

SYNTHETIC MINOR OPERATING PERMIT	
EVALUATION REPORT	
Hitachi Global Storage Technologies Inc.	
Plant Number: A0085	Application Number: 24185

BACKGROUND

Hitachi Global Storage Technologies, Inc. (HGST) is subject to the requirements of Title V of the Federal Clean Air Act, Part 70 of Volume 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review because it is a major facility as defined by BAAQMD Regulation 2-6-212. HGST is a major facility because it has the PTE (“potential to emit”) more than 100,000 tons per year of greenhouse gases (GHG). Major facilities that are willing to accept federally enforceable permit conditions that limit emissions to less than Title V thresholds can apply for a Synthetic Minor Operating Permit. Based on 2010 usage data, it is estimated that actual emissions at HGST are well below major facility thresholds. Therefore, HGST has elected to apply for a Synthetic Minor permit.

This permit will establish federally enforceable permit conditions to limit the facility to a maximum of 90,000 tons/yr of GHG. Synthetic Minor permits must have practically enforceable limits and conditions that ensure that emissions never exceed major facility thresholds.

HGST is a facility that develops hard disk drives, solid state drives, and external storage services that are used by technology companies to store, preserve, and manage data. HGST was founded in 2003 and has become a separate and wholly owned subsidiary of Western Digital Corporation since March 2012. HGST maintains its U.S. headquarters in San Jose, California and is marketed under the HGST brand name.

POTENTIAL TO EMIT

HGST has various permitted and exempt sources that can be categorized into the following categories: (1) boilers, (2) diesel generators, (3) tanks, (4) custom lubers, (5) deco washers, (6) miscellaneous solvent units, (7) gas turbine emergency generator, (8) thermal oxidizer, (9) semiconductor fab areas, (10) other permitted sources, and (11) miscellaneous exempt sources.

Using EPA and BAAQMD emission factors and permit limits, BAAQMD has estimated the PTE of regulated air pollutants for all permitted and exempt sources at the facility. Details of these estimates are presented in Appendix A. These estimates are summarized below in Table 1.

Table 1. Potential to Emit of Regulated Air Pollutants – Facility Wide

Sources	Criteria Pollutants					
	NO _x Emissions	CO Emissions	SO ₂ Emissions	POC Emissions	NPOC Emissions	PM ₁₀ Emissions
	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
Boilers	9.985	29.009	0.461	4.228	--	5.842
Diesel Generators	47.873	10.051	3.553	3.704	--	3.205
Tanks	--	--	--	0.828	0.008	--
Custom Lubers	--	--	--	--	16.425	--
Deco Washers	--	--	--	3.088	--	--
Misc Solvent Units	--	--	--	14.133	12.323	--
49.5 Megawatt Gas Turbine Emergency Generator	12.178	4.815	2.091	0.026	--	0.760

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Sources	Criteria Pollutants					
	NO _x Emissions	CO Emissions	SO ₂ Emissions	POC Emissions	NPOC Emissions	PM ₁₀ Emissions
	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
Thermal Oxidizer	0.810	3.565	0.010	0.088	--	0.121
Semiconductor Fab Areas	--	--	--	14.353	3.314	--
Other Sources	--	--	--	0.718	0.009	0.002
Misc Sources (Exempt)	--	--	--	0.368	0.130	0.033
Total	70.846	47.440	6.115	41.534	32.208	9.963

Using EPA emission factors or CATEFs and permit limits, BAAQMD has estimated the PTE of hazardous air pollutants for all permitted and exempt sources at the facility. Details of these estimates are presented in Appendix B. These estimates are summarized below in Table 2.

Table 2. Potential to Emit of Hazardous Air Pollutants – Facility Wide

Air Toxics	Source				Total Emissions (tons/yr)
	Boilers	Diesel Generators	Turbine	Thermal Oxidizer	
Acetaldehyde	1.13E-02	1.11E-02	--	2.34E-04	0.023
Acrolein	2.08E-03	1.34E-03	--	4.29E-05	0.003
Arsenic	1.54E-04	--	6.92E-04	3.18E-06	0.001
Benzene	6.69E-03	1.35E-02	3.46E-03	1.38E-04	0.024
Beryllium	9.22E-06	--	1.95E-05	1.91E-07	0.000
Cadmium	8.46E-04	--	3.02E-04	1.75E-05	0.001
Chromium	1.08E-03	--	6.92E-04	2.22E-05	0.002
Cobalt	6.46E-05	--	--	1.33E-06	0.000
Dichlorobenzene	9.22E-04	--	--	1.91E-05	0.001
Ethyl Benzene	7.30E-03	--	--	1.51E-04	0.007
Formaldehyde	5.17E-01	1.17E-01	1.76E-02	1.07E-02	0.661
Hexane	1.38E+00	--	--	2.86E-02	1.412
Lead	3.84E-04	--	8.81E-04	7.94E-06	0.001
Manganese	2.92E-04	--	4.97E-02	6.04E-06	0.050
Mercury	2.00E-04	--	7.55E-05	4.13E-06	0.000
Naphthalene	4.69E-04	5.92E-03	2.20E-03	9.69E-06	0.009
Nickel	1.61E-03	--	2.89E-03	3.34E-05	0.005
Selenium	1.84E-05	--	1.57E-03	3.81E-07	0.002
Toluene	2.81E-02	5.92E-03	--	5.82E-04	0.035
Xylenes	2.09E-02	4.13E-03	--	4.32E-04	0.025
1,3-Butadiene	--	5.66E-04	1.01E-03	--	0.002
Total Emissions					2.264

Using 40 CFR Part 98 emission factors and permit limits, BAAQMD has estimated the PTE of GHG for all permitted and exempt sources at the facility. Details of these estimates are presented in Appendix C. These estimates are summarized below in Table 3.

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Table 3. Potential to Emit of GHG – Facility Wide

Source	GHG (tons/year)
Boilers	93,818
Emergency Generators	2,370
49.5 Megawatt Gas Turbine Emergency Generator	29,914
80 kW Microturbine	1,076
Thermal oxidizer	1,896
Semiconductor Fab Area	5,828
TOTAL	134,902

As demonstrated above, HGST’s PTE of any regulated air pollutant is below major facility threshold (95 tons/year), HGST’s PTE of any single hazardous air pollutant is below major facility threshold (9 tons/year), and HGST’s PTE of any combination of hazardous air pollutants is below major facility threshold (23 tons/year). On the other hand, HGST has a PTE of GHG as CO₂ equivalent (CO₂e) that exceeds the major facility threshold (100,000 tons/year). However, the estimated actual emissions are significantly below both PTE and the Major Source threshold. Therefore, HGST is applying for a Synthetic Minor Operating Permit (SMOP).

Table 4 below summarizes the actual GHG emissions from the facility based on 2010 usage data. Details of these calculations are presented in Appendix D.

Table 4. Actual Emissions of GHG – Facility Wide

Source	GHG (tons/year)
Boilers	20,056
Emergency Generators	47
49.5 Megawatt Gas Turbine Emergency Generator	1,103
80 kW Microturbine	0
Thermal oxidizer	0
Semiconductor Fab Area	514
TOTAL	21,720

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SYNTHETIC MINOR OPERATING PERMIT

In order to be eligible for a synthetic minor permit, a site must either have a maximum potential to emit that is less than each Title V emission threshold (less than 95 tons/year of NO_x, CO, POC, PM₁₀, and SO₂, less than 9 tons/year of any single hazardous air pollutant (HAP), and less than 23 tons/year of all HAPs combined) or must accept conditions limiting the site to less than these emissions thresholds (Regulation 2-6-423). In addition, EPA has recently adopted Title V permitting threshold for GHG emissions that became effective for all sites on July 1, 2011. Any site that has the potential to emit more than 100,000 tons/year of GHG (expressed as CO₂ equivalent) will be deemed a major facility and required to obtain a Title V permit. To be eligible for a Synthetic Minor Operating Permit for GHG emissions, the facility must accept conditions limiting its GHG emissions to 90% of the Title V emission threshold, or 90,000 tons/year on a CO₂ equivalent basis, pursuant to Regulation 2-6-423.2.2.

HGST has proposed the addition of federally enforceable throughput limitations such that CO₂e emissions will be less than 90,000 tons/yr. Compliance with this limit will be demonstrated on a rolling monthly basis through the use of an emission calculation procedure that applies a throughput to an established emission factor to each source or source group.

