TECHNICAL SUPPORT DOCUMENT
WAFERTECH
SWCAA ID 1978

Air Discharge Permit SWCAA 97-2040R8
Application CL-1610

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Abbreviations

ADP            Air Discharge Permit
AP-42          Compilation of Emission Factors, AP-42, Fifth Edition, Volume 1, Stationary Point and Area Sources – published by the US Environmental Protection Agency
BACT           Best available control technology
Btu            British thermal unit
Btu/gal        Heat content expressed in British thermal units per gallon
CFR            Code of Federal Regulations
CO             Carbon monoxide
EPA            U.S. Environmental Protection Agency
gr/dscf        Grains per dry standard cubic foot (68 °F, 1 atmosphere)
HAP            Hazardous air pollutant listed pursuant to Section 112 of the Federal Clean Air Act
LAER           Lowest achievable emission rate
lb/hp-hr       Pounds per horsepower hour
lb/MMBtu       Pound per million British thermal units
lb/10⁶ scf      Pounds per million standard cubic feet
lb/10³ gal      Pounds per thousand gallons
MMBtu/hr       Millions of British thermal units per hour
MSDS           Material Safety Data Sheet
NOₓ            Nitrogen oxides
PM             Total particulate matter (includes both filterable particulate matter measured by EPA Method 5 and condensable particulate matter measured by EPA Method 202)
PM₁₀           Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
PM₂.₅          Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers (includes both filterable particulate matter measured by EPA Method 201 or 201A and condensable particulate matter measured by EPA Method 202)
ppm            Parts per million
ppmv           Parts per million by volume
ppmvd          Parts per million by volume, dry
PSD            Prevention of Significant Deterioration
RACT           Reasonably Available Control Technology
RCW            Revised Code of Washington
SQER           Small Quantity Emission Rate listed in WAC 173-460
SO₂            Sulfur dioxide
SWCAA          Southwest Clean Air Agency
TAP            Toxic air pollutant pursuant to Chapter 173-460 WAC
T-BACT         Best Available Control Technology for toxic air pollutants
tpy            Tons per year
VOC            Volatile organic compound
WAC            Washington Administrative Code
1. **FACILITY IDENTIFICATION**

Applicant Name: WaferTech  
Applicant Address: 5509 NW Parker Street, Camas, WA 98607-9299  
Facility Name: WaferTech  
Facility Address: 5509 NW Parker Street, Camas, WA 98607-9299  
SWCAA Identification: 1978  
Contact person: Ms. Judy Schramm, Environmental Engineer  
Primary Process: Semiconductor Manufacturing  
SIC/NAICS Code: 3674/334413  
Facility Classification: Synthetic Minor >80 tpy (SM80)

2. **FACILITY DESCRIPTION**

WaferTech, LLC (WaferTech) produces integrated circuits (ICs) on eight-inch wafers using advanced Complementary Metal Oxide Semiconductor (CMOS) technology with circuit widths ranging from initial production at 0.35 microns down to 0.15 microns and less. These include digital logic, mixed-mode logic, and standard and embedded memory ICs. Such ICs are used in a variety of products – from desktop computers to automobiles to consumer electronics to communication equipment.

WaferTech produces ICs with state-of-the-art production tools in etch, implant, diffusion, chemical vapor deposition (CVD), ion implant, photolithography and thin film departments. These operations are conducted in the integrated circuit fabrication facility.

WaferTech is also equipped with several support facilities that include wastewater treatment, ultra-pure water, water recycling, process cooling water, steam generation, cryogenic gas, emergency power, air pollution control, chemical storage and distribution operations.

The facility’s emission units consist of hot water boilers, emergency generators, concentrator/oxidizer units, acid scrubbers, Wastewater Treatment Plant scrubbers and Central Utility Plant scrubbers.

3. **CURRENT PERMITTING ACTION**

WaferTech is requesting approval for modification of the oxidizer combustion temperature requirement. Permit SWCAA 97-2040R7 requires that the minimum oxidizer reaction chamber temperature not be less than 1360 °F for oxidizers 1F1-VOC-01 through 1F2-VOC-05 and 1350 °F for oxidizers 1F2-VOC-06 through 1F2-VOC-08. WaferTech has provided operating manuals for the oxidizers stating that oxidizer units 1F1-VOC-01 through 1F1-VOC-04 will commence abatement at 1360 °F and oxidizer units 1F2-VOC-05 through 1F2-VOC-08 will commence abatement at 1250 °F. WaferTech’s concern is that during startup of the oxidizer, abatement will commence before the oxidizer has reached the set operating temperature. SWCAA will modify the permit language to allow the oxidizer to begin operation at a lower temperature but require that the oxidizer setpoint be adjusted to the proper steady state operating temperature.

WaferTech also requests an increase in the carbon monoxide (CO) emission limit for the oxidizers. The CO limit established by Permit 97-2040R7 is 0.14 lb/hr for each oxidizer (approximately 23 ppm at maximum operating conditions). This limit was based on engineering judgment and not manufacturer information. According to the manufacturer the expected CO emission rate is not to exceed 50 to 125 ppm. Source testing performed on oxidizer 1F2-VOC-06 on February 5, 2004 indicated CO emissions of 0.49 lb/hr and 109 ppm. WaferTech requests that the CO emission limit be increased to 0.75 lb/hr, each and 26.3 tpy, combined. SWCAA will modify the CO limit for the oxidizers.
WaferTech requests an increase in the nitric acid emission limit from the acid scrubbers from 1,300 lb/yr to 1,750 lb/yr. This increase will allow for increased production. WaferTech does not request an increase in the short term nitric acid emission limit of 0.35 ppmdv each. The Small Quantity Emission Rate (SQER) for nitric acid is 1,750 lb/yr, therefore modeling will not be required. SWCAA will increase the nitric acid emission limit as requested.

WaferTech also requests an increase in the chlorine emission limit from the acid scrubbers from 175 lb/yr to 500 lb/yr. Production increases have lead to an increase in chlorine use at the facility. The SQER for chlorine is 175 lb/yr. Chlorine emissions were modeled and compared with the acceptable source impact level (ASIL). As described in section 9 of this report, modeled impacts were below the ASIL.

4. PROCESS DESCRIPTION

![Process Diagram]
4.a **Chemical Mechanical Planarization (CMP):** CMP is a processing step that is used to flatten the surface of the semiconductor wafer and many of the layers that are build-up on top of it. It may also be used as an etchback process, especially for materials that can’t be etched by conventional means like wet etches or plasma processes. CMP may occur many times during the fabrication of the integrated circuit. Usually, CMP will occur immediately after film deposition. It will be followed either by photolithography or another film deposition.

One of the main reasons for CMP is to improve the surface planarity and allow for increased circuit density, improved wiring pitches, and make more advanced circuit designs possible.

4.b **Diffusion Process:** The purpose of the diffusion in the fabrication of ICs is to dope the wafer with a controlled amount of impurities so as to change the wafer electrically. A quartz furnace has dopant gases pumped into the chamber that contains the wafers. The chamber is heated to 900 degrees centigrade causing the dopant particles to diffuse into the wafer. The types of dopants used include boron, arsenic and phosphorus.

4.c **Etch:** Etching is a processing step used to remove material from the wafer surface. This removal may be patterned or unpatterned. Two types of etching, wet and dry, are currently in use. Both wet and dry etching involve three steps:
- Disperse the etchant
- Etch material on wafer surface
- Remove by-products created during etching

Patterned etching takes place in conjunction with photolithography. After exposing and developing the photoresist, the areas of the wafer that are not protected by the photoresist are etched away. In this way the pattern transfer is obtained. Unpatterned etching takes place over the entire wafer surface. It is used to remove masking layers such as photoresist, oxide or nitride, or used as a cleaning step. Wet etching uses liquid chemicals (acids, bases and solvents) that react chemically with the wafer material to be removed. Dry etching uses plasma to remove material by chemical reaction, physical means or combination of the two.

4.d **Ion Implantation Process:** Ion implantation, like diffusion, is a technique for introducing dopant atoms such as boron, phosphorus, arsenic and antimony into the substrate of the wafer. When an electron is either added to or removed from an atom, the resulting atom becomes charged and is called an ion. If an ion has been added to the atom the ion is negatively charged and if an electron has been removed from an atom the ion is positively charged. The ions are generated in the ion source.

