

**ENGINEERING EVALUATION**  
**City of Richmond**  
**Plant: 15756**  
**Application: 18332**

**BACKGROUND**

City of Richmond has applied to obtain an Authority to Construct (AC) and/or a Permit to Operate (PO) for the following equipment:

**S-2**

**Emergency Standby Diesel Generator Set            at            2600 Barrett Avenue**  
**2008 AB Volvo, Model: D500/TAD1641GE            Richmond, CA 94804**  
**757 BHP, 3.67 MMBTU/hr**

The Emergency Diesel Engine Generator Set (S-2) is equipped with the best available control technology (BACT) for minimizing the release of air borne criteria pollutants and harmful air toxins due to fuel combustion. The criteria pollutants are nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), precursor organic compounds (POC) from unburned diesel fuel, sulfur dioxide (SO<sub>2</sub>) and particulate matter (PM<sub>10</sub>). All of these pollutants are briefly discussed on the District's web site at [Baaqmd.gov](http://Baaqmd.gov).

The engine meets the Environmental Protection Agency and California Air Resources Board (EPA/CARB) Tier 2 Off-road standard. The engine will burn commercially available California low sulfur diesel fuel. The sulfur content of the diesel fuel will not exceed 0.0015% by weight. The operation of the engine should not pose any health threat to the surrounding community or the public at large.

The engine is subject to attached condition no. 22822.

**EMISSIONS**

S-2 has been certified by CARB to be a cleaner burning engine. Except for SO<sub>2</sub>, the emission factors for this engine are from the CARB Certification (CARB Executive Order # U-R-014-0102). The SO<sub>2</sub> emissions were calculated based on the maximum allowable sulfur content (0.0015 wt% S) of the diesel fuel with assumption that all of the sulfur present will be converted to SO<sub>2</sub> during the combustion process. The POC emission factor is assumed to be 5% of the total CARB's certified NO<sub>x</sub> and POC (NMHC+NO<sub>x</sub>) factor based on District Policy.

Basis:

- 22 hr/yr operation for testing and maintenance
- 26.8 gallons/hr max fuel use rate
- NMHC + NO<sub>x</sub>, CO and PM<sub>10</sub> emission factors provided by CARB Certification with Executive Order U-R-014-0102
- POC is assumed to be 5% of NMHC + NO<sub>x</sub>
- NO<sub>x</sub> is assumed to be 95% of NMHC + NO<sub>x</sub>
- SO<sub>2</sub> emissions are quantified based on the full conversion of 0.0015 wt% (~ 15 ppm) sulfur in the ULS diesel fuel.

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**Annual Average Emissions:**

NOx = ( 22 hr/yr )( 757 hp )( 3.83 g/hp-hr )( 1 lb/454g ) = **140.33** lb/yr or **0.0702** TPY  
 CO = ( 22 hr/yr )( 757 hp )( 0.52 g/hp-hr )( 1 lb/454g ) = **19.15** lb/yr or **0.0096** TPY  
 POC = ( 22 hr/yr )( 757 hp )( 0.20 g/hp-hr )( 1 lb/454g ) = **7.39** lb/yr or **0.0037** TPY  
 PM10 = ( 22 hr/yr )( 757 hp )( 0.07 g/hp-hr )( 1 lb/454g ) = **2.74** lb/yr or **0.0014** TPY  
 SO2 = ( 0.000015 lb S/lb fuel )( 7.206 lb fuel/gal fuel )( 26.8 gal fuel/hr )( 64 lb SO2/32 lb S )( 22 hr/yr )  
       = **0.1275** lb/yr or **0.000064** TPY

**Daily Emissions:**

Daily emissions are calculated to establish whether a source triggers the requirement for BACT (10 lb/highest day total source emissions for any class of pollutants). 24-hr/day of operation will be assumed since no daily limits are imposed on intermittent and unexpected operations.