DETERMINATION OF EMISSIONS

The majority of HGST's emissions of GHG arise from the combustion of fuels (i.e., natural gas and diesel fuel) in stationary sources. A small amount of emissions of GHG are from the use of fluorinated GHG in semiconductor fab areas.

Combustion Sources Fired by Natural Gas

HGST will use its facility-wide gas meter to measure throughput of natural gas used by natural gas fired equipment. HGST also has added non-resettable totalizing meters to each of its natural gas fired boiler. Therefore, facility-wide natural gas usage in permitted and exempt-permit stationary sources at HGST will be estimated based on either utility meter data or fuel meter data. The CO₂e emissions from all natural gas fired equipment are based on the following emission factors and Global Warming Potentials (GWPs) from 40 CFR Part 98 as well as kg-to-lb mass conversion factor:

- a. CO₂ emission factor: 53.02 kg/MMBtu
- b. CH₄ emission factor: 0.001 kg/MMBtu
- c. N₂O emission factor: 0.0001 kg/MMBtu
- d. CO₂ GWP: 1
- e. CH₄ GWP: 21
- f. N₂O GWP: 310
- g. 1 kg = 2.2046 lbs

Simplified, the CO₂e emission factor for all natural gas fired equipment is 117.0 lb/MM BTU, which is derived as follows:

$$((53.02 \text{ kg/MMBtu} * 1) + (0.001 \text{ kg/MMBtu} * 21) + (0.0001 \text{ kg/MMBtu} * 310)) * 2.2046 \text{ lbs/kg} \\ = 117.0 \text{ lb/MMBtu}$$

Combustion Sources Fired by Diesel Fuel

HGST will use either its fuel meters or its hour meters to measure throughput of diesel fuel used by diesel fuel fired equipment. If diesel fuel usage and engine load are not measured but run time is recorded, HGST shall assume an engine operated at full load and maximum fuel use rate its entire run time. Alternatively, to measure diesel fuel usage, HGST shall monitor diesel fuel inventory for all diesel fuel tanks at its facility on a semiannual or more frequent basis; to estimate fuel usage between the last inventory monitoring activity and the next one, HGST may prorate the diesel fuel usage from the reading of the last inventory monitoring activity. The CO₂e emissions from all

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diesel fuel fired equipment are based on the following emission factors, GWPs, and high heat value from 40 CFR Part 98 as well as kg-to-lb mass conversion factor:

- a. CO₂ emission factor: 73.96 kg/MMBtu
- b. CH₄ emission factor: 0.003 kg/MMBtu
- c. N₂O emission factor: 0.0006 kg/MMBtu
- d. CO₂ GWP: 1
- e. CH₄ GWP: 21
- f. N₂O GWP: 310
- g. High heat value of 0.138 MM BTU/gallon
- h. 1 kg = 2.2046 lbs

Simplified, the CO₂e emission factor for all diesel fuel fired equipment is 163.6 lb/MM BTU or 22.58 lb/gallon, which is derived as follows:

$$\begin{aligned} & ((73.96 \text{ kg/MMBtu} * 1) + (0.003 \text{ kg/MMBtu} * 21) + (0.0006 \text{ kg/MMBtu} * 310)) * 2.2046 \text{ lbs/kg} \\ & = 163.6 \text{ lb/MMBtu} \\ & = 163.6 \text{ lb/MMBtu} * 0.138 \text{ MMBtu/gallon} = 22.58 \text{ lb/gallon} \end{aligned}$$

Semiconductor Fab Areas

HGST will track its fluorinated GHG usage by bottle use at each tool in semiconductor fab areas. HGST's chemical coordinator tracks the ordering of these bottles, and HGST's ChemSafety chemical inventory system tracks the inventory of fluorinated gases. Full bottles are delivered from B042 Chemical Distribution Center to tools as needed. The CO₂e emissions from all semiconductor fab areas are calculated in accordance with the 2006 Intergovernmental Panel on Climate Change (IPCC) Tier 2b emission calculations. Alternatively, HGST may use the semiconductor emissions estimate calculator provided in CARB's (California Air Resources Board's) website. When converting mass units, HGST shall use 2.2046 lb/kg conversion factor.

SYNTHETIC MINOR OPERATING PERMIT CONDITIONS

Synthetic Minor Operating Permit Conditions (Condition #25245) will be added as follows in accordance with BAAQMD Regulation 2, Rule 6, Section 423.2, District Procedures for Synthetic Minor Operating Permits: Permit Content to avoid designation as a Title V facility.

SYNTHETIC MINOR OPERATING PERMIT

HGST, Inc.
San Jose, CA 95119
Application #24185
Site #A0085

HGST, Inc., Site #A0085, has a synthetic minor operating permit. This operating permit covers all sources at the facility, including exempt sources.

The following conditions establish the federally enforceable permit terms to ensure that this plant is classified as a Synthetic Minor Facility under BAAQMD Regulation 2, Rule 6, Major Facility Review; and ensure that it is not subject to the permitting requirements of Title V of the Federal Clean Air Act as amended in 1990 and 40 CFR Part 70. All applications submitted by the applicant and all modifications to the plant's equipment after issuance of the synthetic minor permit must be evaluated to ensure that the facility will not exceed the synthetic minor general

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limits below and that sufficient monitoring, recordkeeping, and reporting requirements are imposed to ensure enforceability of the limits.

Any revision to a condition establishing this plant's status as a Synthetic Minor Facility or any new permit term that would limit emissions of a new or modified source for the purpose of maintaining the facility as a synthetic minor, must undergo the procedures pursuant to Regulation 2, Rule 6, section 423. The basis for the synthetic minor conditions is an emission limit for regulated air pollutants of 95 tons per year, an emission limit of 90,000 tons per year for greenhouse gases (on a CO₂ equivalent or CO₂e basis), an emission limit for a single HAP (hazardous air pollutant) of 9 tons per year, and an emission limit for a combination of HAPs of 23 tons per year.

Synthetic Minor Conditions:

1. The owner/operator shall in no event emit from this site exceeding any of the emission limits listed below.

NOx	95 tons/year
CO	95 tons/year
POC	95 tons/year
PM10	95 tons/year
SO ₂	95 tons/year
Any Single HAP	9 tons/year
Combination of HAPs	23 tons/year
CO ₂ e	90,000 tons/year

The facility has successfully demonstrated that the facility wide potential to emit NO_x, CO, POC, PM₁₀, SO₂ and HAPs are below the Title V emissions thresholds. However, the potential to emit CO₂e is above Title V emissions threshold and is subject to additional monitoring under the synthetic minor operating permit. The owner/operator shall ensure that the total emissions of greenhouse gases from all combustion equipment and all semiconductor fab areas at the facility (including exempt sources and abatement devices) shall not exceed 90,000 tons on a CO₂e basis, totaled over any consecutive twelve month period. (basis: Regulation 2-6-423.2)

2. The owner/operator shall demonstrate compliance with the emission limit for CO₂e as outlined below:
 - a. Combustion Sources Fired by Natural Gas: the owner/operator shall use either facility-wide utility meter and/or source-specific fuel meters to measure facility-wide natural gas usage in all permitted and exempt-permit natural gas fired combustion sources at the facility. Emission factor for CO₂e shall be 117.0 lb of CO₂e per MM BTU of natural gas, from 40 CFR Part 98. Natural gas

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consumption applied to the emission factor shall be actual metered throughput. Sources without a dedicated fuel meter shall be grouped together and linked to a main fuel meter in such a way as to determine the entire fuel use for the group.

- b. **Combustion Sources Fired by Diesel Fuel:** the owner/operator shall use either fuel meters and/or hour meters to measure diesel fuel usage in all permitted and exempt-permit diesel fuel fired combustion sources at the facility; if diesel fuel usage and engine load are not measured but run time is recorded, the owner/operator shall assume an engine operated at full load and maximum fuel use rate its entire run time. Alternatively, to measure diesel fuel usage in all permitted and exempt-permit diesel fuel fired combustion sources at the facility, the owner/operator shall monitor diesel fuel inventory for all diesel fuel tanks at the facility on a semiannual or more frequent basis; to estimate fuel usage between the last inventory monitoring activity and the next one, the owner/operator may prorate the diesel fuel usage from the reading of the last inventory monitoring activity. Emission factor for CO_{2e} shall be 163.6 lb of CO_{2e} per MM BTU of diesel fuel or 22.58 lb of CO_{2e} per gallon of diesel fuel, from 40 CFR Part 98. Fuel consumption shall be based on actual usage for each source in this category.
- c. **Semiconductor Fab Areas:** the owner/operator shall track fluorinated greenhouse gases usage by bottle use at each tool in semiconductor fab areas and/or utilize the facility's chemical inventory system to track fluorinated gases inventory. CO_{2e} emissions from all permitted and exempt-permit semiconductor fab areas shall be calculated in accordance with the 2006 Intergovernmental Panel on Climate Change (IPCC) Tier 2b emission calculations. Alternatively, the owner/operator shall utilize the semiconductor emissions estimate calculator provided in California Air Resources Board's website.

