

**DRAFT ENGINEERING EVALUATION**  
**Linden Residence**  
**Application No. 27278**  
**Plant No. 23128**

**BACKGROUND**

Linden Residence has applied for an Authority to Construct (AC) and/or Permit to Operate for the following equipment:

**S-1 Emergency Standby Natural Gas Generator, General Motors, Model: Vortec 5.0L, Model Year: 2015, 89 bhp, 0.713 MMBtu/hr abated by A-1, Nett Technologies, Model: T-6 Series, 3-way Catalyst**

The equipment will be located at 87 Linden Avenue, Atherton, CA 94027.

The natural gas powered emergency unit (S-1) will provide emergency standby power in the event of a disruption to power service. During an emergency, the generator will operate 24 hours a day until regular electric supply is restored. The engine will operate for a maximum of 50 hours per year for maintenance and testing, as limited by Regulation 9-8-330.3.

The engine is subject to attached condition no. 23107.

**EMISSIONS CALCULATIONS**

Basis:

- 89 bhp output rating
- 50 hr/yr operation for testing and maintenance
- 699 scf/hr max fuel use
- 1020 BTU/ft<sup>3</sup> natural gas heat content

The emissions factors used to estimate criteria pollutant emissions from S-1 are based on engine manufacturer emissions data. Total Hydrocarbon emission rates were assumed to be equal to Precursor Organic Compound (POC) emission rates.

**Annual Average Emissions:**

Annual emissions are calculated based on the number of hours per year of operation for testing and maintenance. See Table 1.

**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. See Table 1.

Table 1. Annual and daily criteria pollutants from S-1

Pollutant	Emissions Factor (g/bhp-hr)	Emissions (lb/yr)	Emissions (TPY)	Emissions (lb/day)
NO <sub>x</sub> <sup>1</sup>	0.11	1.1	0.001	0.5
POC <sup>1</sup>	0.01	0.1	0.000	0.0
CO <sup>1</sup>	1.18	11.6	0.006	5.6
Pollutant	Emissions Factor (lb/MMBtu)	Emissions (lb/yr)	Emissions (TPY)	Emissions (lb/day)
PM10 <sup>2</sup>	0.0100	0.3	0.000	0.1
SO <sub>2</sub> <sup>2</sup>	0.00059	0.0	0.000	0.0

<sup>1</sup>Emission factors based on manufacturers data.

<sup>2</sup>Emission factors from AP-42 section 3.2, table 3.2-2.

### **TOXIC RISK SCREENING ANALYSIS**

To estimate Hazardous Air Pollutants (HAPs) or Toxic Air Contaminants (TACs) emissions from S-1, the higher emission factors of those from EPA AP-42 Table 3.2-2 for natural gas fired 4-stroke lean burn engines and CARB California Air Toxics Emission Factors (CATEFs) for natural gas fired 4-stroke lean burn engines with less than 650 hp are used. The engine being permitted has a maximum firing rate of 0.713 MMBtu/hr and a maximum rating of 89 hp.

The HAP emission estimates are based on uncontrolled emission factors for natural gas engines and assume a conservative abatement efficiency of 50% removal of organic HAP compounds. The abatement efficiency assumption is based on the fact that the engine is being permitted with an exhaust catalyst and an air/fuel ratio controller.

As shown in Tables 2 and 3 below, no TACs exceed the District's Risk Screening trigger levels. Therefore, a Health Risk Screening Analysis (HRSA) is not required.

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**Table 2. HAP EMISSIONS ESTIMATES BASED ON AP-42 TABLE 3.2-2**

