

**DRAFT**  
**ENGINEERING EVALUATION**  
**CITY OF OAKLAND.**  
**P#21651-A#24969**  
**9222 SENECA STREET**  
**OAKLAND, CA 94605**

**BACKGROUND**

City of Oakland has applied for an Authority to Construct and/or Permit to Operate the following equipment:

S-1 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins;  
Model: QSB5-G3 NR3; Rated Horsepower: 145 HP; Model Year: 2013

The emergency standby diesel engine generator set S-1 will be installed after District approval. The S-1 will be located at 9222 Seneca Street, EBMUD Property 198, in Oakland, California. The emission calculations are shown below in emissions summary.

The above engine provides emergency power for all essential electrically powered equipment at the above site. The emergency engines must be periodically tested to ensure that they will generate electricity when needed.

**EMISSIONS SUMMARY**

**S-1 New Emergency Standby Diesel Engine Generator Set**

**Annual Emissions:**

The 145 HP diesel engine is a CARB Certified engine under EPA/CARB family 8CEXL0275AAG. For this report, it is assumed that the emission value of Total Unburned Hydrocarbons (HC) is equivalent to the emission value of POC.

**Table (1)**

<b>Emission Factors</b>		
Component	Emission (g/kw·hr)	Emission (g/bhp·hr)
NOx	2.910	2.17
CO	0.778	0.58
POC	0.067	0.05
PM <sub>10</sub>	0.080	0.06
SO <sub>2</sub> *	0.0074	0.0055

*\*The emission factor for SO<sub>2</sub> is from Chapter 3, Table 3.4-1 of the EPA Document AP-42, Compilation of Air Pollutant Emission Factors. SO<sub>2</sub> 8.09E-3 (% S in fuel oil) lb/hp-hr = 8.09E-3 (0.0015% S) (454 g/lb) = 0.0055 g/hp-hr*

**Maximum Emissions in Tons per year for testing:****Table (2)**

Maximum Emissions in Tons per year						
Pollutant	g/hp-hr	hp	hr/yr	1 lb/453.6 g	lb/yr	TPY
NO <sub>x</sub>	2.17	145	50	0.0022	34.684	0.017
CO	0.58	145	50	0.0022	9.270	0.005
POC	0.05	145	50	0.0022	0.799	0.0004
PM <sub>10</sub>	0.06	145	50	0.0022	0.960	0.0005
SO <sub>2</sub>	0.0055	145	50	0.0022	0.088	0.00004

**Maximum Daily Emissions:**

A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations. Check Table (3) for emissions per day.

**Table (3)**

Maximum Daily Emissions					
Pollutant	g/hp-hr	hp	hr/day	1 lb/453.6 g	lb/day
NO <sub>x</sub>	2.17	145	24	0.0022	16.648
CO	0.58	145	24	0.0022	4.450
POC	0.05	145	24	0.0022	0.384
PM <sub>10</sub>	0.06	145	24	0.0022	0.460
SO <sub>2</sub>	0.0055	145	24	0.0022	0.042

**Plant Cumulative Increase: (tons/year):**

The cumulative increase for new engine S-1 is as shown in Table (4).

**Table (4)**

Plant Cumulative Increase			
Pollutant	Existing tons/yr.	New tons/yr.	Total Increase
NO <sub>x</sub>	0.00	0.017	0.017
CO	0.00	0.005	0.005
POC	0.00	0.0004	0.0004
PM <sub>10</sub>	0.00	0.0005	0.0005
SO <sub>2</sub>	0.00	0.00004	0.00004
NPOC	0.00	0.000	0.000

**Toxic Risk Screening:**

The toxic emission of diesel particulate exceeds the District Risk Screening Trigger level, as shown below in Table (5). A Risk Screening Analysis has been performed.

