Air Quality Permitting
Technical Analysis

Tier II Operating Permit and Permit to Construct No. 057-00025

UNIVERSITY OF IDAHO
MOSCOW, IDAHO

Prepared by:

Darrin Mehr
Associate Air Quality Engineer
August 2, 2002

Project No. T2-010200

FINAL PERMIT

TABLE OF CONTENTS

ACRONYMS, UNITS, AND CHEMICAL NOMENCLATURE

ACFM	Actual Cubic Feet Per Minute
AFS	AIRS Facility Subsystem
AIRS	Aerometric Information Retrieval System
AQCR	Air Quality Control Region
BACT	Best Available Control Technology
Btu/hr	British Thermal Units Per Hour
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CO#1	First Consent Order
CO#2	Second Consent Order
CO#3	Third Consent Order
CO#4	Fourth Consent Order
COMS	Continuous Opacity Monitoring System
DEQ	Idaho Department of Environmental Quality
dscf	Dry Standard Cubic Feet
EF	Emission Factor
EPA	United States Environmental Protection Agency
gpm	Gallons Per Minute
gr	Grain (1 lb = 7,000 grains)
HAPs	*Hazardous Air Pollutants*
Hr	Hour
IDAPA	Idaho Administrative Procedures Act
km	Kilometer
lb/hr	Pound Per Hour
lbs steam/hr	Pounds Steam Per Hour
MACT	Maximum Available Control Technology
MMBtu	Million British Thermal Units
NAAQS	National Ambient Air Quality Standards
NESHAP	Nation Emission Standards for Hazardous Air Pollutants
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NOV	Notice of Violation
NSPS	New Source Performance Standards
O_3	Ozone
O & M	Operation and Maintenance
permit	Operating Permit
PM	Particulate Matter
PM_{10}	Particulate Matter with an Aerodynamic Diameter of 10 Micrometers or Less
ppm	Parts Per Million
PS1	Performance Specification One, per 40 CFR 60
PSD	Prevention of Significant Deterioration
PTC	Permit To Construct
PTE	Potential To Emit
SCC	Source Classification Code
scf	Standard Cubic Feet
SIP	*State Implementation Plan*
SO_2	Sulfur Dioxide
TSP	Total Suspended Particulates
T/yr	Tons Per Year
$\mu g/m^3$	Micrograms per Cubic Meter
µm	Micrometers
U of I	University of Idaho
VECP	Visible Emissions Compliance Plan
VOC	Volatile Organic Compound

PURPOSE

The purpose for this memorandum is to satisfy the requirements of IDAPA 58.01.01 Sections 400 through 470, *Rules for the Control of Air Pollution in Idaho* for Tier II Operating Permits and Sections 200 through 228 for Permits to Construct .

PROJECT DESCRIPTION

This project includes the issuance of a Tier II operating permit for the University of Idaho (U of I) located in Moscow, Idaho. The emissions sources of the facility are:

- One solid fuels wood-waste-fired boiler (wood-waste boiler);
- Two natural gas-fired boilers;
- Three diesel-fired emergency electrical generator engines;
- Other typically insignificant point sources including natural gas-fired domestic hot water heaters, small natural gas-fired space heating units, laboratory fume hoods, etc.; and
- Fugitive particulate matter emissions resulting from vehicle traffic on paved roads and parking lots, boiler ash handling, and wood-waste material transfer operations.

The scope of this project is the issuance of an Idaho Department of Environmental Quality (DEQ) required Tier II permit. The Tier II permit is a facility-wide operating permit that includes the most significant sources at the U of I. The emissions units included in the permit will be required to comply with the National Ambient Air Quality Standards (NAAQS). This Tier II permit is intended to serve as the enforceable document addressing the permitting requirements for the wood-waste boiler, which was constructed in 1986. This Tier II permit must be issued prior to DEQ's termination of the U of I's effective consent order.

This project incorporates the requirements listed in the consent orders that meet the criteria of *applicable requirements*, per the definition listed in IDAPA 58.01.01.008.03. These requirements have been included in the Tier II permit.

Finally, this Tier II permit serves as the basis for developing the facility's Tier I permit, and will be used along with the facility's Tier I permit application to draft and issue a Tier I permit to the facility.

The facility's air quality source file was used extensively in the development of this Tier II permit.

FACILITY DESCRIPTION

The U of I's primary campus is located in Moscow, Idaho. The facility covers approximately 1,200 acres of land. The facility is comprised of educational instruction buildings, research buildings, various student housing units, activity centers, and infrastructure to support day-to-day operations at the U of I.

The facility contains numerous individual buildings that house the instructional and research functions. Some buildings are equipped with domestic hot water heaters, small boilers, and small furnaces, which are generally fired on natural gas.

The most significant emissions sources are located in the power building, where the three main boilers provide steam for space heating during cold weather and space cooling through an absorption chiller system during the summer. Two of these boilers are fired exclusively by natural gas and the third boiler is fired on wood-waste and a small amount of paper waste. The other significant sources are three diesel-fired engines for emergency electrical backup generators located on the campus.

SUMMARY OF EVENTS

On November 7, 1985, the contract for the U of I's wood-waste boiler was awarded to Midwesco.

On February 28, 1986, the U of I submitted a permit to construct (PTC) application for the wood-waste boiler to DEQ. The application was dated February 14, 1986.

On October 15, 1986, the U of I commenced construction of the wood-waste boiler.

On October 23, 1986, DEQ issued a denial for a PTC for the solid fuels wood-waste-fired boiler.

On November 17, 1986, DEQ personnel observed that construction of the wood-waste boiler has commenced.

On November 24, 1986, DEQ issued a Notice of Violation (NOV) to the U of I for failure to obtain a PTC for their new wood-waste boiler.

On November 25, 1986, a compliance conference was conducted between DEQ and the U of I.

On December 23, 1986, a consent order (CO#1) regarding failure to obtain a PTC for the solid fuels wood-waste-fired boiler was issued by DEQ and signed by the U of I .

On February 1, 1988, in response to problems the U of I experienced meeting CO#1 source testing requirements, DEQ amended the consent order to allow testing at steam-loading rates between 33,000 lbs/hr and 38,000 lbs/hr. If compliance within this range is demonstrated, the wood-waste boiler's operational limitation will be set at 38,000 lbs steam/hr.

On February 24, 1988, the U of I conducted a source test on the wood-waste boiler.

On July 19, 1988, DEQ sent to the U of I a letter stating that:

- The conditions of the amended CO#1 "... have now been met.";
- Because they passed the source test at 40,500 lbs steam/hr, that amount is the operational limitation on the boiler; and
- If a higher limit is desired, the U of I must conduct and pass an additional source test at higher steam-loading rates.

On January 3, 1989, DEQ sent to the U of I a letter informing them that they could proceed with a source test at a higher steam-loading rate. However, after the source test was conducted and compliance demonstrated, they must obtain a PTC to operate above the established operational limitation of 40,500 lbs steam/hr.

On May 13, 1992, DEQ sent to the U of I a letter reiterating that to operate the wood-waste boiler above 40,500 lbs steam/hr would be a modification, therefore a PTC must be obtained in advance.

On January 20, 1993, a DEQ inspection discovered that the U of I's wood-waste boiler routinely exceeded the 40,500 lbs steam/hr limit during November and December of 1992, and in January 1993. It was determined that some production rates were higher than 70,000 lbs steam/hr.

On April 27, 1993, the U of I was notified by letter that they were in violation for failure to obtain a PTC authorizing wood-waste boiler operations greater than 40,500 lbs steam/hr.

On January 21, 1994, the United States Environmental Protection Agency (EPA) issued to the U of I a NOV for failure to obtain a PTC for operation of the wood-waste boiler at steam-loading rates above 40,500 lbs steam/hr.

On April 26, 1994, the EPA verbally agreed to allow DEQ to negotiate a NOV settlement with the U of I. DEQ told the EPA of the intent to issue an operating permit to the U of I *"... to cover all permitable air sources."*

On May 18, 1994, a compliance conference was held between DEQ and the U of I. Negotiations continued into early 1995.

On February 16, 1995, the U of I conducted a source test on the boiler. The test demonstrated noncompliance at an average steam-loading rate of 53,000 lbs/hr. The performance test results averaged 0.096 grains per dry standard cubic feet (gr/dscf), corrected to 8% oxygen by volume, vs. the grain-loading standard limitation of 0.080 gr/dscf, corrected to 8% oxygen by volume.

On March 28, 1995, a second consent order (CO#2) regarding the solid fuels wood-waste-fired boiler was issued by DEQ and signed by the U of I.

On July 25, 1995, DEQ received an application for a Tier II permit from the U of I, requesting synthetic minor emissions limits to exempt the facility from Title V permitting requirements.

On August 4, 1995, DEQ received the facility's modeling results to demonstrate compliance with the NAAQS in support of the Tier II permit application.

On February, 8, 1996, DEQ sent to the U of I a stipulated penalty demand letter (pursuant to the requirements of CO#2) for the visible emissions violation observed in 1995. In this letter, DEQ offered to waive the required penalty in exchange for submittal of a Visible Emissions Compliance Plan (VECP).

On February 17, 1996, the U of I conducted another source test. The source test did not demonstrate compliance, however it was not formally reviewed by DEQ. The unreviewed test results were 0.134 gr/dscf, corrected to 8% oxygen by volume vs. the grain-loading standard limitation of 0.080 gr/dscf, corrected to 8% oxygen by volume. The U of I voluntarily imposed a steam load limit of 30,000 lbs/hr until further source tests could demonstrate compliance at a higher rate.

On March 8, 1996, DEQ and the U of I met to discuss issues with the wood-waste boiler.

On March 29, 1996, DEQ received the initial submittal of the U of I's VECP.

On April 15, 1996, DEQ received a second submittal of the U of I's VECP (which was subsequently adopted by reference into CO#3).

On November 15, 1996, a third consent order (CO#3) regarding the wood-waste boiler was issued by between DEQ and U of I. Consent order #3 was negotiated and written to address emissions problems (particulate and VEs) for the U of I's wood-waste boiler and did not specifically address permitting issues. Consent order #3 did not replace CO#2, although specific conditions and requirements within CO#3 conflicted with CO#2; therefore could be reasonably assumed to supersede the requirements of CO#2.

Consent order #3 set forth provisions for conducting testing on the solid fuels wood-waste boiler, and upon completion of successful testing to demonstrate emissions compliance, assignment of steam loading limitations equivalent to the rate of operation occurring at the time of the successful source test by DEQ.

On February 10, 1997, the U of I conducted a source test on the wood-waste boiler.

On February 20, 1997, DEQ received a source test report for the February 10, 1997 testing.

On March 20, 1997, DEQ approved the source test report by letter to the U of I. Pursuant to CO#3, a steam loading limitation of 42,000 lbs steam/hr was assigned to the U of I's wood-waste boiler. This limit was equivalent to the average steam-loading rate that occurred during the source test.

On July 30, 1997, DEQ received an application from the U of I, dated July 25, 1997, to burn paper waste in the wood-waste boiler. On September 18, 1997, additional information regarding the paper waste fuel delivery system was submitted by the U of I in a letter dated September 12, 1997.

On September 4, 1997, DEQ issued a PTC exemption concurrence to the U of I for the combustion of paper waste combustion in the wood-waste boiler.

On February 27, 1998, the U of I conducted a subsequent source test to increase the wood-waste boiler's allowable steam load limitation.

On March 27, 1998, the U of I submitted the test report to DEQ. In addition to the source test report, the U of I also requested termination of the consent order.

On April 24, 1998, DEQ approved the source test report by letter to the U of I. Pursuant to CO#3, a steam loading limitation of 52,300 lbs steam/hr was assigned to the wood-waste-fired boiler. This limit was equivalent to the average steam-loading rate that occurred during the source test. Regarding termination of the consent order, DEQ denied the request. Denial was based on the assessment that without the consent order in place, the U of I would not have any enforceable limitation on operation of the wood-waste boiler.

On May 28, 1998, DEQ received a request from the U of I to confirm that certain requirements of CO#3 had been fulfilled.

On October 21, 1998, DEQ sent a written response to the U of I's May 28, 1998 request.

On September 14, 1999, the U of I informed DEQ by letter that it planned to conduct another source test in an effort to increase the allowed steam loading limitation. The U of I also requested that the requirement for conducting carbon monoxide testing be removed from CO#3.

On March 16, 2000, a fourth consent order (CO#4) was issued by DEQ. Consent order #4 was an amended/revised version of CO#3. In it, DEQ removed the requirement to conduct an emissions test for carbon monoxide was removed, and made other miscellaneous updates and revisions.
On March 27, 2000, CO#4 was sent to the U of I.

On March 27, 2001, the Tier II permit application was declared complete.

On May 14, 2001, DEQ received a letter dated May 7, 2001, containing revised data for the stack heights of two emergency generators and one natural gas boiler. The stack parameters for other sources were verified.

A public comment period was held from June 11, 2002, until July 11, 2002.

A public hearing was held on July 9, 2002.

DISCUSSION

1. Emission Estimates

See Appendix A to review the emissions estimates for this project.

Wood-waste Boiler (S-B00)

Emissions estimates were originally provided in the July 24, 1995, Tier II permit application and the March 1996, Tier I (or Title V) permit application. The Tier I permit application was updated with an August 31, 1998, amendment to the application. These submittals, and the performance test reports for the wood-waste boiler, dated February 4, 1997, and March 23, 1998, provided the basis for the NAAQS compliance demonstration's emissions rates.