Compound		AP-42 EF (lb/MMBTU)	Assumed Abatement Efficiency (%)	Emissions (lb/hr)	Trigger Level (lb/hr)	HRSA Triggered? (Yes/No)	Emissions (lb/year)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Yes/No)
1,1,2,2-Tetrachloroethane	<	4.00E-05	50	1.18E-05	None	No	5.89E-04	1.90E+00	No
1,1,2-Trichloroethane	<	3.18E-05	50	9.36E-06	None	No	4.68E-04	6.60E+00	No
1,1-Dichloroethane	<	2.36E-05	50	6.94E-06	None	No	3.47E-04	6.60E+01	No
1,2,3-Trimethylbenzene		2.30E-05	50	6.77E-06	None	No	3.38E-04	None	No
1,2,4-Trimethylbenzene		1.43E-05	50	4.21E-06	None	No	2.10E-04	None	No
1,2-Dichloroethane	<	2.36E-05	50	6.94E-06	None	No	3.47E-04	5.30E+00	No
1,2-Dichloropropane	<	2.69E-05	50	7.92E-06	None	No	3.96E-04	None	No
1,3,5-Trimethylbenzene		3.38E-05	50	9.95E-06	None	No	4.97E-04	None	No
1,3-Butadiene		2.30E-05	50	7.86E-05	None	No	3.93E-03	6.30E-01	No
1,3-Dichloropropene	<	2.64E-05	50	7.77E-06	None	No	3.88E-04	None	No
2-Methylnaphthalene		3.32E-05	50	9.77E-06	None	No	4.88E-04	None	No
2,2,4-Trimethylpentane		2.50E-04	50	7.36E-05	None	No	3.68E-03	None	No
Acenaphthene		1.25E-06	50	CATEF	--	No	CATEF	--	No
Acenaphthylene		5.53E-06	50	CATEF	--	No	CATEF	--	No
Acetaldehyde		8.36E-03	50	CATEF	--	No	CATEF	--	No
Acrolein		5.14E-03	50	CATEF	--	No	CATEF	--	No
Benzene		4.40E-04	50	CATEF	--	No	CATEF	--	No
Benzo(b)fluoranthene		1.66E-07	50	CATEF	--	No	CATEF	--	No
Benzo(e)pyrene		4.15E-07	50	1.22E-07	None	No	6.11E-06	None	No
Benzo(g,h,i)perylene		4.14E-07	50	CATEF	--	No	CATEF	--	No
Biphenyl		2.12E-04	50	6.24E-05	None	No	3.12E-03	None	No
Butane		5.41E-04	50	1.59E-04	None	No	7.96E-03	None	No
Butyr/Isobutyraldehyde		1.01E-04	50	2.97E-05	None	No	1.49E-03	None	No
Carbon Tetrachloride	<	3.67E-05	50	1.08E-05	4.20E+00	No	5.40E-04	2.50E+00	No
Chlorobenzene	<	3.04E-05	50	8.95E-06	None	No	4.47E-04	3.90E+04	No
Chloroethane		1.87E-06	50	5.50E-07	None	No	2.75E-05	None	No
Chloroform	<	2.85E-05	50	8.39E-06	3.30E-01	No	4.19E-04	2.00E+01	No
Chrysene		6.93E-07	50	CATEF	--	No	CATEF	--	No
Cyclopentane		2.27E-04	50	6.68E-05	None	No	3.34E-03	None	No
Ethane		1.05E-01	50	3.09E-02	None	No	1.54E+00	None	No
Ethylbenzene		4.43E-05	50	1.17E-05	None	No	5.84E-04	4.30E+01	No
Ethylene Dibromide	<	4.43E-05	50	1.30E-05	None	No	6.52E-04	1.50E+00	No

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**Table 2. HAP EMISSIONS ESTIMATES BASED ON AP-42 TABLE 3.2-2**  
(Continued)

Compound		AP-42 E.F. (lb/MMBTU)	Assumed Abatement Efficiency (%)	Emissions (lb/hr)	Trigger Level (lb/hr)	HRSA Triggered? (Yes/No)	Emissions (lb/year)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Yes/No)
Fluoranthene		1.11E-06	50	CATEF	--	No	CATEF	--	No
Fluorene		5.67E-06	50	CATEF	--	No	CATEF	--	No
Formaldehyde		5.28E-02	50	CATEF	--	No	CATEF	--	No
Methanol		2.50E-03	50	7.36E-04	6.20E+01	No	3.68E-02	1.50E+05	No
Methylcyclohexane		1.23E-03	50	3.62E-04	None	No	1.81E-02	None	No
Methylene Chloride		2.00E-05	50	5.89E-06	3.10E+01	No	2.94E-04	1.10E+02	No
n-Hexane		1.11E-03	50	3.27E-04	None	No	1.63E-02	None	No
n-Nonane		1.10E-04	50	3.24E-05	None	No	1.62E-03	None	No
n-Octane		3.51E-04	50	1.03E-04	None	No	5.16E-03	None	No
n-Pentane		2.60E-03	50	7.65E-04	None	No	3.83E-02	None	No
Naphthalene		7.44E-05	50	CATEF	--	No	CATEF	--	No
PAH		2.69E-05	50	CATEF	--	No	CATEF	--	No
Phenanthrene		1.04E-05	50	CATEF	--	No	CATEF	--	No
Phenol		2.40E-05	50	7.06E-06	1.30E+01	No	3.53E-04	7.70E+03	No
Propane		4.19E-02	50	1.23E-02	None	No	6.16E-01	None	No
Pyrene		1.36E-06	50	CATEF	--	No	CATEF	--	No
Styrene	<	2.36E-05	50	6.94E-06	4.60E+01	No	3.47E-04	3.50E+04	No
Tetrachloroethane		2.48E-06	50	7.30E-07	None	No	3.65E-05	None	No
Toluene		4.08E-04	50	CATEF	--	No	CATEF	--	No
Vinyl Chloride		1.49E-05	50	4.38E-06	4.00E+02	No	2.19E-04	1.40E+00	No
Xylene		1.84E-04	50	5.41E-05	4.90E+01	No	2.71E-03	2.70E+04	No

