

## ENGINEERING EVALUATION REPORT

<b>Plant Name:</b>	<b>UCSF Benioff Childrens Hospital Oakland</b>
<b>Application Number:</b>	<b>27671</b>
<b>Plant Number:</b>	<b>1785</b>

### **BACKGROUND**

The applicant is applying for an Authority to Construct for a new Emergency Stand-By Diesel Power Generator Set. The applicant is requesting an Authority to Construct for the following equipment:

#### **S-13 Emergency Stand-By Diesel Generator Set; Cummins Model QSX15-G9, 755 BHP**

### **CRITERIA POLLUTANT EMISSIONS CALCULATIONS**

The proposed engine has not been certified by the California Air Resources Board. Manufacturer's ISO 8178-1 5-mode weighted emission factors for the engine family were used for all criteria pollutant emission calculations except SO<sub>2</sub>. The emission factors used are as follows:

Source(s)	S-13
EPA Engine Family	FCEXL015.AAJ (J103)
CARB Executive Order	N/A
PM10	0.082
POC	0.194
NOx	3.684
SO <sub>2</sub> <sup>1</sup>	0.004
CO	0.447

The applicant requested operation at 50 hours per year, which is consistent with the California Air Resources Board Air Toxic Control Measure for Stationary Compression Ignition Engines, 17 CFR 93115, (May 19, 2011).

At a 50 hours per year testing and maintenance limitation, criteria emissions are as follows:

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<sup>1</sup> SO<sub>2</sub> emission factor calculated from fuel rate for EPA certified engine  
SO<sub>2</sub> g/bhp-hr = (34.4 gal/hr)\*(7.1 lb/gal)\*(0.0015 lb S/100 lb)\*(64.06 lb SO<sub>2</sub>/lb mol/32.06 lb S/lb mol)\*(453.6 g/lb)  
\*(1/755 BHP) = 0.004 g/bhp/hr

**TABLE 1 – CRITERIA POLLUTANT EMISSIONS**

<b>SOURCE</b>	<b>BHP</b>	<b>PM10 G/BHP-HR</b>	<b>POC G/BHP-HR</b>	<b>NOX G/BHP-HR</b>	<b>SO2 G/BHP-HR</b>	<b>CO G/BHP-HR</b>
<b>S-13</b>	<b>755</b>	<b>0.082</b>	<b>0.194</b>	<b>3.684</b>	<b>0.004</b>	<b>0.447</b>
<b>BACT (Tier 2 ATCM limits)</b>		<b>0.15</b>	<b>0.24</b>	<b>4.56</b>	<b>N/A</b>	<b>2.60</b>
<b>Meets BACT?</b>		<b>YES</b>	<b>YES</b>	<b>YES</b>	<b>N/A</b>	<b>YES</b>
<b>LB/HR</b>		<b>0.14</b>	<b>0.32</b>	<b>6.13</b>	<b>0.01</b>	<b>0.74</b>
<b>LB/DAY</b>		<b>3.28</b>	<b>7.75</b>	<b>147.16</b>	<b>0.18</b>	<b>17.87</b>
<b>LB/YEAR</b>		<b>6.83</b>	<b>16.14</b>	<b>306.59</b>	<b>0.37</b>	<b>37.24</b>
<b>TPY</b>		<b>0.003</b>	<b>0.008</b>	<b>0.153</b>	<b>1.83E-04</b>	<b>0.019</b>

This engine triggers BACT for NOx and CO, and triggers TBACT for PM10

**OLD SOURCES: EMISSION REDUCTIONS**

The applicant is not planning to shut down any existing sources on start-up of the new engines, therefore no contemporaneous on-site emission reductions were calculated for this application.