Once the ions are selected, they are accelerated to a high enough speed to penetrate the wafer. Dopants such as boron provide positive ions for doping. The wafer is coated with a resist or a film layer that acts as a barrier to protect areas of the wafer where no implantation is desired.

4.e **Photolithography:** Photolithography is a process where a pattern representing the circuit components of an IC is transferred from a mask to the surface of the wafer. Various terms are used for photolithography such as patterning, printing, photo, masking, etc.

The wafer is coated with a light sensitive material called photoresist. The mask is placed above the wafer and UV light is flashed through the mask onto the wafer, exposing the resist. The exposed resist is then dissolved, exposing the silicon dioxide below. The silicon dioxide is etched away leaving the pattern of the mask now on the wafer. Finally the protective resist is removed. This process is repeated several times during wafer processing.
4.f **Metallization Processing (Sputter):** Metallization is the process of depositing a thin layer of metal on the wafer to allow for the electrical connections of the IC components. Interconnects are electrical conducting paths that are formed during the metallization process. Silicides and alloys made with aluminum are most often used to make the interconnects. The sputtering system utilized for the metallization process consists of a vacuum chamber filled with argon gas. A plasma is struck and the argon ions are then accelerated with a biasing voltage into the target material (Al). Metal atoms are knocked off the target and land on the wafers. The wafer can be heated to improve adhesion of the metal.

4.g **Thin Films, Deposition or Chemical Vapor Deposition:** Thin film deposition is one of the most common fabrication processes. Thin films may be metals, semiconductors or insulators. Films may be used as a temporary protective layer or to construct circuit or device components. One of the layering techniques is called deposition. Chemical Vapor Deposition (CVD) is a process used to deposit a thin layer of film onto the wafer surface. CVD takes place in a heated furnace. Gas is pumped into the chamber causing a reaction to take place of either depositing a thin film onto the wafer or growing a film on the wafer.
Figure 4.1 WaferTech Hot Water Boiler Diagram

[Diagram of WaferTech Hot Water Boiler]

- Exhaust stack: 1C1-HWB-01
- Exhaust stack: 1C1-HWB-04
- Natural Gas
- Natural Gas or Fuel Oil
- Natural Gas or Fuel Oil
- Process Hot Water

1C1-HWB-01 → 1C1-HWB-02 → 1C1-HWB-03 → 1C1-HWB-04 → 1C1-HWB-05 (NEW)
Figure 4.2 Oxidizer/Concentrator Diagram
Figure 4.3 Acid Scrubbing and Ammonia Scrubbing System Diagram
Figure 4.4 Acid Scrubbing and Ammonia Scrubbing System (Continued)
Figure 4.5 Wastewater Treatment System and Central Utility Plant Scrubber Diagrams
5. EQUIPMENT/ACTIVITY IDENTIFICATION

Emission units identified at the facility include the following:

5.a Boiler 1C1-HWB-01: Hot water boiler manufactured by Cleaver-Brooks, model number CBLE-700-600-125W, serial number OL095883, provides process hot water. Boiler is equipped with a low NOx burner rated at 24.4 MMBtu/hr. The fuel is natural gas. The boilers are located in the Central Utility Plant.

5.b Boiler 1C1-HWB-02: Hot water boiler manufactured by Cleaver-Brooks, model number CBLE-700-600-125W, serial number OL095884, provides process hot water. Boiler is equipped with a low NOx burner rated at 24.4 MMBtu/hr. The fuel is natural gas.

5.c Boiler 1C1-HWB-03: Hot water boiler manufactured by Cleaver-Brooks, model number CBLE-700-600-125W, serial number OL095885, provides process hot water. Boiler is equipped with a low NOx burner rated at 24.4 MMBtu/hr. The primary fuel is natural gas with fuel oil used during natural gas curtailment.

5.d Boiler 1C1-HWB-04: Hot water boiler manufactured by Cleaver-Brooks, model number CBLE-700-600-125W, serial number OL095886, provides process hot water. Boiler is equipped with a low NOx burner rated at 24.4 MMBtu/hr. The primary fuel is natural gas with fuel oil used during natural gas curtailment.

5.e Boiler 1C1-HWB-05: Hot water boiler manufactured by Cleaver-Brooks, model number CBLE-200-600-125W provides process hot water, serial number OL100815. The boiler is equipped with a low NOx burner rated at 24.4 MMBtu/hr. The primary fuel is natural gas with fuel oil used during natural gas curtailment.

5.f Emergency Generator #1: Caterpillar generator set engine model 3512B serial number 5567-1 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level. The generators are located in the Central Utility Plant.

5.g Emergency Generator #2: Caterpillar generator set engine model 3512B serial number 5615-3 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.h Emergency Generator #3: Caterpillar generator set engine model 3512B serial number 5615-1 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.i Emergency Generator #4: Caterpillar generator set engine model 3512B serial number 5615-5 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.j Emergency Generator #5: Caterpillar generator set engine model 3512B serial number 5615-6 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.k Emergency Generator #6: Caterpillar generator set engine model 3512B serial number 5610 is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.
diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.l. Emergency Generator #7: Caterpillar generator set engine model 3512B is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.m Emergency Generator #8: Caterpillar generator set engine model 3512B is rated at 2032 engine brake horsepower and 1500 kW with a fuel consumption rate of 107 gallons/hour of no. 2 diesel fuel at 100 percent load. The exhaust gas flowrate is 12,105 cfm through a 1.2 foot diameter stack 63 feet above ground level.

5.n Oxidizer/Concentrator 1F1-VOC-01: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-110 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.5 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.o Oxidizer/Concentrator 1F1-VOC-02: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-111 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.5 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.p Oxidizer/Concentrator 1F1-VOC-03: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-113 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.5 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.q Oxidizer/Concentrator 1F1-VOC-04: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-112 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through
which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.5 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.r Oxidizer/Concentrator 1F2-VOC-05: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-119 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.3 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95% destruction/removal efficiency for VOCs.

5.s Oxidizer/Concentrator 1F2-VOC-06: Munters-Zeol VOC Oxidizer/Concentrator serial number 1900-122 rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.3 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.t Oxidizer/Concentrator 1F2-VOC-07: Munters-Zeol VOC Oxidizer/Concentrator rated at an average air flow rate of 10,000 acfm consists of a rotating hydrophobic zeolite unit through which exhaust air passes. VOCs are preferentially adsorbed on the zeolite and the cleaned air passes and is exhausted to atmosphere. The VOCs on a small area of the rotating unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300°F. Desorption air will flow in the opposite direction of the adsorption flow and will be delivered to the thermal oxidizer via a second blower through a second gas-to-gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.3 MMBtu/hr which will be fired continuously on natural gas. The thermal oxidizer reaction chamber operates up to a maximum of 1800°F with a normal operating temperature of 1360°F to 1500°F. The unit has a 95 percent destruction/removal efficiency for VOCs.

5.u Oxidizer/Concentrator 1F2-VOC-08: This unit is a Munters Zeol model IZS-1900-TH VOC Oxidizer/Concentrator designed to treat an average air flow rate of 10,000 scfm and a maximum air flow rate of 13,500 scfm. The unit consists of a rotating hydrophobic zeolite unit through which exhaust air passes. The VOCs are preferentially adsorbed on the zeolite and the clean air passes through and is exhausted to atmosphere via a 32 inch stack approximately 96 feet above ground level.
The VOCs on a small area of the rotating concentrator unit are continuously desorbed by a reverse flow of hot air preheated via a heat exchanger located in the exhaust stream of the thermal oxidizer. The minimum temperature of this air to provide sufficient desorption is 300 °F. The unit will operate at a temperature between 350 °F and 360 °F. The desorption air will be delivered to the thermal oxidizer via a second blower through a second gas to gas heat exchanger. The thermal oxidizer utilizes a burner with a maximum heat input rating of 1.3 MMbtu/hr. The thermal oxidizer reaction chamber operates up to a maximum of 1,425 °F with a normal operating temperature of 1,350 °F to 1,425 °F. The minimum temperature operating temperature is 1250 °F. The thermal oxidizer is exhausted through a 14 inch diameter stack approximately 96 feet above ground level. The oxidizer will be located on the second floor of the first Fab.