Table 1: WOOD-WASTE BOILER (S-B00) INFORMATION

Boiler Part / Manufacturer for Emissions Unit S-B00	Model[3]	Design Rated Capacity	Burner Type / Boiler Design	Control Device	Date Constructed or Last Modified
Furnace Unit/ Solid Fuels, Inc.	Solid Fuels Gasification Type Burner (stated as custom built – no model #)	Not Determined[1]	Traveling Grate	Multiclone	
Steam Boiler/ Nebraska	WTS-2-110 S-P-1 with economizer, without flyash re-injection	60,000[2]	Not Applicable		October 15, 1986

1. Design rated capacity of the furnace is not conclusively known. The heat-input capacity in units of million British thermal units per hour, or MMBtu/hr) is listed in Tier I permit application as 88.4 MMBtu/hr. The PTC application submitted on behalf of the U of I by Solid Fuels, Inc., in 1986, listed the furnace capacity at 88 MMBtu/hr. The boiler review conducted by Hal Burkitt Associates, per consent order requirements, listed the furnace heat input capacity as approximately 95 MMBtu/hr.
2. Design rated capacity of the boiler in units of pounds of steam per hour (lbs steam/hr)
3. Information taken from PTC application materials, dated February 6, 1986.

The modeled emissions rates for the wood-waste boiler used the performance testing information developed by the U of I since 1995, and US EPA AP-42 emissions factors. The U of I has been able to document the performance characteristics of the wood-waste boiler with several performance tests.

The PM_{10} (particulate matter with a mean aerodynamic diameter of 10 microns or less) emissions rate used in the NAAQS demonstration was based on the March 1998 performance test emissions rate. That test utilized EPA Reference Method 5 only, where the particulate matter is trapped by a filter. A Method 202 back-half analysis to quantify condensible particulate matter was not performed with that test.

The purpose of this Tier II permit is to establish a permit that creates enforceable emissions limitations. The modeled PM_{10} emissions rate was established assuming that condensible particulate matter would increase emissions by at least 25% of the filterable emissions rate. There was no study or past performance testing on the wood-waste-fired boiler used to establish the 25% value, and it is included in the emissions limit in the event a PM_{10} compliance test is ever required in the future. The amount of PM_{10} emissions depends, in part, upon the wood-waste used for fuel and the combustion efficiency in the wood-waste boiler's furnace. PM_{10} compliance testing generally uses EPA Method 201 or 201A to quantify the filterable particulate portion and Method 202 to quantify the condensible portion of the emissions.

The hourly emissions rates in Table 2 were used in the modeling analysis and are included in Appendix A of the permit to establish federally enforceable emissions limitations on the solid fuels wood-waste-fired boiler. They were derived using AP-42 and source test-based emissions factors at rated capacity and an additional 20%, which was included in the allowable emissions rates to provide for a margin of flexibility. See section 2 of this memorandum to review the discussion of air quality impact modeling.

Table 2: WOOD-WASTE BOILER (S-B00) EMISSIONS RATES

SOURCE	PM		PM_{10}		SO_2		CO		NO_X		VOC	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
Solid Fuels Wood-waste Fired Boiler (S-B00)	13.79	60.42	17.24	75.52	0.82	3.58	37.44	163.99	16.35	71.63	2.40	10.51

Natural Gas Boilers (S-B0 and S-B4):

Table 3: NATURAL GAS BOILER INFORMATION

Boiler Identification and Manufacturer	Model	Rated Heat Input Capacity (MMBtu/hr)	Burner Type	Date Constructed or Last Modified
S-B0 – Cleaver-Brooks	DLD-76	82.5	Conventional	1975
S-B4 – Combustion Engineering	NB 242	42.9	Conventional	1958

Table 4: NATURAL GAS BOILERS - EMISSIONS RATES

SOURCE	PM		PM_{10}		SO_2		CO		NO_X		VOC	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
S-B0	0.61	2.69	0.61	2.69	0.05	0.22	6.79	29.8	8.09	35.43	0.44	1.95
S-B4	0.32	1.40	0.32	1.40	0.03	0.13	3.53	15.5	4.21	18.42	0.23	1.01

These emissions rates were calculated using AP-42 emissions factors from Section 1.4, July 1998, for natural gas combustion. The emissions rates were estimated using the rated heat input capacity for each unit and unrestricted operating hours.

Diesel Generators (S-G01, S-G02, S-G03)

Table 5: DIESEL GENERATORS INFORMATION

Source and Location	Manufacturer and Model Number	Emissions Control and Pollutants Controlled
S-G01 -- Gibb Hall	Kohler Model 18 NA 3160	Uncontrolled
S-G02 – Power Plant	Kohler Model 180ROZJ181	Uncontrolled
S-G03 – McClure Hall	CAT Model 3412	Uncontrolled

Table 6: DIESEL EMERGENCY ELECTRICAL GENERATORS – EMISSIONS RATES

SOURCE	PM		PM_{10}		SO_2		CO		NO_X		VOC	
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
S-G01	1.15	1.03	1.15	1.03	1.07	0.97	3.52	3.16	16.32	14.69	1.33	1.20
S-G02	1.02	0.92	1.02	0.92	0.96	0.86	3.14	2.82	14.55	13.10	1.19	1.07
S-G03	1.46	1.31	1.46	1.31	1.36	1.23	4.47	4.02	20.73	18.66	1.69	1.52

The emissions rates in Table 6 were calculated using AP-42 emissions factors from Section 3.3, October 1996. The emissions rates were estimated using the rated heat input capacity for each unit and 1800 operating hours per year.

The emissions units listed above are included in this permitting project as the "significant" sources. The emissions rates from those sources are listed below in Table 7 and in the permit's Appendix B-Air Emissions Inventory.

Table 7: EMISSIONS ESTIMATES SUMMARY FOR SIGNIFICANT SOURCES[1]

PM		PM_{10}		SO_2		CO		NO_X		VOC	
Lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr
18.35	67.86	21.80	82.87	4.29	6.99	58.89	219.29	80.25	171.93	7.28	17.26

[1] Summary of emissions from Tables 2, 4, and 6.

Other Emissions Units

Emissions were estimated for the rest of the sources at the facility. The other emissions units were primarily small units that consisted of hot water heaters and small boilers, internal combustion engines, and incinerators. The inventory reflects potential emissions. An assumption of 500 hours of operation was applied to the emergency electrical generators and all other sources were assumed to operate continuously (see Appendix A to review the emissions inventory for these sources). Table 8 contains the summary of the emissions from these sources. Table 9 contains a summary of the annual allowable emissions from the facility's combustion sources.

Table 8: MISCELLANEOUS SOURCES EMISSIONS SUMMARY

PM T/yr	PM_{10} T/yr	SO_2 T/yr	CO T/yr	NO_X T/yr	VOC T/yr
1.38	1.38	0.17	11.78	21.59	2.59

Table 9: FACILITY-WIDE ANNUAL EMISSIONS SUMMARY[1]

PM T/yr	PM_{10} T/yr	SO_2 T/yr	CO T/yr	NO_X T/yr	VOC T/yr
69.24	84.25	7.16	231.07	193.52	19.75

[1] Summary of emissions from Tables 7and 8.

2. Modeling

A modeling demonstration for NAAQS compliance was submitted on August 4, 1995. That modeling analysis was submitted as part of the original Tier II permit application, dated July 24, 1995. The modeling demonstration included seven emissions units that emitted air pollutants from six individual stacks. Emissions of CO, PM_{10}, and nitrogen oxides (NO_x) were modeled by the U of I to demonstrate compliance with the NAAQS. The original Tier II permit application was submitted with the intent to issue a permit with emissions limitations that made the U of I a synthetic minor source, and thus exempt from Title V permitting. See Appendix B to review a copy of the modeling demonstration review and analysis by DEQ's air quality modeler, Mary Anderson.

This Tier II permit project includes all emissions units that are considered significant, as originally modeled by the U of I with the 1995 Tier II permit application. Emissions rates were re-estimated using information gained from subsequent performance tests for the wood-waste boiler and with the idea of establishing allowable emissions rates that provide an appropriate amount of operational and compliance flexibility.

The particulate matter standard that the U of I's wood-waste boiler is required to establish compliance with is the grain-loading standard of 0.080 gr/dscf, corrected to 8% oxygen by volume. The grain-loading standard establishes no time period of reference for an emissions rate. It is a snapshot in time determined by testing conducted over a specific time period. Therefore, the modeled emission rates analysis took into account emissions rates that allowed the full utilization of the rated capacity of the wood-waste boiler of 60,000 lbs steam/hr, an additional allowance to operate at up to 120% of tested capacity if compliance with any applicable emissions limitation or emissions standard is demonstrated, and an additional factor of 24% to allow for variability in performance testing results. This assumption affects only the wood-waste boiler.

Upon subsequent review by DEQ staff it was determined that this approach should be revised to include only a single 20% allowance for variances in emissions results to establish emissions limits. That additional 20% allowance at rated capacity provides an adequate margin of flexibility. Therefore, the actual ambient impacts are slightly less than those presented in the following table. Any future modeling analyses should account for the allowable emissions limits listed in Appendix A of the permit.

Table 10: AMBIENT AIR QUALITY IMPACTS[1]

Pollutant	Averaging Period	Ambient Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Ambient Concentration ($\mu g/m^3$)	Regulatory Limit ($\mu g/m^3$)	Compliant Yes or No?	Year of Meteorological Data for Compliance
NO_2	Annual	52.95	40	92.95	100	Yes	1990
PM_{10}	Annual	5.19	32.7	37.89	50	Yes	1990
	24-hour	41.99	86	127.99	150	Yes	1989
SO_2	Annual	2.64	18.3	20.94	80	Yes	1990
	24-hour	39.07	120	159.07	365	Yes	1989
	3-hour	64.97	374	438.97	1300	Yes	1990
CO	8-hour	198.96	5130	5328.96	10000	Yes	1987
	3-hour	463.24	11450	11913.16	40000	Yes	1989

[1] This table was taken directly from Table 5 of DEQ Modeling Review Memorandum.

The modeling demonstration used worst-case assumptions for the emissions units.

1) Hours of operation for natural gas-fired boilers S-B0 and S-B4 were assumed to be continuous at 8,760 hours per year, and the firing rates were assumed to be at rated design capacity. The ambient impact analysis includes the emissions from natural gas-fired boiler S-B1. Boiler S-B1 was removed from the permit by formal request from the University by public comment. Removal of natural gas boiler S-B1 did not affect the ambient impacts for the facility. The original modeling analysis accounted for wood-waste boiler S-B00 operating at full capacity continuously, with natural gas-fired boiler S-B1 being inoperative

2) The emergency electrical generators' internal combustion engines are allowed to operate up to 24 hours per day, in any combination of days throughout the year, as long as total operating hours do not exceed 1,800 hours per year in any rolling 12-month period.

3) The wood-waste boiler was assumed to operate 8,760 hours per year. The emissions modeled for the unit were based upon past performance testing results, and US EPA AP-42 emissions factors for pollutants where historical performance testing results were unavailable.

Compliance with each pollutant and each averaging period of the NAAQS was demonstrated for these emissions units.

3. Area Classification

The University of Idaho, Latah County, is located in AQCR 62. The area is classified as unclassifiable for federal and state criteria air pollutants (i.e., NO_x, VOCs, PM_{10}, CO, and SO_x).

4. Facility Classification

The facility is not a designated facility as defined in IDAPA 58.01.01.006.25. The facility is classified as an A source due to potential emissions of criteria pollutants greater than 100 tons per year.

5. Regulatory Review

This permit is subject to the following permitting requirements:

a. IDAPA 58.01.01.401.03 Tier II Operating Permit

"The Director may require or revise a Tier II operating permit for any stationary source or facility whenever the Department determines that:

(b) Specific emission standards, or requirements on operation or maintenance are necessary to ensure compliance with any applicable emission standard or rule."

The DEQ is issuing this facility-wide Tier II permit because a PTC or some other enforceable permit must be issued by the DEQ that qualifies as the construction and operation authorization for the wood-waste boiler. This boiler was constructed in 1986 without a state or federally issued PTC, and the DEQ and the U of I have entered into several consent orders that cover this boiler's construction and operation. The U of I will be issued a Title V permit at some point in the future, and the consent orders are intended to be terminated prior to issuance of the Tier I permit.

b. IDAPA 58.01.01.403 Permit Requirements for Tier II Sources

No Tier II operating permit shall be granted unless the applicant shows to the satisfaction of the DEQ that:

*"**01. Emission Standards.** The stationary source would comply with all applicable local, state or federal emission standards. (5-1-94)*

***02. NAAQS.** The stationary source would not cause or significantly contribute to a violation of any ambient air quality standard. (5-1-94)"*

The applicability of New Source Performance Standards (NSPS) - Subpart Db or Dc for steam generating units was not addressed in this project. A formal NSPS applicability review for the wood-waste boiler must be finalized prior to issuance of the Tier I permit.

The ambient impact assessment demonstrated compliance with all NAAQS standards using worst case assumptions that included worst-case emissions rates, and an operating limitation of 1,800 hours per year for each of the three diesel-fired electrical generator engines, as discussed in Section 2 of this memorandum.

Permit Requirements Due to Emissions Standards and NAAQS Analysis:

Solid Fuels Wood-waste-fired Boiler (S-B00)

This boiler is subject to the state of Idaho grain-loading standard for boilers combusting wood-waste. The standard limits PM emissions to 0.080 gr/dscf, corrected to 8% oxygen, by volume. See section 5j. of this memorandum to review the discussion of the grain-loading standards for this boiler and the natural gas-fired boilers.

The permittee is required to operate the multiclone unit continuously at all times of wood-waste boiler operation as specified by permit condition 3.7. This is a federally enforceable requirement that is necessary for this emissions unit to reduce PM emissions to the levels required to comply with the grain loading standard and any PM emission limits. The multiclone must be operated according to the specifications in the O & M manual as required by Permit Condition 3.8.

Appendix A of the permit contains enforceable emissions limits for the wood-waste boiler. For the limits to be enforceable, a method of compliance demonstration is necessary. The permittee currently monitors and records steam production. The steam production rate must be based upon individual, independent one-hour average values. Individual hourly average values are distinctly different from an average hourly value, which relies upon an averaging method where total steam production over an extended period of time, such as a 24-hour period, is divided by the number of operating hours.

The permittee is then required to create an average hourly steam production value based upon a rolling three-hour average. This requirement matches the methodology used to establish production limitations based on performance testing. In performance testing, a maximum hourly production rate is created for the emissions unit, or process, based on three individual hourly production rates (or average hourly if the test run did not equal one hour). The three-hour rolling average requirement provides a small margin of variability in steam production and equates directly to the basis from which the hourly steam production limitation was created. This data manipulation is required to be performed monthly.

