State of Idaho
Department of Environmental Quality
Air Quality Division

AIR QUALITY PERMIT
STATEMENT OF BASIS

Permit to Construct No. P-2008.0136

Final

Eagle Silicon

Caldwell Facility

Caldwell, Idaho

Facility ID No. 027-00099

February 23, 2009

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Permit Writer

The purpose of this Statement of Basis is to satisfy the requirements of IDAPA 58.01.01.et seq, Rules for the Control of Air Pollution in Idaho, for issuing air permits.

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Acronyms, Units, and Chemical Nomenclature

AFS	AIRS Facility Subsystem
AIRS	Aerometric Information Retrieval System
cfm	cubic feet per minute
DEQ	Department of Environmental Quality
EL	screening emissions levels
EPA	U.S. Environmental Protection Agency
gr/dscf	grains (1 lb = 7,000 grains) per dry standard cubic foot
HAP	Hazardous Air Pollutants
HF	hydrogen fluoride, hydrofluoric acid
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
lb/hr	pounds per hour
lb/day	pounds per calendar day
MACT	Maximum Achievable Control Technology
PM	particulate matter
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
PTC	permit to construct
Rules	Rules for the Control of Air Pollution in Idaho
SIC	Standard Industrial Classification
SM	synthetic minor
TAP	Toxic Air Pollutants
T/yr	tons per consecutive 12-calendar month period
UTM	Universal Transverse Mercator

1. FACILITY INFORMATION

1.1 Facility Description

The Eagle Silicon Caldwell facility purchases discarded wafers from semiconductor manufacturers to recycle the silicon. The recycled silicon wafers are then sold to customers who reformulate the silicon into a form that can be used for new products. Before the silicon can be sold for other manufacturing uses, the die (small blocks of semiconducting material fabricated into a circuit) must be removed from the wafer. Mechanical and chemical cleaning process units are used to remove the die from the wafers.

1.2 Permitting Action and Facility Permitting History

This permit is the initial Permit to Construct (PTC) for this facility.

2. APPLICATION SCOPE AND APPLICATION CHRONOLOGY

2.1 Application Scope

Eagle Silicon proposes to install two baghouses for the interior ventilation of the recycling building and additional hydrofluoric acid (HF) systems to allow the recycling of additional wafers.

2.2 Application Chronology

August 20, 2008	PTC application and $1,000 application fee were received.
September 2, 2008 - September 18, 2008	Opportunity for a public comment period was held. No comment or request for a public comment period was received.
September 16, 2008	PTC application was determined incomplete.
September 16, 2008	Draft permit and statement of basis were sent for peer and Boise Regional Office review.
October 16, 2008	Supplemental application information was received.
November 14, 2008	PTC application was determined complete.
November 19, 2008	Draft permit and statement of basis were sent to the facility for review.
December 5, 2008	Response to facility comments was sent to the facility for review.
December 24, 2008	$2,500 PTC processing fee was received.
February 2, 2009	Supplemental information was received from the facility.
February 13, 2009	Second draft permit and statement of basis were sent to the facility for review.
February 23, 2009	Final permit and statement of basis were issued.

3. TECHNICAL ANALYSIS

3.1 Emission Unit and Control Device

Table 3.1 EMISSION UNIT AND CONTROL DEVICE INFORMATION

Source ID No.	Source Description	Emissions Control	Emissions Control ID No.
EU1	Mechanical silicon cleaning process units Open-topped polishers Enclosed polishers Silicon screener	Baghouse 1 Baghouse 2	BAGH1 BAGH2
EU2	Chemical silicon cleaning process units HF chemical baths	Solid Lime Dry Scrubber	(N/A)

3.2 Emissions Inventory

Information relating the throughput or production rate of recycled silicon wafers to the uncontrolled emissions estimates could not be readily determined, so conservative assumptions were used by the applicant to estimate uncontrolled emissions rates.

Uncontrolled emissions of PM_{10} from the mechanical silicon cleaning process units were estimated based on the operation of the machines in batch mode, with batch durations lasting one to two days. Assuming a batch cycle time of one day and assuming a pound of dust is generated when unloading each batch, 20 enclosed machines operating each day of the year would result in 3.65 T/yr of annual uncontrolled PM_{10} emissions. Assuming that 5 pounds of dust is generated each day of operation, 10 open-topped units operated each day of the year would result in 9.1 T/yr of annual uncontrolled PM_{10} emissions, as summarized in Table 3.2.

Uncontrolled emissions of toxic air pollutants (TAP) from the chemical silicon cleaning process units were calculated assuming that three identically-sized HF baths would be operated each day of the year, at an operating temperature of less than 100°F and an operating concentration of less than 30% HF by weight. Although the uncontrolled emissions in the emissions inventory were used to demonstrate compliance with the screening emissions level (EL) for fluorides, for operational flexibility in permitting requirements, the scrubber was considered a control device at the request of the applicant. Refer to the additional discussion in Section 4.9 (Permit Condition 2.3). It should be noted that when the solid lime dry scrubber is operated according to manufacturer's specifications, controlled emissions of fluorides are expected to be lower than the values summarized in Table 3.4.

The controlled PM and PM_{10} emission calculations are based on the design exhaust grain loading for each baghouse, the maximum air flow rate of each baghouse, and the maximum hours of operation per year (8,760 hr/yr). All PM emissions have been assumed to be PM_{10}. Controlled emissions of TAP and lead from the mechanical silicon cleaning process units were calculated based on the analytical composition of process stream material, and assuming that emissions would be an equivalent fraction of PM emissions.

An estimate of the controlled emissions of criteria pollutants is presented in Table 3.3, and the controlled emissions of TAP and HAP is summarized in Table 3.4.

Emissions estimates were based on continuous 24-hour operation (8,760 hr/yr) to allow maximum operational flexibility. None of the controlled potential emissions exceeded any applicable major source thresholds for criteria pollutants or for HAP (individual or combined thresholds). The controlled

emissions of arsenic, quartz, cristobalite, tridymite, and silicon carbide each exceeded applicable EL listed in IDAPA 58.01.01.585-586.

Emissions inventory estimates are included in Appendix B.

Table 3.2 UNCONTROLLED EMISSIONS ESTIMATES OF CRITERIA POLLUTANTS

Emissions Unit	PM_{10}		Lead	
	lb/hr	T/yr	lb/hr	T/yr
20 enclosed mechanical silicon cleaning process units (EU1)		3.65		
10 open-topped mechanical silicon cleaning process units (EU1)		9.10		
7 chemical silicon cleaning process baths (EU2)				7.00E-03
Total, Point Sources		**12.75**		**7.00E-03**

Table 3.3 CONTROLLED EMISSIONS ESTIMATES OF CRITERIA POLLUTANTS

Emissions Unit	PM_{10}		Lead
	lb/hr	T/yr	lb/qtr
30 mechanical silicon cleaning process units (EU1)	0.86	3.80	
7 chemical silicon cleaning process baths (EU2)			7.00E-03
Total, Point Sources	**0.86**	**3.80**	**7.00E-03**

Table 3.4 CONTROLLED TAP AND HAP EMISSIONS SUMMARY

TAP	HAP	Emissions Screening Levels	24-hour Average[a]	Annual Average[a]	Annual
		lb/hr	lb/hr	lb/hr	T/yr
Arsenic	Arsenic	1.50E-06		1.83E-05	0.01
Cadmium	Cadmium	3.70E-06		4.29E-07	0.01
Chromium	Chromium	3.30E-02	1.26E-05		0.01
Fluorides, as F	Hydrogen fluoride	1.67E-01	1.67E-01		0.80
Lead[a]	Lead	1.37E-02	3.17E-06		0.01
Mercury	Mercury	7.00E-03	8.57E-07		0.01
Selenium	Selenium	1.30E-02	4.29E-07		0.01
Barium		3.30E-02	3.51E-05		0.01
Copper		6.70E-02	4.48E-04		0.01
Silver		7.00E-03	1.05E-05		0.01
Silica, Quartz		6.70E-03	0.01		0.05
Silica, Cristobalite		3.30E-03	0.01		0.05
Silica, Tridymite		3.30E-03	0.01		0.05
Silicon Carbide		6.67E-01	0.86		3.77
				TOTAL HAP / TAP (T/yr)	4.81
				INDIVIDUAL HAP (T/yr)	0.80
				TOTAL HAP (T/yr)	0.86

a. 24-hour average only applies to non-carcinogenic TAP. Annual average only applies to carcinogenic TAP. Rolling 3-month and quarterly average apply to lead.

