

**ENGINEERING EVALUATION
CITY OF BERKELEY CORPORATION YARD
P#21109-A#24105
1326 ALLSTON WAY
BERKELEY, CA 94702**

Background

City of Berkeley Corporation Yard 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: DSHAE-5791722; Rated Horsepower: 364 HP; Model Year: 2007

- S-2 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins; Model: 590DGCA; Rated Horsepower: 99 HP; Model Year: 1998

The emergency standby generator set S-2 is in operation at present. The engine was installed in 1998. Therefore, it is a loss of exemption engine and does not need a risk screening analysis and emission calculations. The S-2 is located at 1326 Allston Way, in Berkeley, California.

The emergency standby generator set S-1 will be installed after District approval. The S-1 will be located at 1326 Allston Way, in Berkeley, California. The emission calculations are shown below in emissions summary.

Both the engines provide emergency power (in the event of a blackout) 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.

Emission Summary

S-2 Loss of Exemption Engine

Emissions

Emissions from S-2 do not need to be calculated since S-2 is not defined as a new or modified source pursuant to Regulation 2-1-232 and 2-1-234.

Cumulative Increase

Emissions from S-2 do not count towards the facility's cumulative increase since S-2 is not defined as a new or modified source pursuant to Regulation 2-1-232 and 2-1-234.

BACT

Since S-2 is a loss-of-exemption source, it is not subject to BACT requirements pursuant to Regulation 2-2.

Offsets

Offsets are not required because S-2 is not a new or modified source pursuant to Regulation 2-1 and 2-2.

Toxic Risk Screen Analysis

A Toxic Risk Screen Analysis is not required for this source since S-2 is not a new or modified source and not subject to Regulation 2-1-316.

Statement of Compliance

S-2 is a loss-of-exemption standby generator installed before May 17, 2000. Pursuant to Regulation 9-8-110.5, S-2 is not subject to Regulations 9-8-301, 9-8-305, 9-8-501 and 9-8-503. S-2 is subject to the monitoring and record keeping procedures described in Regulation 9-8-530, the SO₂ limitations of Regulation 9-1-302 (ground level concentration), 9-1-304 (0.5% by weight in fuel), and the Ringelmann No. 2 limitations of Regulation 6-303(emissions opacity limitations).

Per Regulation 6, Section 303, a person shall not emit for a period or periods aggregating more than three minutes in any hour, a visible emission that 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 or greater than 40% opacity. This engine is not expected to produce visible emissions or fallout in violation of this regulation and will be assumed to be in compliance with Regulation 6 pending a regular inspection.

Source (S-2) is also subject to the SO₂ limitations of Regulation 9-1-302 (ground level concentration) and 9-1-304 (0.5% by weight in fuel). Per Regulation 9, Rule 1, Section 302, a person shall not emit from any source a gas stream containing sulfur dioxide in excess of 300 ppm (dry). Additionally, per Regulation 9, Rule 1, Section 304, a person shall not burn any liquid fuel having sulfur content in excess of 0.5% by weight. Compliance with both Regulations 9-1-302 and 9-1-304 is likely since California law mandates using diesel fuel with a 0.05% by weight sulfur.

This application is considered ministerial under the District's proposed CEQA guidelines (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 in accordance with Permit Handbook Chapter 2.3.

This source is not defined as a new or modified source and is therefore not subject to the public notification requirements of Regulation 2-1-412.

A toxic risk screening analysis is not required.

BACT, PSD, NSPS, and NESHAPS are not triggered.

ATCM:

This facility will comply with new ATCM. Compliance with the following permit conditions will meet the ATCM requirements. The source S-2 has 1998 engine and the applicant did not provide information regarding PM10 emissions from this source. Air Resource Board web site for certified engines does not have the PM10 emissions for this typical engine. Therefore, District will authorize only 20 hours of reliability-related testing.

S-1 New Emergency Standby Diesel Engine Generator Set**Annual Emissions:**

The 364 HP diesel engine is a CARB Certified under Executive order U-R-002-0393, as a member of the EPA/CARB family 7CEXL0540AAB. 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)

Emission Factors		
Component	Emission (g/kw·hr)	Emission (g/bhp·hr)
NO _x	3.711	2.767
CO	3.299	2.460
POC	0.194	0.145
PM ₁₀	0.150	0.112
SO ₂ *	0.0074	0.0055

*The emission factor for SO₂ is from Chapter 3, Table 3.4-1 of the EPA Document AP-42, Compilation of Air Pollutant Emission Factors.
 SO₂ 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:**Table (2)**