**CUMULATIVE EMISSIONS INCREASE**

Changes to the cumulative emissions inventory are as follows:

**TABLE 2 - CUMULATIVE EMISSION INCREASE INVENTORY**

	<b>Current Balance (tons/yr)</b>	<b>Emission Increases (tons/yr)</b>	<b>On-Site Reductions (tons/yr)</b>	<b>Off-sets From DSFB (tons/yr)</b>	<b>New Total (tons/yr)</b>
<b>PM</b>	<b>0.100</b>	<b>0.003</b>	<b>0.000</b>	<b>0.000</b>	<b>0.103</b>
<b>POC</b>	<b>0.150</b>	<b>0.008</b>	<b>0.000</b>	<b>0.000</b>	<b>0.158</b>
<b>NOx</b>	<b>1.150</b>	<b>0.153</b>	<b>0.000</b>	<b>0.000</b>	<b>1.303</b>
<b>SO2</b>	<b>0.160</b>	<b>0.000</b>	<b>0.000</b>	<b>0.000</b>	<b>0.160</b>
<b>CO</b>	<b>1.370</b>	<b>0.019</b>	<b>0.000</b>	<b>0.000</b>	<b>1.389</b>

**OFFSETS**

The total Potential to Emit for the facility after start-up of the new source will be less than 100 TPY for each criteria pollutant and less than 10 TPY for each ozone precursor (NO<sub>x</sub> and POC) (see Attachment 1).

Since the facility does not have the potential to emit more than 10 tons per year of nitrogen oxide or precursor organic compounds emissions on a pollutant-specific basis, the facility is not subject to NO<sub>x</sub> or POC offsets under Regulation 2-2-302.

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 2-1-203, and is not subject to PM<sub>10</sub> or SO<sub>2</sub> offsets under Regulation 2-2-303.

## **TOXIC RISK MODELING**

The District uses PM<sub>10</sub> emissions as a proxy for toxic emission exposure to surrounding residential and industrial populations. A PM<sub>10</sub> emissions level of 0.34 lbs/year automatically triggers a health risk screening assessment pursuant to Regulation 2, Rule 5. At a maximum 50 hours per year per engine permitted operation, this application exceeds a PM<sub>10</sub> emission level of 0.34 lbs/year and so requires that a health risk screening assessment be performed.

The AERMOD risk screening model was run to calculate project cancer and non-cancer risks. Meteorological data from the Oakland STP was used to estimate maximum annual average ambient PM<sub>10</sub> concentrations. Distance and directionality were used as the primary considerations to determine sites of maximum exposure. Elevated terrain was considered using 10m DEM input from the 10 m NED input for the Alameda County NAD83 sub area. Model runs were made with both rural and urban dispersion coefficients. Stack and building parameters for the analysis were based on information provided by the applicant.

Estimates of residential risk assume potential exposure to annual average TAC concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume potential exposure occurs 8 hours per day, 245 days per year, for 40 years. Risk estimates for students assume a higher breathing rate, and potential exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years. Cancer risk adjustment factors (CRAFs) were used to calculate all cancer risk estimates. The CRAFs are age-specific weighting factors used in calculating cancer risks from exposures of infants, children and adolescents, to reflect their anticipated special sensitivity to carcinogens.

The highest project risks were obtained by modeling emissions using rural terrain dispersion coefficients, therefore these values were used in the health risk calculations. The model produced a maximum annual project ground level concentration (GLC) of 65.82 for residential receptors, resulting in a cancer risk of approximately 3.6 in a million, and a maximum annual project GLC of 45.35 µg/m<sup>3</sup> per g/sec for off-site worker receptors, resulting in a cancer risk of approximately 1.2 in a million. The facility operates an on-site kindergarten – 12<sup>th</sup> grade school on the hospital premises, located approximately 350 feet from the site of the new generator engine. Risk estimates for students assume a higher breathing rate, and potential exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years. However, since the engine is less than 500 feet from the closest K-12 school, the engine is not allowed to operate between 7:30 a.m. and 3:30 pm on days when the school is in session. Potential exposure to students is therefore considered to be negligible.