**Table (5)**

<b>Toxic Emission Of Diesel Particulate</b>						
Source	PM <sub>10</sub> Emission Factor (g/HP-hr)	HP	Annual Usage (Hours/year)	Diesel Exhaust Particulate Emissions (lb/year)	Trigger Level (lb/yr)	Risk Screen Required? (Yes/No)
1	0.06	145	50	0.96	0.34	Yes

Calculation:

$$\begin{aligned}
 \text{PM}_{10} \text{ from CARB Certified levels } &= 0.08 \text{ (g/kW-hr)} / 1.341 \text{ (hp/kW)} = 0.06 \text{ (g/hp-hr)} \\
 \text{Diesel Exhaust Particular Emission (lb/yr.)} &= \text{PM}_{10} \text{ (g/hp-hr)} * \text{HP} * \text{Annual Usage (hr/yr)} \\
 &= 0.06 * 145 * 50 \\
 &= 435 \text{ g/yr} / 453.6 \text{ g/lb} \\
 &= 0.96 \text{ lb/yr}
 \end{aligned}$$

Since the engine meets Best Available Control Technology for Toxics (TBACT) requirements (emission level of 0.15 g/hp-hr or less), the maximum acceptable cancer risk is 10 in a million. Results from the health risk screening analysis show that for 50 hours of operation per year, excluding periods when operation is required due to emergency conditions, the risk to the maximally exposed nearest receptor is 7.8 in a million. The analysis was performed at a PM<sub>10</sub> emission of 0.96 lb/year (see the February 21, 2013 memo from the Toxics Evaluation Section). In accordance with the District's Risk Management Regulation 2, Rule 5, this risk level is considered acceptable.

**Public Notification:**

Since this plant is located within 1000 ft. of Bishop O' Dowd High School, public notification is required.

**Statement of Compliance**

S-1 is subject to the monitoring and record keeping requirements of Regulation 9-8-530 and the SO<sub>2</sub> limitations of 9-1-301 (ground-level concentration) and 9-1-304 (0.5% by weight in fuel). Regulation 9-8-530 requirements are incorporated into the proposed permit conditions. Compliance with Regulation 9-1 is expected since diesel fuel with a 15 ppm by weight sulfur is mandated for use in California. Like all sources, S-1 is subject to Regulation 6 ("Particulate and Visible Emissions"). This engine is not expected to produce visible emissions or fallout in violation of this regulation and it is assumed to comply with Regulation 6 pending a regular inspection.

**CEQA:**

This application is considered ministerial under the District's proposed CEQA guidelines (Regulation 2-1-312) and therefore is not subject to CEQA review.

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

In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO<sub>2</sub> or PM<sub>10</sub>.

Based on the emission calculations above, the owner/operator of S-1 is subject to BACT for NOx since the maximum daily emissions of NOx exceed 10 lbs/day. Please refer to the discussion on “Daily Emissions” on page 2 of this evaluation. BACT 1 levels do not apply for ‘engines used exclusively for emergency use during involuntary loss of power’ as per Reference b, Document 96.1.3, Revision 6 dated 4/13/2009 of the BAAQMD BACT Guidelines for IC Engines. Hence, the owner/operator has to meet BACT 2 limits presented below in Table (6).

**Table (6)**

<b>BAY AREA AIR QUALITY MANAGEMENT DISTRICT Best Available Control Technology (BACT) Guideline</b>
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<b>Source:</b>	<b>IC Engine – Compression Ignition: Stationary Emergency, non- Agricultural, non-direct drive fire pump</b>	<b>Revision:</b>	<b>6</b>
		<b>Document #:</b>	<b>96.1.3</b>
<b>Class:</b>	<b>&gt; 50 BHP Output</b>	<b>Date:</b>	<b>04/13/2009</b>

**Determination**

Pollutant	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
<b>NOx</b>	1. n/s <sup>d</sup> 2. Current tier <sup>a,b</sup> standard for NOx at applicable horsepower rating	1. n/s <sup>d</sup> 2. Any engine certified or verified to achieve the applicable standard. <sup>a,b</sup>