The hourly steam production rate is used in conjunction with the emissions factor listed in the permit. The emissions factors listed in Table 10 were back-calculated from the allowable emissions rates in Appendix A of the permit (see Appendix A of this memorandum).

Table 10: SOLID FUELS WOOD-WASTE-FIRED BOILER (S-B00) HOURLY EMISSIONS RATE COMPLIANCE

Pollutant	Steam Production (lb steam/hr)	Emissions Factor	Emissions
PM_{10}		0.2395 lb PM_{10} / 1000 lb steam =	lbs PM_{10} / hr
CO		0.5200 lb CO / 1000 lb steam =	lbs CO / month
NO_x		0.2271 lb NO_x / 1000 lb steam =	Lbs NO_x / month

The permittee is required to demonstrate compliance with the hourly and annual emissions limitations by following the methods specified in permit condition 3.13.

Hourly

The permittee is required to demonstrate compliance with the hourly PM_{10} emissions limit by multiplying the emission factor in Table 3.1 of the Tier II permit by the hourly steam production rate, based on the rolling three-hour average.

Annual

Compliance with the annual emission limitations listed in Appendix A of this permit shall be determined by summing the hourly steam production on monthly basis and multiplying the monthly steam production by the emission factors listed in Table 3.1 of this permit. The monthly emission rate values shall be summed for each consecutive 12-month period, and shall be converted to an annual basis.

The permittee may use emission factors developed through Department-approved performance testing in place of the emission factors listed in Table 3.1, provided they are in the same units as the emission factors listed in Table 3.1, and are formally approved by the Department."

Annual emission limits apply for PM_{10}, CO, and NO_x, and the calculations in Tier II Permit Condition 3.13 and Table 3.1 create a compliance demonstration that supports the annual limits. Total monthly steam production is multiplied by the emission factor in Table 3.1 of the permit. The monthly emission rate does not establish compliance with an emission limit. Each monthly emission rate, in lbs/month, is summed for any consecutive twelve-month period. The resulting value must be converted to a ton per year value, where one ton equals 2000 lbs, and any consecutive period of twelve months is one year. This value is the basis for annual emission limit compliance.

An operating limit applies for the wood-waste boiler's steam production limit. The limit is specified by permit condition 3.5, and initially, the production limit is set at 52,300 lb steam/hr, based on a three-hour rolling average. The production limit may be altered as allowed by permit condition 3.5, which incorporates the most recently approved performance test results for PM emissions, and compares those emissions to the limitation imposed by the grain loading standard. The permittee is still restricted to an hourly steam production limit, based on a three-hour rolling average.

Natural Gas Boilers S-B0 and S-B4

No requirement was included for demonstrating compliance with emissions limits for the natural gas-fired boilers. The natural gas-fired boilers are allowed to operate at rated capacity on a continuous basis.

Diesel Generators S-G01, S-G02, and S-G03

The permittee is required to monitor and record the operating hours of the engines on a monthly basis to demonstrate compliance with a limitation of 1,800 hours per rolling 12-month period. No further compliance demonstration is required in the permit.

c. IDAPA 58.01.01.404.01(b) Opportunity for Public Comment

IDAPA 58.01.01.404.01(b) reads:

"The Department's proposed Tier II operating permit shall be made available to the public in at least one (1) location in the region in which the facility is located. The availability of such materials shall be made known by notice published in a newspaper of general circulation in the county(ies) in which the facility is located. A copy of such notice shall be sent to the applicant. There shall be a thirty (30) day period after publication for comment on the Department's proposed Tier II operating permit. Such comment shall be made in writing to the Department. (5-1-94)"

d IDAPA 58.01.01.406 Obligation to Comply

This citation reads:

"Receiving a Tier II operating permit shall not relieve any owner or operator of the responsibility to comply with all applicable local, state and federal rules and regulations."

e. IDAPA 58.01.01.470 Permit Application Fees for Tier II Permits

This citation reads:

"Any person applying for a Tier II permit shall pay a permit application fee of five hundred dollars ($500) for each permit requested or amended."

The permittee will be notified of this requirement prior to issuance of the Tier II permit.

g. IDAPA 58.01.01.585-586 Toxic Air Pollutant Non-Carcinogenic and Carcinogenic Increments

Construction of the wood-waste boiler occurred in 1986. The construction pre-dates the applicability of the toxic air pollutant provisions in IDAPA 58.01.01.210, and 585-586. Toxic air pollutant emissions review was not applicable until June 1, 1995, the date specified in the regulation. Toxic air pollutants emitted by emissions units and activities were not addressed as part of this project.

h. IDAPA 58.01.01.625 Visible Emission Limitation

"A person shall not discharge any air pollutant to the atmosphere from any point of emission for a period aggregating more than three (3) minutes in any sixty (60) minute period which is greater than twenty percent (20%) opacity as determined by this section."

Wood-waste Boiler

The visible emissions requirement is applied to each of the individual emissions units. The wood-waste boiler S-B00 and natural gas-fired boiler S-B01 share a common stack and this limitation is applicable whether both emissions units are operating concurrently or individually.

Permit condition 3.4 - Boiler Visible Emission Limits, reads:

"Visible emissions from the Solid Fuels Wood-waste-fired Boiler stack shall not exceed 20% opacity for a period or periods aggregating more than three minutes in any 60-minute period as required in IDAPA 58.01.01.625."

The shared stack is equipped with an in-stack Continuous Opacity Monitoring System (COMS). The COMS is a Land Model 4500 that was manufactured by Sick Optic Electronic and Land Combustion. The COMS unit serial number is 9595083. The U of I submitted a test report dated July 22, 1996, titled, "*E. P. A. Calibration Drift Test per Federal Register, Title 40, Part 60, Appendix B, Specification, July 1, 1993.*"

The results listed in this report documented a 24-hour zero drift value of 0.0%, compared to the EPA requirement of less than 2.0%. The 24-hour calibration drift result was 0.2%, compared to the EPA requirement of less than 2.0%.

Both the November 15, 1996 and the March 16, 2000 consent orders specifically state in section XII.B.2, that the COMS and the opacity recording system installed by the U of I meets the requirements of 40 CFR 60, Appendix B, Performance Specification 1.

Compliance with the visible emissions limitation is demonstrated with permit condition 3.9, which addresses requirements for the COMS and backup visible emissions compliance demonstration on a daily basis using a method similar to that listed in permit condition 2.7 in the Facility Wide Conditions section. The backup compliance demonstration is only required for periods of wood-waste boiler operation where the COMS operational time is less than the 95% of total wood-waste boiler operating time within the applicable reporting period. Reporting periods are established 40 CFR 60.7(c). The COMS data will be used to establish compliance with the visible emission standard of IDAPA 58.01.01.625, which requires a quarterly reporting period for COMS operation. The reporting period may be reduced to semi-annually as allowed by 40 CFR 60.7(e). Excess emissions are to be addressed by the provisions of IDAPA 58.01.01.130-136, rather than that specified by 40 CFR 60.7, although both are similar. COMS downtime reporting should be re entirely different than

Natural Gas Boilers S-B0 and S-B4

The natural gas boilers are not anticipated to exhibit significant levels of opacity. Natural gas burns efficiently and is a gaseous fuel with few impurities that would create visible emissions. It is generally accepted that natural gas combustion in emissions units that have been properly maintained will not exceed the 20% opacity limitation listed in IDAPA 58.01.01.625. No specific visible emissions monitoring is required under this permit beyond that required by the quarterly facility-wide visible emissions walk-around of permit condition 2.7.

This permit condition does not preclude U of I staff from identifying a combustion problem for one or more of the natural gas-fired boilers. In the event significant levels of visible emissions are observed being emitted by the natural gas-fired boilers, inspection and possible repair or maintenance of the boilers is warranted.

Diesel-fired Generators S-G01, S-G02, and S-G03

No specific visible emissions monitoring is required under this permit beyond that required by the monthly facility-wide visible emissions walk-around of permit condition 2.7. The engines actually operate infrequently, and visible emissions are anticipated to be of greatest concern during a cold startup situation. IDAPA 58.01.01.130-136 addresses the requirements for periods of operation where emissions are expected to cause an exceedance of the visible emissions standard.

i. IDAPA 58.01.01.650 General Rules for the Control of Fugitive Dust

See permit section 2-Facility-wide conditions. This permit section includes the current facility-wide conditions for controlling emissions from fugitive sources of particulate matter.

The U of I campus contains numerous paved and unpaved parking lots and roadways. The large amount of vehicle traffic on these surfaces creates a potential for fugitive dust emissions.

The fugitive dust emissions resulting from the material transfer operations of wood-waste fuel delivery, specifically the unloading of wood-waste materials from semi-truck trailers to the receipt hopper. The wood-waste is conveyed to a silo for temporary storage.

Combustion of wood-waste in the wood-waste boiler results in ash material collection by the multiclone unit. The transfer operation of the ash is controlled by the addition of water according to the permit application materials.

j. IDAPA 58.01.01.675 and 677 Fuel-burning Equipment - Particulate Matter Standards for Minor and Existing Sources

"A person shall not discharge to the atmosphere from any fuel burning equipment in operation prior to October 1, 1979, or with a maximum rated input of less than ten (10) million BTU per hour, particulate matter in excess of the concentrations shown in the following table:

Fuel Type	Allowable Particulate (Gr/Dscf)	Emissions (% Oxygen)
Gas	0.015	3%

The effluent gas shall be corrected to the oxygen concentration shown."

There are several small natural gas boilers at the facility that are subject to this standard. No compliance demonstration requirement is included in the permit for those sources.

k. IDAPA 58.01.01.675 and 676 Fuel-burning Equipment - Particulate Matter Standards for New Sources

"A person shall not discharge to the atmosphere from any fuel burning equipment with a maximum rated input capacity of ten (10) million BTU's per hour or more, and commencing operation on or after October 1, 1979, particulate matter in excess of the concentrations shown in the following table:

Fuel Type	Allowable Particulate (Gr/Dscf)	Emissions (% Oxygen)
Gas	0.015	3%
Wood Product	0.080	8%

The effluent gas shall be corrected to the oxygen concentration shown."

Solid Fuels Wood-waste-fired Boiler (S-B00)

The wood-waste boiler was constructed in 1986, combusts wood products as a fuel, and has a heat input capacity greater than 10 MMBtu/hr. The applicable grain-loading standard is 0.080 gr/dscf, corrected to 8% oxygen by volume. Compliance testing will be required according to permit sections 3.14 and 3.15. Section 3.14 specifies the test requirements, and section 3.15 specifies testing frequency. Testing required by the permit must be conducted within 12 months prior to or after permit issuance. A staggered testing frequency based on the tested performance of the emissions unit is provided for in the permit. The hourly steam production rate shall be used in combination with the compliance test's grain-loading result to establish on-going compliance with the grain-loading standard.

Table 11: NATURAL GAS-FIRED BOILERS (S-B0, S-B1, AND S-B4)

Boiler Identification and Manufacturer	Model	Rated Heat Input Capacity (MMBtu/hr)	Burner Type	Date Constructed or Last Modified
S-B0 – Cleaver-Brooks	DLD-76	82.5	Conventional	1975
S-B4 – Combustion Engineering	NB 242	42.9	Conventional	1958

No additional performance testing or other requirements are included in the permit for either of the natural gas-fired boilers. Natural gas is regarded as a "clean" burning fuel with regard to particulate matter emissions. Front half catch (or the filterable portion) of particulate matter emissions were quantified using standard US EPA AP-42 emissions factors and the information on the oxygen content present in the exhaust from a relative accuracy test report on a NO_x continuous emissions monitoring system (CEMS). The actual emissions from the natural gas-fired boilers are anticipated to be far below the PM emissions rate allowed by the grain-loading standard (see Appendix C). Therefore, the permit does not require a compliance demonstration with this requirement.

The permittee was issued an exemption by DEQ to burn confidential papers as applied for in their application. Permit condition 3.6 addresses fuel requirements for the wood-waste boiler. An enforceable limitation of 0.5% by weight of paper-derived fuel versus wood-waste is included in the permit. Monitoring and record keeping requirements are specified in permit condition 3.12. Combustion of typical wood trade waste materials is explicitly prohibited.

l. IDAPA 58.01.01.728 Rules for the Sulfur Content of Fuels – Distillate Fuel Oil

"No person shall sell, distribute, use or make available for use, any distillate fuel oil containing more than the following percentages of sulfur: (5-1-94)

01. ASTM Grade 1. *ASTM Grade 1 fuel oil - 0.3 percent by weight. (5-1-94)*

02. ASTM Grade 2. *ASTM Grade 2 fuel oil - 0.5 percent by weight. (5-1-94)"*

The facility purchases distillate fuel oil for use in emergency generator engines and other engines onsite. Section 2.16 of the permit establishes the method of compliance demonstration for the sulfur content limitation of distillate fuels received and used in various emissions units by the facility. This is a state-wide requirement which is intended to limit the amount of ground-level emissions of sulfur oxides from combustion of these fuels. Permit section 2.15 reads:

"The permittee shall maintain documentation of the actual sulfur content in percent by weight for each shipment of distillate fuel oil received. The documentation must identify the supplier of the fuel, the date of fuel delivery, the grade of distillate fuel, and the sulfur content in percent by weight."

m. Prevention of Significant Deterioration

A preliminary review was conducted of the DEQ's PSD applicability analysis for the construction of the wood-waste boiler. Initial construction for this boiler commenced approximately October 15, 1986, according to U of I compliance documentation.

According to the definition listed in IDAPA 58.01.01.006.58, the U of I is not a designated facility itself. At the time of construction of the wood-waste boiler, the facility contained three natural gas boilers, with a combined heat input capacity of 204 MMBtu/hr. The threshold for designated facility applicability is 250 MMBtu/hr of heat input, per IDAPA 58.01.01.006.v.