NOx = ( 24 hr/yr )( 757 hp )( 3.83 g/hp-hr )( 1 lb/454g ) = **153.09** lb/day  
 CO = ( 24 hr/yr )( 757 hp )( 0.52 g/hp-hr )( 1 lb/454g ) = **20.89** lb/day  
 POC = ( 24 hr/yr )( 757 hp )( 0.20 g/hp-hr )( 1 lb/454g ) = **8.06** lb/day  
 PM10 = ( 24 hr/yr )( 757 hp )( 0.07 g/hp-hr )( 1 lb/454g ) = **2.98** lb/day  
 SO2 = ( 0.000015 lb S/lb fuel )( 7.206 lb fuel/gal fuel )( 26.8 gal fuel/hr )( 64 lb SO2/32 lb S )( 24 hr/day )  
       = **0.1390** lb/day

**Table 1**

Pollutant	Emission Factor	Emission Factor	Annual Emissions (lb/yr)	Annual Emissions (TPY)	Max. Daily (lb/day)
	(g/kw-hr)	(g/hp-hr)			
NMHC+NOx	5.40	4.03	147.72	0.0739	161.15
NOx	5.13	3.83	140.33	0.0702	153.09
CO	0.70	0.52	19.15	0.0096	20.89
POC	0.27	0.20	7.39	0.0037	8.06
PM10	0.10	0.07	2.74	0.0014	2.98
SO2	-	-	0.1275	0.000064	0.1390

**PLANT CUMULATIVE INCREASE**

City of Richmond at “401 27<sup>th</sup> Street, Richmond, CA 94804” is an existing facility. Therefore, the District’s database contains information on existing emissions at the plant. Table 2 summarizes the cumulative increase in criteria pollutant emissions that will result at Plant 15756 from the operation of S-2.

**Table 2**

Pollutant	Current plant emissions (TPY)	Increase in plant emissions associated with this application (TPY)	Cumulative emissions (Current + Increase) (TPY)
NO <sub>x</sub>	0.131	0.07016	0.20116
CO	1.577	0.00957	1.58657
POC	0.263	0.00369	0.26669
PM <sub>10</sub>	0.044	0.00137	0.04537
SO <sub>2</sub>	0.009	0.00006	0.00906

**TOXIC RISK SCREENING ANALYSIS**

This application required a Toxics Risk Screen because the diesel particulate emissions are greater than the toxic trigger level.

<u>Toxic Pollutant Emitted</u>	<u>Emission Rate (lb/yr)</u>	<u>Risk Screening Trigger (lb/yr)</u>
PM10 (Diesel Particulate)	2.74	0.58

S-2 meets Best Available Control Technology for toxics (TBACT) since the diesel particulate emissions are less than 0.1 g/bhp-hr. For an engine that meets the TBACT requirement, it must also pass the toxic risk screening level of less than ten in a million. Estimates of residential risk assume exposure to annual average toxic air contaminate concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume exposure occurs 8 hours per day, 245 days per year, for 40 years. Risk estimates for students assume a higher breathing rate, and exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years.

Based on 22 hours per year of operation, the emergency generator passed the Health Risk Screening Analysis (HRSA) conducted on July 23, 2008 by the District's Toxic Evaluation Section. The sources pose no significant toxic risk, since the increased cancer risk to the maximally exposed receptor (Resident) is 8.2 in a million. The hazard index for a resident is 0.005. The increased cancer risk to workers is 9.9 in a million and the hazard index is 0.0071. The increased cancer risk to students is 0.2 in a million and the hazard index is 0.00045. Thus, in accordance with Regulation 2, Rule 5, the above risk level is acceptable for an engine such as S-2.