Emissions of CO_{2e} from each source or source group shall be calculated and recorded on a monthly basis. Annual emissions shall be summarized on a rolling 12-month basis. All records required by the Synthetic Minor Operating Permit shall be kept on site and be available for inspection by BAAQMD personnel for at least 5 years from the date that a record was made. (basis: Regulation 2-6-423.2)

3. The owner/operator shall develop and maintain monitoring tables to clearly demonstrate compliance with the CO_{2e} Synthetic Minor Operating Permit limits on a rolling 12-month basis beginning with the first calendar month after the issuance of the Synthetic Minor Operating Permit. All monitoring tables shall be updated as applicable when equipment is added to or removed from the facility. The facility has the authority under the Synthetic Minor Operating Permit to make additions and deletions to equipment in the approved monitoring tables without prior approval of the BAAQMD provided that approved emissions factors and monitoring methodologies are followed. The BAAQMD has the authority at any

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time to require modifications to the monitoring tables as deemed necessary to improve the accuracy or clarity of monitored data. (basis: Regulation 2-6-423.2)

PUBLIC COMMENT

In accordance with SIP Regulations 2-6-423.3 and 2-6-423.4, the BAAQMD's preliminary decision to issue a Synthetic Minor Operating Permit to Plant #85 is subject to a 30-day public comment period and a 30-day EPA review period. A Notice Inviting Written Public Comment was published in the Mercury News newspaper on May 18, 2012. The BAAQMD also sent a notification of its preliminary decision to EPA Region IX and ARB. The comment period ended on June 18, 2012. The BAAQMD received no comments.

RECOMMENDATION

Staff recommends the BAAQMD make a final decision to issue a Synthetic Minor Operating Permit to Plant #85.

By: _____
Kevin Oei
Air Quality Engineer

Date: _____

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**APPENDIX A
POTENTIAL TO EMIT OF REGULATED AIR POLLUTANTS ESTIMATES**

Table A1. Potential to Emit of Regulated Air Pollutants – Boilers

Boiler Data ¹			Emission Factors						Emissions				
Source No.	Hitachi Boiler No.	Heat Input Rating	Hours of Operation ²	NO _x Emission Factor ³	CO Emission Factor ³	SO ₂ Emission Factor ⁴	POC Emission Factor ⁴	PM ₁₀ Emission Factor ⁴	NO _x Emissions	CO Emissions	SO ₂ Emissions	POC Emissions	PM ₁₀ Emissions
		(MMBtu/hr)		(ppmv)	(ppmv)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMBtu)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
S-320	1	43	8,760	9	50	0.0006	0.0054	0.0075	2.053	6.969	0.111	1.016	1.403
S-307	2	43							2.053	6.969	0.111	1.016	1.403
S-4	4	24							1.146	3.889	0.062	0.567	0.783
S-5	5	24							1.146	3.889	0.062	0.567	0.783
S-326 ⁵	3	45							15	50	3.587	7.293	0.116
Subtotal									9.985	29.009	0.461	4.228	5.842

Notes

- Boiler data obtained from BAAQMD's Databank for Plant # 85.
- Continuous operation using natural gas throughout the year assumed.
- Emission factors obtained from Regulation 9, Rule 7. (The values were converted from ppmv to lb/MMBtu.)
- Emission factors obtained from Table 1.4-2 of the External Combustion Section of AP-42. (The values were converted from lb/10⁶ scf to lb/MMBtu.)
- Per Condition # 23701 for Plant # 85. (The emissions calculated for S-326 incorporate combined emissions from S-326 and S-9513, Microturbine.)

Table A2. Potential to Emit of Regulated Air Pollutants – Diesel Generators

Diesel Generator Data ¹			Emission Factors					Emissions				
Source No. ¹	Engine Rating ¹	Hours of Operation ²	NO _x Emission Factor ³	CO Emission Factor ³	POC Emission Factor ³	SO ₂ Emission Factor ⁴	PM ₁₀ Emission Factor ³	NO _x Emissions	CO Emissions	POC Emissions	SO ₂ Emissions	PM ₁₀ Emissions
	(hp)		(lb/bhp-hr)	(lb/bhp-hr)	(lb/bhp-hr)	(lb/bhp-hr)	(lb/bhp-hr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
9000	182	500	0.011	0.003	0.002	0.002	0.001	0.494	0.131	0.077	0.093	0.025
9001	335		0.031	0.007	0.002	0.002	0.002	2.596	0.559	0.207	0.172	0.184
9011	81		0.031	0.007	0.002	0.002	0.002	0.628	0.135	0.050	0.042	0.045
9013	68		0.031	0.007	0.002	0.002	0.002	0.527	0.114	0.042	0.035	0.037
9014	106		0.031	0.007	0.002	0.002	0.002	0.822	0.177	0.065	0.054	0.058
9015	160		0.031	0.007	0.002	0.002	0.002	1.240	0.267	0.099	0.082	0.088
9018	310		0.031	0.007	0.002	0.002	0.002	2.403	0.518	0.191	0.159	0.171
9021	575		0.031	0.007	0.002	0.002	0.002	4.456	0.960	0.355	0.295	0.316
9022	350		0.031	0.007	0.002	0.002	0.002	2.713	0.585	0.216	0.179	0.193
9041	160		0.031	0.007	0.002	0.002	0.002	1.240	0.267	0.099	0.082	0.088
9042	465		0.031	0.007	0.002	0.002	0.002	3.604	0.777	0.287	0.238	0.256
9055	97		0.031	0.007	0.002	0.002	0.002	0.752	0.162	0.060	0.050	0.053
9056	474		0.031	0.007	0.002	0.002	0.002	3.674	0.792	0.293	0.243	0.261
9067	356		0.031	0.007	0.002	0.002	0.002	2.759	0.595	0.220	0.182	0.196
9072	536		0.014	0.002	0.000	0.002	0.000	1.868	0.220	0.022	0.275	0.011
9109	74		0.031	0.007	0.002	0.002	0.002	0.574	0.124	0.046	0.038	0.041
9111	384		0.031	0.007	0.002	0.002	0.002	2.976	0.641	0.237	0.197	0.211
9112	600		0.031	0.007	0.002	0.002	0.002	4.650	1.002	0.371	0.308	0.330
9115	235		0.031	0.007	0.002	0.002	0.002	1.821	0.392	0.145	0.120	0.129
9420	160		0.031	0.007	0.002	0.002	0.002	1.240	0.267	0.099	0.082	0.088
9501	370	0.031	0.007	0.002	0.002	0.002	2.868	0.618	0.228	0.190	0.204	
9502	370	0.031	0.007	0.002	0.002	0.002	2.868	0.618	0.228	0.190	0.204	
9510	325	0.009	0.001	0.000	0.002	0.000	0.733	0.080	0.027	0.167	0.018	
9512	160	0.009	0.001	0.001	0.002	0.000	0.370	0.050	0.040	0.082	0.000	
Subtotal								47.873	10.051	3.704	3.553	3.205

Notes

- Generator data obtained from BAAQMD's Databank for Plant # 85.
- 500 hours/yr of diesel use for testing and emergency situations assumed, based on EPA guidance (1995).
- Emission factors for NO_x, CO, VOC, and PM₁₀ for S-9000 from Cummins. Emission factors for S-9072, S-9510, and S-9512 obtained from CARB. All the other emission factors obtained from Table 3.3-1 from the Stationary Internal Combustion Sources Section of AP-42.
- Emission factor for SO₂ obtained from Table 3.3-1 from the Stationary Internal Combustion Sources Section of AP-42.