The historical documentation contained an October 28, 1986 technical memorandum from D. Hardesty to the U of I source file, stated that offsetting of emissions was dropped due to the existing boilers qualifying as a non-designated facility. Therefore, all discussions and information transfer about residual fuel oil and coal as fuels in boiler combustion for netting emissions from the past were disregarded for the construction of the wood-waste boiler at that time.

DEQ staff requested information concerning the boiler emissions units at this facility. Based upon information subsequently gained, staff recommend that a more exhaustive determination of PSD applicability be initiated for the facility. It is vital that the U of I has adequate time to research material and develop a response to an information request. NSPS – Subpart Db and Dc applicability should also be finalized for the wood-waste boiler. These issues should be addressed through the facility's Title V permit.

n. Consent Orders

Four individual consent orders cover the historical operation of the wood-waste boiler.

- Consent Order #1, dated December 23, 1986
- Consent Order #2, dated March 28, 1995
- Consent Order #3, dated November 15, 1996
- Consent Order #4, dated March 16, 2000

DEQ has agreed that the U of I has complied with all substantive requirements of the consent orders. However, DEQ declined to release the U of I from the consent orders in response to the U of I's written request because the U of I did not have an enforceable document from DEQ allowing ongoing operation of the wood-waste boiler.

DEQ's viewpoint was that if the consent orders were terminated and the Title V permit was issued, the U of I would be out of compliance due to the failure to obtain a PTC for the wood-waste boiler. The Tier II permit is the appropriate permit for an emissions unit with an operating history dating back to 1986. DEQ may release the U of I from the consent orders by formally terminating them following receipt and consideration of a written request from the U of I. Upon issuance of the Tier II permit and termination of the consent orders, applicable requirements for the Tier I permit will be established by the Tier II permit. The Tier II permit will supersede all of these consent orders upon issuance.

6. AIRS

AIRS/AFS[a] FACILITY-WIDE CLASSIFICATION[b] DATA ENTRY FORM

AIR PROGRAM / POLLUTANT	SIP [c]	PSD [d]	NSPS [e] (Part 60)	NESHAP [f] (Part 61)	MACT [g] (Part 63)	TITLE V	AREA CLASSIFICATION A – Attainment U – Unclassifiable N – Nonattainment
SO_2 [h]	B						U
NO_x [i]	A					A	U
CO [j]	A	B				A	U
PM_{10} [k]	A	SM				A	U
PT (Particulate) [l]	A	SM					U
VOC [m]	B						U
THAP (Total HAPs) [n]							
			APPLICABLE SUBPART				

[a] Aerometric Information Retrieval System (AIRS) Facility Subsystem (AFS)

[b] AIRS/AFS Classification Codes:
- A = Actual or potential emissions of a pollutant are above the applicable major source threshold. For NESHAP only, class "A" is applied to each pollutant which is below the 10 ton-per-year (T/yr) threshold, but which contributes to a plant total in excess of 25 T/yr of all NESHAP pollutants.
- SM = Potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable regulations or limitations.
- B = Actual and potential emissions below all applicable major source thresholds.
- C = Class is unknown.
- ND = Major source thresholds are not defined (e.g., radionuclides).

[c] State Implementation Plan
[d] Prevention of Significant Deterioration
[e] New Source Performance Standards
[f] National Emission Standards for Hazardous Air Pollutants
[g] Maximum Achievable Control Technology
[h] Sulfur Dioxide
[i] Nitrogen Oxides
[j] Carbon Monoxide
[k] Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
[l] Particulate Matter
[m] Volatile Organic Compounds
[n] Hazardous Air Pollutants

FEES

Fees apply to this facility in accordance with IDAPA 58.01.01.470. The facility is subject to permit application fees for this Tier II permit of $500.

RECOMMENDATIONS

Based on the review of the application materials, and all applicable state and federal regulations, staff recommends that DEQ issue a Tier II operating permit and permit to construct to the U of I. An opportunity for public comment on the air quality aspects of the proposed operating permit was provided in accordance with IDAPA 58.01.01.404.01.c. Staff members have notified the facility in writing of the required Tier II application fee of $500.00. The permit will be issued upon receipt of the fee.

DAM:sd G:\AIR PERMITS\T 2\UOI MOSCOW\PUBLIC COMMENT\T2-057-00025 TECH MEMO.DOC

cc: Joan Lechtenberg, Air Quality Division
Jim Bellatty, Lewiston Regional Office
Sherry Davis, Technical Services Division

Appendix A

Emissions Estimates for Modeling

and

Emissions Estimates for the Air

Emissions Inventory for other Fuel Combustion Sources

UNIVERSITY OF IDAHO

Darrin Mehr
Associate Air Quality Engineer
Process Engineering Group
Technical Services Office

AMBIENT IMPACT ANALYSIS
NAAQS COMPLIANCE DEMONSTRATION FOR THE Tier II OP

Note:
The 1995 ambient impact assessment for NAAQS compliance did not include SO2, and does not contain the most recent source test information on the woodwaste boiler identified as emissions unit #00.
The natural gas combustion emissions factors in AP-42 have changed since 1995.

Calculation Legend for Natural Gas Combustion
MAXIMUM HOURLY EMISSIONS [Units of pounds per hour (lb/hr)]
Rated Heat Input Capacity (MM Btu/hr) * Emission Factor (lb/MM Btu)

MAXIMUM ANNUAL EMISSIONS [Units of tons per year (T/yr)]
Maximum Hourly Emissions (lb/hr) * Hours of Operation (Assumed to be 8760 hours per year without any enforceable limitation)
/ conversion factor of 2000 lb/ton

Note:
The worst case inputs must be used for the modeling of emissions.

Table 1: Natural Gas Boiler Information

Natural Gas Boilers		Rated Heat Input Capacity from Title V application	Burner Type from Tier I app.		Low-NOx Burner ?
Boiler 0	Cleaver-Brooks	82.5 MM Btu/hr heat input	Conventional		No
Boiler 1	Babcock&Wilcox	78.6 MM Btu/hr heat input	Conventional		No
Boiler 4	Combustion Engrg	42.9 MM Btu/hr heat input	Conventional		No

Table 2 Emissions Factors: Chapter 1.4 Natural Gas Combustion, July 1998

Natural Gas Boilers	NOx Uncontrolled lb/MM CF	NOx Low NOx lb/MM CF	SO2 lb/MM CF	PM-10 front + back half lb/MM CF	CO lb/MM CF	VOCs lb/MM CF
	100	50	0.6	7.6	84	5.5
Assuming a heating value of 1,020 Btu/scf, divide lb/10^6 cu ft by 1,020 to arrive at lb/MM Btu	(lb/ MM Btu)	(lb/ MM Btu)	(lb/ MM Btu)	(lb/ MM Btu)	(lb/ MM Btu)	(lb/ MM Btu)
	0.0980	0.0490	0.0006	0.0075	0.0824	0.0054

Table 3: Natural Gas Boiler Combustion (Maximum Hourly Emissions)

	NOx Uncontrolled (lb/hr)	NOx Low NOx (lb/hr)	SO2 (lb/hr)	PM-10 (lb/hr)	CO (lb/hr)	VOCs (lb/hr)
Boiler 0	8.09	4.04	0.049	0.61	6.79	0.44
Boiler 1	7.71	3.85	0.046	0.59	6.47	0.42
Boiler 4	4.21	2.10	0.025	0.32	3.53	0.23

Table 4: Natural Gas Boiler Combustion (Maximum Annual Emissions)

	NOx Uncontrolled (T/yr)	NOx Low NOx (T/yr)	SO2 sulfur dioxide (T/yr)	PM-10 (T/yr)	CO (T/yr)	VOCs (T/yr)
Boiler 0	35.43	17.71	0.21	2.69	29.76	1.95
Boiler 1	33.75	16.88	0.20	2.57	28.35	1.86
Boiler 4	18.42	9.21	0.11	1.40	15.47	1.01

WOODWASTE BOILER 00

The following information is taken from the March 23, 1998 Performance Test for CO, grain loading standard (or PM), and opacity Statement:

The exhaust flow rate (or stack velocity) does not appear to increase linearly with increased steam production.

Increased CO concentration does not demonstrate any linearity with increased stack velocity or steam production.

Test Run	(#)	1	2	3
Steam Flow	(lb steam/hr)	81000	60000	53000
Stack Velocity	feet/second	31.5	29.6	32
CO concentration in ppm		62	55	75

64667 lb/hr avg

Table 5: Woodwaste Boiler 00 Combustion (Maximum Hourly)
Emissions Factors Listing for the Woodwaste Boiler (except CO)

Woodwaste Boiler 00	**NOx** (lb/ton)	**SOx** (lb/ton)	**PM-10** (lb/hr) see Note 1	**CO** (lb/hr) see Note 2	**VOCs** (lb/ton)
Referred to as S-B-00 in the Title V and Tier II OP applications	1.5	0.075	10.02	6.3	0.22
	(lb/MM Btu)*	(lb/MM Btu)	**(lb/hr)**	**(lb/hr)**	(lb/MM Btu)
	0.165	0.00825	10.02	6.3	0.0242

* Table 1.6-3, February 1999 AP-42, footnote "a":

"To convert from lb/ton to lb/MMBtu, multiply by 0.11. Emission factors are based on wet, as-fired wood waste with average properties of 50 weight % moisture and 4500 Btu/lb higher heating value."

Calculations Data:

Note 1: PM-10 was taken from the 1998 performance test. The test conducted was an EPA Reference Method 5 test (front half catch only). As a surrogate for an accurate PM-10 value, which should include condensible particulate matter in addition to the PM-10 fraction of filterable particulate matter, the 1998 performance test's reported grain loading will be used in this analysis. The test indicated good combustion characteristics compared to the 1995 and 1996 performance tests.

The PM emission rate was determined at an average steam production rate of 52,300 lb steam/hr (avg of 3 runs)

Using a linear increase and the 0.0706 gr/dscf @ 8% O2 avg. test result, the allowable operational capacity would be approximately 59,200 lb steam/hr. The modeling will still be conducted for 60,000 lb steam/hr capacity.

The February 4, 1997 performance test had average grain-loading emissions (EPA Method 5 only) of 0.064 grains per dry standard cubic feet (gr/dscf) @ 8% oxygen, while producing 41,000 lb steam/hr. Carbon monoxide emissions were 23.4 lb/hr average at an average steam production rate of 45,000 lb/hr.

There is insufficient information to accurately identify the emission rate of condensable PM-10 emissions to model for compliance with the PM-10 standards.

Note 2: The carbon monoxide emission rate from the 1998 performance test will be used in this inventory as an indicator of excellent combustion performance but a more conservative approach must be used as a ambient impact modeling emission rate

Information for the Woodwaste boiler

60,000 lb steam/hr at rated capacity	From boiler nameplate
6.90 lb steam/ bone dry lb woodwaste fuel	; from 1998 performance test report
9,498 Btu/bone dry lb woodwaste fuel	
4,635 Btu/lb woodwaste fuel as-received, or "wet basis"	; from 1998 performance test report
52300 lb steam/hr avg. of 3 test runs for Method 5 PM test during the 1998 performance test	
64700 lb steam/hr avg. of 3 test runs for Method 10 carbon monoxide test during the 1998 performance test	

Table 7 Calculation Method for NOx, SOx, and VOCs:

lb pollutant per hour = Emission factor [lb/MM Btu] * (9498 Btu/ b.d. lb WW) / (6.90 lb steam/ b.d. lb WW) * (60,000 lb steam / hour)

Table 7 Calculation Method for PM, PM-10, and CO

lb pollutant per hour = Emission rate from performance test [lb/hr] * performance test steam production scaled linearly to 60,000 lb steam/hr

AT 60,000 LB/HR OF STEAM PRODUCTION

Table 7: Woodwaste Boiler Combustion (Maximum Hourly Emissions) at an operating rate of 60,000 lb/hr

Boiler 00	NOx (lb/hr)	sulfur oxides (lb/hr)	PM-10 (lb/hr)	PM (lb/hr)	CO (lb/hr)	VOCs (lb/hr)
	13.63	0.68	11.495	11.495	5.84	2.00

CO emission rate based on 1998 test for 5.84 lb/hr

Table 8: Woodwaste Boiler Emissions at a worst case allowable emissions scenario (for modeling purposes)

Boiler 00	**NOx (lb/hr)**	**sulfur oxides (lb/hr)**	**PM-10 (lb/hr)**	**PM*** (lb/hr)**	**CO ** (lb/hr)**	**VOCs (lb/hr)**
	16.35	**0.82**	**17.24**	**13.79**	**37.44**	**2.40**

LEGEND:

NOx, SOx, VOC

Table 8 Emission rate = Table 7 emission rate * 120% to allow for variability in emissions

PM-10

PM-10 emission rate = (Table 7 emissions rate + (1.25 * Table 7 emissions rate to account for condensibles))
* 120% to account for variability in emissions

CO

Assumptions: Table 8 reflects Table 7's emission rates at rated capacity and 120% additional allowance for variability in emissions rates--except for carbon monoxide.

For carbon monoxide emissions, there can be a large variation in emissions rate, so a value of 45 lb/hr is being used for the ambient impact assessment. (February 1996 test had an average emission rate of 13.9 lb/hr and the Feb 1997 test had an avg emission rate of 23.4 lb/hr--which also demonstrated compliance with grain-loading standard (Method 5 only).

** CO emission = 23.4 lb CO/hr * (60,000 lb steam/hr / 45,000 lb steam/hr per '97 test) * 1.2

PM

Assumptions: Table 8 takes into account the same EPA Reference Method 5 emission rate used for the PM-10 emissions rate. However, the definition of particulate matter includes all PM that exists at standard conditions. PM-10 refers to all PM with a mean aerodynamic diameter less than a nominal 10 microns, but specifically includes condensible PM. The PM hourly emissions rate (lb/hr) was calculated using the PM-10 emission rate without the condensible portion.