**BACT**

BACT is triggered for NOx and CO since the maximum daily emissions of the above pollutants exceed 10 lb/day. Please refer to the discussion on "Daily Emissions" in page 2 of this evaluation. BACT for this source is presented in the current BAAQMD BACT/TBACT Workbook for this source category as shown below:

Source:	<i>IC Engine - Compression Ignition</i>	Revision:	<b>5</b>
		Document #:	<b>96.1.2</b>
Class:	<b>&gt; or = 175 horsepower output rating</b>	Date:	<b>01/11/02</b>
<b>POLLUTANT</b>	<b>BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice 3. TBACT</b>	<b>TYPICAL TECHNOLOGY</b>	
<b>NOx</b>	1. 1.5 g/bhp-hr [107 ppmvd @ 15% O <sub>2</sub> ] <i>a,b</i> 2. 6.9 g/bhp-hr [490 ppmvd @ 15% O <sub>2</sub> ] <i>a,b,c</i> 3. 6.9 g/bhp-hr [490 ppmvd @ 15 % O <sub>2</sub> ]	1. Selective Catalytic Reduction (SCR) + Timing Retard + Turbocharger w/ Intercooler <i>a,b</i> 2. Timing Retard ≤ 4° + Turbocharger w/ Intercooler <i>a,b,c</i> 3. Timing Retard ≤ 4° + Turbocharger w/ Intercooler	
<b>CO</b>	1. n/s 2. 2.75 g/bhp-hr [319 ppmvd @ 15% O <sub>2</sub> ] <i>b,c</i>	1. Catalytic Oxidation <i>b</i> 2. CARB or EPA (or equivalent) low-CO emitting certified engine <i>b,c</i>	

It can be seen from above that S-2 satisfies the current BACT 2 standard for NOx and CO (6.9 g/hp-hr and 2.75 g/hp-hr, respectively). The more restrictive BACT 1 standard is not applicable to this engine because it will be limited to operation as an emergency standby engine.

**OFFSETS**

City of Richmond at “401 27<sup>th</sup> Street, Richmond, CA 94804” is an existing facility. Table 3 summarizes the increase in criteria pollutant emissions that will result from the operation of S-2.

**Table 3**

<b>Pollutant</b>	<b>Increase in Emissions At Plant Since April 5, 1991 (TPY)</b>	<b>Increase in Emissions Associated With This Application (TPY)</b>	<b>Total Emissions (Post 4/5/91 + Increase) (TPY)</b>	<b>Regulation 2-2-302 and 2-2-303 Offset Triggers (TPY)</b>
NO <sub>x</sub>	0.131	0.07016	0.20116	> 10; < 35
CO	1.577	0.00957	1.58657	NA
POC	0.263	0.00369	0.26669	> 10; < 35
PM <sub>10</sub>	0.044	0.00137	0.04537	> 1
SO <sub>2</sub>	0.009	0.00006	0.00906	> 1

It can be seen from Table 2 above that S-2 does not trigger any offset. Therefore, offsets are not warranted for any emission.

**NSPS**

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

Each engine has a total displacement of 16.12 liters and has 6 cylinders, so each cylinder has a volume of less than 10 liters. The engine is 2008 model year and is not fire pumps. Section 60.4205(b) requires this engine to comply with the emission standards in Section 60.4202, which refers to 40CFR89.112 and 40CFR89.113 for all pollutants. For engines above 750 hp, these standards are:

- NMHC+NO<sub>x</sub>: 4.8 g/hp-hr
- CO: 2.6 g/hp-hr
- PM: 0.15 g/hp-hr

According to CARB Executive Order# U-R-014-0102, the engine will comply with the standards.

Sections 60.4206 and 60.4211(a) require 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 a maximum sulfur content of 500 parts per million (ppm), a cetane index of 40 or a maximum aromatic content of 35 percent by volume. 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 a maximum sulfur content of 15 parts per million

(ppm), and the same cetane index or aromatic content as previously stated. 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 it has been 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 22 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/operators do not have to submit an initial notification to EPA for emergency engines.

Because the engine does not have a 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 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines, because it is not located at a major facility for hazardous air pollutants.

**CARB STATIONARY DIESEL ENGINE 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-2) is in compliance with the above ATCM requirements. The diesel engine will operate for no more than 22 hours per year for maintenance and reliability testing. This engine is subject to the EPA Tier 2 off-road CI engine standards for HC, NO<sub>x</sub>, NMHC+NO<sub>x</sub> and CO. As shown in the Table 4, the engine meets these requirements.