The maximum calculated carcinogenic risk is below 10 in a million and the maximum calculated chronic hazard index is less than 1.0, and so the engine as proposed is acceptable under Regulation 2, Rule 5.

## **BACT/TBACT REVIEW**

Under Regulation 2, Rule 2, any new source which results in an increase of more than 10 lbs per day of any criteria pollutant must be evaluated for adherence to BACT and TBACT control technologies. This engine triggers BACT for NO<sub>x</sub> and CO, and triggers TBACT for PM<sub>10</sub>. For compression ignition I.C. engines with firing rates greater than 50 BHP, this means the engine must be fired on ultra-low sulfur diesel fuel (fuel oil with less than 0.0015% by weight sulfur content). BACT/TBACT also requires that the engine meet current tier standards for POC, NO<sub>x</sub>, and CO emissions, and meet a PM<sub>10</sub> emission limitation of no more than 0.15 g/bhp-hr. The proposed engine complies with the current tier standards and meets BACT/TBACT.

## **PSD REVIEW**

Since the facility is not one of the 28 Prevention of Significant Deterioration (PSD) source categories listed in Section 169(1) of the Clean Air Act, the facility is not a "Major Facility" for the purposes of PSD, and is not subject to PSD permitting requirements under Regulation 2-2-304.

## **TITLE V REVIEW**

Since the facility will not have the potential to emit more than 100 tons per year of any criteria pollutant, more than 10 tons per year of any single hazardous air pollutant, or more than 25 tons per year of all hazardous air pollutants combined, the facility is not a "Major Facility" for the purposes of Title V as defined in Regulation 2-6-212, and is not subject to Title V permitting requirements under Regulation 2-6-301.

## **PUBLIC NOTIFICATION REQUIREMENTS**

UCSF Benioff Childrens Hospital Oakland provides an on-site school for Kindergarten through 12<sup>th</sup> grade children which is accredited by the Oakland Unified School District, and which is considered to be a school site for the provisions of the California Health and Safety Code, Section 42301.6, and Regulation 2, Rule 1-412. Therefore, the proposed generator engine is subject to Public Notice requirements under these legal requirements.

## **COMPLIANCE DETERMINATION**

The engine is covered under ministerial exemption, Chapter 2.3.1 of the BAAQMD Permit Handbook. CEQA is not triggered for emergency standby generators under this provision.

The engine is governed by and complies with the **California Air Resources Board's Air Toxic Control Measure for Stationary Compression Ignition Engines, CCR Title 17, Section 93115**. The explicit annual equipment usage limitation of 50 hours per year per engine for testing and maintenance operations will be included as part of the permit conditions. Operations under emergency conditions are unlimited.

The engine is governed by and complies with the provisions of **Regulation 2, Rule 5, "New Source Review for Toxic Air Contaminants."**

The engine is exempt from the emission limitations of **Regulation 9, Rule 8-305, 8-501, and 8-503**, since they meet the provisions of **Regulation 9, Rule 8-110.5, "Exemptions: Emergency Standby Engines."**

The engine is required to meet NSPS requirements as set out in 40 CFR Part 60, Subpart IIIIG, **Standards of Performance for Stationary Compression-Ignition Internal Combustion Engines, Set G, 2007 and Later Model Non-Fire Pump Emergency Less than 10L per Cylinder**, since the rated engine power is greater than 25 BHP. Under 40 CFR 60.4211(c), the applicant may show compliance by buying and operating engines certified to the emission standards for new non-road CI engines for the same model year and maximum engine power in 40 CFR 89.112 and 40 CFR 89.113 (PM<sub>10</sub> emissions less than 0.2 g/kW-hr, NMHC+NO<sub>x</sub> emissions less than 6.4 g/kW-hr, and CO emissions less than 3.5 g/kW-hr). The engine proposed in this application is certified to these emission levels.