5.v Acid Scrubber 1F1-SCR-01: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-108-60, with a scrubbing medium solution of (50 percent) NaOH to maintain a pH above 8.0. Each scrubber has a design air flow rate at normal operation of 32,500 acfm and a maximum air flow rate of 44,000 cfm. The overall dimensions of each unit are 15 feet in length, 11 feet in height and 10 feet in width. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR–04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.w Acid Scrubber 1F1-SCR-02: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-108-60, with a scrubbing medium solution of (50 percent) NaOH to maintain a pH above 8.0. The scrubber has a design air flow rate at normal operation of 32,500 acfm and a maximum air flow rate of 44,000 cfm. The overall dimensions of each unit are 15 feet in length, 11 feet in height and 10 feet in width. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR-04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.x Acid Scrubber 1F1-SCR-03: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-108-60, with a scrubbing medium solution of (50 percent) NaOH to maintain a pH above 8.0. The scrubber has a design air flow rate at normal operation of 32,500 acfm and a maximum air flow rate of 44,000 cfm. The overall dimensions of each unit are 15 feet in length, 11 feet in height and 10 feet in width. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR-04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.y Acid Scrubber 1F1-SCR-04: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-108-60, with a scrubbing medium solution of (50 percent) NaOH to maintain a pH above 8.0. The scrubber has a design air flow rate at normal operation of 32,500 acfm and a maximum air flow rate of 44,000 cfm. The overall dimensions of each unit are 15 feet in length, 11 feet in height and 10 feet in width. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR-04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.z Acid Scrubber 1F1-SCR-15: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. counter current scrubber, model number SPT-132-84, with a scrubbing medium solution of (50 percent) NaOH to maintain a pH above 8.0. The scrubber has a design air flow rate at normal operation of 50,000 acfm. The overall dimensions of the unit are 132 inches in diameter and 20 feet in height. Each scrubber has a 99 percent efficiency for the removal of HCl, H3PO4, and H2SO4 gases and 98-99 percent removal efficiency of nitric acid (HNO3) gases. The entrainment separator removes 99 percent of all entrained liquid droplets 10 microns and larger. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR–04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.aa Acid Scrubber 1F1-SCR-16: Ceilcote Air Pollution Control – Air-Cure dynamics, Inc. counter current scrubber, model number SPT-132-84, with a scrubbing solution of sodium hydroxide to maintain a pH above 8.0. The scrubber has a design air flow rate at normal operation of 50,000 acfm. The overall dimensions of the unit are 132 inches in diameter and 20 feet in height. Each scrubber has a 99 percent efficiency for the removal of HCl, H3PO4, and H2SO4 gases and 98-99 percent removal efficiency of nitric acid (HNO3) gases. The entrainment separator removes 99 percent of all entrained liquid droplets 10 microns and larger. Scrubbers 1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR–04, and 1F1-SCR-15 operate in parallel. Ten ammonia scrubbers exhaust to the acid scrubber system.
dimensions of the unit are 132 inches in diameter and approximately 20 feet in height. The scrubber will have an 84 inch bed depth of 3K Tellerette packing and an entrainment separator section consisting of Chevron blades. The scrubber recirculating system will maintain the scrubber liquor flow rate at 475 gpm. The scrubber will be exhausted through a 46 inch diameter stack 96 feet above ground level. The scrubber will have an estimated removal efficiency of 99 percent for HF, 98 percent for HNO₃, 90 percent for F₂ and 50 percent for NH₄. The entrainment separator will remove 99 percent of all entrained liquid droplets 10 microns and larger. The scrubber will be located on the first floor of the first Fab. Ten ammonia scrubbers exhaust to the acid scrubber system.

5.bb Acid Scrubber 1P5-SCR-01: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-68-60, which uses an injection of 50 percent solution of NaOH to maintain a pH above 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 14 feet 6 inches in length, 11 feet in height and 6 feet in width. Each scrubber has a 5 foot bed depth of no. 2 Tellerette packing and an entrainment separator section consisting of Chevron blades. Each scrubber recirculating system maintains the scrubber liquor flow rate at 150 gpm for each of the scrubbers. There is one exhaust stack for the P5 scrubbers through a 40 inch diameter stack 98 feet above ground level. Scrubbers 1P5-SCR-01 through 1P5-SCR-04 operate in parallel.

5.cc Acid Scrubber 1P5-SCR-02: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-68-60, which uses an injection of 50 percent solution of sodium hydroxide (NaOH) to maintain a pH above 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 14 feet 6 inches in length, 11 feet in height and 6 feet in width. Each scrubber has a 5 foot bed depth of no. 2 Tellerette packing and an entrainment separator section consisting of Chevron blades. Each scrubber recirculating system maintains the scrubber liquor flow rate at 150 gpm for each of the scrubbers. There is one exhaust stack for the P5 scrubbers through a 40 inch diameter stack 98 feet above ground level. Scrubbers 1P5-SCR-01 through 1P5-SCR-04 operate in parallel.

5.dd Acid Scrubber 1P5-SCR-03: Ceilcote Air Pollution Control – Air-Cure Dynamics, Inc. cross flow scrubber model number HRP-68-60 which uses sodium hydroxide to maintain a pH equal to or greater than 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 13 feet 6 inches in length, 12 feet in height and 7 feet in width. Each scrubber will have a 5 foot bed depth of 3” type K Tellerette packing and an entrainment separator section consisting of Chevron blades. Each scrubber recirculating system will maintain the scrubber liquor flow rate at 150 gpm for each of the scrubbers. Each scrubber will exhaust through a 40 inch diameter stack 98 feet above ground level. According to the manufacturer, each scrubber will have a 99 percent efficiency for the removal of HF, 98 percent for HNO₃, 95 percent for HCl and H₂SO₄, 90 percent for F₂ and 50 percent for NH₄ removal efficiency of gases. The entrainment separator will remove 99 percent of all entrained liquid droplets 10 microns and larger. Scrubbers 1P5-SCR-01 through 1P5-SCR-04 operate in parallel and will be located on the fifth floor of the Process Support Building.

5.ee Acid Scrubber 1P5-SCR-04: Ceilcote Air Pollution Control – Air-Cure Dynamics, Inc. cross flow scrubber model number HRP-68-60 which uses sodium hydroxide to maintain a pH equal to or greater than 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 13 feet 6 inches in length, 12 feet in height and 7 feet in width. Each scrubber will have a 5 foot bed depth of 3” type K Tellerette packing and an entrainment separator section consisting of Chevron blades. Each scrubber recirculating system will maintain the scrubber liquor flow rate at 150 gpm for each of the scrubbers. Each scrubber will exhaust through a 40 inch diameter stack 98 feet above ground level. According to the manufacturer, each scrubber will have a 99 percent efficiency for the removal of HF, 98 percent for HNO₃, 95 percent for HCl and H₂SO₄, 90 percent for F₂ and 50 percent for NH₄ removal efficiency of gases. The entrainment separator will remove 99 percent of all entrained liquid droplets 10
microns and larger. Scrubbers 1P5-SCR-01 through 1P5-SCR-04 operate in parallel and will be located on the fifth floor of the Process Support Building.

5.ff  Acid Scrubber 1F2-SCR-01: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-68-60, which uses an injection of 50 percent solution of NaOH to maintain a pH above 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 14 feet 6 inches in length, 11 feet in height and 6 feet in width. Each scrubber has a 5 foot bed depth of no. 2 Tellerette packing and an entrainment separator section consisting of chevron blades. Each scrubber recirculating system maintains the scrubber liquor flow rate at 150 gpm for each of the scrubbers. There is one exhaust stack for the F2 scrubbers, 36 inches in diameter and 96 feet above ground level. Scrubbers 1F2-SCR-01, and 1F2-SCR-02 operate in parallel. One ammonia scrubber, 1F2-SCR-03, exhausts to the 1F2 acid scrubbing system.

5.gg  Acid Scrubber 1F2-SCR-02: Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. cross flow scrubber, model number HRP-68-60, which uses an injection of 50 percent solution of NaOH to maintain a pH above 8.0. Each scrubber has a design air flow rate of 28,000 cfm. The overall dimensions of each unit are 14 feet 6 inches in length, 11 feet in height and 6 feet in width. Each scrubber has a 5 foot bed depth of no. 2 Tellerette packing and an entrainment separator section consisting of chevron blades. Each scrubber recirculating system maintains the scrubber liquor flow rate at 150 gpm for each of the scrubbers. There is one exhaust stack for the F2 scrubbers, 36 inches in diameter and 96 feet above ground level. Scrubbers 1F2-SCR-01, and 1F2-SCR-02 operate in parallel. One ammonia scrubber, 1F2-SCR-03, exhausts to the 1F2 acid scrubbing system.