Table A3. Potential to Emit of Regulated Air Pollutants – Tanks

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Source No. ¹	Description ¹	Orientation ²	Abated by ²	Tank Contents ²	Annual Emissions - Abated ³		Annual Emissions - Abated ⁴			Annual Emissions - Abated ⁵		
					NPOCs	POCs	PM	POCs	NPOCs	PM	POCs	NPOCs
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
9	T-6	H	A35	70% IPA, 18% NPA, 2% NMP, 10% water	--	6.06E-04	--	6.50E-05	--	--	6.06E-04	--
10	T-7	H	A35	1.4 % PGMEA, 1.5 % NMP, 0.04 % IPA, 0.001% NPA, 97 % water	--	3.73E-06	--	6.50E-05	--	--	6.50E-05	--
293	T-16 (NMP Waste tank)	H	A60 A61 A23	80% NMP and 20% water	--	6.43E-05	--	2.14E-05	--	--	6.43E-05	--
294	T- 4 (Chemical Storage tank)	H	A60 A61 A23	NMP 100 %	--	1.46E-04	--	5.38E-05	--	--	1.46E-04	--
295	T-12 (Waste Storage tank)	H	A60 A61 A23	70% IPA, 18% NPA, 2% NMP, 10% water	--	4.72E-03	--	2.23E-04	--	--	4.72E-03	--
296	T-13 (Waste Storage tank)	H	A60 A61 A23	70% IPA, 18% NPA, 2% NMP, 10% water	--	4.72E-03	--	8.52E-05	--	--	4.72E-03	--
300	T-5(Chemical Storage tank)	H	A60 A61	NMP 100 %	--	1.47E-04	--	2.85E-05	--	--	1.47E-04	--
302	T-17(NMP Waste tank)	H	A60 A61	80% NMP and 20% water	--	6.43E-05	--	1.99E-05	--	--	6.43E-05	--
314	T-6(Chemical Storage tank)	H	A60 A61 A23	Virgin PGMEA	--	1.43E-03	--	3.21E-04	--	--	1.43E-03	--
315	T-B7(Chemical Storage tank)	H	A60 A61 A23	Virgin PGMEA	--	1.43E-03	--	--	--	--	1.43E-03	--
472	T-9 (Solvent Waste Storage tank)	H	A35	95% PGMEA and 5% water	--	2.21E-04	--	1.51E-04	--	--	2.21E-04	--
476	T-60 (NMP Waste tank)	H	A35	80 % NMP, 20 % water	--	2.39E-05	--	3.14E-04	--	--	3.14E-04	--
715	Equalization Tank	V		0.006% NMP, 0.00003% acetone, 99.9 % water	3.79E-03	7.27E-04	--	3.41E-03	--	--	3.41E-03	3.79E-03
716	Equalization Tank	V		0.006% NMP, 0.00003% acetone, 99.9 % water	3.79E-03	7.27E-04	--	3.41E-03	--	--	3.41E-03	3.79E-03
791	T5 (Non-chlorinated Equalization Tank)	H	A29	1.0 % PGMEA, 0.8 % NMP, 0.02% NPA, 0.002% IPA, 0.001% acetone, 98 % water	5.06E-07	1.05E-05	--	9.34E-02	--	--	9.34E-02	5.06E-07
792	T801D (Fixed Film Bioreactor)	V	A29	1 % PGMEA, 0.8 % NMP, 0.02% NPA, 0.001% acetone, 98% water	7.13E-07	1.55E-05	--	4.33E-01	--	--	4.33E-01	7.13E-07
794	T801A (Rotating Biological Contactors)	V	A29	1 % PGMEA, 0.8 % NMP, 0.02% NPA, 0.001% acetone, 98% water	5.57E-07	1.21E-05	--	7.54E-02	--	--	7.54E-02	5.57E-07
794	T801B (Rotating Biological Contactors)	V	A29	1 % PGMEA, 0.8 % NMP, 0.02% NPA, 0.001% acetone, 98% water	5.57E-07	1.21E-05	--	7.54E-02	--	--	7.54E-02	5.57E-07
794	T801C (Rotating Biological Contactors)	V	A29	1 % PGMEA, 0.8 % NMP, 0.02% NPA, 0.001% acetone, 98% water	5.57E-07	1.21E-05	--	7.54E-02	--	--	7.54E-02	5.57E-07
883	T-203 (Scrubber Waste)	V		1.0 % IPA, 99% water	--	5.84E-05	--	1.12E-02	--	--	1.12E-02	--
1162	T-11 (Solvent Waste Storage Tank)	H	A60 A61 A23	95% PGMEA and 5% water	--	1.43E-03	--	2.01E-04	--	--	1.43E-03	--
1165	T-10 (Solvent Waste Storage Tank)	H	A60 A61 A23	95% PGMEA and 5% water	--	1.43E-03	--	--	--	--	1.43E-03	--
1554	T-2 (Solvent Spill tank)	H		100% IPA	--	1.55E-02	--	--	--	--	1.55E-02	--
1558	T-20 (Solvent Spill tank)	H	A42	100% IPA	--	1.84E-03	--	--	--	--	1.84E-03	--
1560	T-64 (Contaminated Rain water)	H	A35	100% IPA	--	8.38E-03	--	6.64E-03	--	--	8.38E-03	--
1564	T-11 (Non-Chlorinated Waste tank)	H	A42	100% IPA	--	6.99E-04	--	--	--	--	6.99E-04	--
1565	T-19 (Non-Chlorinated Waste tank)	H	A42	100% IPA	--	1.84E-03	--	--	--	--	1.84E-03	--

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Source No. ¹	Description ¹	Orientation ²	Abated by ²	Tank Contents ²	Annual Emissions - Abated ³		Annual Emissions - Abated ⁴			Annual Emissions - Abated ⁵		
					NPOCs	POCs	PM	POCs	NPOCs	PM	POCs	NPOCs
					(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
1566	T-10 (Scrubber Waste)	H	A42	100% IPA	--	6.99E-04	--	--	--	--	6.99E-04	--
1567	T-19 (Scrubber Waste)	H	A29	0.02% NPA, 0.002% IPA, 0.001% acetone, 99.9 % water	6.61E-08	1.43E-07	--	--	--	--	1.43E-07	6.61E-08
1605	T-3 (Non-Chlorinated Hydrocarbons)	H		100% IPA	--	1.23E-02	--	--	--	--	1.23E-02	--
Subtotal					0.008	0.059	0.000	0.778	0.000	0.000	0.828	0.008

Notes

1. Tank data obtained from BAAQMD's Databank for Plant # 85.
2. Tank data provided by Hitachi Global Storage Technologies. For S-1554, S-1558, S-1560, S-1564 to S-1566, and S-1605 assumed horizontal tanks containing 100% IPA.
3. Storage tank emissions estimated using the EPA TANKS program, except for the emissions from two open-roof tanks (S-715 and S-716) which were estimated using EPA Risk Management Program (RMP) methodology. Assumed 90% VOC removal efficiency for all abatement equipment.
4. Emissions obtained from BAAQMD's Database on 4/2012 for respective sources.
5. The larger of emissions estimated using EPA TANKS program or EPA Risk Management Program (RMP) methodology and emissions obtained from BAAQMD's Database on 4/2012.

Table A4. Potential to Emit of Regulated Air Pollutants – Custom Lubers

Source No. ¹	NPOC Emissions ¹	NPOC Emissions
	(lb/day)	(tons/yr)
844	10	1.825
845	10	1.825
846	10	1.825
847	10	1.825
848	10	1.825
849	10	1.825
850	10	1.825
851	10	1.825
852	10	1.825
Subtotal	90	16.425

Notes

1. Emissions data obtained from Condition # 15518 for Plant # 85.

Table A5. Potential to Emit of Regulated Air Pollutants – Deco Washers

Source No. ¹	Hitachi Deco Washer No.	POC Emissions ¹	POC Emissions
		(lb/yr)	(tons/yr)
9503	1	6,175	3.088
9504	2		
9505	3		
9506	4		
9507	5		
9508	6		
9509	7		

Notes

1. Emissions data obtained from Condition # 20846 for Plant # 85.

Table A6. Potential to Emit of Regulated Air Pollutants – Miscellaneous Solvent Units

Source No. ¹	Description ¹	Density ²	POC Emissions ²	NPOC Emissions ²
		(lb/gal)	(tons/yr)	(tons/yr)
502	Solvent and Oil Blending Operations	7	0.098	--
819	Wipe Cleaning Operations	6.6 for IPA; 6.6 for Acetone; 14.62 for FC-72;	13.509	11.005
820				
822				

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829		11.18 for Zip MC Cleaner; 0.07 for Ink Remover		
832				
873	Vapor solvent Cleaner	See Notes	0.526	--
885				
886	Vapor Degreaser	See Notes	--	1.318
Subtotal			14.133	12.323

Notes

1. Source data obtained from BAAQMD's Databank for Plant # 85.
2. For S-502, emissions calculated from typical solvent density of 7 lb/gal and 28 gal/yr POC usage. For S-819, S-820, S-822, S-829, S-832, emissions calculated from throughput limits in Condition # 10142. For S-873, vendor guaranteed emission factor of 0.12 lb/hr of POC assumed. For S-885 and S-886, emissions calculated from emission limit in Condition # 23561.

