60E-09	0.0000	0.0000
Propylene				59.904	7.17E-04	0.0430	0.0430
Selenium				59.904	1.18E-08	0.0000	0.0000
Toluene				59.904	3.59E-05	0.0022	0.0022
Vanadium				59.904	2.25E-06	0.0001	0.0001
Xylenes				59.904	2.67E-05	0.0016	0.0016

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Project Potential to Emit

Table 3 summarizes the criteria pollutant and TAC emissions from the new source S-1.

Table 3. New Source (S-1) Potential to Emit Review [1]					
Pollutant		**Calculated Emissions**			
		lb/hr	*lb/day*	*lb/yr*	*tons/yr*
Criteria Pollutants	**NO_X**		0.11	5.71	0.003
	POC		0.537	27.91	0.014
	CO		0.936	48.67	0.024
	$PM_{10}/PM_{2.5}$		0.174	9.05	0.005
	SO_2		6.58E-04	3.42E-02	1.71E-05
	Methane		2.52E-03	1.31E-01	6.56E-05
Toxic Air Contaminants (TACs)	**Acetaldehyde**	2.64E-05		1.65E-02	
	Acrolein	2.54E-07		1.59E-04	
	Arsenic	1.88E-08		1.17E-05	
	Benzene	7.53E-07		4.70E-04	
	Beryllium	5.64E-10		3.52E-07	
	Cadmium	1.04E-07		6.47E-05	
	Copper	8.00E-08		4.99E-05	
	Ethylbenzene	8.94E-07		5.58E-04	
	Formaldehyde	6.24E-05		3.90E-02	
	n-Hexane	5.93E-07		3.70E-04	
	Lead	4.70E-08		2.94E-05	
	Manganese	3.58E-08		2.23E-05	
	Mercury	2.45E-08		1.53E-05	
	Naphthalene	5.74E-08		3.58E-05	
	Nickel	1.98E-07		1.23E-04	
	PAH	6.34E-10		3.95E-07	
	Propylene	6.88E-05		4.30E-02	
	Selenium	1.13E-09		7.07E-07	
	Toluene	3.45E-06		2.15E-03	
	Vanadium	2.16E-07		1.35E-04	
	Xylenes	2.56E-06		1.60E-03	

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Plant Cumulative Emissions

This project located at 981 Broadway, Sonoma, CA 95476 is a new facility. Therefore, there are no existing emissions at the plant. Table 4 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-1.

Table 4. Plant Cumulative Emissions

Pollutant	Existing Emissions (TPY)	S-1 Emissions (TPY)	Cumulative Emissions (TPY)
NOx	0.000	0.003	0.003
POC	0.000	0.014	0.014
CO	0.000	0.024	0.024
PM_{10}	0.000	0.005	0.005
$PM_{2.5}$	0.000	0.005	0.005
SO_2	0.000	1.71E-05	1.71E-05
Methane	0.000	6.56E-05	6.56E-05

HEALTH RISK ASSESSMENT

Table 5 summarizes the TAC emissions associated with the current application in comparison with the respective health risk assessment (HRA) trigger levels set forth in BAAQMD Regulation 2-5, Table 1. As seen, all the TAC emissions are below the trigger levels therefore, no HRA is required.

Table 5. Proposed TAC Emissions vs. HRSA Trigger Levels for the Project

TAC	Total Net Emissions		Trigger Levels		HRA Triggered
	Hourly (lb/hr)	Annual (lb/yr)	Acute (lb/hr)	Chronic (lb/yr)	(Yes/No)
Acetaldehyde			2.10E-	2.90E+0	No
Acrolein			1.10E-	1.40E+0	No
Arsenic			8.80E-	1.60E-03	No
Benzene			1.20E-	2.90E+0	No
Beryllium			N/A	3.40E-02	No
Cadmium			N/A	1.90E-02	No
Copper			4.40E-	N/A	No
Ethylbenzene			N/A	3.30E+0	No
Formaldehyde			2.40E-	1.40E+0	No
n-Hexane			N/A	2.70E+0	No
Lead			N/A	2.90E-01	No
Manganese			N/A	3.50E+0	No
Mercury			2.70E-	2.10E-01	No
Naphthalene			N/A	2.40E+0	No
Nickel			8.80E-	3.10E-01	No
PAH			N/A	3.30E-03	No
Propylene			N/A	1.20E+0	No
Selenium			N/A	8.00E+0	No
Toluene			2.20E+	1.60E+0	No
Vanadium			1.30E-	N/A	No
Xylenes			9.70E+	2.70E+0	No

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GRAIN LOADING RATE

Regulation 6-1-310.1: Particulate Weight Limitation, states that any source may not emit matter in excess of 0.15 grain/dscf of exhaust gas volume.