5.hh  Wastewater Treatment System Scrubber 1T1-FSTS-01-SCRB: The scrubber is a Ceilcote Air Pollution Control scrubber rated at 750 cfm with 60 gpm of recirculation flow of NaOH solution. This scrubber has a 6 inch diameter exhaust stack which exhausts approximately 33 feet above ground level. Two separate Hydrokinetic scrubbers exhausting to the Ceilcote scrubber are identified as follows:

1)  Scrubber 1T1-FSTS-02-SCRB controls emissions from the HCl unloading tank emissions during unloading. The scrubber contains 3 feet of 2.3” polypropylene packing and will utilize a once through circulation of water at eight gpm. When no unloading/transfers is occurring, there will be minimal to no air flow over the top of the tanks but any breathing losses from the tanks will be vented inside the building to five gallon buckets of water with a pH indicator.

2)  Scrubber 1T1-FSTS-03-SCRB controls emissions from the HCl day tank emissions during transfers. When no unloading/transfers is occurring, there will be minimal to no air flow over the top of the tanks but any breathing losses from the tanks will be vented inside the building to five gallon buckets of water with a pH indicator.

5.ii  Wastewater Treatment System Scrubber 1T1-HFTS-02-FS01: The scrubber is a Ceilcote Air Pollution Control - Air-Cure Dynamics, Inc. scrubber, model number MS-1200, with a scrubbing medium solution of 50 percent NaOH to maintain a pH above 8.0. The scrubber has a maximum design air flow rate of 1,200 acfm. The scrubber has 2K Tellerette mist eliminator. The unit is 31 inches in diameter and approximately eight feet in height. The unit contains a fan at the top of the scrubber creating a negative pressure inside the scrubber. Ducting installed at the scrubber inlet draws process gas into the scrubber. The gas and scrubbing liquid contact each other in the sparger section (tubes immersed in the scrubbing liquid) of the sump. The mixture of liquid and gas bubbles is carried into the packed bed section of the scrubber above, which acts as a gas-liquid contactor and as a mist eliminator in the upper zone of the scrubber, before being exhausted from the scrubber. The scrubber will be exhausted through an 8 inch diameter stack 42 feet above ground level.
Central Utility Plant Scrubber 1C1-SCR-01: The scrubber is a packed scrubbing tower manufactured by Metpro Duall that is rated at 35 cfm, and has a scrubbing medium of water. The recirculation system maintains scrubber liquor flow rate at about five gpm. The scrubber is exhausted through a 12 inch diameter stack eight feet above ground level. The scrubber is designed for a minimum of 90 percent removal efficiency of HCl.

Central Utility Plant Scrubber 1C1-SCR-02: is a packed bed acid scrubber manufactured by Hydrokinetics used to control hydrochloric acid (HCl) generated during the performance of ion exchange resin regeneration operations. The scrubber collects vapor from the deionization regeneration collection tank when regeneration chemicals are discharged to this tank. These operations are located in the Central Utility Plant (CUP) which currently has a scrubber for HCl unloading operations. The scrubber utilizes once-through industrial cold water at 8 gpm as the scrubbing medium for a manufacturer quoted efficiency of 85 percent removal of HCl.

6. EMISSIONS DETERMINATION

Emissions to the ambient atmosphere from integrated circuit production, as proposed in application CL-1610 and previous applications, consist of nitrogen oxides (NO\textsubscript{x}), carbon monoxide (CO), volatile organic compounds (VOC), nonmethane hydrocarbons (NMHC), particulate matter (PM), sulfur dioxide (SO\textsubscript{2}), toxic air pollutants (TAPs) and hazardous air pollutants (HAPs).

6.a Boiler Emission Calculations:
Emission data for all the boilers has been provided by the vendor and is shown in the following table.

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Natural Gas</th>
<th>Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>ppm</td>
<td>lb/MMBtu</td>
</tr>
<tr>
<td>NO\textsubscript{x}</td>
<td>30</td>
<td>0.035\textsuperscript{3}</td>
</tr>
<tr>
<td>SO\textsubscript{2}</td>
<td>1</td>
<td>0.001</td>
</tr>
<tr>
<td>VOC</td>
<td>40</td>
<td>0.016</td>
</tr>
<tr>
<td>PM (total)</td>
<td>N/A</td>
<td>0.01</td>
</tr>
</tbody>
</table>

\textsuperscript{1} CO emissions 150ppm and 0.11 lb/MMBtu at less than 50 percent rated capacity

\textsuperscript{2} Based on 0.05 percent sulfur by weight

\textsuperscript{3} Actual emissions will be calculated based on source test data

Annual emission limits for both natural gas and diesel operation are calculated below.

Natural Gas: Annual emission limits for criteria pollutants are based on the short term emission factors supplied by the vendor and 8,760 hours of operation. Annual emission limits for toxic air pollutants are based on short term emission factors which received an emission factor rating of A or B in AP-42 Section 1.4 (3/98) and 8,760 hours of operation.

\[
\begin{align*}
\text{CO} & = 0.04 \times \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \times \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \times \frac{\text{hr}}{\text{yr}} \times 5 \times \frac{\text{boilers}}{x} \times \frac{\text{ton}}{\text{2000 lb}} = 21.4 \times \frac{\text{ton}}{\text{yr}} \quad \text{Eq. 6-1} \\
\text{NO}\textsubscript{x} & = 0.035 \times \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \times \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \times \frac{\text{hr}}{\text{yr}} \times 5 \times \frac{\text{boilers}}{x} \times \frac{\text{ton}}{\text{2000 lb}} = 18.7 \times \frac{\text{ton}}{\text{yr}} \quad \text{Eq. 6-2} \\
\text{SO}\textsubscript{2} & = 0.001 \times \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \times \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \times \frac{\text{hr}}{\text{yr}} \times 5 \times \frac{\text{boilers}}{x} \times \frac{\text{ton}}{\text{2000 lb}} = 0.5 \times \frac{\text{ton}}{\text{yr}} \quad \text{Eq. 6-3}
\end{align*}
\]
Diesel: Annual emission limits are based on the short term emission factors supplied by the vendor and 502,000 gallons per year of diesel consumption. \( \text{SO}_2 \) emissions are based on a fuel sulfur content of 0.05 weight percent and all the sulfur converted to \( \text{SO}_2 \). Annual emission limits for toxic air pollutants were not calculated because no toxic air pollutants received an emission factor rating of A or B in AP-42 Section 1.3 (9/98). Emission factors with a rating of C or less are not considered reliable.

\[
\begin{align*}
\text{VOC} & = 0.016 \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \frac{\text{hr}}{\text{yr}} \times 5 \text{ boilers} \times \frac{\text{ton}}{2,000 \text{ lb}} = 0.85 \frac{\text{ton}}{\text{yr}} \quad \text{Eq. 6-4} \\
\text{PM} & = 0.01 \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \frac{\text{hr}}{\text{yr}} \times 5 \text{ boilers} \times \frac{\text{ton}}{2,000 \text{ lb}} = 5.3 \frac{\text{ton}}{\text{yr}} \quad \text{Eq. 6-5} \\
\text{Benzene} & = 0.00000206 \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \frac{\text{hr}}{\text{yr}} \times 5 \text{ boilers} = 2.2 \frac{\text{lbs}}{\text{yr}} \quad \text{Eq. 6-6} \\
\text{Formaldehyde} & = 0.00007 \frac{\text{lb}}{\text{MMBtu}} \times 24.4 \frac{\text{MMBtu}}{\text{hr}} \times 8,760 \frac{\text{hr}}{\text{yr}} \times 5 \text{ boilers} = 79 \frac{\text{lbs}}{\text{yr}} \quad \text{Eq. 6-7}
\end{align*}
\]

Actual annual emissions will be calculated based on the most recent source test and fuel consumption. For emissions where source testing has not been performed, emissions shall be based on the emission equations above and actual fuel consumption.