**References**

a	Current tier standard (listed on reverse side): The current CARB or EPA off-road tier standard for the pollutant of concern within the appropriate horsepower range. Where NMHC + NOx is listed (with no individual standards for NOx or NMHC) as the standard, the portions may be considered 95% NOx and 5% NMHC. For the purposes of determining BACT NMHC = POC. Any engine which has been certified or demonstrated to meet the current year tier standard may be considered a current certified engine for that pollutant.
b	For pollutants NOx, POC and CO, an engine which does not meet the current EPA or CARB off-road tier standard may represent BACT2, providing 1) the engine met the most stringent EPA Tier Standard in effect at the time of installation (Tier 1 minimum) or 2) the engine met the most stringent EPA Tier Standard in effect prior to the Tier change for that horsepower rating with the permit application submitted within 6 months of the effective date of the Tier change. [Source: California Health & Safety Code Section 93116.3(b) (7)]
c	Previous BACT determination dated 01/11/02.
d	Cost effectiveness analysis must be based on lesser of 50 hr/yr or as limited by toxic risk screen.

**BACT Table 1**

BACT 2 Emission Limits based on CARB ATCM Emissions Standards for Stationary Emergency Standby Diesel-Fueled CI Engines >50 BHP g/Kw-hr (g/bhp-hr)

Maximum Engine Power	PM	NMHC+NOx	CO
37 < KW < 56 (50 < HP < 75)	0.20 (0.15)	4.7 (3.5)	5.0 (3.7)
56 < KW < 75 (75 < HP < 100)	0.20 (0.15)	4.7 (3.5)	5.0 (3.7)
75 < KW < 130 (100 < HP < 175)	0.20 (0.15)	4.0 (3.0)	5.0 (3.7)
130 < KW < 225 (175 < HP < 300)	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
225 < KW < 450 (300 < HP < 600)	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
450 < KW < 560 (600 < HP < 750)	0.20 (0.15)	4.0 (3.0)	3.5 (2.6)
KW > 560 (HP > 750)	0.20 (0.15)	6.4 (4.8)	3.5 (2.6)

Following is a comparison of the current tier standard and the CARB certified emissions. For NMHC + NOx and CO the emission limits set by BACT 2 are met, as shown in Table (7) below.

**Table (7)**

Analysis of BACT2 Limits			
Pollutant	CARB Certified Engine Emission (g/hp-hr)	Emission Limits as set by BACT 2 for Tier III Engine (g/hp-hr)	Have the limits been met?
NMHC +NOx	2.75	3.0	YES
CO	0.58	2.6	YES

Since CARB certification data was used to establish the NMHC + NOx emission factor, the BACT 2 emission limits have not been incorporated into the permit conditions and are assumed to be complied with through the design standards demonstrated by the CARB certification testing.

**Offsets:** Offsets must be provided for any new or modified source at a facility that emits more than 10 tons/yr of POC or NOx. Based on the emission calculations above, offsets are not required for this application.

PSD and NESHAPS do not apply.

**New Source Performance Standard (NSPS):**

The engine is subject to 40 CFR 60, Subpart III, Standards of Performance for Stationary Compression Ignition Internal Combustion Engine because it was manufactured after April 1, 2006, as required by Section 60.4200(a)(2)(i).

The engine at source S-1 has a total displacement of 4.5 liters (275 cu in) and has 4 in-line cylinders, so each cylinder has a volume of less than 10 liters. The engine is a 2013 model year tier III engine and is not a fire pump. Section 60.4205(b) requires the engine to comply with the emission standards in Section 60.4202, which refers to 40CFR89.112 and 40CFR89.113 for all the pollutants. For engine less than 450 hp, these standards are:

NMHC+NO<sub>x</sub>: 3.0 g/hp-hr

CO: 2.6 g/hp-hr

PM: 0.15 g/hp-hr

20% opacity during acceleration mode

15% opacity during lugging mode

50% opacity during peaks in acceleration or lugging mode

The engine will comply with the above standards.

Sections 60.4206 and 60.4211(a) requires that the owner/operator operate and maintain the engine according to the manufacturer's written instructions or procedures developed by the owner or operator that are approved by the engine manufacturer, over the entire life of the engine. The owner/operator is expected to comply with this requirement.