Basis: *Operating hours:* 624 hr/yr
Roaster emission point: 500 ascfm at 1,350 degrees F
Maximum hourly PM emissions = (0.279 lb/ton) × (104 lb/hour) / (2000 lb/ton) = 0.01451 lb/hour

[(0.01451 lb PM_{10}/hr) × (7000 grain/lb)] / [(60 min/hr) × (124.45 dscfm)] = 0.01360 grain/dscf

Therefore, S-1 does not emit matter more than 0.15 grain/dscf and complies with Regulation 6-1-310.1.

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, either 1,000 feet of the boundary of a K-12 school, or an Overburdened Community. The project is within 1,000 feet from two schools: Sonoma Valley High School, Creekside High School, and Adele Harrison Middle School. It is not located within an Overburdened Community, and it does not trigger a Health Risk Assessment.

Therefore, the project is subject to the public notification requirements of Reg. 2-1-412. The Air District will initiate a 30-day public notice and consider all comments received.

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, PM_{10}, $PM_{2.5}$. or SO_2. Referencing Table 3, the coffee roaster will not emit more than 10.0 lbs/day of any criteria pollutant, therefore, is not subject to BACT requirements.

Offsets: Under Section 2-2-302, POC and NOx 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. The facility does not have the potential to emit more than 10 tons per year of NOx or POC emissions, therefore is not subject to NOx or POC offsets.

Prevention of Significant Deterioration (PSD): 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 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 310.1 limits total suspended particulate (TSP) emissions to 0.15 grains/dscf of exhaust gas volume. As shown in the Grain Loading Rate calculation above, the source's particulate emissions are less than 0.15 grains/dscf.

Section 311.1 limits TSP emission rate based on the source's process weight rate. According to Table 6-1-311.1, the applicable TSP emission limit to the source is 1.78 lb/hour because the proposed coffee roaster can process up to 104 lbs of green beans per hour. This source is expected to comply with this limit as the maximum hourly PM emissions are estimated to be 0.0145 lb/hour.

Sections 310.2 and 311.2 are applicable to sources with TSP greater than 1000 kg/yr. Neither section is applicable because the source's potential to emit TSP is below 1,000 kg per year.

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.

Combustion of natural gas is expected to produce a SO_2 concentration of no more than 1 ppmv of SO_2 [5], thereby meeting the requirement of a maximum outlet concentration of 300 ppmv of SO2 prescribed in Regulation 9, Rule 1-302.

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

[5] $SO_2 = [(0.00057\ lb/MMBtu) \times (385.5\ ft^3\ SO_2/lb\ mol\ SO_2)]/[(1\ ft^3\ SO_2/10^6\ sdft^3 flue) \times (20.9/(20.9 - 3)) \times (64.0588\ lb\ SO_2/lb\ mol\ SO_2) \times (8710\ sdft^3 flue/MMBtu)] = 0.338\ ppmv\ at\ 3\%\ O_2$

Permit Conditions

Permit Condition #100416

1. The owner/operator shall not roast more than 64,896 pounds (32.448 tons) of green coffee beans at Coffee Roaster S-1 in any consecutive 12-month period.
   [Basis: Cumulative Increase]

2. The owner/operator shall not use more than 57,050 cubic feet of natural gas at S-1 during any consecutive twelve-month period.
   [Basis: Cumulative Increase]

3. The owner/operator may abate S-1 Coffee Roaster at any time of operation by A-1 Wet Scrubber.
   [Basis: Voluntary abatement]

4. 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]

5. The owner/operator shall ensure operation of S-1 does not exceed the following emission limits:

NO_X	100 pounds per MMSCF natural gas
CO	1.5 pounds per ton of beans roasted
POC	0.86 pounds per ton of beans roasted
Formaldehyde	0.0008 pounds per ton of beans roasted
Acetaldehyde	0.0005 pounds per ton of beans roasted

   [Basis: Cumulative Increase, Regulation 2-5]

6. 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-1 Coffee Roaster.
   b. Monthly records of natural gas usage.
   c. Monthly usage records shall be totaled for each consecutive 12-month period.

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]

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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/Permit to Operate to change permit conditions for the following equipment:

S-1 Coffee Roaster
Make: Probat, Model: L12,
Max Throughput Capacity: 104 lb/hr, Max Firing Rate: 0.096 MMBtu/hr

*To be optionally abated by***:**

A-1 Wet Scrubber
Make: VortX, Model: 450 Ecofilter

Daniel Oliver 08/28/2024

Senior Air Quality Engineer

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