**Table 4  
ATCM Tier 2 Compliance**

Pollutant	CARB Certified g/bhp-hr	ATCM Tier 2 g/bhp-hr
NMHC+NO <sub>x</sub>	4.03	4.80
NO <sub>x</sub>	N/A	N/A
NMHC (POC)	N/A	N/A
CO	0.52	2.63
PM	0.07	0.15

**STATEMENT OF COMPLIANCE**

Source S-2 is subject to and expected to be in compliance with the requirements of District Regulation 1-301 (*Public Nuisance*), Regulation 6-303 (*Particulate Matter and Visible Emissions*), Regulation 9-1 (*Sulfur Dioxide*) and Regulation 9-8 (*NO<sub>x</sub> and CO from Stationary Internal Combustion Engines*). In order to ensure compliance with the requirements of these regulations, the facility will be conditionally permitted to meet the requirements.

From Regulation 1-301, no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance or annoyance to any considerable number of persons or the public; or which endangers the comfort, repose, health or safety of any such persons or the public, or which causes, or has a natural tendency to cause, injury or damage to business or property. For purposes of this section, three or more violation notices validly issued in a 30 day period to a facility for public nuisance shall give rise to a rebuttable presumption that the violations resulted from negligent conduct.

S-2 is subject to the limitations of Regulation 6-303 (*Particulate Matter and Visible Emissions*). Regulation 6, Section 303 states that 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 low PM10 emitting engine is not expected to produce visible emissions or fallout in violation of this regulation, and it will be assumed to be in compliance with Regulation 6 pending a regular inspection.

S-2 is also subject to the SO<sub>2</sub> limitations of Regulation 9-1-301 (*Limitation on Ground Level Concentrations of Sulfur Dioxide*), Regulation 9-1-302 (*Limitations Sulfur Dioxide Emissions*) and 9-1-304 (*Burning of Solid and Liquid Sulfur Dioxide Fuel*). From Regulation 9-1-301, the ground level concentrations of SO<sub>2</sub> will not exceed 0.5 ppm continuously for 3 consecutive minutes or 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. 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). And Regulation 9, Rule 1, Section 304, states that 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.

Regulation 9-8 "NOx and CO from Stationary Internal Combustion Engines." From Regulation 9-8-110.4, the source is not subject to the requirements of Regulations 9-8-301 (*Emission Limits on Fossil Derived Fuel Gas*), 9-8-302 (*Emission Limits on Waster Derived Fuel Gas*), and 9-8-502(*Record Keeping*).

S-2 is exempt from Regulation 9-8-502; however, it is subject to the monitoring and record keeping procedures described in Regulation 9-8-530 (*Emergency Standby Engines, Monitoring and Recordkeeping*). The requirements of this Regulation are included in the permit conditions below.

This application is considered to be ministerial under the District's 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.

PSD is not triggered.

This facility is less than 1,000 feet from the nearest school and therefore is subject to the public notification requirements of Regulation 2-1-412. A public notice will be prepared and sent to all addresses within 1000 feet of the diesel generator set and parents and guardians of students of St. Cornelius Elementary School. The public comment period lasted from XX/XX/XXXX to XX/XX/XXXX. At the end of the comment period, there were (no?) voicemail or written comments received.

**PERMIT CONDITIONS**

CONDITION 22822

1. Operating for reliability-related activities is limited to 22 hours per year per engine.  
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]
2. The owner or 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 hours 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 or 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)]

*End of Conditions*

**RECOMMENDATION**

Issue City of Richmond an AC/PO for the following equipment:

<p><b>S-2</b>  <b>Emergency Standby Diesel Generator Set</b>  <b>2008 AB Volvo, Model: D500/TAD1641GE</b>  <b>757 BHP, 3.67 MMBTU/hr</b></p>	<p>at</p>	<p><b>2600 Barrett Avenue</b>  <b>Richmond, CA 94804</b></p>
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Date: 08/12/2008

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Engineering Division