3.3 Ambient Air Quality Impact Analysis

The facility has demonstrated compliance to DEQ's satisfaction that emissions from this facility will not cause or significantly contribute to a violation of any ambient air quality standard. The facility has also demonstrated compliance to DEQ's satisfaction that the emissions increase due to this permitting action will not exceed any AAC or AACC for TAP. The controlled TAP emissions rates that were compared to the EL assumed the use of operational limitations as described in Section 3.2.

Based on the emissions inventory, the controlled emission rates of TAP and criteria pollutants from all emission sources were below the corresponding EL established in IDAPA 58.01.01.585 and 586, except for arsenic, quartz, cristobalite, tridymite, and silicon carbide. Modeling was conducted to demonstrate compliance with the applicable AAC or AACC as summarized in Table 3.5.

Compliance with TAP increments was demonstrated, because using the controlled ambient concentration is an option for demonstrating compliance in accordance with IDAPA 58.01.01.210.08. The modeling analysis demonstrated compliance with the applicable AAC or AACC, and modeling analyses conducted in the development of TAP rules indicates that if a controlled emissions rate is below the EL, controlled ambient concentrations are expected to be below the AAC or AACC. Refer to Table 3.4 in Section 3.2 for a comparison of TAP emission rates to the EL.

The increase in PM_{10} emissions was greater than the established threshold in the State of Idaho Air Quality Modeling Guideline[1]. However, the two proposed baghouses will be the only sources of PM and PM_{10} emissions at the Caldwell facility. DEQ has developed a secondary discretionary modeling threshold that can be applied on a case-by-case basis. ENVIRON provided IDEQ with the proposed baghouse stack locations, stack parameters, and potential emission rates, and based on the information provided, it was determined that a modeling analysis to demonstrate compliance with the NAAQS was not required for this project.[2]

Table 3.5 TAP AMBIENT IMPACT ANALYSIS RESULTS

Pollutant	Averaging Period	Maximum Increase in Ambient Impact ($\mu g/m^3$)	AAC/AACC ($\mu g/m^3$)	SCL ($\mu g/m^3$)	Percent of Limit
Arsenic	Annual	8.04E-05	2.30E-04		35.0%
Silica, Quartz	24-hour	0.1	5		2.0%
Silica, Cristobalite	24-hour	0.1	2.5		4.0%
Silica, Tridymite	24-hour	0.1	2.5		4.0%
Silicon Carbide	24-hour	12.5	500		2.5%

An emissions inventory is included in Appendix B.

[1] Table 1, State of Idaho Air Quality Modeling Guideline, Doc ID AQ-011, rev. 1, December 31, 2002.
[2] Email from Kevin Schilling (DEQ) to Kyle Heitkamp (ENVIRON), July 30, 2008.

4. REGULATORY REVIEW

4.1 Attainment Designation (40 CFR 81.313)

The facility is located in Canyon County, which is designated as attainment or unclassifiable for PM_{10}, $PM_{2.5}$, CO, NO_2, SO_X, and Ozone.

4.2 Permit to Construct (IDAPA 58.01.01.201)

The addition of HF systems, the addition of two baghouses and an increase in silicon wafer recycling throughput does not meet the permit to construct exemption criteria contained in Sections 220 through 223 of the Rules. Therefore, a PTC is required.

4.3 Title V Classification (IDAPA 58.01.01.300, 40 CFR Part 70)

The facility is classified as a natural minor facility, because emissions are intrinsically limited based on the number of mechanical silicon cleaning process units and chemical process baths proposed.

The facility is not classified as a major facility for Tier I permitting purposes, in accordance with IDAPA 58.01.01.008.10. The facility is not a designated facility as defined in IDAPA 58.01.01.006.30.

4.4 PSD Classification (40 CFR 52.21)

The facility is classified as a PSD natural minor facility because emissions are intrinsically limited based on the number of mechanical silicon cleaning process units and chemical process baths proposed.

4.5 NSPS Applicability (40 CFR 60)

The facility is not subject to NSPS.

4.6 NESHAP Applicability (40 CFR 61)

The facility is not subject to NESHAP in 40 CFR 61.

4.7 MACT Applicability (40 CFR 63)

The facility is not subject to MACT standards in 40 CFR 63.

The provisions of Subpart BBBBB—National Emission Standards for Hazardous Air Pollutants for Semiconductor Manufacturing, do not apply to minor sources of HAP emissions. The facility is therefore not subject to this NESHAP.

4.8 CAM Applicability (40 CFR 64)

The facility is a synthetic minor source, and is therefore not subject to CAM in 40 CFR 64.

4.9 Permit Conditions Review

This section describes the permit conditions for this initial permit.

New Permit Condition 2.3

The facility-wide emissions of PM_{10} and fluorides from silicon cleaning operations shall not exceed any corresponding emission rate limit listed in Table 2.2.

Table 2.2 SILICON CLEANING OPERATIONS EMISSIONS LIMITS[1]

Source Description (ID No.)	PM_{10}[2]	Fluorides, as F
	lb/hr[3]	lb/day[4]
Mechanical Silicon Cleaning Process Units – Baghouse 1 (BAGH1)	0.43	
Mechanical Silicon Cleaning Process Units – Baghouse 2 (BAGH2)	0.43	
Chemical Silicon Cleaning Process Units – Solid Lime Dry Scrubber		4.00

[1] In the absence of any other credible evidence, compliance is assured by complying with the operating, monitoring, and recordkeeping requirements of this permit.
[2] Particulate matter with an aerodynamic diameter less than or equal to a nominal ten (10) micrometers, including condensable particulate as defined in IDAPA 58.01.01.006.80.
[3] Pounds per hour as determined by a test method prescribed by IDAPA 58.01.01.157 or DEQ approved alternative.
[4] Pounds per calendar day as determined by a test method prescribed by IDAPA 58.01.01.157 or DEQ approved alternative.

Discussion

This permit condition limits PM_{10} and fluoride emissions from the mechanical silicon cleaning process and chemical silicon cleaning process units, based on the emission rates used to demonstrate compliance with the NAAQS modeling threshold for PM_{10}, and the TAP EL for fluorides (respectively).

The applicant has indicated that the baghouse will be designed to achieve the PM_{10} emissions limit of 0.43 lb/hr for each baghouse, as calculated based on the manufacturer certified grain loading performance of 0.01 gr/dscf and a maximum flow rate of 5,000 cfm, and has requested the inclusion of this emissions limit and the associated performance testing in order to allow the operational flexibility to install and operate up to 10 open-topped and up to 20 enclosed polishers as required to handle the recycling throughput of the facility, up to the design capacity of the baghouses.