Section 60.4207(a) requires that by October 1, 2007, the owner/operator must use fuel that complies with 40 CFR 80.510(a). This means that the fuel must have sulfur content of 500 parts per million (ppm) maximum, a cetane index of 40 or a maximum aromatic content of 35 volume percent. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California

Section 60.4207(b) requires that by October 1, 2010, the owner/operator must use fuel that complies with 40 CFR 80.510(b). This means that the fuel must have sulfur content of 15 parts per million (ppm) maximum, and the same cetane index or aromatic content as above. The owner/operator is expected to comply with this requirement because CARB diesel is required to be used in California.

Section 60.4209(a) requires a non-resettable hour meter. This requirement is already in the standard permit conditions.

The engine will comply with the requirements of Section 60.4211(c) because this engine is certified in accordance with 40 CFR Part 89.

The engine will comply with the requirement in Section 60.4211(e) to run for less than 100 hours per year for maintenance checks and readiness testing, and the prohibition of running for any reason other than emergency operation, maintenance, and testing because it is limited by permit condition to 50 hours per year for reliability testing and otherwise may only operate for emergencies.

The owner/operator is not required to perform tests in accordance with Section 60.4212 or 60.4213.

Section 60.4214 states that owner/operator do not have to submit an initial notification to EPA for emergency engines.

Because the engine do not have diesel particulate filter, it is not subject to Section 60.4214(c).

The owner/operator is required to comply with certain sections of 40 CFR 60, Subpart A, General Provisions. The owner/operator is expected to comply with this requirement.

#### **NESHAP**

This engine is not subject to the emission or operating limitations in 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engine, because per Section 63.6590, engines that are subject to NSPS Subpart IIII are not subject to the NESHAPS.

#### **Airborne Toxic Control Measure (ATCM):**

The State Office of Administrative Law approved the Airborne Toxic Control Measure (ATCM) on November 8, 2004. State law requires the local Air Districts to implement and enforce the requirements of the ATCM. Effective January 1, 2005, there is a prohibition on the operation of new diesel emergency standby engines greater than 50 bhp unless the following operating requirements and emission standards are met:

“Stationary Diesel Engine ATCM” section 93115, title 17, CA Code of Regulations.

#### **Diesel PM – General Requirements**

1. Meet 0.15 g/bhp-hr PM standard
2. Operate 50 hours per year, or less, for maintenance and testing (except emergency use and emissions testing)

#### **HC, NO<sub>x</sub>, NMHC+NO<sub>x</sub>, CO**

1. Meet standards for off-road engines of the same model year and horsepower rating as specified in the OFF-Road Compression Ignition Engine Standards;  
Or if no standards have been established
2. Meet the Tier 1 standards for an off-road engine for the same maximum rated power.



This emergency standby diesel engine (S-1) is in compliance with the above ATCM requirements. The diesel engine will operate for no more than 50 hours per year for maintenance and reliability testing. Engine meets all the ATCM requirements.

## PERMIT CONDITIONS

Condition #22850 for S-1 Emergency Standby Diesel Engine Generator Set, at Plant #21651

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing. [Basis: "Regulation 2-5]
2. The owner/operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, State or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, State or Federal emission limits is not limited. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e) (2) (A) (3) or (e) (2) (B) (3)]
3. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e) (4) (G) (1)]
4. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request
  - a. Hours of operation for reliability-related activities (maintenance and testing).
  - b. Hours of operation for emission testing to show compliance with emission limits.
  - c. Hours of operation (emergency).
  - d. For each emergency, the nature of the emergency condition.
  - e. Fuel usage for each engine(s).[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e) (4) (I), (or, Regulation 2-6-501)]
5. At School and Near-School Operation: If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply: The owner/operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:
  - a. Whenever there is a school-sponsored activity (if the engine is located on school grounds)
  - b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session.

"School" or "School Grounds" means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). "School" or "School Grounds" includes any building or structure, playground, athletic field, or other areas of school property but does not include unimproved school property. [Basis:

"Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e) (2) (A) (1)] or (e) (2) (B) (2)].

## 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 2-1-412.6. After the comments are received and reviewed, the District will make a final determination on the permit.

I recommend that 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 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins;  
Model: QSB5-G3 NR3; Rated Horsepower: 145 HP; Model Year: 2013

By: \_\_\_\_\_ Date: 02/26/2013  
Madhav Patil

Air Quality Engineering