Table 9: Woodwaste Boiler Combustion (Maximum Annual Emissions) tons per year (T/yr)

Boiler 00	NOx (T/yr)	sulfur oxides (T/yr)	PM-10 (T/yr)	PM (T/yr)	CO (T/yr)	VOCs (T/yr)
	71.63	3.58	75.52	60.42	163.99	10.51

Table 10: Modeling Inputs Boilers

Emission Unit	NOx (lb/hr)	SOx (lb/hr)	PM-10 (lb/hr)	CO (lb/hr)	VOCs (lb/hr)
S-B-00 and S-B-1 Combined stack of 00 & 1	**24.1**	**0.9**	**17.83**	**43.91**	**2.82**
S-B-0	**8.09**	**0.049**	**0.61**	**6.79**	**0.44**
S-B-4	**4.21**	**0.025**	**0.32**	**3.53**	**0.23**

GENERATORS

Unit	Heat Input (MMBtu/hr)
S-G01	3.7
S-G02	3.3
S-G03	4.7

AP-42 Table 3.3-1, October 1996,

	NOx (lb/MMBtu)	SO x (lb/MMBtu)	PM-10 (lb/MMBtu)	CO (lb/MMBtu)	VOCs (lb/MMBtu)
Diesel	4.41	0.29	0.31	0.95	0.36

Table 11: Maximum Hourly Emissions from Emergency Electrical Generator Engines

Emissions Unit		NOx (lb/hr)	SO x (lb/hr)	PM-10 (lb/hr)	CO (lb/hr)	VOCs (lb/hr)
Designation	*Location*					
S-G01	Gibb Hall	16.32	1.07	1.15	3.52	1.33
S-G02	Power Plant	14.55	0.96	1.02	3.14	1.19
S-G03	McClure Hall	20.73	1.36	1.46	4.47	1.69

Table 12: Emergency Electrical Generator Potential Annual Emissions Based on 1800 hours.

Emissions Unit		NOx (T/yr) *	SOx (T/yr)	PM-10 (T/yr)	CO (T/yr)	VOCs (T/yr)
S-G01	Gibb Hall	14.69	0.97	1.03	3.16	1.20
S-G02	Power Plant	13.10	0.86	0.92	2.82	1.07
S-G03	McClure Hall	18.65	1.23	1.31	4.02	1.52

* Annual Emissions (T/yr) = Maximum Hourly Emissions (lb/hr) * (1800 hr/yr) / (2000 lb/ton)

Summary of Potential to Emit for all Significant Sources
HOURLY EMISSIONS

Emission Unit	Fuel	NOx Hourly Emissions (lb/hr)	SOx Hourly Emissions (lb/hr)	PM-10 Hourly Emissions (lb/hr)	CO Hourly Emissions (lb/hr)	VOCs Hourly Emissions (lb/hr)
S-B-00	woodwaste	16.35	0.82	17.24	37.44	2.40
S-B-0	natural gas	8.09	0.049	0.61	6.79	0.44
S-B-1	natural gas	7.71	0.046	0.59	6.47	0.42
S-B-4	natural gas	4.21	0.025	0.32	3.53	0.23
S-G01	diesel	16.32	1.07	1.15	3.52	1.33
S-G02	diesel	14.55	0.96	1.02	3.14	1.19
S-G03	diesel	20.73	1.36	1.46	4.47	1.69
	totals:	87.95	4.33	22.39	65.36	7.71

ANNUAL EMISSIONS

Emission Unit	Fuel	NOx Annual Emissions (T/yr)	Sox Annual Emissions (T/yr)	PM-10 Annual Emissions (T/yr)	CO Annual Emissions (T/yr)	VOCs Annual Emissions (T/yr)
S-B-00	woodwaste	71.63	3.58	75.52	163.99	10.51
S-B-0	natural gas	35.43	0.21	2.69	29.76	1.95
S-B-1	natural gas	33.75	0.20	2.57	28.35	1.86
S-B-4	natural gas	18.42	0.11	1.40	15.47	1.01
S-G01	diesel	14.69	0.97	1.03	3.16	1.20
S-G02	diesel	13.10	0.86	0.92	2.82	1.07
S-G03	diesel	18.65	1.23	1.31	4.02	1.52
	totals	205.66	7.16	85.45	247.57	19.11

generators S-G01, S-G02, and S-G03 are each assumed to operate up to 1800 hours per year as requested by U of I (1995 Tier II OP application)

Validity Check on the PM-10 Emission Rates - Approximate

Estimation Methods:

Approximate Heat input = Rated boiler capacity (lb steam/hr) * (Enthalpy needed to create 1 lb steam in Btu /lb steam)/ boiler efficiency

Boiler Nameplate Rating:	60000	lb steam /hr
Enthalpy change for steam	1200	Btu / lb steam
Approximate boiler efficiency	70	%

Approximate Heat input at rated capacity= 1.03E+08 Btu/hr

Approximate heat content for woodwaste with 50% moisture content = 4500 Btu/lb (as-received)

Note that heat content varies greatly depending on quality and moisture content.

The 4,500 Btu/lb is an AP-42 assumption.

Hourly fuel input to boiler = Rated Boiler Heat Input / Fuel heat content

Hourly fuel rate = 22857 lb/hr

or 11.43 tons/hr

US AP-42 Table 1.6-2, February, 1999, woodwaste boiler emission factors

Assume: Woodwaste consisting of wood and bark

Stoker boiler without flyash reinjection

CO is the median value provided.

CO and PM factors are rated "C", PM-10 factor is rated "E"

Emissions Factors: AP-42, Table 1.6-2

PM lb/ton fuel	PM-10 lb/ton fuel	CO lb/ton fuel
5.5	1.7	13.6

Emissions Rates (AP-42 Factors)

At RATED CAPACITY			120% OF RATED CAPACITY		
PM (lb/hr)	PM-10 (lb/hr)	CO (lb/hr)	PM (lb/hr)	PM-10 (lb/hr)	CO (lb/hr)
62.86	19.43	155.43	75.43	23.31	186.51

PERMIT CONDITION 3.19 (Table 3.1) DEVELOPMENT:

To create the emission factor to be used in the Tier II OP, the hourly emission rate limits in Appendix A will be divided by the hourly steam production rate used to establish those emission rates.

Appendix A Emissions Limits (hourly)

Boiler 00	**NOx (lb/hr)**	**SOx (lb/hr)**	**PM-10 (lb/hr)**	**PM (lb/hr)**	**CO (lb/hr)**	**VOCs (lb/hr)**
	16.35	0.82	17.24	13.79	37.44	2.40

STEAM Usage Correlation

72000 lb steam / hr

Table 3.1 was derived by dividing the allowable hourly emission rates in Appendix A by the rated capacity of the boiler, or 60,000 lb steam/ hr, at 120% of rated capacity, for 72,000 lb/hr.

Tier II OP 057-00025 Table 3.1

BOILER 00	NOx (lb NOx per 1000 lb steam)	SOx (lb SOx per 1000 lb steam)	PM-10 (lb PM-10 per 1000 lb steam)	PM (lb PM per 1000 lb steam)	CO (lb CO per 1000 lb steam)	VOCs (lb VOCs per 1000 lb steam)
	0.2271	0.0114	0.2395	0.1916	0.5200	0.0333

University of Idaho
Emissions Inventory for Emissions Units Not Specifically Regulated by the Tier II OP

CF or cu ft = cubic feet
MM = million

Table 1 Emissions Factors: Chapter 1.4 Natural Gas Combustion, July 1998, TABLE 1.4-1, 2

Small Boilers <100 MM Btu/hr Natural Gas -Fired	NOx Uncontrolled lb/MM CF	NOx Low NOx lb/MM CF	SO2 lb per MM CF	PM-10 lb per MM CF	CO lb per MM CF	VOCs lb per MM CF
	100	50	0.6	7.6	84	5.5
Assuming a heating value of 1,020 Btu/scf, divide lb/10^6 cu ft by 1,020 to arrive at lb/MM Btu PM-10 is front + back half	NOx lb per MM Btu	NOx lb per MM Btu	SO2 lb per MM Btu	PM-10 lb per MM Btu	CO lb per MM Btu	VOCs lb per MM Btu
	0.0980	0.0490	0.0006	0.0075	0.0824	0.0054

Table 2 Emissions Factors: Chapter 1.4 Natural Gas Combustion, July 1998, TABLE 1.4-1, 2

Residential Furnaces of <0.3 MM Btu/hr Natural Gas -Fired	NOx Uncontrolled lb/MM CF	NOx Low NOx lb/MM CF	SO2 lb per MM CF	PM-10 lb per MM CF	CO lb per MM CF	VOCs lb per MM CF
	94	N/A	0.6	7.6	40	5.5
Assuming a heating value of 1,020 Btu/scf, divide lb/10^6 cu ft by 1,020 to arrive at lb/MM Btu	NOx lb per MM Btu	NOx lb per MM Btu	SO2 lb per MM Btu	PM-10 lb per MM Btu	CO lb per MM Btu	VOCs lb per MM Btu
	0.0922	N/A	0.0006	0.0075	0.0392	0.0054

NATURAL GAS-FIRED EMISSIONS UNITS

Small Boilers, Furnaces, and Hot Water Heaters.

Assumptions:

Hot water heaters use the same emission factors as small furnaces at <0.3 MM Btu/hr (Table 2) and at heat inputs greater than 0.3 mm Btu/hr, apply the small boiler emission factors.

Calculation Method for Potential Emissions Inventory

'Emission (ton/yr) = (Rated Heat Input Capacity in MM Btu/hr) * (Pollutant Emission Factor in lb/MM Btu) * (Operating Hours in hr/yr) / (2000 lb/ton)

Table 3

Emissions Unit Identification	Fuel	Emission Unit Location	Rated Capacity (MM Btu/hr)	Assumed Hours of Operation	NOx (Ton/yr)	SO2 (Ton/yr)	PM-10 (Ton/yr)	CO (Ton/yr)	VOCs (Ton/yr)
Space Heating Boiler	Natural Gas	Holm Research Cntr	2.47	8760	1.061	0.006	0.081	0.891	0.058
Space Heating Boiler	Natural Gas	Holm Research Cntr	2.47	8760	1.061	0.006	0.081	0.891	0.058
Space Heating Boiler	Natural Gas	Dairy Milk Parlor/barn	1.075	8760	0.462	0.003	0.035	0.388	0.025
Space Heating Boiler	Natural Gas	Martin Lab	1	8760	0.429	0.003	0.033	0.361	0.024
Space Heating Boiler	Natural Gas	Martin Lab	1	8760	0.429	0.003	0.033	0.361	0.024
Space Heating Boiler	Natural Gas	Aquaculture Institute	0.672	8760	0.289	0.002	0.022	0.242	0.016
Space Heating Boiler	Natural Gas	Kibbie Dome	0.509	8760	0.219	0.001	0.017	0.184	0.012
Space Heating Boiler	Natural Gas	President's Residence	0.5	8760	0.215	0.001	0.016	0.180	0.012
Space Heating Boiler	Natural Gas	Kibbie East End Ad	0.318	8760	0.137	0.001	0.010	0.115	0.008
Space Heating Boiler	Natural Gas	Dairy Milk Parlor/barn	0.225	8760	0.097	0.001	0.007	0.081	0.005
Space Heating Boiler	Natural Gas	Dairy Milk Parlor/barn	0.225	8760	0.097	0.001	0.007	0.081	0.005
Space Heating Boiler	Natural Gas	Campus Police Station	0.154	8760	0.066	0.000	0.005	0.056	0.004
Space Heating Boiler	Natural Gas	Targhee Hall	0.051	8760	0.022	0.000	0.002	0.018	0.001
Space Heating Furnace	Natural Gas	Holm Research Cntr-3	0.05	8760	0.020	0.000	0.002	0.009	0.001
Space Heating Furnace	Natural Gas	Holm Research Cntr-4	0.075	8760	0.030	0.000	0.002	0.013	0.002
Space Heating Furnace	Natural Gas	Yard 1 Storage	0.045	8760	0.018	0.000	0.001	0.008	0.001
Space Heating Furnace	Natural Gas	U of I Foundation office	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Meat Lab/Pavillion - 2	0.51	8760	0.219	0.001	0.017	0.184	0.012
Space Heating Furnace	Natural Gas	Targhee Hall	0.5	8760	0.215	0.001	0.016	0.180	0.012
Space Heating Furnace	Natural Gas	Business Tech Incuba.	0.414	8760	0.178	0.001	0.014	0.149	0.010
Space Heating Furnace	Natural Gas	North Campus Cntr-4	0.4	8760	0.172	0.001	0.013	0.144	0.009
Space Heating Furnace	Natural Gas	North Campus Cntr-4	0.4	8760	0.172	0.001	0.013	0.144	0.009