Table A7. Potential to Emit of Regulated Air Pollutants – Gas Turbine Emergency Generator

Source No.	Turbine Data ¹			Emission Factors ²				Emissions				
	Diesel Fuel Use Permit Limit	Hours of Operation	NO _x Emissions ¹	CO Emission Factor	SO ₂ Emission Factor	POC Emission Factor	PM ₁₀ Emission Factor	NO _x Emissions	CO Emissions	SO ₂ Emissions	POC Emissions	PM ₁₀ Emissions
	(gal/hr)	(hrs/yr)	(lb/hr)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMBtu)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
428	5,300	172	141.6	0.08	0.033	0.0004	0.0120	12.178	4.815	2.091	0.026	0.760

Notes

1. Turbine data obtained from BAAQMD's Databank for Plant # 85.
2. Emission factors obtained from Tables 3.1-1 and 3.1-2a of the Stationary Gas Turbine section of AP-42.

Table A8. Potential to Emit of Regulated Air Pollutants – Thermal Oxidizer

Source No.	Turbine Data ¹				Emission Factors ²			Emissions				
	Heat Input Rating	Hours of Operation	NO _x Emissions ¹	CO Emissions ¹	SO ₂ Emission Factor	POC Emission Factor	PM ₁₀ Emission Factor	NO _x Emissions	CO Emissions	SO ₂ Emissions	POC Emission Factor	PM ₁₀ Emissions
	(MMBtu/hr)	(hrs/yr)	(lb/MMBtu)	(lb/MMBtu)	(lb/MMscf)	(lb/MMscf)	(lb/MMscf)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
A-47	3.7	8,760	0.05	0.22	0.6	5.5	7.6	0.810	3.565	0.010	0.088	0.121

Notes

1. Thermal oxidizer data obtained from BAAQMD's Databank for Plant # 85.
2. Emission factors obtained from AP-42 Chapter 1.4, Natural Gas Combustion.

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Table A9. Potential to Emit of Regulated Air Pollutants – Semiconductor Fab Areas

Source No. ¹	Abated by ¹	Compounds ¹	Density ² (lb/gal)	Usage ¹			Emissions - Unabated ³		Emissions - Abated ³	
				NPOC	POC	POC	NPOC	POC	NPOC	POC
				(gal/yr)	(lb/yr)	(gal/yr)	(tons/yr)	(tons/yr)	(tons/yr)	(tons/yr)
514	A-43 A-47 A720 A730	Photoresist maskant	8.4	--	--	15,000	--	56.700	--	5.670
		IPA	6.6			40,000		41.739		7.132
		NMP	See Notes			193,500		10.999		1.100
		Acetone	6.6			1,000		--		3.314
674	A-43 A-47	--	--	--	9,035	--	--	4.518	--	0.452
Subtotal							3.314	113.955	3.314	14.353

- Notes**
- Semiconductor fab data obtained from BAAQMD's Databank for Plant # 85.
 - Densities obtained from MSDS. Density of PGMEA used for photoresist maskant.
 - Net solvent usage assumed to be 100% of the gross solvent usage at S-514. Assumed a VOC control efficiency of 90% for abatement equipment, except for IPA and acetone at S-514 used for wipe cleaning. Emissions from NMP based on 1997 source test (0.324 TPY of POC with 57,000 gal/yr).

Table A10. Potential to Emit of Regulated Air Pollutants – Other Permitted Sources

Source No. ¹	Description ¹	Abated by ¹	Emission Factor ²	PM ₁₀ Emissions ² (tons/yr)	POC Emissions ² (tons/yr)	NPOC Emissions ² (tons/yr)
721	Cooling Tower		0.09 lb/hr of POC, 0.01 lb/day of PM	0.002	0.394	--
793	Neutralization Pit (T767)	A-29	0.74 lb/hr of POC (unabated), 0.0203 lb/hr of NPOC (unabated)	--	0.324	0.009
836	Automated Metal Parts Cleaners		None	--	--	--
882	Ozone Cleaning Station, Genus/Alm Tools, BLDG 6, 0.026 LB/H		None	--	--	--
Subtotal				0.002	0.718	0.009

- Notes**
- Source data obtained from BAAQMD's Databank for Plant # 85.
 - For S-721, emission factors from 11/28/1990 source test. For S-793, emission factors from 5/13, 5/21, 6/6/1991 and assumed 90% abatement efficiency by A-29. For S-836, no emissions per BAAQMD Application # 8320. For S-882, no criteria pollutant emissions since ozone is not regulated by BAAQMD.

Table A11. Potential to Emit of Regulated Air Pollutants – Miscellaneous Exempt Sources

Source No. ¹	Description ¹	Abated by ¹	Emission Factor ²	PM ₁₀ Emissions ²	POC Emissions ²	NPOC Emissions ²	PM ₁₀ Emissions ²	POC Emissions ²	NPOC Emissions ²
				(lb/day)	(lb/day)	(lb/day)	(tons/yr)	(tons/yr)	(tons/yr)
30	NMP Reclaim Tank	A-35	See Notes	--	2.51E-03	7.24E-03	--	4.58E-04	1.32E-03
419	DIESEL FUEL TANK		See Notes	--	8.66E-01	--	--	1.58E-01	--
420	DIESEL FUEL TANK		See Notes	--	7.57E-01	--	--	1.38E-01	--
444	HCL STORAGE TANK <30%	A-53	See Notes	--	--	--	--	--	--
701	Flash Mix Tank No 1	A-700	See Notes	--	--	--	--	--	--
702	Flash Mix Tank No 2	A-700	See Notes	--	--	--	--	--	--
706	T778 HCl Day Use Tank #2 <30%	A-700	See Notes	--	--	--	--	--	--
712	Sodium Hypochlorite Feed Tank	A-700	See Notes	5.13E-03	4.27E-02	--	9.36E-04	7.79E-03	--
760	T721 HCl Tank <30%	A-710	See Notes	1.07E-02	--	--	1.95E-03	--	--
761	Concentrate Plant Tanks	A-710	See Notes	--	--	--	--	--	--
771	Concentrate Plant Tanks		See Notes	--	--	--	--	--	--
772	Rinse Plant Tanks		See Notes	--	--	--	--	--	--
779	T720 HCl Storage Tank <30%	A-710	See Notes	1.55E-02	--	--	2.83E-03	--	--
780	Rinse Plant Tanks		See Notes	--	--	--	--	--	--
790	Organics Plant Tanks	A-710	See Notes	--	--	--	--	--	--
840	SITE WIDE ADHESIVE USE		127.5 lb/yr of POC, 256.7 lb/yr of NPOC	--	0.349	0.703	--	0.064	0.128
1115	5 T-1 (B.004, WV-19) HCL TANK <30%	A-51	See Notes	1.48E-01	--	--	2.70E-02	--	--
Subtotal							0.033	0.368	0.130

- Notes**
- Source data obtained from BAAQMD's Databank for Plant # 85.
 - For tanks, emissions obtained from BAAQMD's Database on 4/2012 for respective sources. For S-840, emission factors are from BAAQMD Application # 8349.