The applicant has indicated that based on stack testing results, the scrubber can achieve the fluoride emissions limit of 4.00 lb/day (equivalent to the 0.167 lb/hr EL), and has requested the inclusion of this emissions limit and the associated performance testing in order to allow the operational flexibility to install and operate up to seven chemical silicon cleaning process units as required to handle the recycling throughput of the facility.

By requiring performance testing for the baghouses and when the number of chemical silicon cleaning process units has reached the proposed maximum number of tools, throughput or other operational limits were not required, as requested by the permittee. Because TAP emissions associated with the mechanical silicon cleaning process units were linked directly to the PM_{10} emissions rate (particulate TAP emissions were calculated as a weight fraction of the total PM/PM_{10} emissions, based upon bulk silicon analysis test results included in the application), individual TAP emissions limits were not required for the mechanical silicon cleaning process units. By demonstrating with performance testing that an increase in permitted emissions has not resulted after the installation of additional mechanical or chemical silicon cleaning process units up to the maximum number of tools proposed, a permit revision for the installation of additional units should not be required, in accordance with the definition of modification in IDAPA 58.01.01.006.63.

New Permit Condition 2.4
Emissions from the baghouse stacks, or any other stack, vent, or functionally equivalent opening associated with the silicon cleaning operations shall not exceed 20% opacity for a period or periods aggregating more than three minutes in any 60-minute period as required by IDAPA 58.01.01.625. Opacity shall be determined by the procedures contained in IDAPA 58.01.01.625.

Discussion

This permit condition limits visible emissions from the silicon cleaning processes in accordance with IDAPA 58.01.01.625. Compliance with this limit is demonstrated by the monitoring and recordkeeping requirements in Permit Condition 2.10.

New Permit Condition 2.5

The permittee shall install and operate the Solid Lime Dry Scrubber to control fluoride emissions from the Chemical Silicon Cleaning Process Units to demonstrate compliance with the fluoride emission limit in Permit Condition 2.3.

Discussion

The estimated controlled emissions from the chemical silicon cleaning process and the demonstration of compliance with the TAP EL for fluorides (as F) were based on operation of the scrubber control device. The EL for fluorides was used to demonstrate preconstruction compliance with toxic standards in accordance with IDAPA 58.01.01.210.

New Permit Condition 2.6

The permittee shall discharge into an enclosed building no more than 5 open-topped and 10 enclosed Mechanical Silicon Cleaning Process Units per day, or shall install and operate at least one of the two baghouses to control PM and PM_{10} emissions from the Mechanical Silicon Cleaning Process Units to insure compliance with the PM_{10} emission limits in Permit Condition 2.3.

Based on the test results for the installed baghouse required in Permit Condition 2.14 , an emission factor shall be developed that will determine the number of polishing units that may be installed before installation of the second baghouse is required. Records of the emission factor and supporting calculations shall be maintained with the Scrubber and Baghouse/Filter System Procedures document in accordance with Permit Condition 2.9.

Discussion

The estimated controlled emissions from the mechanical silicon cleaning process and the demonstration of compliance with the NAAQS modeling threshold for PM_{10} were based on operation of baghouse control devices.

Supplemental information was submitted by the permittee stating that current operations in an enclosed building do not use forced air ventilation, and that without baghouse control operations are not expected to result in emissions of dust to the atmosphere. However, supporting documentation to verify this statement was not available. It was more conservatively estimated that operation of up to 5 open-topped and 10 enclosed process units and assuming a reasonable PM/PM_{10} control efficiency of 70% for an enclosed building would result in emissions below the emissions rate limits in Permit Condition 2.3.

This permit condition allows for both methods of operation.

New Permit Condition 2.7

The permittee shall install, calibrate, maintain, and operate equipment to continuously measure the pressure differential across the Solid Lime Dry Scrubber in accordance with manufacturer specifications.

Discussion

This permit condition requires the use of a pressure differential monitor. The estimated controlled emissions from the chemical silicon cleaning process and the demonstration of compliance with the TAP EL for fluorides (as F) was based on proper operation and maintenance of a scrubber control device.

New Permit Condition 2.8

The permittee shall install, calibrate, maintain, and operate equipment to continuously measure the pressure differential across Baghouse 1 and Baghouse 2 in accordance with manufacturer specifications.

Discussion

This permit condition requires the use of a pressure differential monitor. The estimated controlled emissions from the mechanical silicon cleaning process and the demonstration of compliance with the NAAQS modeling threshold for PM_{10} were based on proper operation and maintenance of baghouse control devices.

New Permit Condition 2.9

Within 60 days after initial startup of each scrubber and baghouse/filter system, the permittee shall have developed, updated, and submitted to DEQ a Scrubber and Baghouse/Filter System Procedures document for the inspection and operation of the installed emissions control devices. The Scrubber and Baghouse/Filter System Procedures document shall be updated within 60 days after initial startup of each emissions control device.

The Scrubber and Baghouse/Filter System Procedures document shall be a permittee developed document independent of the manufacturer supplied operating manual but may include summaries of procedures in the manufacturer supplied operating manual.

At a minimum the following items shall be included in the Scrubber and Baghouse/Filter System Procedures document;

- Procedures and schedule for inspecting and maintaining the Solid Lime Dry Scrubber, Baghouse 1, and Baghouse 2 in accordance with Permit Condition 2.10 and to comply with General Provision 2.
- Procedures for corrective action that will be taken if visible emissions are present from the baghouses at any time, including procedures to determine whether bags or cartridges are ruptured, and procedures to determine if bags or cartridges are not appropriately secured in place.
- The manufacturer's recommended minimum values that shall be maintained for pressure drop across the scrubber and the baghouses, in inches of water.
- For each baghouse installed, records of the emission factor developed in accordance with Permit Condition 2.6.
- For the second baghouse installed, records demonstrating functional equivalency to the first baghouse as required by Permit Condition 2.14.

The permittee shall operate the scrubber and the baghouses in accordance with the Scrubber and

Baghouse/Filter System Procedures document.

The contents of the Scrubber and Baghouse/Filter System Procedures document shall be based on manufacturer's specifications. A copy of the manufacturer's recommendations shall be included with the Scrubber and Baghouse/Filter System Procedures document and both shall be made available to DEQ representatives upon request.

The Scrubber and Baghouse/Filter System Procedures document shall be submitted to DEQ within 60 days of permit issuance for review and comment at the following address and shall contain a certification by a responsible official. Any changes to the Scrubber and Baghouse/Filter System Procedures document shall be submitted within 15 days of the change.

Air Quality Permit Compliance
Department of Environmental Quality
Boise Regional Office
1445 N. Orchard
Boise, ID 83706

The Scrubber and Baghouse/Filter System Procedures document shall remain onsite at all times and shall be made available to DEQ representatives upon request.

The operation and monitoring requirements specified in the Scrubber and Baghouse/Filter System Procedures document are incorporated by reference to this permit and are enforceable permit conditions.

Discussion

This permit condition requires the development and documentation of procedures for the operation and maintenance of each scrubber and baghouse control device, and requires monitoring and recordkeeping to insure compliance with the manufacturer's specifications and recommendations. The estimated controlled emissions from the chemical and mechanical silicon cleaning processes and the demonstration of compliance with the NAAQS modeling threshold for PM_{10} and the TAP EL for fluorides were based on proper operation and maintenance of scrubber and baghouse control devices.

Because not all of the emissions control devices may be installed at the same time, updates to the procedures document are required within 60 days of startup of each device.

Records supporting the emission factor developed from baghouse performance testing and the demonstration of functional equivalency for the second baghouse are required to demonstrate compliance with Permit Conditions 2.6 and 2.14.