Maximum Emissions in Tons per year						
Pollutant	g/hp-hr	hp	hr/yr	1 lb/453.6 g	lb/yr	TPY
NO _x	2.767	364	50	0.0022	111.022	0.056
CO	2.460	364	50	0.0022	98.704	0.049
POC	0.145	364	50	0.0022	5.818	0.0029
PM ₁₀	0.112	364	50	0.0022	4.494	0.0022
SO ₂	0.0055	364	50	0.0022	0.221	0.00011

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 _x	2.767	364	24	0.0022	53.290
CO	2.460	364	24	0.0022	47.378
POC	0.145	364	24	0.0022	2.793
PM ₁₀	0.112	364	24	0.0022	2.157
SO ₂	0.0055	364	24	0.0022	0.106

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 _x	0	0.056	0.056
CO	0	0.049	0.049
POC	0	0.0029	0.0029
PM10	0	0.0022	0.0022
SO ₂	0	0.00011	0.00011
NPOC	0	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)

Toxic Emission Of Diesel Particulate						
Source	PM ₁₀ 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)
S-1	0.112	364	50	4.49	0.58	Yes

Calculation:

$$\begin{aligned}
 \text{PM}_{10} \text{ from CARB Certified levels } &= 0.15 \text{ (g/kW-hr)} / 1.341 \text{ (hp/kW)} = 0.112 \text{ (g/hp-hr)} \\
 \text{Diesel Exhaust Particular Emission (lb/yr.)} &= \text{PM}_{10} \text{ (g/hp-hr)} * \text{HP} * \text{Annual Usage (hr/yr)} \\
 &= 0.112 * 364 * 50 \\
 &= 2038.4 \text{ g/yr} / 453.6 \text{ g/lb} \\
 &= 4.49 \text{ lb/yr}
 \end{aligned}$$

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 8.2 in a million. The analysis was performed considering the PM₁₀ emission of 4.49 lb/year (see the June 4, 2012 memo from the Toxics Evaluation Section). In accordance with the District's Risk Management Regulation 2, Rule 5 this risk level is considered acceptable as the engine meets current TBACT requirements.

Public Notification:

Since this plant is located within 1000ft of a Berkeley Rose 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 SO₂ 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, SO₂ or PM₁₀.

Based on the emission calculations above, the owner/operator of S-1 is subject to BACT for the following pollutants: NOx and CO since the maximum daily emissions of these pollutants 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)

<p>BAY AREA AIR QUALITY MANAGEMENT DISTRICT Best Available Control Technology (BACT) Guideline</p>

Source:	IC Engine – Compression Ignition: Stationary Emergency, non-Agricultural, non-direct drive fire pump	Revision:	6
		Document #:	96.1.3
Class:	> 50 BHP Output	Date:	04/13/2009

Determination

Pollutant	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
NOx	1. n/s ^d 2. Current tier ^{a,b} standard for NOX at applicable horsepower rating	1. n/s ^d 2. Any engine certified or verified to achieve the applicable standard. ^{a,b}
CO	1. n/s ^d 2. The more stringent of either 2.75 g/bhp-hr [319 ppmvd @ 15% O ₂] ^{c or the current Tier a,b standard.}	1. n/s ^d 2. Any engine certified or verified to achieve the applicable standard.

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 + NO_x is listed (with no individual standards for NO_x or NMHC) as the standard, the portions may be considered 95% NO_x 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 NO_x, 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.

Following is a comparison of the current tier standard and the CARB certified emissions. For NMHC + NO_x 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 +NO _x	2.912	3.0	YES
CO	2.46	2.6	YES

Since CARB certification data was used to establish the NMHC + NO_x and CO emission factors, 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 NO_x. 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 IIII, 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 8.9 liters (543 cu in) and has 6 cylinders, so each cylinder has a volume of less than 10 liters. The engine is a 2007 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 600 hp, these standards are:

NMHC+NO_x: 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

According to CARB Executive Order U-R-002-0393, the engine will comply with the 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_x, NMHC+NO_x, 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-2 Emergency Standby Diesel Engine Generator Set, at Plant #21109

1. The owner/operator shall not exceed 20 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)].

Condition #22850 for S-1 Emergency Standby Diesel Engine Generator Set, at Plant #21109

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

Propose to issue an Authority to Construct to City of Berkeley Corporation Yard for:

S-1 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins;
Model: DSHAE-5791722; Rated Horsepower: 364 HP; Model Year: 2007 and;

Propose to issue a Loss of Exemption letter for:

S-2 Emergency Standby Diesel Engine Generator Set: Diesel Engine Make: Cummins;
Model: 590DGCA; Rated Horsepower: 99 HP; Model Year: 1998

EXEMPTIONS

None.

By: Madhav Patil

Date: 6/6/2012

Air Quality Engineering