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**APPENDIX B
POTENTIAL TO EMIT OF HAZARDOUS AIR POLLUTANTS ESTIMATES**

Table B1. Potential to Emit of Hazardous Air Pollutants – Boilers

Source No. ¹			S - 4	S - 5	S - 307	S - 320	S - 326	
Heat Input Rating (MMBtu/hr) ¹			24	24	43	43	45	
Heat Content of Natural Gas (Btu/scf)			1020					
CAS	Pollutant	Highest Emission Factor ² (lb/mmscf)	Annual Emissions					Subtotal by Chemical (tons/yr)
			(tons/yr)					
7.51E+04	Acetaldehyde	1.47E-02	1.51E-03	1.51E-03	2.71E-03	2.71E-03	2.84E-03	1.13E-02
1.07E+05	Acrolein	2.70E-03	2.78E-04	2.78E-04	4.99E-04	4.99E-04	5.22E-04	2.08E-03
7.44E+06	Arsenic	2.00E-04	2.06E-05	2.06E-05	3.69E-05	3.69E-05	3.86E-05	1.54E-04
7.14E+04	Benzene	8.70E-03	8.97E-04	8.97E-04	1.61E-03	1.61E-03	1.68E-03	6.69E-03
7.44E+06	Beryllium	1.20E-05	1.24E-06	1.24E-06	2.22E-06	2.22E-06	2.32E-06	9.22E-06
7.44E+06	Cadmium	1.10E-03	1.13E-04	1.13E-04	2.03E-04	2.03E-04	2.13E-04	8.46E-04
7.44E+06	Chromium	1.40E-03	1.44E-04	1.44E-04	2.59E-04	2.59E-04	2.71E-04	1.08E-03
7.44E+06	Cobalt	8.40E-05	8.66E-06	8.66E-06	1.55E-05	1.55E-05	1.62E-05	6.46E-05
2.53E+07	Dichlorobenzene	1.20E-03	1.24E-04	1.24E-04	2.22E-04	2.22E-04	2.32E-04	9.22E-04
1.00E+05	Ethyl Benzene	9.50E-03	9.79E-04	9.79E-04	1.75E-03	1.75E-03	1.84E-03	7.30E-03
5.00E+04	Formaldehyde	6.72E-01	6.93E-02	6.93E-02	1.24E-01	1.24E-01	1.30E-01	5.17E-01
1.11E+05	Hexane	1.80E+00	1.86E-01	1.86E-01	3.32E-01	3.32E-01	3.48E-01	1.38E+00
7.44E+06	Lead	5.00E-04	5.15E-05	5.15E-05	9.23E-05	9.23E-05	9.66E-05	3.84E-04
7.44E+06	Manganese	3.80E-04	3.92E-05	3.92E-05	7.02E-05	7.02E-05	7.34E-05	2.92E-04
7.44E+06	Mercury	2.60E-04	2.68E-05	2.68E-05	4.80E-05	4.80E-05	5.02E-05	2.00E-04
9.12E+04	Naphthalene	6.10E-04	6.29E-05	6.29E-05	1.13E-04	1.13E-04	1.18E-04	4.69E-04
7.44E+06	Nickel	2.10E-03	2.16E-04	2.16E-04	3.88E-04	3.88E-04	4.06E-04	1.61E-03
7.78E+06	Selenium	2.40E-05	2.47E-06	2.47E-06	4.43E-06	4.43E-06	4.64E-06	1.84E-05
1.09E+05	Toluene	3.66E-02	3.77E-03	3.77E-03	6.76E-03	6.76E-03	7.07E-03	2.81E-02
1.33E+06	Xylenes	2.72E-02	2.80E-03	2.80E-03	5.02E-03	5.02E-03	5.26E-03	2.09E-02
Subtotal								1.98E+00

Notes

1. Boiler data obtained from BAAQMD's Databank for Plant # 85.
2. The larger of the emission factors from US EPA AP-42, Ventura AB2588, and those from CATEF.

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Table B2. Potential to Emit of Hazardous Air Pollutants – Diesel Generators

Source No. ¹	HP ¹	Fuel Use (gal/hr) ¹	Operating Hours (hours/yr) ²	Compound	Benzene	Toluene	Xylenes	1,3-Butadiene	Formaldehyde	Acetaldehyde	Acrolein	Naphthalene	
				CAS #	71432	108883	1330207	106990	50000	75070	107028	91203	
				AP-42 Emission Factor (lb/MMBtu)	9.33E-04	4.09E-04	2.85E-04	3.91E-05	1.18E-03	7.67E-04	9.25E-05	8.48E-05	
				AP-42 Emission Factor (lb/gal)	1.29E-04	5.64E-05	3.93E-05	5.40E-06	1.63E-04	1.06E-04	1.28E-05	1.17E-05	
				CATEF Emission Factor (lb/gal)	3.25E-05	--	--	--	1.11E-03	--	--	5.64E-05	
Highest Emission Factor ³ (lb/gal)	1.29E-04	5.64E-05	3.93E-05	5.40E-06	1.11E-03	1.06E-04	1.28E-05	5.64E-05					
9000	182	9.0	500	Maximum Annual Emission Rate (tons/yr)	2.90E-04	1.27E-04	8.85E-05	1.21E-05	2.50E-03	2.38E-04	2.87E-05	1.27E-04	
9001	335	24.4			7.85E-04	3.44E-04	2.40E-04	3.29E-05	6.77E-03	6.46E-04	7.79E-05	3.44E-04	
9011	81	5.9			1.90E-04	8.33E-05	5.80E-05	7.96E-06	1.64E-03	1.56E-04	1.88E-05	8.32E-05	
9013	68	4.9			1.58E-04	6.91E-05	4.82E-05	6.61E-06	1.36E-03	1.30E-04	1.56E-05	6.91E-05	
9014	106	5.9			1.90E-04	8.33E-05	5.80E-05	7.96E-06	1.64E-03	1.56E-04	1.88E-05	8.32E-05	
9015	160	8.7			2.80E-04	1.23E-04	8.55E-05	1.17E-05	2.41E-03	2.30E-04	2.78E-05	1.23E-04	
9018	310	22.5			7.24E-04	3.17E-04	2.21E-04	3.04E-05	6.24E-03	5.95E-04	7.18E-05	3.17E-04	
9021	575	39.0			1.26E-03	5.50E-04	3.83E-04	5.26E-05	1.08E-02	1.03E-03	1.24E-04	5.50E-04	
9022	350	21.5			6.92E-04	3.03E-04	2.11E-04	2.90E-05	5.97E-03	5.69E-04	6.86E-05	3.03E-04	
9041	160	8.7			2.80E-04	1.23E-04	8.55E-05	1.17E-05	2.41E-03	2.30E-04	2.78E-05	1.23E-04	
9042	465	28.2			9.08E-04	3.98E-04	2.77E-04	3.80E-05	7.83E-03	7.46E-04	9.00E-05	3.98E-04	
9055	97	5.9			1.90E-04	8.33E-05	5.80E-05	7.96E-06	1.64E-03	1.56E-04	1.88E-05	8.32E-05	
9056	474	29.3			9.43E-04	4.13E-04	2.88E-04	3.95E-05	8.13E-03	7.75E-04	9.35E-05	4.13E-04	
9067	356	21.5			6.92E-04	3.03E-04	2.11E-04	2.90E-05	5.97E-03	5.69E-04	6.86E-05	3.03E-04	
9072	536	26.1			8.40E-04	3.68E-04	2.57E-04	3.52E-05	7.24E-03	6.91E-04	8.33E-05	3.68E-04	
9109	74	5.4			1.74E-04	7.62E-05	5.31E-05	7.28E-06	1.50E-03	1.43E-04	1.72E-05	7.61E-05	
9111	384	22.4			7.21E-04	3.16E-04	2.20E-04	3.02E-05	6.22E-03	5.93E-04	7.15E-05	3.16E-04	
9112	600	31.0			9.98E-04	4.37E-04	3.05E-04	4.18E-05	8.60E-03	8.20E-04	9.89E-05	4.37E-04	
9115	235	17.1			5.50E-04	2.41E-04	1.68E-04	2.31E-05	4.75E-03	4.52E-04	5.46E-05	2.41E-04	
9420	160	9.5			3.06E-04	1.34E-04	9.34E-05	1.28E-05	2.64E-03	2.51E-04	3.03E-05	1.34E-04	
9501	370	24.4			7.85E-04	3.44E-04	2.40E-04	3.29E-05	6.77E-03	6.46E-04	7.79E-05	3.44E-04	
9502	370	24.4			7.85E-04	3.44E-04	2.40E-04	3.29E-05	6.77E-03	6.46E-04	7.79E-05	3.44E-04	
9510	325	16.2			5.21E-04	2.29E-04	1.59E-04	2.19E-05	4.50E-03	4.29E-04	5.17E-05	2.28E-04	
9512	160	8.0			2.58E-04	1.13E-04	7.87E-05	1.08E-05	2.22E-03	2.12E-04	2.55E-05	1.13E-04	Subtotal
					Subtotal by Chemical (tons/yr)	1.35E-02	5.92E-03	4.13E-03	5.66E-04	1.17E-01	1.11E-02	1.34E-03	5.92E-03

Notes

1. Generator data obtained from BAAQMD's Databank for Plant # 85.
2. Assume 500 hours/yr of diesel use for testing and emergency situations, based on EPA guidance (1995).
3. The larger of the emission factors from US EPA AP-42 and those from CATEF.