Emissions Unit Identification	Fuel	Emission Unit Location	Rated Capacity (MM Btu/hr)	Assumed Hours of Operation	NOx (Ton/yr)	SO2 (Ton/yr)	PM-10 (Ton/yr)	CO (Ton/yr)	VOCs (Ton/yr)
Space Heating Furnace	Natural Gas	Human Resources	0.3	8760	0.121	0.001	0.010	0.052	0.007
Space Heating Furnace	Natural Gas	Industrial Education-6	0.255	8760	0.103	0.001	0.008	0.044	0.006
Space Heating Furnace	Natural Gas	Family Housing-1	0.25	8760	0.101	0.001	0.008	0.043	0.006
Space Heating Furnace	Natural Gas	Industrial Education-2	0.25	8760	0.101	0.001	0.008	0.043	0.006
Space Heating Furnace	Natural Gas	North Campus Cntr-1	0.24	8760	0.097	0.001	0.008	0.041	0.006
Space Heating Furnace	Natural Gas	North Campus Cntr-1	0.24	8760	0.097	0.001	0.008	0.041	0.006
Space Heating Furnace	Natural Gas	Motor Pool/ Garage-2	0.22	8760	0.089	0.001	0.007	0.038	0.005
Space Heating Furnace	Natural Gas	Industrial Education-7	0.215	8760	0.087	0.001	0.007	0.037	0.005
Space Heating Furnace	Natural Gas	Golf course club house	0.2	8760	0.081	0.001	0.007	0.034	0.005
Space Heating Furnace	Natural Gas	Meat Lab/Pavillion - 1	0.2	8760	0.081	0.001	0.007	0.034	0.005
Space Heating Furnace	Natural Gas	Meat Lab/Pavillion - 1	0.2	8760	0.081	0.001	0.007	0.034	0.005
Space Heating Furnace	Natural Gas	Meat Lab/Pavillion - 1	0.2	8760	0.081	0.001	0.007	0.034	0.005
Space Heating Furnace	Natural Gas	Industrial Education-5	0.16	8760	0.065	0.000	0.005	0.027	0.004
Space Heating Furnace	Natural Gas	North Campus Cntr-3	0.15	8760	0.061	0.000	0.005	0.026	0.004
Space Heating Furnace	Natural Gas	Golf course club house	0.137	8760	0.055	0.000	0.004	0.024	0.003
Space Heating Furnace	Natural Gas	Industrial Education-4	0.13	8760	0.052	0.000	0.004	0.022	0.003
Space Heating Furnace	Natural Gas	Ag Publications	0.12	8760	0.048	0.000	0.004	0.021	0.003
Space Heating Furnace	Natural Gas	Motor Pool/ Garage-3	0.12	8760	0.048	0.000	0.004	0.021	0.003
Space Heating Furnace	Natural Gas	Motor Pool/ Garage-3	0.12	8760	0.048	0.000	0.004	0.021	0.003
Space Heating Furnace	Natural Gas	Ag Engineering Office	0.12	8760	0.048	0.000	0.004	0.021	0.003
Space Heating Furnace	Natural Gas	Ag Engineering Office	0.12	8760	0.048	0.000	0.004	0.021	0.003
Space Heating Furnace	Natural Gas	Bookstore-3	0.115	8760	0.046	0.000	0.004	0.020	0.003
Space Heating Furnace	Natural Gas	Aquaculture Lab - 2	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Aquaculture Lab - 2	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Aquaculture Lab - 2	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Aquaculture Lab - 2	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Aquaculture Lab - 2	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Hemo-parasitic Barn	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	Hemo-parasitic Barn	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	North Campus Cntr-3	0.1	8760	0.040	0.000	0.003	0.017	0.002
Space Heating Furnace	Natural Gas	0.09 MMBtu/hr each	0.72	8760	0.291	0.002	0.023	0.124	0.017
Space Heating Furnace	Natural Gas	Sheep House	0.09	8760	0.036	0.000	0.003	0.015	0.002
Space Heating Furnace	Natural Gas	0.088 MM Btu/hr each	0.616	8760	0.249	0.002	0.020	0.106	0.015

Emissions Unit Identification	Fuel	Emission Unit Location	Rated Capacity (MM Btu/hr)	Assumed Hours of Operation	NOx (Ton/yr)	SO2 (Ton/yr)	PM-10 (Ton/yr)	CO (Ton/yr)	VOCs (Ton/yr)
Space Heating Furnace	Natural Gas	Business Tech Incuba.	0.08	8760	0.032	0.000	0.003	0.014	0.002
Space Heating Furnace	Natural Gas	Industrial Education-3	0.075	8760	0.030	0.000	0.002	0.013	0.002
Space Heating Furnace	Natural Gas	Bookstore-2	0.074	8760	0.030	0.000	0.002	0.013	0.002
Space Heating Furnace	Natural Gas	North Campus Cntr-5	0.172	8760	0.069	0.000	0.006	0.030	0.004
Space Heating Furnace	Natural Gas	Family Housing-3	0.066	8760	0.027	0.000	0.002	0.011	0.002
Space Heating Furnace	Natural Gas	Family Housing-3	0.066	8760	0.027	0.000	0.002	0.011	0.002
Space Heating Furnace	Natural Gas	Dairy House	0.06	8760	0.024	0.000	0.002	0.010	0.001
Space Heating Furnace	Natural Gas	Beef House	0.06	8760	0.024	0.000	0.002	0.010	0.001
Space Heating Furnace	Natural Gas	0.06 MM Btu/hr each	0.54	8760	0.218	0.001	0.018	0.093	0.013
Space Heating Furnace	Natural Gas	Bookstore-1	0.05	8760	0.020	0.000	0.002	0.009	0.001
Space Heating Furnace	Natural Gas	@ 0.046 MM Btu/hr each	4.968	8760	2.005	0.013	0.162	0.853	0.117
Space Heating Furnace	Natural Gas	Motor Pool/Garage-1	0.044	8760	0.018	0.000	0.001	0.008	0.001
Space Heating Furnace	Natural Gas	pumphouse	0.04	8760	0.016	0.000	0.001	0.007	0.001
Space Heating Furnace	Natural Gas	pumphouse	0.04	8760	0.016	0.000	0.001	0.007	0.001
Space Heating Furnace	Natural Gas	Aquaculture Lab - 1	0.025	8760	0.010	0.000	0.001	0.004	0.001
Space Heating Furnace	Natural Gas	Industrial Education-1	0.02	8760	0.008	0.000	0.001	0.003	0.000
Water Heater	Natural Gas	Kibbie East End Addn	3.4	8760	1.460	0.009	0.111	1.226	0.080
Water Heater	Natural Gas	Holm Research	2.4	8760	1.031	0.006	0.078	0.866	0.057
Water Heater	Natural Gas	Meats Lab - 1	0.5	8760	0.215	0.001	0.016	0.180	0.012
Water Heater	Natural Gas	Meats Lab - 2	0.26	8760	0.105	0.001	0.008	0.045	0.006
Water Heater	Natural Gas	Targhee Hall	0.2	8760	0.081	0.001	0.007	0.034	0.005
Water Heater	Natural Gas	Martin Lab	0.199	8760	0.080	0.001	0.006	0.034	0.005

Emissions Unit Identification	Fuel	Emission Unit Location	Rated Capacity (MM Btu/hr)	Assumed Hours of Operation	NOx (Ton/yr)	SO2 (Ton/yr)	PM-10 (Ton/yr)	CO (Ton/yr)	VOCs (Ton/yr)
Water Heater	Natural Gas	Dairy Milking Parlor	0.199	8760	0.080	0.001	0.006	0.034	0.005
Water Heater	Natural Gas	President's Residence	0.08	8760	0.032	0.000	0.003	0.014	0.002
Water Heater	Natural Gas	0.048 MM Btu/hr each	5.184	8760	2.093	0.013	0.169	0.890	0.122
Incinerator Burners (does not include waste materials' combustion products)	Natural Gas	Life Science North (single chamber incinerator)	1.6	8760	0.687	0.004	0.052	0.577	0.038
Incinerator Burners (does not include waste materials' combustion products)	Natural Gas	Holm Research (single chamber incinerator)	2	8760	0.859	0.005	0.065	0.721	0.047

	NOx	SO2	PM-10	CO	VOCs
Subtotal for Small Boilers, water heaters, and furnaces.	**15.94**	**0.10**	**1.25**	**10.20**	**0.90**

Small Emergency Electrical Generators, and Incinerators' burners

Table 4
Natural Gas
Emissions Factors: Reciprocating Engines, July 2000,

2 cycle lean burn natural gas-fired engines *These emission factors are intended for engines* >50 hp these engines are <50 hp, closest fit factors. assume 100% load	NOx (lb per MM Btu)	Sox lb per MM Btu	PM-10 lb per MM Btu	CO lb per MM Btu	VOCs lb per MM Btu
	3.17	5.88E-04	3.84E-02	0.386	1.64

Table 5
Gasoline
Emissions Factors: Engines, October 1996, TABLE 3.3-

uncontrolled emissions engines based on heat content of fuel input to the engine	NOx (lb per MM Btu)	Sox lb per MM Btu	PM-10 lb per MM Btu	CO lb per MM Btu	VOCs lb per MM Btu
	1.63	8.40E-02	1.00E-01	62.7	2.79

Note: Refueling and evaporative organic compound emissions were excluded from the VOC emission factor.

Table 6

Diesel

Emissions Factors: Engines, October 1996, TABLE 3.3-

uncontrolled emissions engines based on heat content of fuel input to the engine	NOx (lb per MM Btu)	Sox lb per MM Btu	PM-10 lb per MM Btu	CO lb per MM Btu	VOCs lb per MM Btu
	4.41	2.90E-01	3.10E-01	0.95	0.36

Table 7

Emissions Unit Identification	Fuel	Emission Unit Location	Rated Capacity (MM Btu/hr)	Assumed Hours of Operation	NOx (Ton/yr)	SO2 (Ton/yr)	PM-10 (Ton/yr)	CO (Ton/yr)	VOCs (Ton/yr)
Emergency Generator	Natural Gas	College of Forestry	2.368	500	1.877	0.000	0.023	0.229	0.229
Emergency Generator	Natural Gas	Engineering/Physics	1.138	500	0.902	0.000	0.011	0.110	0.110
Emergency Generator	Natural Gas	Library	0.696	500	0.552	0.000	0.007	0.067	0.067
Emergency Generator	Natural Gas	Kibbie Dome	0.557	500	0.441	0.000	0.005	0.054	0.054
Emergency Generator	Natural Gas	Theophilus Tower	0.418	500	0.331	0.000	0.004	0.040	0.040
Emergency Generator	Natural Gas	Administration	0.313	500	0.248	0.000	0.003	0.030	0.030
Emergency Generator	Natural Gas	McConnell Hall	0.277	500	0.220	0.000	0.003	0.027	0.027
Emergency Generator	Gasoline	Student Union Bldg	0.051	500	0.021	0.001	0.001	0.799	0.799
Biofuels test engines	Rapeseed oil assumed to be Equivalent to Diesel for this Inventory's emissions	Engineering Isotopes Lab (3 engines)	0.055	8760	1.062	0.070	0.075	0.229	0.229

	NOx	SO2	PM-10	CO	VOCs
Subtotal for small engines (tons/yr)	**5.65**	**0.07**	**0.13**	**1.58**	**1.58**

SUMMARY

Total for miscellaneous combustion-related sources wide

NOx	*SO2*	*PM-10*	*CO*	*VOCs*
21.59	***0.17***	***1.38***	***11.78***	***2.49***

Appendix B

DEQ Modeling Review Memorandum

by Mary Anderson, Air Quality Modeler

Dated October 31, 2001

MEMORANDUM

TO: Darrin Mehr, State Office of Technical Services

FROM: Mary Anderson, Air Quality Modeler, State Office of Technical Services

SUBJECT: Modeling Review for the Tier II Operating Permit Application; University of Idaho in Moscow, Idaho

DATE: October 31, 2001

1. SUMMARY:

The University of Idaho submitted the modeling results for the Tier II operating permit application in August of 1995. This original submittal included the following sources: boiler 00/boiler 1, boiler 0, boiler 4, power plant IC engine (SG02), McClure Hall IC engine (SG03), and the Gibb Hall IC engine (SG01). This modeling analysis was used to determine ambient impacts for a Tier II application. The criteria pollutants of concern for this facility are particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}), oxides of nitrogen (NO_x), sulfur dioxide (SO_2), and carbon monoxide (CO). Only NO_x, CO, and PM_{10} were analyzed in the original application. The Department of Environmental Quality (DEQ) staff determined that SO_2 emissions also needed to be analyzed. In addition, there were discrepancies in the stack heights between the various submittals. Therefore, on May 14, 2001, the University of Idaho submitted the corrected stack height information. This final modeling analysis used this updated information as well as updated information on allowable emissions. This modeling analysis does not model the toxic air pollutants (TAPs) emitted from the University of Idaho. The impacts due to the TAPs will be addressed under a separate analysis. This final modeling analysis conducted for the University of Idaho Tier II operating permit demonstrated compliance with the applicable standards.

2. DISCUSSION:

2.1 Applicable Air Quality Impact Limits

This facility is located in Latah County, which is designated an unclassifiable area for all criteria pollutants. Therefore, total ambient impacts, including background, for these criteria pollutants must be below the National Ambient Air Quality Standards (NAAQS), listed in Table 1.

Table 1. Applicable regulatory limits

Pollutant	Averaging Period	Regulatory Limit[1] ($\mu g/m^3$)[2]
Nitrogen dioxide	Annual	100
Sulfur dioxide	3-hour	1,300
	24-hour	375
	Annual	80
Carbon monoxide	1-hour	40,000
	8-hour	10,000
PM_{10}[3]	24-hour	150
	Annual	50

1. IDAPA 58.01.01.577
2. Micrograms per cubic meter
3. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers

2.2 Background Concentrations

There are no monitors located in the Moscow area for the criteria pollutants of concern for this project. Therefore, statewide background concentrations were used. These concentrations are presented in Table 2.

Table 2. Background concentrations

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)[1]
Nitrogen dioxide	Annual	40
Sulfur dioxide	3-hour	374
	24-hour	120
	Annual	18.3
Carbon monoxide	1-hour	11,450
	8-hour	5,130
PM_{10}[2]	24-hour	86
	Annual	32.7

1. Micrograms per cubic meter
2. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers

2.3 Modeling Impact Assessment

In August of 1995, the University of Idaho submitted the modeling results for the Tier II operating permit application. The original analysis submitted by the university, and completed by Brown and Caldwell, was performed on ISCST2 using conservative screening meteorological data from the SCREEN2 model. The original analysis also included all six sources (boiler boiler stacks and boiler emergency generators) at the university.

In May of 2001, DEQ staff conducted a new modeling analysis for the Tier II application using the information and modeling files submitted with the application in 1995. This information was updated using more recent submittals by the University of Idaho. DEQ determined that SO_2 emissions also needed to be analyzed.

DEQ staff used the most recent version of the U.S. Environmental Protection Agency approved ISC-Prime model. Because there are numerous buildings of various heights in close proximity to the stacks, DEQ determined that it is appropriate to use ISC3-PRIME. ISC3-PRIME is used because the ISC3 model does not incorporate building downwash effects as accurately as ISC3-PRIME, and therefore, tends to overestimate building cavity and downwash concentrations. Also, ambient air is determined to be right next to the buildings (i.e., in the cavity of the building for downwash). ISCST3 cannot account for impacts in the cavity region. However, ISC-Prime is capable of this. All regulatory defaults are used along with the rural dispersion coefficients, building downwash impacts, and five years of Spokane surface and upper air meteorological data. A rural land-use option is used because it best represents land usage around the facility. The receptor grid used by Brown and Caldwell in the initial modeling analysis is used here. An additional fine receptor grid in the university boundary was added. This fine receptor grid had spacing of 50 meters. For the first kilometer in each direction, the grid spacing is 100 meters. From one to five kilometers, the spacing is 500 meters. From five to ten kilometers, the grid spacing is one kilometer.