6.b Emergency Generator Emission Calculations:
The emergency generator manufacturer provided the following emission factors based on source testing of similar units:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Emissions Factor (gr/BHp-hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO</td>
<td>2.4</td>
</tr>
<tr>
<td>NOx</td>
<td>9.4</td>
</tr>
<tr>
<td>VOC</td>
<td>0.3</td>
</tr>
<tr>
<td>PM (total)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

Annual emission limits for the eight emergency generators are based on 300 hours per year of operation, each, manufacturer’s emission testing for PM, NOx, VOC and CO at 100 percent load, and an engine rating of 2200 brake horse power (BHP), each. \( \text{SO}_2 \) emissions are based on a sulfur content of 0.05 weight percent and all the sulfur converted to \( \text{SO}_2 \). Annual emission estimates are based on the following equations. Annual emission limits for toxic air pollutants were not calculated because no toxic air
pollutants received an emission factor rating of A or B in AP-42 Section 3.4 (10/96). Emission factors with a rating of C or less are not considered reliable.

\[
CO = 2.4 \frac{gr}{BHp \cdot hr} x \frac{lb}{454 gr} x 2200BHp x 300 \frac{hr}{yr} x 8 \text{ generators} \cdot \frac{ton}{2000 lb} = 14.0 \frac{ton}{yr} \quad \text{Eq. 6-13}
\]

\[
NO_x = 9.4 \frac{gr}{BHp \cdot hr} x \frac{lb}{454 gr} x 2200BHp x 300 \frac{hr}{yr} x 8 \text{ generators} \cdot \frac{ton}{2000 lb} = 54.7 \frac{ton}{yr} \quad \text{Eq. 6-14}
\]

\[
SO_2 = 0.05 \text{ wt}%S x 7.206 \frac{lb}{gal} x 107 \frac{gal}{hr} x 300 \frac{hr}{yr} x 2 \frac{lb}{S} \cdot \frac{ton}{2000 lb} = 0.93 \frac{ton}{yr} \quad \text{Eq. 6-15}
\]

\[
VOC = 0.3 \frac{gr}{BHp \cdot hr} x \frac{lb}{454 gr} x 2200BHp x 300 \frac{hr}{yr} x 8 \text{ generators} \cdot \frac{ton}{2000 lb} = 1.7 \frac{ton}{yr} \quad \text{Eq. 6-16}
\]

\[
PM = 0.3 \frac{gr}{BHp \cdot hr} x \frac{lb}{454 gr} x 2200BHp x 300 \frac{hr}{yr} x 8 \text{ generators} \cdot \frac{ton}{2000 lb} = 1.7 \frac{ton}{yr} \quad \text{Eq. 6-17}
\]

Actual annual emissions will be calculated using the above equations and actual hours of operation.

6.c Oxidizer/Concentrator Emission Calculations:
The equipment manufacturer has guaranteed a VOC destruction efficiency of 95 percent for the oxidizer/concentrator system while operating at a flow rate of 10,000 acfm and 91 percent while operating at the maximum flow rate of 13,500 acfm. Based on this destruction efficiency and WaferTech’s estimated solvent usage, annual VOC emissions are estimated at 19 tons per year.

The burner manufacturer, Eclipse, estimates worstcase NO\textsubscript{x} to be 80 ppm (0.57 lbs/hr). However, based on engineering judgment, WaferTech believes the units can meet 12.0 tons per year (0.34 lbs/hr) NO\textsubscript{x}, which is lower than the manufacturer’s worstcase emission estimates.

The CO emission rate is based on source test data with some room for increased production at the facility. CO emissions from the facility are estimated at 0.75 lb/hr each and 26.3 tpy, combined.

Hourly emission limits for each oxidizer for CO, NO\textsubscript{x} and VOCs are based on WaferTech’s estimate of annual emissions from all eight units. Hourly emission limits for each oxidizer for SO\textsubscript{x} and PM are based on AP-42 Section 1.4 (3/98) emission factors for natural gas combustion and the maximum heat input. The AP-42 emission factor for SO\textsubscript{x} used is based on a sulfur content of 0.25 grains per 100 cubic feet of natural gas. Hourly emission limits were calculated as follows:

\[
CO = 26.3 \frac{tons}{yr} x \frac{2000 lb}{ton} x \frac{1}{8 \text{oxidizers}} x \frac{yr}{8760 hr} = 0.75 \frac{lb}{hr} \quad \text{Eq. 6-18}
\]

\[
NO_x = 12.0 \frac{tons}{yr} x \frac{2000 lb}{ton} x \frac{1}{8 \text{oxidizers}} x \frac{yr}{8760 hr} = 0.34 \frac{lb}{hr} \quad \text{Eq. 6-19}
\]

\[
SO_2 = 0.6 \frac{lb}{MMscf} x \frac{MMscf}{1020 \frac{MMBtu}{hr}} x 15 \frac{MMBtu}{hr} = 0.0009 \frac{lb}{hr} \quad \text{Eq. 6-20}
\]

\[
VOC = 19.0 \frac{tons}{yr} x \frac{2000 lb}{ton} x \frac{1}{8 \text{oxidizers}} x \frac{yr}{8760 hr} = 0.54 \frac{lb}{hr} \quad \text{Eq. 6-21}
\]
Annual emissions for CO, NOx and VOCs will be calculated based on source test results in pounds per hour multiplied by hours of operation. Annual emissions for SO2 and PM will be calculated based on the hourly emission rate shown above multiplied by hours of operation. Annual emissions of toxic air pollutants will be based on the VOC destruction efficiency, as measured in the most recent source test, and the amount of pollutants exhausted to the oxidizer.

6.d **Ammonia Scrubber Emission Calculations:**
All ammonia scrubbers exhaust to the acid scrubbers. Therefore ammonia calculations are included in 6.e. below.

6.e **Acid Scrubber Emission Calculations:**
Annual emissions from the Acid Scrubbers shall be calculated based on source test data, where available, and hours of operation. Where source test data is not available, annual emissions shall be calculated based on product use and the following scrubber efficiencies:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Efficiency %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetic Acid</td>
<td>90</td>
</tr>
<tr>
<td>Arsine</td>
<td>50</td>
</tr>
<tr>
<td>Boron Trifluoride</td>
<td>90</td>
</tr>
<tr>
<td>Chlorine</td>
<td>92.5</td>
</tr>
<tr>
<td>Chromic Acid</td>
<td>90</td>
</tr>
<tr>
<td>Chromium Trioxide</td>
<td>90</td>
</tr>
<tr>
<td>Hydrobromic Acid</td>
<td>90</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>90</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>0</td>
</tr>
<tr>
<td>Nitrogen Trifluoride</td>
<td>0</td>
</tr>
<tr>
<td>Phosphine</td>
<td>0</td>
</tr>
<tr>
<td>Potassium Chromate</td>
<td>0</td>
</tr>
<tr>
<td>Potassium Dichromate</td>
<td>0</td>
</tr>
<tr>
<td>Potassium Hydroxide</td>
<td>80</td>
</tr>
<tr>
<td>Silane</td>
<td>80</td>
</tr>
<tr>
<td>Sodium Bisulfite</td>
<td>90</td>
</tr>
<tr>
<td>Sodium Dichromate</td>
<td>50</td>
</tr>
<tr>
<td>Sodium Hydroxide</td>
<td>80</td>
</tr>
<tr>
<td>Sulfur Hexafluoride</td>
<td>0</td>
</tr>
<tr>
<td>Tetraethylorthosilicate</td>
<td>99</td>
</tr>
<tr>
<td>Tungsten Hexafluoride</td>
<td>99</td>
</tr>
</tbody>
</table>

6.f **Wastewater Treatment Scrubber and Central Utility Plant Emission Calculations:**
Annual emissions from the Wastewater Treatment scrubbers and Central Utility Plant scrubbers shall be calculated based on source test data, where available, and hours of operation. Where source test data is not available, annual emissions shall be calculated based on product use and scrubber efficiency.

7. **REGULATIONS AND EMISSION STANDARDS**
Regulations that establish emission standards applicable to the proposed facility include, but are not limited to, the regulations and codes listed below.
7.a Title 40 Code of Federal Regulations (40 CFR) 60.7 "Notification and Record Keeping" requires that notification shall be submitted to SWCAA, the delegated authority, for date construction commenced, anticipated initial startup, and initial startup.

7.b 40 CFR Part 60.8 "Performance Tests" requires that emission tests be conducted according to test methods approved in advance by the permitting authority and a copy of the results be submitted to the permitting authority.