New Permit Condition 2.10

Each month the permittee shall conduct a facility-wide inspection of potential sources of visible emissions; including any stack, vent, or other functionally equivalent opening; during daylight hours and under normal operating conditions, to demonstrate compliance with Permit Condition 2.4. The inspection shall consist of a see/no see evaluation for each potential source. If any visible emissions are present from any point of emission, the permittee shall either take appropriate corrective action as expeditiously as practicable or perform a Method 9 opacity test in accordance with the procedures outlined in IDAPA 58.01.01.625. A minimum of 30 observations shall be recorded when conducting the opacity test. If opacity is greater than 20% for a period or periods aggregating more than three minutes in any 60-minute period, the permittee shall take all necessary corrective action and report the exceedance in accordance with IDAPA 58.01.01.130-136.

The permittee shall maintain records of the results of each visible emissions inspection and each opacity

test when conducted. The records shall include, at a minimum, the date and results of each inspection and test and a description of the following: the permittee's assessment of the conditions existing at the time visible emissions are present (if observed), any corrective action taken in response to the visible emissions, and the date corrective action was taken. All records shall be maintained on-site for a period of 5 years and shall be made available to DEQ representatives upon request.

Discussion
This permit condition requires the permittee to conduct inspection and monitoring to insure compliance with the opacity limits in Permit Condition 2.4. Recordkeeping of the results of each inspection and when corrective measures are implemented is also required.

New Permit Condition 2.11

Any week the scrubber is operated, the permittee shall monitor and record the pressure drop across the scrubber on a weekly basis to demonstrate compliance with Permit Condition 2.7.

Discussion

This permit condition requires monitoring and recordkeeping to demonstrate compliance with Permit Condition 2.7.

New Permit Condition 2.12

Any week a baghouse is operated, the permittee shall monitor and record the pressure drop across each of the baghouses operated on a weekly basis to demonstrate compliance with Permit Condition 2.8.

Discussion

This permit condition requires monitoring and recordkeeping to demonstrate compliance with Permit Condition 2.8.

New Permit Condition 2.13

Performance testing on the Solid Lime Dry Scrubber stack shall be performed within 60 days following the date upon which the seven proposed HF chemical baths and associated scrubbing capacity have been installed.

The performance tests shall measure the fluorides (as F) emissions rate in pounds per calendar day to demonstrate compliance with the emission limit in Permit Condition 2.3.

The performance test shall be conducted under worst-case normal operating conditions and in accordance with IDAPA 58.01.01.157; Permit Condition 2.15; and General Provision 6 of this permit. The permittee is encouraged to submit a performance testing protocol for approval 30 days prior to conducting the performance tests.

Discussion

This permit condition requires performance testing to demonstrate compliance with the fluoride emissions limit in Permit Condition 2.3 when any HF chemical baths are added to the process above the number for which emissions estimates have been provided. The applicant has requested the flexibility to add HF chemical baths to the network of tools controlled by the scrubber(s) without any resulting increase in permitted emissions by demonstrating compliance with the emissions limits in Permit Condition 2.3. Refer to the discussion for Permit Condition 2.3 for additional information.

New Permit Condition 2.14

Performance testing of the first baghouse stack shall be performed 1) within 12 months following installation, or 2) when the number of installed open-topped polishers exceeds 10, or 3) when the number of enclosed polishers exceeds 20; whichever of these three conditions occurs first. A PM_{10} emission factor shall be developed that will determine the number of polishers that may be installed and operated to insure compliance with the PM_{10} emission rates in Permit Condition 2.3 before the second baghouse is required.

If a second baghouse is installed and is designed to the same or functionally equivalent specifications as the first baghouse, source testing will not be required as long as the number of polishers does not exceed those determined allowable by testing the first baghouse. Records demonstrating the functional equivalency of the second baghouse shall be maintained with the Scrubber and Baghouse/Filter System Procedures document in accordance with Permit Condition 2.9.

Performance tests shall measure the PM_{10} emissions rate in pounds per hour, and the opacity to demonstrate compliance with the emission limits in Permit Conditions 2.3 and 2.4.

Performance tests shall be conducted under worst-case normal operating conditions and in accordance with IDAPA 58.01.01.157; Permit Conditions 2.16, and 2.17; and General Provision 6 of this permit. The permittee is encouraged to submit a performance testing protocol for approval 30 days prior to conducting any performance tests.

Discussion

The applicant has requested the flexibility to add up to 10 open-topped and up to 20 enclosed polishers to the baghouse control system without any resulting increase in permitted emissions by demonstrating compliance with the emissions limits in Permit Conditions 2.3 and 2.4. As a result, performance testing is required to develop an emission factor in order to verify the maximum number of tools the baghouse control system can handle without exceeding the emissions limits.

In addition, because a manufacturer's certification of grain loading performance or control efficiency was not available at the time of permit issuance, performance testing of the first baghouse stack will be required within 12 months after installation in order to demonstrate compliance with the PM_{10} emissions limits (whether or not all of the proposed tools have been installed).

New Permit Condition 2.15

The permittee shall monitor and record the following during each performance test:

- The number of HF chemical baths installed.
- The number of HF chemical baths in operation.

Discussion

Monitoring and recordkeeping of performance test parameters is required to demonstrate compliance with Permit Condition 2.13 and General Provision 6.

New Permit Condition 2.16

The permittee shall monitor and record the following during each performance test:

- The number of open-topped polishing machines installed.
- The number of open-topped polishing machines in operation and vented to the baghouse being tested.

- The number of enclosed polishing machines installed.
- The number of enclosed polishing machines in operation and vented to the baghouse being tested.
- The visible emissions observed.

Discussion

Monitoring and recordkeeping of performance test parameters is required to demonstrate compliance with Permit Condition 2.14 and General Provision 6.

New Permit Condition 2.17

The permittee shall use EPA Method 5 and 202 or such comparable and equivalent methods approved in accordance with IDAPA 58.01.01.157 to determine compliance with the PM_{10} emission limit in Permit Condition 2.3. If performance test results from an EPA Method 202 or DEQ approved alternative test support a request to exclude the requirement to use EPA Method 202 in subsequent performance testing, this request should be made and supporting test results and documentation included in subsequent performance testing protocols submitted in accordance with General Provision 6.

The permittee shall use EPA Method 9 to determine compliance with the opacity matter standard in Permit Condition 2.4 in accordance with IDAPA 58.01.01.625.04.

Discussion

Test method and procedure requirements are required in accordance with IDAPA 58.01.01.700 and IDAPA 58.01.01.625.

The permittee requested the flexibility to request the elimination of Method 202 from future performance testing if the initial test demonstrates negligible levels of emissions. Because published guidance does provide DEQ with the authority to approve alternate testing options for processes depending on exhaust gas conditions, this flexibility was identified in the permit condition.

New Permit Condition 2.18

Performance test reports shall include records of the monitoring required by Permit Condition 2.15 or 2.16, and documentation that the performance test was conducted in accordance with Permit Condition 2.13 or 2.14. Performance test reports shall be submitted by the permittee to the following address:

Air Quality Permit Compliance
Boise Regional Office
Department of Environmental Quality
1445 N. Orchard St.
Boise, ID 83706

Discussion

Performance test reporting is required to demonstrate compliance with General Provision 6.

5. PERMIT FEES

Table 5.1 lists the processing fee associated with this permitting action. The facility is subject to a processing fee of $2,500 in accordance with IDAPA 58.01.01.225 because its permitted emissions are between one to less than 10 tons per year. Refer to the chronology in Section 2.2 for fee receipt dates.