There were discrepancies in the stack heights between the various submittals. Therefore, on May 14, 2001, the University of Idaho submitted the corrected stack height information. This information is included in Table 3.

Table 3. Stack information.

Stack Identifier	Height (feet)	Diameter (feet)	Temperature (°F)[1]	Stack Velocity (ft/s)[2]
Boiler 00/Boiler 1[3] (B 00/1)	131	5	289	46.1
Boiler 00[3] (B00)	131	5	283	30.8
Boiler 1[3] (B1)	131	5	300	15.3
Boiler 0 (B0)	69	5	300	15.71
Boiler 4 (B4)	69	4	300	19.88
Gibb Hall Engine (SG-01)	12	0.667	750	176.63
Power Plant Engine (SG-02)	50	0.667	750	95.38
McClure Engine (SG-03)	10	0.667	750	185.98

1. Degrees Fahrenheit
2. Feet per second
3. Boiler 00 and 1 exit through the same stack. Both can operate simultaneously or separately.

Three operating scenarios were analyzed: 1) all boilers and generators operating, 2) boilers 00, 0, and 4 and all generators operating, and 3) boilers 1, 0, and 4 and all generators operating. This was to account for the different stack parameters associated with the boiler 00/1 stack when both boilers operate simultaneously and separately. On October 24, 2001, the emission rates were modified to account for allowable emissions from the woodwaste boiler (B00). Table 4 presents the emission rates that were used in this ambient air analysis.

Table 4. Emission rates (pounds per hour).

Pollutant	B00	B1	B0	B4	SG-01[1]	SG-02[1]	SG-03[1]
Short-term Emission Rates (1, 3, 8, 24 hour averaging period)							
PM_{10}[2]	20.69	0.59	0.61	0.32	1.15	1.02	1.46
CO[3]	44.93	6.47	6.79	3.53	3.52	3.14	4.47
SO_2[4]	0.98	0.046	0.049	0.025	1.07	0.96	1.36
Long-term Emission Rates (Annual averaging period)							
PM_{10}	20.69	0.59	0.61	0.32	0.236	0.21	0.306
SO_2	0.98	0.046	0.049	0.025	0.22	0.197	0.279
NO_x[5]	19.62	7.71	8.09	4.21	3.36	2.99	4.25

1. The emergency generators only operate for a maximum of 1,800 hours per year However, they can operate for a 24-hour period straight
2. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
3. Carbon monoxide
4. Sulfur dioxide
5. Oxides of nitrogen

3. MODELING RESULTS:

Table 5 presents the results of the modeling analysis. Boilers 0 and 4 and power plant generator SG-01 are driving the ambient concentrations. Therefore, the ambient concentrations for each of the scenarios were identical. Nitrogen dioxide exceeded the NAAQS when the background concentration was added to the predicted ambient concentration when it conservatively assumed total conversion of NO_x to NO_2. However, when the Tier II approach, described in the *Guideline on Air Quality Models* (40 CFR Part 51, Appendix W), is applied then the ambient impacts are in compliance with the NAAQS. The default annual value for the NO_2/NO_x ratio is 0.75. All other pollutants are in compliance with the NAAQS.

Table 5. Ambient air analysis results.

Pollutant	Averaging Period	Ambient Concentration ($\mu g/m^3$)[1]	Background Concentration ($\mu g/m^3$)[1]	Total Ambient Concentration ($\mu g/m^3$)[1]	Regulatory Limit ($\mu g/m^3$)[1]	Compliant Y or N?	Meteorological Year for Compliance
NO_2[2,3]	Annual	52.95	40	92.95	100	Y	1990
PM_{10}[4]	Annual	5.19	32.7	37.89	50	Y	1990
	24-hour	41.99	86	127.99	150	Y	1989
SO_2[5]	Annual	2.64	18.3	20.94	80	Y	1990
	24-hour	39.07	120	159.07	365	Y	1989
	3-hour	64.97	374	438.97	1300	Y	1990
CO[6]	8-hour	198.96	5130	5328.96	10000	Y	1987
	1-hour	463.24	11450	11913.16	40000	Y	1989

1. Micrograms per cubic meter
2. Assumes that 75% of the NO_x is converted to NO_2, based on guidance in the *Guideline on Air Quality Models* (40 CFR Part 61 Appendix W)
3. Nitrogen dioxide
4. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
5. Sulfur dioxide
6. Carbon monoxide

Electronic copies of the modeling analysis are saved on disk. Darrin Mehr reviewed this modeling memo to ensure consistency with the permit and technical memorandum.

MA:bm G:\AHW\MANDERSON\TIER II\UNIVERISITY OF IDAHO\MODELING TECH MEMO.DOC

Appendix C

Comparison of a Particulate Matter

Emissions Estimate to the

Grain-loading Standard

for Natural Gas-fired Boilers

S-B0, S-B1, and S-B4

Idaho Department of Environmental Quality
Office of Technical Services

Calculation Log Sheet

Discipline: Process Engineering Group / AIR | Project: University of Idaho - T2-010200

W.O. Number: T2-010200

Calculation Number	Rev. No.	Date	Originator	Title of Calculation
GRAIN-1		1/20/02	DARIN METR	GRAINLOADING VS. EMISSION RATE - Natural Gas.

10-01-01

Idaho Department of Environmental Quality
Office of Technical Services

Calculation Cover Sheet

Calc. Number: GRAIN - 1

Project No.:	Discipline:	Number of Sheets:
T2-010200	Process Engineering Group / AIR	2

Project:
University of Idaho

Title of Calculation:
GRAINLOADING VS. EMISSION RATE - Natural Gas.

Item:
Natural Gas Combustion Emissions of PM versus Grainloading

Source of Data:
University of Idaho Tier I OP Application. - stack information and boiler size.

Sources of Formulae/References/Assumptions:
AP-42 - Section 1.4.

☒ Preliminary Calculation ☐ Final Calculation Supersedes Calculation Number _____

Rev. No.	Revision	Calculation By	Date	Checked By	Date	Approved By	Date

Idaho Department of Environmental Quality
Office of Technical Services

CALCULATION SHEET

Sheet 1 of 2

Project UNIVERSITY OF IDAHO Work Order T2-010200 File No.

Title of Calculation GRAIN LOADING / EMISSION RATE Prepared By DAM Date

Item GRAIN LOADING COMPARISON. Checked By Date

NATURAL GAS-FIRED BOILERS S-B0, S-B1, S-B4

NATURAL GAS COMBUSTION.
0.015 grains / dscf @ 3% O_2

SPREADSHEET EMISSION RATES using AP-42, Table 1.4-2.
S-B0 : 0.61 lb/hr total PM_{10} including condensibles
S-B1 : 0.59 lb/hr " "
S-B4 : 0.32 lb/hr " " " "

AP-42 Section 1.4, Table 1.4-2, July 1998
Filterable PM_{10} / PM = 1.9 lb / 10^6 cubic feet natural gas.
Condensible PM_{10} = 5.7 lb / 10^6 cu. ft. Nat gas
Total Emission factor for PM / PM_{10} including condensibles = 7.6 $\frac{lb}{10^6 \text{ cuft}}$

FILTERABLE PM / PM_{10} for GRAIN LOADING COMPARISON.
25% of PM / PM_{10} Emissions are FILTERABLE PARTICULATE

S-B0 : $\left(0.61 \frac{lb\ PM/PM_{10}\ (Total)}{hr}\right)(0.25) = 0.15 \frac{lb}{HR}$ Filterable PM / PM_{10}

S-B1 : $(0.59\ lb/hr\ Total\ PM/PM_{10})(0.25) = 0.15 \frac{lb}{HR}$ Filterable PM / PM_{10}

S-B4 : $(0.32\ lb/HR\ Total\ PM/PM_{10})(0.25) = 0.08 \frac{lb}{HR}$ Filterable PM / PM_{10}

TIER I OP APPLICATION, dated march 1996:
EXHAUST FLOW RATES, from Section 2, Part B - STACK DATA
S-B0 : 18,500 dscfm (dry standard cubic feet per minute) @ 300°F minimum
S-B1 : 18,000 dscfm @ 300 degrees Fahrenheit minimum.
S-B4 : 15,000 dscfm @ 300 deg F minimum.

Idaho Department of Environmental Quality
Office of Technical Services

CALCULATION SHEET

Sheet 2 of 2

Project U of I / TIER II OP Work Order T2-010200 File No. _____

Title of Calculation GRAIN LOADING VS EMISSION RATE Prepared By DAN Date _____

Item Basis for Not Requiring Compliance Demonstration Checked By _____ Date _____

IDAPA 58.01.01.676 & 675 for NATURAL GAS COMBUSTION

$0.015 \frac{gr}{dscf}$ @ $3\%\ O_2$.

JR SIMPLOT NATURAL GAS-FIRED BOILER (HPB&W Boiler) May 1, 2001 RATA (Operating at >100-120,000 lb steam/hr) This is a much larger boiler than any of U of I's.)

HOWEVER, Performance testing is generally only done on NSPS Subpart Db-sized boilers (Heat Input > 100 mm Btu/hr)

Avg O_2 % from 4 TEST RUNS = **2.82% O_2**

$$C_{3\%O_2 V} = C_{VS}\left(\frac{21 - \%O_2 \text{ Correcting to}}{21 - \%O_2 \text{ in gas effluent}}\right)$$

EMISSION LIMIT PER GRAIN LOADING STANDARD.

GIVEN: Emission Rate of 0.015 grain/dscf, corrected to 3% O_2.

$$C_{3V} = C_{VSTD}\left(\frac{21 - \%O_2 \text{ correcting to}}{21 - \%O_2 \text{ tested in gas effluent}}\right)$$

$$\text{ALLOWABLE PM EMISSION} = \left(0.015\frac{gr}{dscf}\right)\left(\frac{1\,lbm}{7000\,gr}\right)\left(18{,}500\frac{dsct}{min}\right)\left(\frac{60\,min}{HR}\right)\left(\frac{21-3}{21-2.8}\right)$$

ALLOWABLE EMISSION RATE = 2.35 $\frac{lb}{hr}$ for S-BD

S-B0: $\frac{\text{AP-42}}{0.15\ \frac{lb}{hr}} < \frac{\text{ALLOWABLE EXAMPLE}}{2.35\ \frac{lb}{hr}}$

S-B1, Substitute S-B2 data: Allowable = 2.29 $\frac{lb}{hr}$ $\quad \frac{\text{AP-42}}{0.15\ \frac{lb}{hr}} < \frac{\text{ALLOWABLE}}{2.29\ \frac{lb}{hr}}$

S-B4 Substitute S-B4 data! Allowable = 1.91 $\frac{lb}{hr}$ $\quad \frac{\text{AP-42}}{0.00\ \frac{lb}{hr}} < \frac{\text{ALLOWABLE}}{1.91\ \frac{lb}{hr}}$

∴ Performance Testing for grainloading Compliance should not be required.

Also note that these comparisons DO NOT correct for elevation effect on atmospheric pressure.

10-01-01

Appendix D

Response to Public Comments

July 24, 2002

STATE OF IDAHO
DEPARTMENT OF ENVIRONMENTAL QUALITY
RESPONSE TO PUBLIC COMMENTS
ON PROPOSED TIER II AIR QUALITY
FOR THE UNIVERSITY OF IDAHO FOR A FACILITY-WIDE OPERATING PERMIT

Introduction

As required by IDAPA 58.01.01.404.01.c (*Rules for the Control of Air Pollution in Idaho*), the Idaho Department of Environmental Quality (DEQ) provided for public comment, including offering an opportunity for a hearing, on the Tier II permit proposed for the University of Idaho. Public comment packages, which included the application materials, and draft permit and technical memorandum, were made available for public review at the Moscow Public Library, DEQ's Lewiston Office, and DEQ's State Office in Boise. A copy of the proposed permit and technical memorandum was also posted on DEQ's Web site. The public comment period was provided from June 11, 2002, to July 11, 2002, and a public hearing was held on July 9, 2002 in Moscow, Idaho. Those comments regarding the air quality aspects of the draft permit are provided below with DEQ's response immediately following.

Public Comments and DEQ Responses

Comments 1-6 were submitted by the University of Idaho.

Comment 1: **Cover Page – Please change our ZIP from 83843 to 83844-2030.**

DEQ Response to Comment 1:

The requested change has been made to the permit.

Comment 2: **Cover Page – Please change the TITLE of FACILITY CONTACT from Safety Officer to Director, EHS.**

DEQ Response to Comment 2:

The requested change has been made to the permit.

Comment 3: Condition 1 – Regulated Sources, Natural Gas Fired Boiler S-B1 – **Please delete this boiler from our permit. The boiler needs extensive repairs and renovations before it can be placed into service. New controls, burners and an exhaust stack are needed. The University is conducting a review of this boiler and an overall future energy assessment which will determine if we need to upgrade this boiler or pursue other options in energy production.**

DEQ Response to Comment 3:

Natural gas-fired boiler S-B1 has been removed from the Tier II permit. The boiler is not regarded as being operational. Facility-wide potential air pollutant emissions have been reduced to the levels listed in the final issued permit. Permit conditions referencing natural gas-fired boiler S-B1 have been removed, or altered accordingly, in sections 3, 4, and 7 of the Tier II permit.

Comment 4: **Condition 3.10 – The draft permit requires the University to monitor and record the hourly steam production rate, and then calculate an average hourly steam production rate based on a rolling three-hour average. Our monitoring system can record the hourly steam production rate but cannot compute, in real time, the average hourly steam production rate based on a rolling three-hour average. The University would like to record the hourly averages, download the information into another software program to compute the rolling three-hour average and average hourly steam production rate, and perform this data processing step on a monthly basis. These results will then be used to demonstrate compliance as specified in Conditions 3.5 and 3.13.**

DEQ Response to Comment 4:

Permit Condition 3.10 has been changed to reflect this comment. A redline/strikeout version of Permit Condition 3.10 is listed below.