7.c 40 CFR 60 Subpart Dc "Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units" applies to any steam generating unit with a heat input greater than or equal to 10 million Btu/hr, but less than or equal to 100 million Btu/hr constructed, modified, or reconstructed after June 9, 1989. Each of the boilers are rated at 24.4 million Btu/hr, therefore, this standard applies to this facility. In a letter dated November 10, 1997 EPA approved monthly fuel logging for boilers 1C1-HWB-01 through 1C1-HWB-04 at this facility. WaferTech has requested a variance from EPA for monthly fuel logging for boiler 1C1-HWB-05.

7.d Title 40 CFR 68 "Chemical Accident Prevention Provisions" requires risk management plans be developed for the substances and thresholds listed in 40 CFR 68.130. Based on a letter dated April 5, 1999 from the Respondent, the Respondent's facility will not utilize any substance that meets the listed thresholds, therefore, this standard does not apply to this facility.

7.e Title 40 CFR Part 70 "State Operating Permit Programs" requires facilities with site emissions of any single criteria pollutant greater than 100 tpy, any single hazardous air pollutant greater than 10 ton/yr, and/or any aggregate combination of hazardous air pollutants greater than 25 tpy to obtain a Title V permit. This facility is not an affected source because emissions from this facility are limited to quantities below the relevant thresholds. Facilitywide NOx emissions are limited to 91.9 tons per year, which is below the relevant threshold of 100 tons per year. This facility is considered an opt-out source.

7.f Revised Code of Washington (RCW) 70.94.141 empowers any activated air pollution control authority to prepare and develop a comprehensive plan or plans for the prevention, abatement and control of air pollution within its jurisdiction. An air pollution control authority may issue such permits as may be necessary to effectuate the purposes of the Washington Clean Air Act [RCW 70.94] and enforce the same by all appropriate administrative and judicial proceedings subject to the rights of appeal as provided in Chapter 62, Laws of 1970 ex. sess.

7.g RCW 70.94.152 requires that no approval to construct or alter an air contaminant source shall be granted unless all known available and reasonable means of emissions control are provided and that the operation will not aid in the contravention of ambient air quality standards.

7.h RCW 70.94.152 provides for the inclusion of conditions of operation as are reasonable necessary to assure the maintenance of compliance with the applicable ordinances, resolutions, rules and regulations when issuing a permit for installations and establishment of an air contaminant source.

7.i Washington Administrative Code (WAC) 173-401-300(7) “Federally Enforceable Limits” provides that any source with the potential to emit exceeding the tonnage thresholds defined in WAC 173-401-200(18) can be exempted from the requirement to obtain an Operating Permit when federally enforceable conditions are established which limit that source’s potential to emit to levels below the relevant tonnage thresholds. Hours limits have been established for each emergency generators at 300 hours of operation per year. In addition, a diesel fuel limit of 502,000 gallons per year has been established for the boilers. Therefore this source is considered to be a Title V opt-out or “synthetic minor” source.
7.j  WAC 173-460 "Controls for New Sources of Toxic Air Pollutants" requires Best Available Control Technology for toxic air pollutants (T-BACT), quantification of emissions of toxic air pollutants and human health and safety.

7.k  WAC 173-470 "Ambient Air Quality Standards for Particulate Matter" established ambient air quality standards for total suspended particulate matter and for particulate matter smaller than 10 microns (PM$_{10}$), which may not be exceeded more than one day per year.

7.l  WAC 173-474 "Ambient Air Quality Standards for Sulfur Oxides" establishes ambient air quality standards for sulfur dioxide in the ambient air, measured as sulfur dioxide, which shall not exceed:
(1) Four-tenths parts per million (0.4 ppm) by volume average for one-hour period more than once per one-year period;
(2) Twenty-five one-hundredths parts per million (0.25 ppm) by volume average for one-hour period more than twice in a consecutive seven-day period;
(3) One-tenth parts per million (0.1 ppm) by volume average for a one-day period more than once per one-year period; and
(4) Two one-hundredths parts per million (0.02 ppm) by volume average for a one-year period.

7.m  WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide" establishes ambient air quality standards for carbon monoxide, ozone, and nitrogen dioxide in the ambient air, which shall not be exceeded.

7.n  SWCAA 400-040 "General Standards for Maximum Emissions" requires all new and existing sources and emission units to meet certain performance standards with respect to Reasonably Available Control Technology (RACT), visible emissions, fallout, fugitive emissions, odors, emissions detrimental to persons or property, sulfur dioxide, concealment and masking, and fugitive dust.

7.o  SWCAA 400-040(1) "Visible Emissions" requires that no emission of an air contaminant from any emissions unit shall exceed twenty percent opacity for more than three minutes in any one hour at the emission point, or within a reasonable distance of the emission point.

7.p  SWCAA 400-040(3) "Fugitive Emissions" requires that reasonable precautions shall be taken to prevent the release of air contaminants to the atmosphere.

7.q  SWCAA 400-040(4) "Odors" requires any source which generates odors which unreasonably interfere with any other property owner's use and enjoyment of their property to use recognized good practice and procedures to reduce these odors to a reasonable minimum.

7.r  SWCAA 400-040(6) "Sulfur Dioxide" requires that no person shall emit a gas containing in excess of one thousand ppm of sulfur dioxide on a dry basis, corrected to 7% O$_2$ or 12% CO$_2$ as required by the applicable emission standard for combustion sources.

7.s  SWCAA 400-050 "Emission Standards for Combustion and Incineration Units" requires that all provisions of SWCAA 400-040 be met and that no person shall cause or permit the emission of particulate matter from any combustion or incineration unit in excess of 0.23 grams per dry cubic meter (0.1 grains per dry standard cubic foot) of exhaust gas at standard conditions.

7.t  SWCAA 400-060 "Emission Standards for General Process Units" requires that all new and existing sources not emit particulate matter in excess of 0.1 grains per dry standard cubic foot of exhaust gas.
7.u SWCAA 400-091 "Voluntary Limits on Emissions" provides for the issuance of a regulatory permit which reduces a source's potential to emit to an amount agreed upon by the owner/operator and the Authority.

7.v SWCAA 400-110 "New Source Review" requires that an application be filed with SWCAA prior to the establishment of any new source or emission unit or modification and that a permit be issued prior to establishment of the new source or emission unit or modification.

7.w SWCAA 400-111 "Requirements for New Sources in Maintenance Plan Area" requires that no approval to construct or alter an air contaminant source shall be granted unless it is evidenced that:

1. The equipment or technology is designed and will be installed to operate without causing a violation of the emission standards;
2. Emissions will be minimized to the extent that the new source will not exceed emission levels or other requirements provided in the maintenance plan;
3. Best Available Control Technology will be employed for all air contaminants to be emitted by the proposed equipment;
4. The proposed equipment will not cause any ambient air quality standard to be exceeded; and
5. If the proposed equipment or facility will emit any toxic air pollutant regulated under WAC 173-460, the proposed equipment and control measures will meet all the requirements of that Chapter.

8. RACT/BACT/BART/LAER/PSD DETERMINATIONS

8.a Prevention of Significant Deterioration (PSD) Applicability: SWCAA has determined that this permitting action will not result in a potential increase in emissions equal to or greater than the PSD thresholds, and therefore is not subject to PSD permitting.

8.b Boilers: The use of natural gas as the primary fuel and low NO\textsubscript{x} burners to achieve NO\textsubscript{x} emissions of 30 ppm and CO emissions of 50 ppm meets the requirements of BACT for the boilers. The use of burners capable of achieving NO\textsubscript{x} emissions of 140 ppm and CO emissions of 90 ppm and a fuel oil consumption limit meets the requirements of BACT for the boilers while combusting fuel oil.

The potential use of active combustion control on the boilers was evaluated. It was determined that this type of combustion control is not designed for internal burners installed in WaferTech’s boilers.

8.c Generators: The use of modern diesel-fired internal combustion engine design, low sulfur diesel fuel (\textless 0.05 percent sulfur by weight), limitation of visible emissions to 5 percent opacity or less, and limitation of engine/generator operation to testing and actual power interruptions has been determined to meet the requirements of BACT for the types and quantities of air contaminants emitted from the diesel-engine powered emergency generators at this facility.

8.d Concentrator/Oxidizer: The use of an oxidizer/concentrator system capable of achieving a VOC destruction efficiency of at least 95 percent by design, an exhaust gas opacity of zero percent and vertical discharge of air contaminants at an adequate stack height and exit velocity for suitable atmospheric dispersion has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from this source.