*CATEFs are used when AP-42 EFs are less conservative (lower) than CATEFs.*

**Table 3. HAP Emission Estimates Based on CATEF Emission Factors**

Substance	E.F. (lb/MMcf)	Assumed Abatement Efficiency (%)	Emissions (lb/hr)	Acute Trigger Level (lb/hr)	HRSA Triggered? (Yes/No)	Abated Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Yes/No)	PAH PEF	PAH Equivalents
Acenaphthene	7.17E-04	50	2.07E-07	None	No	1.03E-05	None	No	--	--
Acenaphthylene	7.59E-03	50	2.19E-06	None	No	1.09E-04	None	No	--	--
Acetaldehyde	3.99E+00	50	1.15E-03	1.00E+00	No	5.76E-02	3.80E+01	No	--	--
Acrolein	1.63E+00	50	4.70E-04	5.50E-03	No	2.35E-02	1.40E+01	No	--	--
Anthracene	2.56E-04	50	7.39E-08	None	No	3.69E-06	None	No	--	--
Benzene	1.21E+00	50	3.49E-04	2.90E+00	No	1.75E-02	3.80E+00	No	--	--
Benzo(a)anthracene	7.78E-05	50	2.24E-08	None	No	1.12E-06	None	No	0.1	1.12E-07
Benzo(a)pyrene	3.55E-05	50	1.02E-08	None	No	5.12E-07	None	No	1.0	5.12E-07
Benzo(b)fluoranthene	3.27E-04	50	9.43E-08	None	No	4.72E-06	None	No	0.1	4.72E-07
Benzo(g,h,i)perylene	1.03E-04	50	2.97E-08	None	No	1.49E-06	None	No	--	--

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**Table 3. HAP Emission Estimates Based on CATEF Emission Factors**  
(Continued)

Substance	E.F. (lb/MMcf)	Assumed Abatement Efficiency (%)	Emissions (lb/hr)	Acute Trigger Level (lb/hr)	HRSA Triggered? (Yes/No)	Abated Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Yes/No)	PAH PEF	PAH Equiv- alents
Benzo(k)fluoranthene	5.30E-04	50	1.53E-07	None	No	7.65E-06	None	No	0.1	7.65E-07
Chrysene	9.64E-05	50	2.78E-08	None	No	1.39E-06	None	No	0.01	1.39E-08
Dibenz(a,h)anthracene	1.09E-05	50	3.14E-09	None	No	1.57E-07	None	No	1.05	1.65E-07
Fluoranthene	2.50E-04	50	7.21E-08	None	No	3.61E-06	None	No	--	
Fluorene	4.60E-04	50	1.33E-07	None	No	6.64E-06	None	No	--	
Formaldehyde	2.87E+01	50	8.28E-03	1.20E-01	No	4.14E-01	1.80E+01	No	--	
Indeno(1,2,3-cd)pyrene	1.20E-04	50	3.46E-08	None	No	1.73E-06	None	No	0.1	1.73E-07
Naphthalene	1.22E-01	50	3.52E-05	None	No	1.76E-03	3.20E+00	No	--	
Phenanthrene	8.93E-04	50	2.58E-07	None	No	1.29E-05	None	No	--	
Propylene	1.87E+01	50	5.39E-03	None	No	2.70E-01	1.20E+05	No	--	
Pyrene	1.23E-04	50	3.55E-08	None	No	1.77E-06	None	No	--	
Toluene	4.12E-01	50	1.19E-04	8.20E+01	No	5.94E-03	1.20E+04	No	--	
Xylene (m,p)	8.63E-02	50	2.49E-05	4.90E+01	No	1.24E-03	2.70E+04	No	--	
Xylene (o)	4.94E-02	50	1.43E-05	4.90E+01	No	7.13E-04	2.70E+04	No	--	
PAH Equivalents as Benzo(a)pyrene	--	--	--	None	No	--	6.90E-03	No	--	2.21E-06

### PLANT CUMULATIVE EMISSIONS

S-1 located at “87 Linden Avenue, Atherton, CA 94027” 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. Cumulative increase in tons/year**

Pollutant	Existing	New	Total
NOx	0.000	0.001	0.001
POC	0.000	0.000	0.000
CO	0.000	0.006	0.006
PM10	0.000	0.000	0.000
SO <sub>2</sub>	0.000	0.000	0.000

### BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

In accordance with Regulation 2-2-301, 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 displayed above, BACT is not triggered for any pollutant since the maximum daily emission of each pollutant does not exceed 10lbs/day.

**OFFSETS**

Per Regulation 2-2-302, 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 emissions displayed in Table 4, offsets are not required for this application.