Table 5.1 PROCESSING FEE TABLE

Emissions Inventory			
Pollutant	**Annual Emissions Increase (T/yr)**	**Annual Emissions Reduction (T/yr)**	**Annual Emissions Change (T/yr)**
NO_X	0.0	0	0.0
SO_2	0.0	0	0.0
CO	0.0	0	0.0
PM_{10}	3.8	0	3.8
VOC	0	0	0.0
HAP[1]	0.9	0	0.9
Total[1]:	**4.7**	**0**	**4.7**
Fee Due	**$2,500.00**		

[1] For the purposes of fee calculation, HAP emissions from PM_{10} are included in the PM_{10} emissions total, and are therefore not included in the HAP emissions total.

6. PUBLIC COMMENT

An opportunity for public comment period on the PTC application was provided in accordance with IDAPA 58.01.01.209.01.c. During this time, there was no comment on the application and there was no request for a public comment period on DEQ's proposed action. Refer to the chronology in Section 2.2 for comment period opportunity dates.

Appendix A – AIRS Information

AIRS/AFS Facility-wide Classification Form

Facility Name: Eagle Silicon - Caldwell Facility

Facility Location: Caldwell

Facility ID: 027-00099 **Date:** 11/03/2008

Project/Permit No.: P-2008.0136 **Completed By:** Morrie Lewis

☐ Check if there are no changes to the facilitywide classification resulting from this action. (compare to form with last permit)

☐ Yes, this facility is an SM80 source.

Identify the facility's area classification as A (attainment), N (nonattainment), or U (unclassified) for the following pollutants:

	SO2	PM10	VOC	
Area Classification:	U	A	U	DO NOT LEAVE ANY BLANK

Check one of the following:

☒ **SIP** [0] - Yes, this facility is subject to SIP requirements. (do not use if facility is Title V)

OR

☐ **Title V** [V] - Yes, this facility is subject to Title V requirements. (If yes, do not also use SIP listed above.)

For SIP or TV, identify the classification (A, SM, B, C, or ND) for the pollutants listed below. Leave box blank if pollutant is not applicable to facility.

	SO2	NOx	CO	PM10	PT (PM)	VOC	THAP
Classification:	B	B	B	B	B	B	B

☐ **PSD** [6] - Yes, this facility has a PSD permit.

If yes, identify the pollutant(s) listed below that apply to PSD. Leave box blank if pollutant does not apply to PSD.

	SO2	NOx	CO	PM10	PT (PM)	VOC	THAP
Classification:	☐	☐	☐	☐	☐	☐	☐

☐ **NSR - NAA** [7] - Yes, this facility is subject to NSR nonattainment area (IDAPA 58.01.01.204) requirements.

Note: As of 9/12/08, Idaho has no facility in this category.

If yes, identify the pollutant(s) listed below that apply to NSR-NAA. Leave box blank if pollutant does not apply to NSR - NAA.

	SO2	NOx	CO	PM10	PT (PM)	VOC	THAP
Classification:	☐	☐	☐	☐	☐	☐	☐

☐ **NESHAP** [8] - Yes, this facility is subject to NESHAP (Part 61) requirements. (THAP only)

If yes, what CFR Subpart(s) is applicable?

☐ **NSPS** [9] - Yes, this facility is subject to NSPS (Part 60) requirements.

If yes, what CFR Subpart(s) is applicable?

If yes, identify the pollutant(s) regulated by the subpart(s) listed above. Leave box blank if pollutant does not apply to the NSPS.

	SO2	NOx	CO	PM10	PT (PM)	VOC	THAP
Classification:	☐	☐	☐	☐	☐	☐	☐

☐ **MACT** [M] - Yes, this facility is subject to MACT (Part 63) requirements. (THAP only)

If yes, what CFR Subpart(s) is applicable?

Appendix B – Emissions Inventory

Proposed Baghouse 1

Emission Calculations

Flowrate Exiting Baghouse

Baghouse Flowrate
cfm
5,000

Grain Loading

Proposed Grain Loading
gr/dscf
0.01

Emission Calculations

Pollutant	lb/hr	TPY [a]
PM	0.4	1.9
PM10 [b]	0.4	1.9

a - Based on 8,760 operating hours per year (Maximum Potential).
b - Assume all PM is PM10.

Proposed Baghouse 2

Emission Calculations

Flowrate Exiting Baghouse

Baghouse Flowrate
cfm
5,000

Grain Loading

Proposed Grain Loading
gr/dscf
0.01

Emission Calculations

Pollutant	lb/hr	TPY [a]
PM	0.4	1.9
PM10 [b]	0.4	1.9

a - Based on 8,760 operating hours per year (Maximum Potential).
b - Assume all PM is PM10.

HF Bath System Uncontrolled Emission Rate Calculation

The uncontrolled HF emissions are based on the following information:

- Three 11 ¾ inch by 17 ¼ inch surface area HF baths,
- Eagle Silicon uses a HF aqueous solution of 25 percent HF and 75 percent water, by weight.
    - Vapor Pressure of HF is conservatively 2.5 mmHg (0.003289 atm) at conservatively 90 °F and 25 percent HF solution by weight – See attached Honeywell Partial Pressure of HF over Aqueous Solutions of HF.
- The HF bath maximum temperature is approximately 90 °F.

$$Surface\ Area\ of\ Each\ HF\ Bath = (11.75\,inches)(17.25\,inches) = 202.68\,in.^2$$

$$Total\ Surface\ Area\ of\ Three\ HF\ Baths\ (A_{TOT}) = (3)(202.68\,in.^2)\left(\frac{1\,ft^2}{144\,in^2}\right)\left(\frac{0.0929\,m^2}{1\,ft^2}\right) = 0.39229\,m^2$$

$$HF\ Mass\ Transfer\ Coefficient\ (K_{HF})\ using\ water\ as\ reference - MW_{H20} = 18g/mole; MW_{HF} = 20g/mole;$$
$$K_{H2O} = 0.83cm/s$$

$$K_{HF} = K_{H2O}\left(\frac{MW_{H2O}}{MW_{HF}}\right)^{1/3} = 0.83\,cm/s\left(\frac{18\,g/mole}{20\,g/mole}\right)^{1/3} = 0.80136\,cm/s = 0.0080136\,m/s$$

$$HF\ Volatilization\ Rate\ (Q_{HF}) = \frac{M_{HF} * K_{HF} * A_{TOT} * VP_{HF}}{R * T}$$

$$Q_{HF} = \frac{(20\,g/mole)(0.0080136\,m/s)(0.39229\,m2)(0.003289\,atm)}{\left(8.21\times10^{-5}\,\frac{m^3 atm}{mole\,K}\right)(305.4\,K)} = 0.008249\,g/s$$

$$Q_{HF} = 0.008249 g/s\left(\frac{1lb}{453.6\,g}\right)\left(\frac{3600\,s}{1\,hr}\right) = 0.065\,lb/hr$$

EAGLE SILICON

INTEGRITY, VALUE, TECHNOLOGY

Table 1. Eagle Silicon Potential TAP Emission Rates

Toxic Air Pollutant	February 2008 Bulk Test (ppm)	September 2008 Bulk Test (% weight)	Potential TAP Emission Rate (lb/hr) [a]	EL [b] (lb/hr)	Exceed EL? (Yes/No)
Arsenic	21.40	--	1.83E-05	1.5E-06	Yes
Barium	41.0	--	3.51E-05	0.033	No
Cadmium	0.500	--	4.29E-07	3.70E-06	No
Chromium	14.700	--	1.26E-05	0.033	No
Copper	523.00	--	4.48E-04	0.067	No
Lead [c]	3.70	--	3.17E-06	0.137	No
Mercury	1.00	--	8.57E-07	0.007	No
Selenium	0.5	--	4.29E-07	0.013	No
Silver	12.20	--	1.05E-05	0.007	No
Silica, Quartz	--	< 0.8 %	0.01	6.70E-03	Yes
Silica, Cristobalite	--	< 0.8 %	0.01	3.30E-03	Yes
Silica, Tridymite	--	< 0.8 %	0.01	3.30E-03	Yes
Silicon Carbide	--	--	0.86	6.67E-01	Yes

a - TAP emission rate based on maximum TAP concentration and potential PM emission rate (0.86 lb/hr) from two proposed baghouses. Silicon Carbide conservatively assumed to be 100 percent of potential PM emissions.

b - Screening Emission Levels, IDAPA 58.01.01.585 and 586.

c - Lead is not a TAP, so ENVIRON compared expected emissions with the hourly equivalent of the annual significant emission rate (1,200 pounds per year).