8.e Ammonia Scrubbers: The use of pH controlled scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from this source.

8.f Acid Scrubbers: The use of pH controlled scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from this source.
WaferTech performed a BACT analysis for fluorine since the facility is requesting an increase in fluorine emissions from 2500 lbs per year to 4500 lbs per year. WaferTech performed a search of control technology databases including EPA’s BACT/LAER Clearinghouse, South Coast Air Quality Management District BACT Guideline, EPA’s New Source Review bulletin board, California Air Resource Boards’ BACT Clearinghouse and Texas BACT Clearinghouse. Control equipment vendors questioned included Ceilcote, Beverly-Pacific, Croll-Reynolds, LanTech and Harrington. In addition, WaferTech contacted consultants including Sematech and CH2M Hill. This search failed to produce any feasible controls other than a scrubber with caustic scrubber liquor.

8.g Wastewater Treatment and Central Utility Plant Scrubbers: The use of pH controlled scrubbers has been determined to meet BACT and T-BACT for the types and quantities of air contaminants emitted from this source.

9. AMBIENT IMPACT ANALYSIS
9.a Modifications proposed in CL-1610 will increase nitric acid emissions from 1,300 pounds per year to 1,750 pounds per year. The SQER for nitric acid is 1,750 lb/yr. Therefore this application will not result in an increase of toxic air pollutants above the applicable Small Quantity Emission Rates (SQER) or Acceptable Source Impact Level (ASILs) specified in WAC 173-460.

9.b Chlorine is classified as a Class B toxic air pollutant with an ASIL value of 5.0 μg/m³ based on a twenty-four hour averaging time. The proposed chlorine emissions were modeled to determine the source's maximum ambient impact level to ensure that the ASIL value is not exceeded. A conservative approach was used assuming all the chlorine emissions were exhausted through one acid scrubber exhaust stack. Based on an emission rate of 0.057 pounds per hour, a stack diameter of 1.02 meters and a stack height of 29.87 meters above ground level, the maximum chlorine ambient twenty-four hour air concentration from the facility was determined to be 0.37 μg/m³, which is less than the ASIL.

9.c Modification of this facility as proposed in CL-1610, if properly maintained, will not cause the ambient air quality requirements of Title 40 Code of Federal Regulations (CFR) Part 50 “National Primary and Secondary Ambient Air Quality Standards” to be violated.

9.d Modification of this facility as proposed in CL-1610 will not cause the requirements of WAC 173-460 “Controls for New Sources of Toxic Air Pollutants”, and WAC 173-470 “Ambient Air Quality Standards for Particulate Matter,” WAC 173-474 “Ambient Air Quality Standards for Sulfur Oxides”, and WAC 173-475 "Ambient Air Quality Standards for Carbon Monoxide, Ozone, and Nitrogen Dioxide” to be violated.

9.e Modification of this facility as proposed in CL-1610, if properly maintained, will not cause a violation of emission standards for sources as established under SWCAA General Regulations Sections 400-040 “General Standards for Maximum Emissions,” 400-050 “Emission Standards for Combustion and Incineration Units,” and 400-060 “Emission Standards for General Process Units.”

10. DISCUSSION OF APPROVAL CONDITIONS
SWCAA has made a determination to issue SWCAA 97-2040R8 in response to application CL-1610. SWCAA 97-2040R8 contains approval requirements deemed necessary to assure compliance with applicable regulations and emission standards as discussed below. This Permit will supersede 97-2040R7 in its entirety.

10.a Concentrator/Oxidizer Conditions:
As discussed in Section 3, WaferTech expressed concern that the oxidizer would not be at the specified minimum operating temperature during initial startup. SWCAA has modified the oxidizer requirements
to include a minimum temperature at which the oxidizer may begin operation and a setpoint at which the oxidizer must be set to operate at.

Also as discussed in Section 3, the CO emission limit for the oxidizers will be increased to 0.75 lb/hr, each and 26.3 tpy, combined. The new limit will be based on the manufacturer’s expected operation of the oxidizer and source test results rather than engineering judgment.

10.b Acid Scrubber Conditions
As discussed in Section 3, SWCAA will increase the nitric acid emission limit to 1,750 lb/yr, combined from all acid scrubbers and the chlorine limit to 500 lb/yr, combined from all acid scrubbers. This will allow for increased production at the facility.

10.c No other modifications to any conditions are being made as part of this Permit Application.

11. START-UP AND SHUTDOWN PROVISIONS/ALTERNATIVE OPERATING SCENARIO/POLLUTION PREVENTION
Pursuant to SWCAA 400-081 “Start-up and Shutdown”, technology based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

11.a Start-up and Shutdown Provisions. Pursuant to SWCAA 400-081 "Start-up and Shutdown", technology based emission standards and control technology determinations shall take into consideration the physical and operational ability of a source to comply with the applicable standards during start-up or shutdown. Where it is determined that a source is not capable of achieving continuous compliance with an emission standard during start-up or shutdown, SWCAA shall include appropriate emission limitations, operating parameters, or other criteria to regulate performance of the source during start-up or shutdown.

Emergency Generators: Visible emissions from the diesel engine driven generators are limited to 5 percent opacity or less during normal operation. The 5 percent opacity limit is appropriate for the diesel engines during normal operation. However, the engines may not be capable of limiting visible emissions to less than 5 percent opacity until the engine achieves normal operating temperature. Therefore, the 5 percent opacity limit shall not apply to the generators exhaust during start-up periods.

Concentrator/Oxidizers: The combustion temperature setpoint for the oxidizers is 1425 °F and 1375 °F for oxidizers 1F1-VOC-01 through 1F2-VOC-05 and 1F2-VOC-06 through 1F2-VOC-08, respectively. However, the units will commence destruction of VOCs at 1360 °F and 1250 °F for oxidizers 1F1-VOC-01 through 1F1-VOC-04 and 1F2-VOC-05 through 1F2-VOC-08, respectively.

11.b Alternate Operating Scenarios: SWCAA conducted a review of alternate operating scenarios applicable to this permitting action. No alternate operating scenarios were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.

11.c Pollution Prevention: SWCAA conducted a review of possible pollution prevention measures for the facility. No pollution prevention measures were identified by either the permittee or SWCAA. Therefore, none were included in the approval conditions.
12. Monitoring and Testing

Emission testing requirements have been established for all emission units with significant emissions. The frequency and method of testing is specified for each unit individually. No modification of the testing requirements is associated with application CL-1610.

13. Facility History

13.a General History: This facility, located at 5509 NW Parker Street in Camas, commenced operation in March 1998.

13.b Previous Permits:

SWCAA 97-2040 was issued on October 6, 1997 in response to application CL-1277. This permit approved installation of a semiconductor manufacturing facility producing integrated circuits consisting of four hot water boilers, eight emergency generators, four concentrator/oxidizers (1F1-VOC-02, 1F1-VOC-02, 1F1-VOC-03, 1F1-VOC-04), eight acid scrubbers (1F1-SCR-01, 1F1-SCR-02, 1F1-SCR-03, 1F1-SCR-04, 1F5-SCR-01, 1F5-SCR-02, 1F2-SCR-01, 1F2-SCR-02), one ammonia scrubber (F2-SCR-03), one Wastewater Treatment Plant scrubber (1T1-FSTS-01-SCRB), and five vacuum system filters.

SWCAA 97-2040R1 was issued on March 2, 1998 in response to application CL-1336. This permit approved changes in recordkeeping requirements for the Central Utility Plant scrubber from recording pH, recirculation flow rate and pressure drop once per shift to recording water flow rate once per shift when operating, and modification of the concentrator/Oxidizers temperature limit from 1400 °F and 350 °F to 1360 °F and 340 °F for the reaction chamber and desorption unit, respectively.

SWCAA 97-2040R2 was issued on October 5, 1998 in response to application CL-1376. This permit approved an increase in the hours of operation of the emergency generators from 100 hours per year to 400 hours per year operation each.

SWCAA 97-2040R3 was issued on December 28, 1998 in response to application CL-1384. This permit approved installation of two additional separate Hydrokinetic scrubbers upstream of the Ceilcote scrubber, one for the HCl unloading tank emissions during unloading and one for the HCl day tank emissions during transfers.