**NEW SOURCE PERFORMANCE STANDARDS (NSPS)**

S-1 is subject to 40 CFR 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition (SI) Internal Combustion Engines (ICEs), Section 60.4230(a)(4)(iv) because the engine is an emergency engine which was manufactured after January 1, 2009 and has a maximum power greater than 25 hp.

*Determining Emissions Standards*

Section 60.4233(e) states owners and operators of stationary SI ICEs with a maximum engine power greater than 100 hp (except gasoline and rich burn engines that use LPG) must comply with emission standards in Table 1 to this subpart for their emergency stationary SI ICE.

From Table 1 for emergency engines greater than 25 hp and less than 130 hp, the emission standards are:

NOx + HC: 10 g/hp-hr

CO: 387 g/hp-hr

S-1 complies with the above emission standards.

**NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAP)**

S-1 is subject to 40 CFR 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines (RICE). Per 40 CFR 63.6590(c)(1), a new or reconstructed stationary RICE located at an area source must meet the requirements of 40 CFR 60, Subpart JJJJ. As stated above in the NSPS section, S-1 meets the emissions requirements of 40 CFR 60, Subpart JJJJ.

**STATEMENT OF COMPLIANCE**

The owner/operator of S-1 shall comply with Regulation 6-1 (*Particulate Matter – General Requirements*) and Regulation 9-1-301 (*Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations*). Pursuant to Regulation 9-1-301, the ground level concentrations of SO<sub>2</sub> shall 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.

S-1 is an emergency standby generator. Per Regulation 9-8 (*NOx and CO from Stationary Internal Combustion Engines*), Section 110.5 (*Emergency Standby Engines*), S-1 is exempt from the requirements of Regulations 9-8-301 (*Emission Limits – Spark-Ignited Engines Powered by Fossil Derived Fuels*), 9-8-302 (*Emission Limits – Spark-Ignited Engines Powered by Waste Derived Fuels*), 9-8-303 (*Emissions Limits – Delayed Compliance, Existing Spark-Ignited Engines, 51 to 250 bhp or Model Year 1996 or Later*), 9-8-304 (*Emission Limits – Compression-Ignited Engines*), 9-8-305 (*Emission Limits – Delayed Compliance, Existing Compression-Ignited Engines, Model Year 1996 or Later*), 9-8-501 (*Initial Demonstration of Compliance*) and 9-8-503 (*Quarterly Demonstration of Compliance*).

Allowable operating hours (50 hours/yr) and the corresponding recordkeeping requirements in Regulations 9-8-330.3 (*Emergency Standby Engines, Hours of Operation*) and 530 (*Emergency Standby and Low Usage Engines, Monitoring and Recordkeeping*) will be included in the permit conditions below.

This application is considered to be ministerial under the District's CEQA 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 and therefore is not discretionary as defined by CEQA. (Permit Handbook Chapter 2.3.2)

Because this equipment will be located within 1,000 feet of Encinal Elementary School, the project is subject to the public notification requirements of Regulation 2-1-412 due to the increase in emissions from the project. A public notice will be sent to all parents of students of the above mentioned school and all residents within 1,000 feet of the facility. There will be a 30-day public comment period.

PSD does not apply.

**PERMIT CONDITIONS**

COND# 23107 -----

1. The owner or operator shall operate the stationary emergency standby engine only to mitigate emergency conditions or for reliability-related activities (maintenance and testing). Operating while mitigating emergency conditions and while emission testing to show compliance with this part is unlimited. Operating for reliability-related activities are limited to 50 hours per year.(Basis: Emergency Standby Engines, Hours of Operation Regulation 9-8-330)
2. The Owner/Operator shall equip the emergency standby engine(s) with: a non-resettable totalizing meter that measures hours of operation or fuel usage.(Basis: Emergency Standby Engines, Monitoring and Record keeping 9-8-530)
3. The Owner/Operator shall not operate unless the natural gas fired engine is abated with a Catalytic Converter/Silencer Unit (Basis: Cumulative Increase)
4. Records: The Owner/Operator shall maintain the following monthly records in a District-approved log for at least 24 months from the date of entry. 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 (maintenance and testing).

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- b. Hours of operation for emission testing.
  - c. Hours of operation (emergency).
  - d. For each emergency, the nature of the emergency condition.
  - e. Fuel usage or operating hours for engine.
- (Basis: Emergency Standby Engines, Monitoring and Recordkeeping 9-8-530)

*End of Conditions*

**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 1,000 feet of at least one school, which triggers the public notification requirements of 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 for the following equipment:

**S-1      Emergency Standby Natural Gas Generator, General Motors, Model: Vortec 5.0L, Model Year: 2015, 89 bhp, 0.713 MMBtu/hr abated by A-1, Nett Technologies, Model: T-6 Series, 3-way Catalyst**

By: Simon Margolis  
Simon Margolis  
Air Quality Engineer

Date: 7/31/2015