Engineering Evaluation
St. Helena Unified School District
Application No. 28371
Plant No. 23763
1433 Grayson Avenue, St. Helena, CA 84575

BACKGROUND

St. Helena Unified School District has applied for an Authority to Construct (AC) and/or a Permit to Operate (PO) for the following equipment:

S-1 **Emergency Standby Generator Set: Propane Gas (PG) engine**
General Motors, Model: Vortec, Model Year: 2016
89 BHP, 0.96MMBtu/hr
Abated by
A-1 **Non-Selective Catalytic Converter (NETT Technologies)**

EMISSIONS CALCULATIONS

The emission factors used to estimate criteria pollutant emissions from the natural gas engine generator set described above are based on engine manufacturer abated emissions data. Total Hydrocarbon emission rates were assumed to be equal to Precursor Organic Compound (POC) emission rates. The Particulate Matter less than 10 microns (PM_{10}) and Sulfur Dioxide (SO_2) emission factors are based on AP 42, Fifth Edition, Volume I, Chapter 3: Stationary Internal Combustion Sources; Section 2.4.1 Control Techniques for 4-Cycle Rich-burn Engines.[1]

The Abatement Manufacturer, Nett Technologies, provided abatement factors for their (TG-Series) Non-Selective Catalytic Converter (NSCR) for the following pollutants: Nitrogen Oxides (NOx):97%, POC: 97%, and Carbon Monoxide (CO): 94%*. See Table 1.

The engine will operate during emergency use and for a maximum of 50 hours per year for maintenance and testing.

The engine is subject to attached condition no. 25251.

Table 1-Estimated Emissions From S-1

Pollutant	Emission Factor (g/BHP-hr)	Emission (lb/hr)	Emission (lb/yr)	Emission (TPY)	Maximum Daily Emissions (lb/day)
NOx *	0.184	0.036	1.807	0.001	0.867
POC *	0.010	0.002	0.095	0.000	0.046
CO *	1.780	0.349	17.446	0.009	8.374
PM_{10}	0.046	0.009	0.456	0.000	0.219
SO_2	0.003	0.001	0.028	0.000	0.014

Basis:
89 hp Max Rated Output
295 cf/hr Max fuel use Rate = 0.96 MMBTU/hr
NOx, HC and CO emission factors are from Manufacturer's Emission Data
The PM and SO2 emission factors are from EPA AP-42, Table 3.2-3 for 4 stroke Rich-burn Engines
Annual Emissions are based on the Annual Limit (50 hr/yr) of operation for testing and maintenance
Max daily emissions are based on 24 hr/day since no daily limits are imposed on emergency operations
* Default abatement reductions used are from BAAQMD Engineering Division, Engine Training Manual, Page 7, August 2012

[1] **SO_2** Emission Factor = 5.88 E-04 Lb./MMBtu; calculations assume 100% of fuel sulfur conversion with the content in natural gas = 2000 gr/10^6scf. **PM_{10}** Fuel input Emission Factor = 9.95E-03 Lb./MMBtu; aerodynamic particle diameter =< 1 µm, for the purposes of filterable emissions PM_{10}= $PM_{2.5}$. These emissions are expected to be negligible, but included for completeness.

TOXIC RISK SCREENING ANALYSIS

The emission factors used to estimate Hazardous Air Pollutants (HAPs) emissions from the engine described above are from: AP-42 for natural gas fired 4-cycle rich burn engine Table 3.2-3, or the California Air Toxics Emission Factor Database (maintained by the California Air Resources Board) for natural gas fired 4-cycle rich burn engines with less than 650 hp. The CATEF Emission Factors maintained by the ARB were used to estimate emissions for all compounds that have AP-42 emission factors and CATEF emission factors. There are no emission factors described by EPA AP-42 used to determine propane gas emissions; therefore, the aforementioned emission factors used by AP-42 for natural gas were assumed to be equivalent as a worst case to determine the emission levels for propane gas fueled engines.