Table 3. TAP Dispersion Modeling Results

Pollutant	Averaging Time	Project Specific Concentrations (ug/m^3)	AAC [a] (ug/m^3)	AACC [b] (ug/m^3)
Arsenic	Annual	8.04E-05	--	2.30E-04
Silica, quartz	24-hour	0.1	5	--
Silica, Cristobalite	24-hour	0.1	2.5	--
Silicon, Tridymite	24-hour	0.1	2.5	--
Silicon Carbide	24-hour	12.5	500	--

A - Acceptable Ambient Concentrations for non-carcinogens IDAPA 58.01.01.585

B - Acceptable Ambient Concentrations for Carcinogens IDAPA 58.01.01.586

Appendix C – Ambient Air Quality Impact Analysis

MEMORANDUM

DATE: November 21, 2008

TO: Morrie Lewis, Permit Writer, Air Program

FROM: Darrin Mehr, Air Quality Analyst, Air Program

PROJECT NUMBER: P-2008.0136

SUBJECT: Modeling Demonstration for Eagle Silicon, Permit to Construct for Their Facility in Caldwell, Idaho

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1.0 Summary

Eagle Silicon submitted an application for a Permit to Construct (PTC) on August 20, 2008. On October 21, 2008, DEQ received a response to DEQ's September 16, 2008 incompleteness determination letter.

Eagle Silicon is an existing facility that recycles silicon materials, which recently has included scrapped silicon wafers not meeting product specifications from semi-conductor manufacturers. The scrap silicon wafers typically contain the dies which contain semi-conducting materials. This die material is removed by either a mechanical process or a chemical process prior to resale as a product.

The proposed project consists of an increase in recycled silicon material to be processed by either the mechanical process or the chemical process. The facility has requested authorization to install two baghouses to control particulate emissions from the mechanical die removal process and multiple hydrofluoric acid baths which will be controlled by dry scrubber beds packed with solid lime. There will be at least two hydrofluoric acid scrubbers.

IDAPA 58.01.01.203.02 requires the facility to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS). IDAPA 58.01.01.210 requires the facility to demonstrate compliance with the toxic air pollutants (TAPs) increments, which are listed in IDAPA 58.01.01.585 and 586.

ENVIRON International Corporation (ENVIRON) performed the ambient air dispersion modeling demonstration for this project on behalf of Eagle Silicon. The modeling analyses: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data; 3) adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed that predicted pollutant concentrations from emissions associated with the facility were below applicable TAP increments at all receptor locations. DEQ did not re-run the modeling demonstration for this project using the applicant's assumptions. DEQ ran the modeling using receptors within the assumed ambient air boundary and for receptors placed between 400 meters and 450 meters from the stack location. Table 1 presents key assumptions and results that should be considered in the development of the permit.

Table 1. KEY ASSUMPTIONS USED IN MODELING ANALYSES	
Criteria/Assumption/Result	**Explanation/Consideration**
Eagle Silicon has requested a facility-wide TAP limit of 0.167 lb/hr of hydrofluoric acid emissions. Because hydrofluoric acid is a non-carcinogenic TAP, the appropriate average period is 24 hours. The daily emission rate for 24 hours of continuous emissions at the 0.167 lb/hr rate is 4.00 pounds per day.	No modeling demonstration was required for hydrofluoric acid because the facility states it will comply with an enforceable limitation of 0.167 lb/hr. There is no recommended limitation on the number of release points for this pollutant because modeling and the associated modeling assumptions were not used to establish this emissions limit. An emission limit on hydrofluoric acid should be included in the permit that limits emissions to either 0.167 lb/hr or 4.00 lb/day.
Eagle Silicon demonstrated compliance with the TAPs increments for the forms of silica using emission rates relying on baghouse control efficiency. DEQ has interpreted this approach as a controlled emission rate and a controlled ambient concentration in accordance with IDAPA 58.01.01.210.08.	The application did not establish whether the two proposed baghouses qualify as air pollution control equipment or process equipment. Therefore, modeling staff assumed the baghouses are considered air pollution control equipment and their effect on TAP emissions AND PM_{10} emissions is a controlled emissions scenario. The permit should contain requirements for installation and proper operation of the baghouses as air pollution control equipment meeting the design criteria used in the submitted ambient air dispersion analyses.
Modeling of PM_{10} emissions was not required for this project because emissions were below secondary modeling thresholds that are currently applied on a case-by-case basis. ENVIRON contacted DEQ and received approval by email to not model PM_{10} emissions to demonstrate compliance with the PM_{10} NAAQS. Potential PM_{10} emissions were estimated to be 0.86 lb/hr and 3.8 T/yr.	There are two identical baghouses proposed for this project. The baghouse vents will vent vertically and will be unobstructed. The exhaust will be vented at a velocity of 47.2 feet per second an exit temperature of 80 degrees Fahrenheit, and a stack height of 30 feet. Exhaust parameters are an important part of applying the draft secondary modeling thresholds. These baghouses are the only sources of PM_{10} listed in the application materials. Potential emissions were estimated based on continuous operation (8,760 hours per year) with a grain loading limit of 0.01 grains per dry standard cubic foot of exhaust, and 5,000 cubic feet per minute of exhaust.

2.0 Background Information

2.1 Applicable Air Quality Impact Limits and Modeling Requirements

This section identifies applicable ambient air quality limits and analyses used to demonstrate compliance.

2.1.1 Area Classification

The Eagle Silicon facility is located in Canyon County, designated as an attainment or unclassifiable area for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), lead (Pb), ozone (O_3), and particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}).

There are no Class I areas within 10 kilometers of the facility.

2.1.2 Significant and Full Impact Analyses

Potential emissions of PM_{10} were below the draft secondary modeling thresholds of 0.9 lb/hr for the 24-hour averaging period and 7 tons per year for the annual averaging period. These thresholds are applied on a case-by-case basis, and ENVIRON received email verification from DEQ that this project qualified for use of the draft secondary thresholds. The draft secondary modeling thresholds are intended to replace

the thresholds currently listed in the *State of Idaho Air Quality Modeling Guideline*. The *Guideline* will be updated in the near future to reflect these changes. No emissions of CO, SO_2, or NO_x were identified in the permit application. Lead emissions were also below the modeling threshold. Therefore, no significant or full impact analyses were conducted for this project.

2.1.3 TAPs Analyses

The increase in emissions from the proposed project are required to demonstrate compliance with the toxic air pollutant (TAP) increments, with an ambient impact dispersion analysis for any TAP with a requested potential emission rate that exceeds the screening emission rate limit (EL) specified by IDAPA 58.01.01.585 or 58.01.01.586.

This project is for an existing facility. The facility is applying for a modification to the existing operations with particulate TAP emissions exhausted to the atmosphere, and an increase in hydrofluoric acid emissions to the atmosphere. The submitted analyses included a project-specific TAPs compliance demonstration per the requirements of IDAPA 58.01.01.210.