SWCAA 97-2040R4 was issued on March 17, 1999 in response to application CL-1397. This permit approved the installation of six ammonia scrubbers, removal of the requirement to perform source testing of acetic acid at the outlet of the acid scrubbers, removal of the VOC testing requirement for the boilers, modification of the hours of operation for the emergency generators from 400 hours per year to 300 hours per year, and an increase in emissions from the acid scrubbers and concentrators/oxidizer units due to an increase in production.

SWCAA 97-2040R5 was issued on August 31, 1999 in response to application CL-1432. This permit approved installation of Central Utility Plant scrubber 1C1-SCR-02, installation of two ammonia scrubbers (1F1-SCR-13 and 1F1-SCR-14), installation of concentrator/oxidizer 1F1-VOC-05, and modification of the gas desorption temperature limit for all the concentrators/oxidizers from 340 °F to 300 °F.

SWCAA 97-2040R6 was issued on August 31, 2000 in response to applications CL-1457 and CL-1467. This permit approved modification of the opacity limit from the acid scrubbers from zero percent to 15 percent, installation of two additional concentrator/oxidizers (1F2-VOC-06 and 1F2-VOC-07), installation of an additional acid scrubber (1F1-SCR-15), an increase in fluorine emissions from 1,000
pounds per year to 2,500 pounds per year, installation of an additional ammonia scrubber (1F1-SCR-16—this scrubber was never installed and the identification number reused to refer to a different scrubber), modification of the liquor recirculation flow rate for scrubber 1T1-FSTS-01-SCRB from 60 gpm to 11 gpm, a decrease in the hours of operation from the emergency generators from 300 hours per year to 50 hours per year, each, a modification of the ammonia scrubber liquor level from 32” to 14.75” to account for a change in location of the reference location, and a modification of the initial ammonia scrubber source test to include dreager tubes.

SWCAA 97-2040R7 was issued on November 22, 2002 in response to application CL-1496. This permit approved modifications to the existing Permit and installation of additional equipment including one boiler, one oxidizer, and three acid scrubbers.

14. PUBLIC COMMENT

Public/Applicant Comment for application CL-1610:

Comments were received from Judy Schramm, WaferTech, in a letter dated February 10, 2004. The comments were as follows:

Comment: Section 2.2 Boiler Reporting requirements: Item 27, Page 5: Increase the time allowed to submit results of emission monitoring on boilers to SWCAA from within 15 days to 45 days. This will allow additional time for WaferTech staff to compile and submit results to the agency within a more reasonable time, due to vacation, training, or other time delays.

Response: The 15 day requirement to report boiler tune-up data to SWCAA is a standard requirement that SWCAA has included in many permits. SWCAA will gladly entertain requests for extensions to the 15 day reporting period when individual circumstances warrant such an extension. However, to remain consistent with all previously written permits, the 15 day requirement will not be modified.

Comment: Section 2.2 Oxidizer/Concentrator Terms and Conditions: Emission Limits: Item 40, page 6: Results from recent emission monitoring on 1F2-VOC-06, which was recently tuned, confirm the manufacturer’s estimates for carbon monoxide emissions for this oxidizer. Results for the average of three, one-hour tests, were 0.49 lb/hr for CO (108.9 ppm). WaferTech is hereby requesting the CO emission limit for the oxidizers be set at 0.75 lb/hr each, 26.3 tpy combined. The increased limit is requested due to anticipated increased production at WaferTech within the next several years.

Response: SWCAA has increased the emission limit as requested. See section 3 of the support document for further details.

Comment: Section 2.4 Acid and Ammonia Scrubbers: Operating Limits and Requirements: Item 68, page 9: Request increasing maximum pH limit for 1F2-SCR-03 from 4.0 to 4.5 to be consistent with all other ammonia scrubber pH limits.

Response: SWCAA does not feel comfortable modifying the pH limit for this scrubber without additional data to support the increase; therefore, this limit was not modified.


Response: The verbiage has been modified as requested.

Comment: Technical Support Document 6c., page 18: Delete second paragraph, referring to obsolete information regarding basis for oxidizer/concentrator CO emission limits, used in permit revision #7.
Response: This information has been removed as requested.

Comments were also received from Judy Schramm, WaferTech, in a letter dated February 25, 2004.

Comment: Increase chlorine emissions to 500 lb/yr. Chlorine is a class B TAP. The small quantity emission rate for chlorine is 175 lb/yr, 0.02 lb/hr with an ASIL of 5.0 μg/m$^3$ based on a twenty-four hour average. WaferTech has previously performed modeling for fluorine emissions (please refer to current permit page 22) and requests to use this modeling for chlorine emissions, due to the similar chemical properties. Based on the fluorine rate of 0.23 lbs/hr, the maximum fluorine ambient twenty-four hour air concentration was determined to be 1.5 μg/m$^3$. An emission limit of 500 lb/yr for chlorine = 0.057 lbs/hr. Therefore, an ambient twenty-four hour air concentration would be 0.37 μg/m$^3$, which is below the ASIL of 5.0 μg/m$^3$.

Response: SWCAA will increase the chlorine limit as requested. See section 3 of this report for more information.

Comment: WaferTech has determined that the efficiency rate for scrubbing chlorine emissions is greater than 90%. Please refer to the enclosed data trending on the pH of the acid scrubbers, which scrubs chlorine emissions. WaferTech contacted the representative for the Ceilcote scrubbers. The scrubbing efficiency for chlorine is based on the pH of the scrubbing solution. A pH of 9.0 will have an efficiency of 90%, at pH 10.0 the Cl2 removal efficiency is 95-97%. Based on recent pH trending, the average scrubber pH is 9.6, the corresponding chlorine scrubber efficiency rate is 92.5%. WaferTech requests that the efficiency rate for chlorine emissions be modified to 92.5% in the permit.

Response: Based on the fact that the scrubbers have historically operated at a pH of 9.6 and will continue to operate at the same set point, a chlorine scrubbing efficiency of 92.5% is a reasonable efficiency to use in the emission calculations. SWCAA will modify the scrubber chlorine efficiency used to calculate emissions to be 92.5%.

Comment: Increase tetraethylorthosilicate (TEOS) emissions to 500 lbs per year. TEOS is a VOC and a class B TAP. The small quantity emission rate is 43,748 lb/yr. The 500 lb/yr request is below the SQER.

Response: The emission limit for this compound is currently 43,748 lb/yr, therefore the emission limit was not modified, however the emission estimates contained in Appendix A was modified to reflect the estimated maximum emissions of tetraethylorthosilicate of 500 lb/yr from the acid scrubbers.
## APPENDIX A

### Summary of Facilitywide Maximum Estimated Air Emissions

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>CAS Number</th>
<th>HAP (Y/N)</th>
<th>ASIL</th>
<th>SQER (µg/m³)</th>
<th>Boiler Emissions (lbs/yr)</th>
<th>Generator Emissions (lbs/yr)</th>
<th>Oxidizer Emissions (lbs/yr)</th>
<th>Acid Scrubber Emissions (lbs/yr)</th>
<th>WWT Scrubber Emissions (lbs/yr)</th>
<th>CUP Scrubber Emissions (lbs/yr)</th>
<th>Facilitywide Emissions (lbs/yr)</th>
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</table>
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<tr>
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<th>SQER (lbs/yr)</th>
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<th>Generator Emissions (lbs/yr)</th>
<th>Oxidizer Emissions (lbs/yr)</th>
<th>Acid Scrubber Emissions (lbs/yr)</th>
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<th>CUP Scrubber Emissions (lbs/yr)</th>
<th>Facilitywide Emissions (lbs/yr)</th>
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## APPENDIX A

### Summary of Facilitywide Maximum Estimated Air Emissions

<table>
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<tr>
<th>Pollutant</th>
<th>HAP</th>
<th>ASIL</th>
<th>SQER</th>
<th>Boiler Emissions (lbs/yr)</th>
<th>Generator Emissions (lbs/yr)</th>
<th>Oxidizer Emissions (lbs/yr)</th>
<th>Acid Scrubber Emissions (lbs/yr)</th>
<th>WWT Scrubber Emissions (lbs/yr)</th>
<th>CUP Scrubber Emissions (lbs/yr)</th>
<th>Facilitywide Emissions (lbs/yr)</th>
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<tbody>
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<td>Sulfuric acid</td>
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1ASIL = Acceptable Source Impact Level (WAC 173-460). All ASILs for Class B TAPs are 24-hour average values. ASILs for Class A TAPs are annual average values.

2SQER = Small Quantity Emission Rate (WAC 173-460).