The HAP emission estimates are based on uncontrolled emission factors for natural gas engines and an assumed worst case abatement efficiency of 50% removal of organic HAP compounds, except for the pollutants which have abated emission factors in CATEF. The abatement efficiency is based on the fact that the engine is being permitted with a Catalytic Converter and an air fuel ratio controller.

As shown in Table 2 and Table 3 below, no toxic air contaminants exceed the District Risk Screening Triggers and a Risk Screening Analysis is not required.

Table 2
HAP EMISSIONS ESTIMATES BASED ON AP-42 TABLE 3.2-3 (FOR COMPOUNDS WITH NO CATEF E.F.)

Compound		E.F.	Unit	Assumed Abatement Efficiency %	Abated Emissions (lb/hr)	Acute Trigger Level (lb/hr)	HRSA Triggered? (Y/N)	Abated Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Y/N)
1,1,2,2-Tetrachloroethane		2.53E-05	lb/MMBtu	50	1.21E-05	None	NO	4.93E-04	1.90E+00	NO
1,1,2-Trichloroethane	<	1.53E-05	lb/MMBtu	50	7.34E-06	None	NO	2.98E-04	6.60E+00	NO
1,1-Dichloroethane	<	1.13E-05	lb/MMBtu	50	5.42E-06	None	NO	2.20E-04	6.60E+01	NO
1,2-Dichloroethane	<	1.13E-05	lb/MMBtu	50	5.42E-06	None	NO	2.20E-04	None	NO
1,2-Dichloropropane	<	1.30E-05	lb/MMBtu	50	6.23E-06	None	NO	2.54E-04	None	NO
1,3-Butadiene		6.63E-04	lb/MMBtu	50	CATEF	None	NO	CATEF	1.10E+00	NO
1,3-Dichloropropene	<	1.27E-05	lb/MMBtu	50	6.09E-06	None	NO	2.48E-04	None	NO
Acetaldehyde		2.79E-03	lb/MMBtu	50	CATEF	1.00E+00	NO	CATEF	3.80E+01	NO
Acrolein		2.63E-03	lb/MMBtu	50	CATEF	5.5E-03	NO	CATEF	1.40E+01	NO
Benzene		1.58E-03	lb/MMBtu	50	CATEF	2.9E+00	NO	CATEF	3.80E+00	NO
Butyr/isobutyraldehyde		4.86E-05	lb/MMBtu	50	2.33E-05	None	NO	9.48E-04	None	NO
Carbon Tetrachloride	<	1.77E-05	lb/MMBtu	50	8.49E-06	4.2E+00	NO	3.45E-04	2.50E+00	NO
Chlorobenzene	<	1.29E-05	lb/MMBtu	50	6.19E-06	None	NO	2.52E-04	3.90E+04	NO
Chloroform	<	1.37E-05	lb/MMBtu	50	6.57E-06	3.3E-01	NO	2.67E-04	2.00E+01	NO
Ethylbenzene	<	2.48E-05	lb/MMBtu	50	CATEF	None	NO	CATEF	4.30E+01	NO
Ethylene Dibromide	<	2.13E-05	lb/MMBtu	50	1.02E-05	None	NO	4.15E-04	1.50E+00	NO
Formaldehyde		2.05E-02	lb/MMBtu	50	CATEF	1.2E-01	NO	CATEF	1.80E+01	NO
Methanol		3.06E-03	lb/MMBtu	50	1.47E-03	6.2E+01	NO	5.97E-02	1.50E+05	NO
Methylene Chloride		4.12E-05	lb/MMBtu	50	1.98E-05	3.1E+01	NO	8.03E-04	1.10E+02	NO
Naphthalene	<	9.71E-05	lb/MMBtu	50	CATEF	None	NO	CATEF	3.20E+00	NO
PAH		1.41E-04	lb/MMBtu	50	CATEF	None	NO	CATEF	None	NO
Styrene	<	1.19E-05	lb/MMBtu	50	5.71E-06	4.6E+01	NO	2.32E-04	3.50E+04	NO
Toluene		5.58E-04	lb/MMBtu	50	2.68E-04	8.2E+01	NO	1.09E-02	1.20E+04	NO
Vinyl Chloride	<	7.18E-06	lb/MMBtu	50	3.44E-06	4.0E+02	NO	1.40E-04	1.40E+00	NO
Xylene		1.95E-04	lb/MMBtu	50	9.35E-05	4.9E+01	NO	3.80E-03	2.70E+04	NO