The proposed installation of the two baghouses will emit arsenic, quartz silica, cristobalite silica, tridymite silica, and silicon carbide in quantities exceeding the screening level emission rate for each TAP.

The permittee has requested allowable hydrofluoric acid emissions of less than 0.167 lb/hr to be applied on a facility-wide basis. Hydrofluoric acid is a non-carcinogenic TAP regulated under IDAPA 58.01.01.585, and has a 24-hour averaging period. Daily emissions for a 24-hour period are 4.00 pounds per day based on the 0.167 lb/hr screening emission rate. No modeling was required for demonstrating compliance with the TAP increment with a facility-wide requested emission limit of 0.167 lb/hr of hydrofluoric acid.

2.2 Background Concentrations

Ambient background concentrations for criteria air pollutants were not required for this modeling demonstration. Emissions of each criteria air pollutant under the requested operating scenario were below modeling thresholds for modeling demonstrations as discussed above in Section 2.1.2 of this memo.

3.0 Modeling Impact Assessment

3.1 Modeling Methodology

Table 2 provides a summary of the modeling parameters used in the submitted modeling analyses.

Table 2. MODELING PARAMETERS		
Parameter	**Description/ Values**	**Documentation/Additional Description**
Model	SCREEN3	SCREEN3, Version 96043
Meteorological data	SCREEN3 met	The full meteorology option was used
Land Use (urban or rural)	Rural	Rural dispersion coefficients were used.
Terrain	Considered	Intermediate terrain was used by the applicant. • From 25 meters to 400 meters the terrain was considered flat. • From 450 meters to 800 meters between the stack and the receptors, a terrain height of 2 meters above the stack base elevation was used. • From 800 to 1,100 meters between the stack and receptors, a terrain height of 4 meters above stack base elevation was used. • From 1,100 to 1,600 meters between the stack and receptors, a terrain height of 6 meters above the stack base elevation was used. • From 1,600 to 5,000 meters between the stack and receptors, a terrain height of 8 meters above stack base elevation was used.
Building downwash	Downwash algorithm	Building downwash effects were considered in the modeling. The dimensions of the building were used as inputs for SCREEN3 and the cavity lengths and concentrations were evaluated using the Huber-Snyder algorithms. The maximum horizontal dimension of this building was correctly entered in SCREEN3.
Receptor grid	Grid 1	Initial ambient receptor set at a distance of 25 meters from the stack location to the ambient air boundary to a distance of 400 meters.
	Grid 2	Receptors were set from a distance of 450 meters to the stack to 5,000 meters to the stack location.

3.1.1 Modeling protocol

A modeling protocol was not submitted by ENVIRON, on behalf of Eagle Silicon, prior to submission of the PTC application. An email from ENVIRON was received by Kevin Schilling, Stationary Source Modeling Coordinator, on July 30, 2008, concerning PM_{10} emissions and the PM_{10} NAAQS compliance demonstration. DEQ responded by email (date unknown) approving the use of draft secondary modeling thresholds for PM_{10} for this project. Modeling was conducted using methods documented in the *State of Idaho Air Quality Modeling Guideline.*

3.1.2 Model Selection

SCREEN3 was used by Eagle Silicon to conduct the ambient air analyses. The two proposed baghouses will have identical exhaust parameters and will be located approximately 80 feet apart. Modeling of emissions using a single representative stack is appropriate for this situation. Eagle Silicon has applied conservative assumptions to the emission rates of modeled TAPs. Building-induced downwash effects were also accounted for in this SCREEN3 analysis.

3.1.3 Meteorological Data

The full meteorology option was used for this analysis, which uses meteorological conditions that references all stability classes and associated wind speeds to provide conservative ambient impact predictions.

3.1.4 Terrain Effects

The modeling analyses conducted by ENVIRON on behalf of Eagle Silicon considered elevated terrain around the facility's site. Intermediate terrain conditions exist—the surrounding terrain is higher in elevation than the stack base elevation, but is below the release elevation.

Eagle Silicon represented the intermediate terrain conditions by inputting elevated terrain values at different distances from the baghouse stacks, as follows:

- Terrain elevation of 2 meters above stack base elevation from 450 meters to 800 meters from stacks;
- Terrain elevation of 4 meters above stack base elevation from 800 meters to 1,100 meters from stacks;
- Terrain elevation of 6 meters above stack base elevation from 1,100 meters to 1,600 meters from stacks; and,
- Terrain elevation of 8 meters above stack base elevation from 1,600 meters to 5,000 meters from stacks.

3.1.5 Facility Layout

DEQ verified proper identification of the facility boundary and buildings on the site by comparing the plot plan submitted with the application to satellite images of the site on the Google Earth internet website. The Google Earth images presented detailed enough information to assure ambient air boundary values and building dimensions used in the analysis were accurate.

3.1.6 Building Downwash

Plume downwash effects caused by structures present at the facility were accounted for in the modeling analyses. The building dimensions were entered in SCREEN3 and the SCREEN3 program used Huber-Schneider downwash algorithms to determine ambient impacts affected by building downwash.

3.1.7 Ambient Air Boundary

The application materials do not contain any discussion or substantiation for the facility's ambient air boundary. ENVIRON used a distance of 25 meters from the proposed baghouse stacks to the property boundary. Review of the facility layout on Google Earth did not provide definitive proof that the property boundary was fenced or posted with no trespassing signs. Fencing and posting are typical methods used to control public access to within an ambient air boundary, as discussed in the *State of Idaho Air Quality Modeling Guideline*.

In the absence of an ambient air boundary defense in the application, DEQ performed an additional SCREEN3 run using ambient receptors spaced from 1 meter from the baghouse stack to a distance of 25 meters from the stack. This approach treats the entire area within the property boundary as ambient air, and is the most conservative approach. The resulting maximum ambient impact for receptors between 1 meter and 25 meters was 16.82 $\mu g/m^3$ per pound of emissions per hour, 1-hour average. This impact is lower than the design concentration of 36.52 $\mu g/m^3$ per pound of emissions per hour, 1-hour average. Therefore, the resolving the defense of the ambient air boundary is not an issue for this project. See Appendix A of this memorandum to review the SCREEN3 output file for DEQ's sensitivity analysis.

3.1.8 Receptor Network

Eagle Silicon used SCREEN3 for the modeling demonstration. The "receptor grid" used by SCREEN3 is

determined by using the minimum distance from each of the two emission points modeled to the ambient air boundary. A maximum distance was input by Eagle Silicon to determine the area covered by receptors. The "grid" for each SCREEN3 run extends from the minimum distance to the maximum distance for 360 degrees around the source.

Eagle Silicon's modeling demonstration was missing receptors spaced from 400 to 450 meters. DEQ verification analysis assumed the land surrounding the facility within this range was flat and un-elevated in relation to the stack base elevation. DEQ's SCREEN3 run for this sensitivity analysis determined that the maximum predicted ambient impact was less than the submitted design ambient concentration. Therefore, no changes to the modeling demonstration were warranted or required. See Appendix B to review the SCREEN3 output file for the sensitivity analysis.

The receptor locations used by Eagle Silicon met the minimum recommendations specified in the *State of Idaho Air Quality Modeling Guideline*. DEQ determined that the receptor grid was adequate to reasonably resolve the maximum modeled ambient impacts.

3.2 Emission Rates

Emissions rates used in the dispersion modeling analyses submitted by the applicant were reviewed against those in the permit application. The following approach was used for DEQ modeling:

- All modeled TAP emissions rates were equal to or greater than the facility's emissions calculated in the PTC application or requested permit allowable emission rates.

The short-term emission rates listed in Table 3 were modeled by Eagle Silicon for 24 hours per day for the non-carcinogenic TAPs and 8,760 hours per year for the carcinogenic TAP. Emission rates are facility-wide emission rates.