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Table B3. Potential to Emit of Hazardous Air Pollutants – Gas Turbine Emergency Generator

Source No. ¹		S - 428	
Diesel Fuel Use Permit Limit (gal/hr) ¹		5,300	
Hours of Operation (hrs/yr) ¹		172	
Compound	CAS #	Emission Factors ²	Emissions
		(lb/MMBtu)	(tons/yr)
1,3- Butadiene	106990	1.60E-05	1.01E-03
Arsenic	7440382	1.10E-05	6.92E-04
Benzene	71432	5.50E-05	3.46E-03
Beryllium	7440417	3.10E-07	1.95E-05
Cadmium	7440439	4.80E-06	3.02E-04
Chromium	7440473	1.10E-05	6.92E-04
Formaldehyde	50000	2.80E-04	1.76E-02
Lead	7439921	1.40E-05	8.81E-04
Manganese	7439965	7.90E-04	4.97E-02
Mercury	7439976	1.20E-06	7.55E-05
Naphthalene	91203	3.50E-05	2.20E-03
Nickel	7440020	4.60E-05	2.89E-03
Selenium	7782492	2.50E-05	1.57E-03
Subtotal			8.11E-02

Notes

1. Turbine data obtained from BAAQMD's Databank for Plant # 85.
2. Emission factors obtained from Tables 3.1-4 and 3.1-5 of the Stationary Gas Turbine section of AP-42.

Table B4. Potential to Emit of Hazardous Air Pollutants – Thermal Oxidizer

Source No. ¹		A-47	
Heat Input Rating (MMBtu/hr) ¹		3.7	
Heat Content of Natural Gas (Btu/scf)		1020	
CAS	Pollutant	Highest Emission Factor ² (lb/mmscf)	Annual Emissions (tons/yr)
75070	Acetaldehyde	1.47E-02	2.34E-04
107028	Acrolein	2.70E-03	4.29E-05
7440382	Arsenic	2.00E-04	3.18E-06
71432	Benzene	8.70E-03	1.38E-04
7440417	Beryllium	1.20E-05	1.91E-07
7440439	Cadmium	1.10E-03	1.75E-05
7440473	Chromium	1.40E-03	2.22E-05
7440484	Cobalt	8.40E-05	1.33E-06
25321226	Dichlorobenzene	1.20E-03	1.91E-05
100414	Ethyl Benzene	9.50E-03	1.51E-04
50000	Formaldehyde	6.72E-01	1.07E-02
110543	Hexane	1.80E+00	2.86E-02
7439921	Lead	5.00E-04	7.94E-06
7439965	Manganese	3.80E-04	6.04E-06
7439976	Mercury	2.60E-04	4.13E-06
91203	Naphthalene	6.10E-04	9.69E-06
7440020	Nickel	2.10E-03	3.34E-05
7782492	Selenium	2.40E-05	3.81E-07
108883	Toluene	3.66E-02	5.82E-04
1330207	Xylenes	2.72E-02	4.32E-04
Total			4.10E-02

Notes

1. Thermal oxidizer data obtained from BAAQMD's Databank for Plant # 85.
2. The larger of the emission factors from US EPA AP-42, Ventura AB2588, and those from CATEF.

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**APPENDIX C
POTENTIAL TO EMIT OF GREENHOUSE GASES ESTIMATES**

Table C1. Potential to Emit of Greenhouse Gases – Boilers

Boiler Data ¹			Diesel			Natural Gas			Total CO ₂ e Emissions (tons/yr)
Source No.	Hitachi Boiler No.	Heat Input Rating (MMBtu/hr)	Hours of Operation ² (hours/yr)	CO ₂ e Emission Factor ³ (lb/MMBtu)	CO ₂ e Emissions (tons/yr)	Hours of Operation ⁴ (hours/yr)	CO ₂ e Emission Factor ⁵ (lb/MMBtu)	CO ₂ e Emissions (tons/yr)	
S-320	1	43	500	163.6	1,759	8,260	117.0	20,778	22,537
S-307	2	43			1,759			20,778	22,537
S-326	3	45			1,841			21,745	23,585
S-4	4	24			982			11,597	12,579
S-5	5	24			982			11,597	12,579
Subtotal									93,818

Notes

- Boiler data obtained from BAAQMD's Databank for Plant # 85.
- Assumed 500 hours/yr of diesel use during boiler testing and when natural gas supply is unavailable.
- CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
- Assume continuous operation using natural gas except for periods of testing and natural gas unavailability.
- CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.

Table C2. Potential to Emit of Greenhouse Gases – Diesel Generators

Source No. ¹	Engine Rating ¹ (hp)	Diesel Fuel Use ¹ (gal/hr)	Hours of Operation ² (hours/yr)	CO ₂ e Emission Factor ³ (lb/MMBtu)	CO ₂ e Emissions ⁴ (tons/yr)
9000	182	9.0	500	163.6	51
9001	335	24.4			138
9011	81	5.9			33
9013	68	4.9			28
9014	106	5.9			33
9015	160	8.7			49
9018	310	22.5			127
9021	575	39			220
9022	350	21.5			121
9041	160	8.7			49
9042	465	28.2			159
9055	97	5.9			33
9056	474	29.3			165
9067	356	21.5			121
9072	536	26.1			147
9109	74	5.4			30
9111	384	22.4			126
9112	600	31			175
9115	235	17.1			97
9420	160	9.5			54
9501	370	24.4			138
9502	370	24.4			138
9510	325	16.2			91
9512	160	8.0			45
Subtotal					2,370

Notes

- Generator data obtained from BAAQMD's Databank for Plant # 85.
- Assumed 500 hours/yr of diesel use for testing and emergency situations, based on EPA guidance (1995).
- CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
- Emissions calculated from multiplying diesel fuel use by operation hours, by 0.138 MMBtu/gal (per 40 CFR Part 98), by emissions factor, and by 1 ton/2000 lbs.

Table C3. Potential to Emit of Greenhouse Gases – Gas Turbine Emergency Generator

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Source No. ¹	Diesel Fuel Use Permit Limit ¹	Hours of Operation ²	CO ₂ e Emission Factor ³	CO ₂ e Emissions
	(gallons/hour)	(hours/year)	(lb/MMBtu)	(tons/year)
S-428	5,300	500	163.6	29,914

Notes

- Turbine data obtained from BAAQMD's Databank for Plant # 85.
- Assumed 500 hours/yr of diesel use for testing and emergency situations, based on EPA guidance (1995).
- CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
- Emissions calculated from multiplying diesel fuel use by operation hours, by 0.138 MMBtu/gal (per 40 CFR Part 98), by emissions factor, and by 1 ton/2000 lbs.

Table C4. Potential to Emit of Greenhouse Gases – Microturbine

Source No. ¹	Natural Gas Fuel Use Permit Limit ¹	CO ₂ e Emission Factor ²	CO ₂ e Emissions
	(MMBtu/year)	(lb/MMBtu)	(tons/year)
S-9513	18,396	117.0	1,076

Notes

- Limit obtained from BAAQMD's Databank for Plant # 85.
- CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.

Table C5. Potential to Emit of Greenhouse Gases – Thermal Oxidizer

Source No. ¹	Heat Input Rating ¹	CO ₂ e Emission Factor ²	CO ₂ e Emissions ³
	(MMBtu/hour)	(lb/MMBtu)	(tons/year)
A-47	3.7	117.0	1,896

Notes

- Limit obtained from BAAQMD's Databank for Plant # 85.
- CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.
- Assumed continuous operation (8,760 hr/yr).