Table 3
HAP EMISSION ESTIMATES BASED ON CATEF EMISSION FACTORS

SUBSTANCE	E.F. MEAN	UNIT	Assumed Abatement Efficiency %	Abated Emissions (lb/hr)	Acute Trigger Level (lb/hr)	HRSA Triggered? (Y/N)	Abated Emissions (lb/yr)	Chronic Trigger Level (lb/yr)	HRSA Triggered? (Y/N)
1,3-Butadiene	1.04E-01	lbs/MMcf	50	1.53E-05	None	NO	7.67E-04	6.30E-01	NO
Acenaphthene	1.94E-03	lbs/MMcf	50	2.86E-07	None	NO	1.43E-05	None	NO
Acenaphthylene	1.45E-02	lbs/MMcf	50	2.14E-06	None	NO	1.07E-04	None	NO
Acetaldehyde	8.83E-01	lbs/MMcf	50	1.30E-04	None	NO	6.51E-03	3.80E+01	NO
Acrolein	5.47E-01	lbs/MMcf	50	8.07E-05	5.50E-03	NO	4.04E-03	1.40E+01	NO
Anthracene	1.84E-03	lbs/MMcf	50	2.71E-07	None	NO	1.36E-05	None	NO
Benzene	1.38E-01	lbs/MMcf	0	5.64E-04	2.90E+00	NO	2.82E-02	3.80E+00	NO
Benzo(a)anthracene	3.39E-04	lbs/MMcf	50	5.00E-08	None	NO	2.50E-06	None	NO
Benzo(a)pyrene	1.15E-04	lbs/MMcf	50	1.70E-08	None	NO	8.48E-07	None	NO
Benzo(b)fluoranthene	2.37E-04	lbs/MMcf	50	3.50E-08	None	NO	1.75E-06	None	NO
Benzo(g,h,i)perylene	1.95E-04	lbs/MMcf	50	2.88E-08	None	NO	1.44E-06	None	NO
Benzo(k)fluoranthene	1.03E-04	lbs/MMcf	50	1.52E-08	None	NO	7.60E-07	None	NO
Chrysene	3.10E-04	lbs/MMcf	50	4.57E-08	None	NO	2.29E-06	None	NO
Dibenz(a,h)anthracene	1.25E-05	lbs/MMcf	50	1.84E-09	None	NO	9.22E-08	None	NO
Ethylbenzene	1.16E-02	lbs/MMcf	50	1.71E-06	None	NO	8.56E-05	4.30E+01	NO
Fluoranthene	9.95E-04	lbs/MMcf	50	1.47E-07	None	NO	7.34E-06	None	NO
Fluorene	6.91E-03	lbs/MMcf	50	1.02E-06	None	NO	5.10E-05	None	NO
Formaldehyde	4.99E-02	lbs/MMcf	0	6.93E-04	2.1E-01	NO	3.47E-02	1.80E+01	NO
Indeno(1,2,3-cd)pyrene	1.69E-04	lbs/MMcf	50	2.49E-08	None	NO	1.25E-06	None	NO
Naphthalene	7.65E-02	lbs/MMcf	50	1.13E-05	None	NO	5.64E-04	3.20E+00	NO
Phenanthrene	7.07E-03	lbs/MMcf	50	1.04E-06	None	NO	5.22E-05	None	NO
Propylene	1.60E+01	lbs/MMcf	50	2.36E-03	None	NO	1.18E-01	1.20E+05	NO
Pyrene	1.79E-03	lbs/MMcf	50	2.64E-07	None	NO	1.32E-05	None	NO
Toluene	1.07E+00	lbs/MMcf	50	1.58E-04	8.2E+01	NO	7.89E-03	1.20E+04	NO
Xylene (m,p)	4.41E-01	lbs/MMcf	50	6.51E-05	4.9E+01	NO	3.25E-03	2.70E+04	NO
Xylene (o)	2.17E-01	lbs/MMcf	50	3.20E-05	4.9E+01	NO	1.60E-03	2.70E+04	NO
Xylene (Total)	6.02E-02	lbs/MMcf	50	8.88E-06	4.9E+01	NO	4.44E-04	2.70E+04	NO
PAH Equivalents as Benzo(a)pyrene	1.70E-06	lbs/MMcf	50	2.35E-10	50	NO	1.18E-08	2.70E+04	NO