Visible emissions will be required to meet a Ringelmann 2 opacity limitation per **Regulation 6-303.1**.

Sulfur emissions will be controlled by the requirement that any fuel used in the engine meet California Clean Air fuel content of 0.0015% bw sulfur, as required by the **California Air Resources Board's Air Toxic Control Measure for Stationary Compression Ignition Engines, CCR Title 17, Section 93115**.

**CONDITIONS**

Condition #22850, setting out the operating conditions and recordkeeping requirements for operations at Source S-13 shall be made part of the source's Authority to Construct/Permit to Operate.

**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 listed below. However, the proposed source will be located within 1000 feet of a school, which triggers the public notification requirements of Regulation 2-1-412.

I recommend that the District initiate a public notice, and consider any comments received before taking final action on issuance of an Authority to Construct for the following sources:

**S-13 Emergency Stand-By Diesel Generator Set; Cummins Model QSX15-G9, 755 BHP**

subject to Conditions #22850.

By \_\_\_\_\_ Date \_\_\_\_\_  
*Catherine S. Fortney*

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing.  
[Basis: Title 17, California Code of Regulations, section 93115, ATCM for Stationary CI Engines]
  
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, 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)]

## ATTACHMENT 1- FACILITY-WIDE POTENTIAL TO EMIT

SOURCE	S CODE	SOURCE DESCRIPTION	THRUPUT	UNITS	COND	APPLIC	PM10 (lb/yr)	POC (lb/yr)	NPOC (lb/yr)	NOX (lb/yr)	SO2 (lb/yr)	CO (lb/yr)
3	C1350189	Space Heat Boiler <sup>(1,2)</sup>	6	MMBTU/hr	1980	1861	391.62	283.41	159.74	574.06	309.18	3883.40
5	C2240098	Standby Diesel Generator <sup>(3)</sup>	2154.9	BHP	22845	3203	71.83	62.00		1338.26	0.17	318.53
6	C2240098	Standby Diesel Generator <sup>(3)</sup>	2154.9	BHP	22845	3203	71.83	62.00		1338.26	0.165	318.53
7	C1350189	Space Heat Boiler <sup>(1,2)</sup>	7	MMBTU/hr	21032	7922	456.89	330.65	186.36	669.74	360.71	4530.63
8	C1350189	Space Heat Boiler <sup>(1,2)</sup>	7	MMBTU/hr	21032	7922	456.89	330.65	186.36	669.74	360.71	4530.63
9	C22AH098	Standby Diesel Generator <sup>(4)</sup>	210	BHP	22820	20742	6.85	6.40		93.80	0.05	20.40
10	C22BH098	Standby Diesel Generator <sup>(4)</sup>	947	BHP	22820	20742	30.90	27.52		403.34	0.23	87.72
11	C1250189	Boiler [Registered]	2.4	MMBTU/hr	--	--	156.65	113.36	63.90	229.62	123.67	1553.36
12	C1250189	Boiler [Registered]	2.4	MMBTU/hr	--	--	156.65	113.36	63.90	229.62	123.67	1553.36
13	TBD	Standby Diesel Generator <sup>(5)</sup>	755	BHP	22850	27671	6.83	16.14		306.59	0.37	37.24
					TOTAL	LB/YEAR	1,807	1,345	660	5,853	1,279	16,834
						TPY	0.903	0.673	0.330	2.927	0.639	8.417
					TOTAL FACILITY PTE =		13.89	TPY				

(1) Excluding diesel back-up fuel usage

(2) NOx and CO emissions based on BACT limits of 25 ppmv and 100 ppmv respectively. Other emissions from AP 42, Table 1.4-2.

(3) Limited to 45 hours per year operation; 0.0015 ppm sulfur fuel

(4) Limited to 20 hours per year operation; 0.0015 ppm sulfur fuel

(5) Limited to 50 hours per year operation; 0.0015 ppm sulfur fuel