Table C6. Potential to Emit of Greenhouse Gases – Semiconductor Fab Areas

Annual Semiconductor Manufacturing Capacity¹

Max annual wafer production	12,748	units/year		
Wafer diameter	0.150	m		
Wafer area	0.018	m ²		
S, annual manufacturing capacity	225.3	m ² /year	2,252,758	cm ² /year

Greenhouse Gas Emissions²

	Greenhouse Gas					
	CF ₄	C ₂ F ₆	CHF ₃	C ₃ F ₈	NF ₃	SF ₆
Emission Factor for gas i, EF _i (kg/m ²)	0.90	1.00	0.04	0.05	0.04	0.20
Global Warming Potential for gas i, GWP _i (kg CO ₂ /kg) ³	6,500	9,200	11,700	7,000	17,200	23,900
Annual Wafer Manufacturing Capacity, S (m ²)	225.3					
Production process emissions of gas i, E _i (MT CO ₂ e/yr)	1,318	2,073	105	79	155	1,077

Subtotal process production emissions 4,806 MT CO₂e/year

d, Factor to account for heat transfer fluid emissions at semiconductor facility 1.1

E _T , Total process emissions including heat transfer fluid emissions	5,287	MT CO ₂ e/year
	5,828	tons CO ₂ e/year

Notes

- Annual manufacturing capacity estimated using data provided by Hitachi.
- Emission estimation method from 40 CFR Part 98, Subpart I - Electronic Manufacturing, Section 98.91 (shown below):

Applicability formulas:

$$E_i = S * EF_i * GWP_i * .001$$

$$E_T = d * S * E_i$$

Estimation method from 40 CFR Part 98, Subpart I, Section 98.91 was used instead of Section 98.93 because this is only for purposes of calculating GHG PTE for comparison to the 100,000 ton CO₂e per year Title V emission threshold. This estimation method is more conservative than that from Section 98.93, and this can be seen by comparing the total CO₂e emissions in Table C6 with the actual emissions of GHG from semiconductor fab areas presented in Appendix D.

- Global Warming Potentials from 40 CFR Part 98 Subpart A.

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**APPENDIX D
ACTUAL EMISSIONS OF GREENHOUSE GASES CALCULATIONS**

Table D1. Actual Emissions of Greenhouse Gases – Boilers

Source No.	Boiler Data ¹		Diesel			Natural Gas			Total CO ₂ e Emissions (tons/yr)
	Hitachi Boiler No.	Heat Input Rating	Hours of Operation (hours/yr)	CO ₂ e Emission Factor ² (lb/MMBtu)	CO ₂ e Emissions (tons/yr)	Natural Gas Use ³ (MMBtu/yr)	CO ₂ e Emission Factor ⁴ (lb/MMBtu)	CO ₂ e Emissions (tons/yr)	
		(MMBtu/hr)							
S-320	1	43	0	163.6	0	342,835	117.0	20,056	20,056
S-307	2	43			0				
S-326	3	45			0				
S-4	4	24			0				
S-5	5	24			0				
Subtotal								20,056	

Notes

- Boiler data obtained from BAAQMD's Databank for Plant # 85.
- CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
- Actual fuel usage.
- CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.

Table D2. Actual Emissions of Greenhouse Gases – Diesel Generators

Source No. ¹	Engine Rating ¹	Diesel Fuel Use ¹	Hours of Operation ² (hours/yr)	CO ₂ e Emission Factor ³ (lb/MMBtu)	CO ₂ e Emissions ⁴ (tons/yr)
	(hp)	(gal/hr)			
9000	182	9.0	10	163.6	1
9001	335	24.4			3
9011	81	5.9			1
9013	68	4.9			1
9014	106	5.9			1
9015	160	8.7			1
9018	310	22.5			3
9021	575	39			4
9022	350	21.5			2
9041	160	8.7			1
9042	465	28.2			3
9055	97	5.9			1
9056	474	29.3			3
9067	356	21.5			2
9072	536	26.1			3
9109	74	5.4			1
9111	384	22.4			3
9112	600	31			3
9115	235	17.1			2
9420	160	9.5			1
9501	370	24.4			3
9502	370	24.4			3
9510	325	16.2			2
9512	160	8.0	1		
Subtotal					47

Notes

- Generator data obtained from BAAQMD's Databank for Plant # 85.
- Actual operation hours.
- CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
- Emissions calculated from multiplying diesel fuel use by operation hours, by 0.138 MMBtu/gal (per 40 CFR Part 98), by emissions factor, and by 1 ton/2000 lbs.

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Table D3. Actual Emissions of Greenhouse Gases – Gas Turbine Emergency Generator

Source No. ¹	Diesel Fuel Use Permit Limit ²	Hours of Operation	CO ₂ e Emission Factor ³	CO ₂ e Emissions
	(gallons/year)	(hours/year)	(lb/MMBtu)	(tons/year)
S-428	97,670	--	163.6	1,103

Notes

1. Turbine data obtained from BAAQMD's Databank for Plant # 85.
2. Actual fuel usage.
3. CO₂e emission factor for diesel obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (73.96*1 + 0.003*21 + 0.0006*310) lb/MMBtu * 2.2046 lb/kg = 163.6 lb/MMBtu.
4. Emissions calculated from multiplying diesel fuel use by operation hours, by 0.138 MMBtu/gal (per 40 CFR Part 98), by emissions factor, and by 1 ton/2000 lbs.

Table D4. Actual Emissions of Greenhouse Gases – Microturbine

Source No. ¹	Natural Gas Fuel Use ²	CO ₂ e Emission Factor ³	CO ₂ e Emissions
	(MMBtu/year)	(lb/MMBtu)	(tons/year)
S-9513	0	117.0	0

Notes

1. Limit obtained from BAAQMD's Databank for Plant # 85.
2. No fuel usage.
3. CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.

Table D5. Actual Emissions of Greenhouse Gases – Thermal Oxidizer

Source No. ¹	Heat Input Rating ¹	CO ₂ e Emission Factor ²	CO ₂ e Emissions ³
	(MMBtu/hour)	(lb/MMBtu)	(tons/year)
A-47	3.7	117.0	0

Notes

1. Limit obtained from BAAQMD's Databank for Plant # 85.
2. CO₂e emission factor for natural gas obtained from the sum of products of CO₂, CH₄, and N₂O emissions factors and their respective GWPs in 40 CFR Part 98 as follows: (53.02*1 + 0.001*21 + 0.0001*310) lb/MMBtu * 2.2046 lb/kg = 117.0 lb/MMBtu.
3. No fuel usage.

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The actual emissions of GHG from semiconductor fab areas were estimated to be 514 tons of CO₂e per year, using “Semiconductor Emissions Estimate Calculator” created by California Air Resources Board. The results report from the calculator is as follows:

Note 1:

Emission Standards for Semiconductor Operations Effective January 1, 2012	
CVD Chamber Cleaning and Etching Processes	
Wafer Surface Area Processed (Million Square Centimeters Per Calendar Year)	Maximum Emissions Limit Per Square Centimeter for a Calendar Year (Kg CO ₂ e/cm ²)
Tier 1: >37.7	0.2
Tier 2: >3.7 and ≤37.7	0.3
Tier 3: ≤3.7	0.5

Facility Profile

Facility Name	Operation Type	Address	City	State	Zip Code
Hitachi GST	Manufacturer		San Jose	CA	

Wafer and Emissions Results for Each Reporting Period

	Wafers Processed (Sq Cm)	Wafers Processed (Million Sq Cm)	Etching and CVD Chamber Clean	
			Emissions (MMT CO ₂ e)	Emissions per Wafers Processed (Kg CO ₂ e/Sq Cm)
Reporting Period 1	2,297,288	2.3	0.0005	0.2
Reporting Period 2				
Reporting Period 3				
Reporting Period 4				

Reporting Period and Facility Category

A reporting period is one calendar year, unless a change in emissions reduction strategy occurs. Any change in emissions reduction strategies or the start of a new calendar year triggers the start of a new reporting period. The tool requires a separate entry for each reporting period.

	Start Date	End Date	Reporting Period (Year)	Facility Category
Reporting Period 1	01/01/10	12/31/10	1.00	Reporting Only
Reporting Period 2				
Reporting Period 3				
Reporting Period 4				

Total Wafer and Emissions Results for Entire Calendar Year

The tool calculates emissions per wafers processed for the entire calendar year. To calculate the emissions per wafers processed, it first calculates the total emissions by summing up emissions from all reporting periods in the same calendar year. Secondly, it calculates total wafers processed by summing up wafers processed from all reporting periods in the same calendar year. Finally, it divides the total emissions by the total wafers processed to determine emissions per wafers processed for the entire calendar year.

Calendar Year	Wafers Processed (Sq Cm)	Wafers Processed (Million Sq Cm)	Etching and CVD Chamber Clean Emissions (MMT CO ₂ e)	Emissions per Wafers Processed (Kg CO ₂ e/Sq Cm)	Facility Category
2010	2,297,288	2.3	0.0005	0.2028	Reporting Only
2011					
2012					
2013					
2014					
2015					