PLANT CUMULATIVE EMISSIONS

Table 4 summarizes the cumulative increase in criteria pollutant emissions that will result from the operation of S-1.

Table 4

Plant Cumulative Increase: (tons/year)			
Pollutant	**Existing**	**New**	**Total**
POC	0.000	0.000	0.000
NOx	0.000	0.001	0.001
CO	0.000	0.009	0.009
PM_{10}	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_2 or PM_{10}.

Based on the emission calculations above, BACT is not triggered for any pollutant since the maximum daily emission of each pollutant does not exceed 10 lb/day. Since the low emissions level is dependent on usage of the abatement device, a condition has been added requiring its use.

New Source Performance Standards (NSPS)

The New Source Performance Standard in 40 CFR 60, Subpart JJJJ applies because the engine was installed after January 1, 2009, which requires emergency spark ignition engines greater than 25 BHP, but less than 130 BHP to emit less than the following emission levels for these criteria pollutants:

Pollutant	S-1 Emission Factor	NSPS Standard
NOx	0.184 g/hp-hr	10.00 g/hp-hr
CO	1.780 g/hp-hr	387.0 g/hp-hr

As the information above shows, S-1 is in compliance with these NSPS emission requirements.

National Emission Standards for Hazardous Air Pollutants (NESHAP)

This engine is subject to the emission or operating limitations in 40 CFR 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines. Per NESHAP 40CFR63.6590(c)(1), a new or constructed reciprocating internal combustion engines is subject to Regulations under 40 CFR Part 60 (NSPS) and no further requirements apply for such engines under NESHAP. Therefore, S-1 complies with NESHAP by meeting the requirements under 40CFR60 (NSPS).

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 emission calculations above, offsets are not required for this application.

STATEMENT OF COMPLIANCE

The owner/operator of S-1 shall comply with Regulation 6, Rule 1 (*Particulate Matter and Visible Emissions Standards*) and Regulation 9-1-301 (*Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations*). From Regulation 9-1-301, the ground level concentrations of SO_2 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.

S-1 is an emergency standby generator; from Regulation 9, Rule 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 on Fossil Derived Fuel Gas*), 9-8-302 (*Emission Limits on Waste Derived Fuel Gas*), 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 and the corresponding record keeping in Regulations 9-8-330 (*Emergency Standby Engines, Hours of Operation*) and 9-8-530 (*Emergency Standby Engines, Monitoring and Recordkeeping*) will be included in the Permit Conditions below.

California Environmental Quality Act (CEQA)

The project 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 emissions factors and therefore is not discretionary as defined by CEQA. (Permit Handbook Chapter 2.3)

Public Notification, Schools

Public Notice is required because the equipment is located within 1000 ft of a K-12 school. S-1 will be located on the campus of St. Helena High School.

PERMIT CONDITIONS

COND# 25251 ----------

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 Recordkeeping 9-8-530)
3. The Owner/Operator shall not operate unless the propane gas fired engine is abated with a Non-Selective Catalytic Reduction 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).
   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 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 1000 feet of a school, which triggers the public notification requirements of District 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 to **St. Helena Unified School District** for the following source:

S-1 **Emergency Standby Generator Set: Propane Gas (PG) engine**
General Motors, Model: Vortec, Model Year: 2016
89 BHP, 0.96MMBtu/hr
Abated by
A-1 **Non-Selective Catalytic Converter (NETT Technologies)**

By:_____

Marc Nash
Air Quality Specialist II
Engineering Division