No criteria air pollutants were modeled for this project. DEQ Emissions of PM_{10} and lead are below modeling thresholds.

Table 3. MODELED TOXIC AIR POLLUTANTS EMISSIONS RATES

Source ID	Description	Toxic Air Pollutants				
		Arsenic (lb/hr)[a]	Silica, Quartz (lb/hr)	Silica, Cristobalite (lb/hr)	Silica, Tridymite (lb/hr)	Silicon Carbide (lb/hr)
BH1, BH2	Baghouse Vent 1 & Baghouse Vent 2	1.83E-05	0.01	0.01	0.01	0.86

[a] Pounds per hour

3. 3 Emission Release Parameters

Table 4 provides emissions release parameters, including stack height, stack diameter, exhaust temperature, and exhaust velocity for point sources. Documentation on the release parameters was not included in the application because the baghouse manufacturer has not been selected yet. The release parameters were accepted by DEQ as submitted.

Table 4. POINT SOURCE STACK PARAMETERS

Release Point	Description	Stack Height (m)[a]	Modeled Stack Diameter (m)	Stack Gas Flow Temperature (K)[b]	Stack Gas Flow Velocity (m/sec)[c]
BH01	Baghouse Vent 1	9.14	0.50	299.8	14.4
BH02	Baghouse Vent 2	9.14	0.50	299.8	14.4

[a] Meters
[b] Kelvin
[c] Meters per second

3.4 Results for Ambient Impact Analyses

3.4.1 Full Impact Analyses

Modeling of criteria air pollutants was not required for this project.

3.4.2 Toxic Air Pollutant Impact Analyses

Modeling for TAPs was required to demonstrate compliance with the TAP increments specified by IDAPA 58.01.01.585 and 586.

The results of the TAPs analyses are listed in Table 5.

Table 5. RESULTS OF TAP ANALYSES

TAP	Averaging Period	Maximum Modeled Concentration (ug/m^3)[a]	ACC/AACC[b] (ug/m^3)	Percent of AAC/AACC
Carcinogenic TAP				
Arsenic	Annual	8.4E-05	2.3E-04	37%
Non-Carcinogenic TAPs				
Silica, Quartz	24-hour	0.1	5.0	2%
Silica, Cristobalite	24-hour	0.1	2.5	4%
Silica, Tridymite	24-hour	0.1	2.5	4%
Silicon carbide	24-hour	12.5	500	3%

[a] Micrograms per cubic meter
[b] Acceptable ambient concentration for non-carcinogens/acceptable ambient concentration for carcinogens

4.0 Conclusions

The ambient air impact analysis submitted, in combination with DEQ's verification analyses, demonstrated to DEQ's satisfaction that emissions from the facility, as represented by the applicant in the permit application, will not cause or significantly contribute to a violation of any air quality standard.

APPENDIX A

DEQ Sensitivity Analysis

Ambient Air Boundary

SCREEN3 Run Results

10/27/08
10:44:19

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Silicon - Ambient air boundary set at 1 meter due to no substantiation in

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 9.1400
STK INSIDE DIAM (M) = 0.5000
STK EXIT VELOCITY (M/S)= 14.3998
STK GAS EXIT TEMP (K) = 299.8000
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 4.8800
MIN HORIZ BLDG DIM (M) = 23.7700
MAX HORIZ BLDG DIM (M) = 64.8600

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.196 M**4/S**3; MOM. FLUX = 12.672 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	0.000	1	1.0	1.0	320.0	30.74	1.81	1.77	NO
5.	0.3048E-09	6	1.0	1.0	10000.0	23.46	3.02	3.01	NO
10.	0.1286E-04	6	1.0	1.0	10000.0	23.46	3.80	3.79	NO
15.	12.15	4	20.0	20.0	6400.0	9.14	1.42	3.45	HS
20.	14.66	4	20.0	20.0	6400.0	9.22	1.85	3.78	HS
25.	16.82	4	20.0	20.0	6400.0	9.29	2.28	4.12	HS

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** REGULATORY (Default) ***
PERFORMING CAVITY CALCULATIONS
WITH ORIGINAL SCREEN CAVITY MODEL

(BRODE, 1988)
****

*** CAVITY CALCULATION - 1 *** *** CAVITY CALCULATION - 2 ***
CONC (UG/M**3) = 0.000 CONC (UG/M**3) = 0.000
CRIT WS @10M (M/S) = 99.99 CRIT WS @10M (M/S) = 99.99
CRIT WS @ HS (M/S) = 99.99 CRIT WS @ HS (M/S) = 99.99
DILUTION WS (M/S) = 99.99 DILUTION WS (M/S) = 99.99
CAVITY HT (M) = 4.89 CAVITY HT (M) = 4.88
CAVITY LENGTH (M) = 26.26 CAVITY LENGTH (M) = 18.76
ALONGWIND DIM (M) = 23.77 ALONGWIND DIM (M) = 64.86

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
END OF CAVITY CALCULATIONS
****

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
****

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	16.82	25.	0.

APPENDIX B

DEQ Sensitivity Analysis

Receptors Placed from 400 meters to 450 meters from Source

SCREEN3 Run Results

11/20/08
13:37:20

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

Eagle Silicon - 400 meters to 450 meters

SIMPLE TERRAIN INPUTS:
SOURCE TYPE = POINT
EMISSION RATE (G/S) = 0.126000
STACK HEIGHT (M) = 9.1400
STK INSIDE DIAM (M) = 0.5000
STK EXIT VELOCITY (M/S)= 14.3998
STK GAS EXIT TEMP (K) = 299.8000
AMBIENT AIR TEMP (K) = 293.1500
RECEPTOR HEIGHT (M) = 0.0000
URBAN/RURAL OPTION = RURAL
BUILDING HEIGHT (M) = 4.8800
MIN HORIZ BLDG DIM (M) = 23.7700
MAX HORIZ BLDG DIM (M) = 64.8600

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 0.196 M**4/S**3; MOM. FLUX = 12.672 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
400.	19.16	4	2.0	2.0	640.0	19.94	29.62	15.58	NO
410.	18.95	4	2.0	2.0	640.0	19.94	30.29	15.88	NO
420.	18.74	4	1.5	1.5	480.0	23.54	31.08	16.41	NO
430.	18.68	4	1.5	1.5	480.0	23.54	31.74	16.71	NO
440.	18.61	4	1.5	1.5	480.0	23.54	32.41	17.00	NO
450.	18.51	4	1.5	1.5	480.0	23.54	33.07	17.30	NO

DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** REGULATORY (Default) ***
PERFORMING CAVITY CALCULATIONS
WITH ORIGINAL SCREEN CAVITY MODEL

(BRODE, 1988)
****

*** CAVITY CALCULATION - 1 *** *** CAVITY CALCULATION - 2 ***
CONC (UG/M**3) = 0.000 CONC (UG/M**3) = 0.000
CRIT WS @10M (M/S) = 99.99 CRIT WS @10M (M/S) = 99.99
CRIT WS @ HS (M/S) = 99.99 CRIT WS @ HS (M/S) = 99.99
DILUTION WS (M/S) = 99.99 DILUTION WS (M/S) = 99.99
CAVITY HT (M) = 4.89 CAVITY HT (M) = 4.88
CAVITY LENGTH (M) = 26.26 CAVITY LENGTH (M) = 18.76
ALONGWIND DIM (M) = 23.77 ALONGWIND DIM (M) = 64.86

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

****
END OF CAVITY CALCULATIONS
****

****
*** SUMMARY OF SCREEN MODEL RESULTS ***
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CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
SIMPLE TERRAIN	19.16	400.	0.