3.10 Boiler Steam Rate Monitoring

The permittee shall monitor and record the hourly steam production rate of the wood-waste boiler~~,~~ which is representative of individual one-hour periods. On a monthly basis, the permittee shall calculate the~~An~~ average hourly steam production rate ~~shall be calculated~~ using each individual hourly steam production values on the basis of a rolling three-hour average. Individual hourly steam production values ~~will~~ shall be used to determine compliance with the hourly steam production limitation specified in Permit Conditions 3.5~~,~~ and 3.13 ~~the emissions limitations~~.

[IDAPA 58.01.01.405.01, 5/1/94]

Therefore, Permit Condition 3.10 reads:

3.10 Boiler Steam Rate Monitoring

The permittee shall monitor and record the hourly steam production rate of the wood-waste boiler which is representative of individual one-hour periods. On a monthly basis, the permittee shall calculate the average hourly steam production rate using each individual hourly steam production value on the basis of a three-hour average. Individual hourly steam production values shall be used to determine compliance with the hourly steam production limitation specified in Permit Conditions 3.5 and 3.13.

[IDAPA 58.01.01.405.01, 5/1/94]

Comment 5: **Insignificant Sources – In our Tier I and II air quality permit application, the University listed laboratory fume hoods, gas cabinets, and gas storage areas as insignificant sources. These three sources are all vented through the same exhaust system and when used, are used for laboratory research. We now believe they should be classified as presumptively insignificant emissions units under IDAPA 58.01.01.317.01.a.i.63.**

DEQ Response to Comment 5:

This comment will have no effect on the Tier II permit.

Comment 6: **Wood Chip Fuel Conveyor Belt System – The University estimates the fugitive emissions from this source as a percentage of the fugitive emissions that occur during the off-loading of the wood fuel at the Power Plant. We estimate this to be 20% of the off-loading fugitive emissions, or 0.07 pounds of dust per ton of fuel times a moisture factor of 0.4. This corresponds to a fugitive emissions factor of 0.03 pounds of dust per ton of wood fuel (wet). In 1997, fugitive dust emissions from the fuel conveyor belt system would have been 1,286 pounds of dust.**

DEQ Response to Comment 6:

This comment will have no effect on the Tier II permit.

Comment 7: **Comment provided via e-mail by Chet Hartman, as listed by email signature, and/or by Chester Hamilton, e-mail account.**

Please refer to the documents contained in this public comment response package to review the comment's text.

DEQ Response to Comment 7:

This comment does not relate to the Tier II permit's air quality considerations and is outside of DEQ's authority and responsibility.

Comment 8: **Comment provided by public hearing testimony, July 9, 2002.**

Page 10, lines 8 through 17of the hearing transcript contain a comment requesting elaboration on the testing, monitoring, and recordkeeping requirements specified by the Tier II permit.

DEQ Response to Comment 8:

Testing, monitoring, and recordkeeping requirements are specified in the permit for various emissions units and emissions-related activities. This information was made available to the public by listing of the Tier II permit and technical memorandum on DEQ's website and public comment packages made available at the Moscow Public Library, the DEQ Lewiston Regional Office, and DEQ's State Office in Boise. Please refer to the permit located in this response package to review the language that the permittee must comply with for testing, monitoring, and recordkeeping.

Following the permit's format, the frequency of testing, monitoring, and recordkeeping are:

FACILITY-WIDE CONDITIONS

Parameter or Emissions Source	Testing	Monitoring	Recordkeeping
Fugitive dust or fugitive particulate matter	Not applicable	1) Reasonable control method monitoring as applied to the emission source	1) Maintain records of the frequency and the method applied to the emission source
		2) Collect fugitive dust Complaints	2) Maintain records of the complaint; the date the complaint was received; an assessment of the complaint's validity, list the corrective action taken, and the date corrective action was taken
Odors	Not applicable	Same as above in Fugitive Dust No. 2.	Same as above in Fugitive Dust No. 2
Visible Emissions	Not applicable	Monthly facility-wide inspection of all sources of visible emissions that do not have other specific visible emissions requirements	The records shall, at a minimum, include the date of each inspection 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.
Excess Emissions	Not applicable	As applicable by the regulation and circumstance. Please refer to IDAPA 58.01.01.130-136.	As applicable by the regulation and circumstance. Please refer to IDAPA 58.01.01.130-136.
Sulfur Content of Distillate Fuels	None required	Monitor actual sulfur content of fuel for each delivery	Maintain documentation of fuel's actual sulfur content for each fuel shipment received, the supplier, date of delivery, and the distillate fuel grade

WOOD-WASTE BOILER S-B00

Parameter or Emission Source	Testing	Monitoring	Recordkeeping
Grain loading (Particulate matter)	Method 5 PM test initially once prior to or after 12 months of permit issuance. Subsequent testing may be required based on the previous test's results.	As required by the test procedures	As required by the test procedures
Visible emissions	See monitoring section	Operation of a continuous opacity monitoring system during operation of the woodwaste boiler. A daily see/no see evaluation with a Method 9 opacity determination if visible emissions are noted is required as a backup monitoring method.	Records of the opacity data must be created and maintained as required by 40 CFR 60.13. The data must be reduced to demonstrate compliance with Idaho's visible emissions standard. Recordkeeping of the results of the see/no see evaluation and Method 9 evaluation (if required) must be created.
Fuel – woodwaste versus paper-derived waste	None	Monitoring and recordkeeping shall be performed to identify and document compliance with the annual restriction on paper-derived fuel that is less than 0.5% by volume of the total volume of all fuel combusted in the wood-waste boiler. Records must be updated monthly.	
Steam production	The hourly steam production rate is recorded during the performance testing to be used to establish a limitation on the steam production rate	Hourly production rate and a monthly determination of an average hourly rate based upon a rolling three hour average steam production	Records must be kept of the monitoring data and the hourly steam production derived from the rolling three hour average steam production
Multiclone pressure drop	Not applicable	A continuously operating device is used to monitor the pressure drop.	The pressure drop is to be recorded once per day on any day that the wood-waste boiler operates. Pressure drop data from performance testing and on-going operation is to be added to the Operations and Maintenance manual.
PM_{10}, CO, and NO_x	Not applicable	See recordkeeping section	The permittee is required to demonstrate compliance with hourly and annual emissions limits by using the steam production rate information and emissions factors listed in the permit to calculate the wood-waste boiler's emissions once per month. The monthly emissions are summed over any consecutive twelve-month period to determine compliance with the annual emissions limitations.

NATURAL GAS BOILERS S-B0, S-B4

Parameter or Emission Source	Testing	Monitoring	Recordkeeping
Visible emissions	None required	None required	None required
Grain loading standard for particulate matter	None required	None required	None required

DIESEL GENERATOR ENGINES S-G0, S-G1, S-G4

Parameter or Emission Source	Testing	Monitoring	Recordkeeping
Operating hours	Not applicable	Monthly monitoring of the number of hours	Monthly recordkeeping of the number of hours

Comment 9: **Comment provided in public hearing testimony, July 9, 2002.**

Page 11, lines 2 through 19 of the hearing transcript, contain a comment requesting elaboration on the modeling results for particulate matter emissions, and whether coal firing is shut down in event of particulates exceeding the national standard.

DEQ Response to Comment 9:

There are no existing emissions units that combust coal. The boiler identified as S-B00 in the permit and technical memorandum combusts woodwaste and paper, and the boilers identified as S-B0, and S-B4 combust natural gas. Natural gas-fired boiler S-B1 was removed from the permit and NAAQS demonstration at the request of the permittee's public comment. Removing boiler S-B1 from the NAAQS demonstration also reduced the facility's ambient impacts.

Criteria air pollutant emissions from the University of Idaho are subject to IDAPA 58.01.01.576 (General Provisions for Ambient Air Quality Standards) and IDAPA 58.01.01.577 (Ambient Air Quality Standards for Specific Air Pollutants) and federal National Ambient Air Quality Standards (NAAQS). There are two types of NAAQS: Primary Standards, designed to establish limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly, and Secondary Standards, set to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The Ambient Air Quality Standards in IDAPA 58.01.01.576 and .577 establish primary and secondary standards that are identical to the federal NAAQS.

These regulations establish standards for ambient concentrations of criteria pollutants including particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}), sulfur oxides (as sulfur dioxide), ozone, carbon monoxide, nitrogen oxides, fluorides, and lead. To demonstrate compliance with these standards, the University of Idaho, and subsequently, DEQ, performed ambient air quality modeling using an EPA-approved regulatory model, the Industrial Source Complex Short-Term (ISCST3) model for PM_{10}, SO_x, NO_x, and CO.

The ISCST3 model predicts ambient concentrations of criteria pollutants based on hourly emissions from a facility. The ambient concentrations included in the Tier II permit represent predicted concentrations from a worst case scenario including worst weather conditions and highest emissions rates. Model inputs include emissions and exhaust parameters from the stacks, meteorological data, and surrounding terrain. The model also predicts effects of other buildings at the facility. DEQ requires the facility to model the maximum potential emissions or the emissions limits requested in a permit application. A draft document titled "State of Idaho Air Quality Modeling Guideline" is available on DEQ's Web site at:

http://www2.state.id.us/deq/air/guidance/Air_Quality_Modeling_Guideline_Draft.pdf.

This document provides guidance to ensure modeling is performed in accordance with DEQ protocol.

Ambient impacts from maximum emissions rates and/or requested emissions limits were assessed. The modeling and supplemental information provided to DEQ by the University of Idaho demonstrated compliance with the ambient air quality standards identified in IDAPA 58.01.01.576 and .577.

The modeling demonstration that was performed predicted a number of ambient impact concentrations. These concentrations from the "highest-high" value downward to lower ambient impact concentrations, such as the second highest high, third highest high, etc. Each averaging period for an National Ambient Air Quality Standard (NAAQS) has a specified value that is picked from the modeling results to establish whether or not the emissions unit or facility in question meets the NAAQS. For example, the PM_{10} ambient standards are an annual standard and a 24-hour standard, and are listed by IDAPA 58.01.01.577.01.a as:

Annual Standard. *Fifty (50) micrograms per cubic meter, as an annual arithmetic mean – never expected* to be exceeded in any calendar year.

Twenty-four Hour Standard. One hundred fifty (150) micrograms per cubic meter as a maximum twenty-four (24) hour concentration—never to be exceeded more than once in any calendar year.

Therefore, based on the requirements of these standards, if a single year of meteorological data is used in the modeling, one must use the highest predicted ambient concentration from the model's output for as the value to establish whether the annual PM_{10} NAAQS compliance has been demonstrated. The 24-hour PM_{10} standard allows for one predicted ambient concentration greater than 150 micrograms per cubic meter, including the background contribution. Therefore, for only one year of meteorological data, the second highest modeled value is noted and used to determine if 24-hour PM_{10} NAAQS compliance has been demonstrated. If two years of meteorological data are used in the modeling demonstration the second highest high and the third highest high ambient impact concentration is used establish compliance with the annual and 24-hour standards, respectively. This pattern continues as additional years of approved meteorological data are used in the modeling demonstration. All boilers and generators have been approved to operate as requested based upon the results of the NAAQS compliance demonstration. The purpose of the modeling demonstration is to assess whether or not the modeled source(s) can comply with the NAAQS using generally conservative assumptions and several years of meteorological data from that area.

Another requirement that relates to this comment is for air pollution emergency events. Industrial facilities are subject to shutdown, curtailment of operations, or alteration of operations during periods where atmospheric stagnation and/or degraded air quality is occurring. These requirements are listed under IDAPA 58.01.01.550-562.

Comment 10: Comment provided by public hearing testimony, July 9, 2002.

Page 11, lines 20 through 25, and page 12, lines 1 through 4 of the hearing transcript, contain a comment requesting disclosure of "all pollutants that come off of these activities at the university...and where they fit in with the national ambient air quality standard."

DEQ Response to Comment 10:

The NAAQS analysis addresses NO_x, SO_x, PM_{10}, and CO. There are other pollutants that are emitted from those emissions units that are covered in this Tier II operating permit. However, quantification of emissions and dispersion modeling was not performed for toxic air pollutants regulated under IDAPA 58.01.01.585 and 586 because installation of the emissions units pre-dated the adoption of those regulations. The toxic air pollutants regulations are implemented through the Idaho State Implementation Plan, which is a state-only requirement. TAPs are not related to the national ambient air quality standards that are regulated under 40 CFR 51.

A revised ambient impact assessment was performed by DEQ to account for the University's request to remove natural gas boiler S-B1 from the permit. The issued permit and technical memorandum reflect the facility's requested emissions.

Comment 11: **Comment provided by public hearing testimony, July 9, 2002.**

Page 12, lines 5 through 12, of the hearing testimony, contain a comment requesting the listing of the sources that contribute to the background concentrations.

DEQ Response to Comment 11:

Ambient background concentrations of criteria air pollutants are specific to the pollutant, such as nitrogen oxides (NO_x), sulfur dioxide (SO_x), particulate matter with a mean aerodynamic diameter of ten microns or less (PM_{10}), and carbon monoxide (CO). The State of Idaho currently does not have an established background concentration value for VOCs. These values are established through ambient monitoring at various sites throughout the state, and subsequent numerical analysis specified by the Environmental Protection Agency (EPA).

Other sources of CO, PM_{10}, NO_x, SO_2 include tailpipe emissions from motor vehicles, agricultural equipment, and locomotives; combustion sources and processes at other industrial sources; woodstoves; and residential natural gas combustion for cooking, space heating, and water heating.

Agricultural equipment travel and operation contribute to airborne particulate matter, as do forest and range fires. Fires also are a source of other combustion products, such as CO and NO_x. Fires contribute to ambient background concentrations unless they are officially excluded from the monitoring data as a "special event."

These are common contributors to ambient background concentrations, but this is not an exhaustive list of all sources which may contribute to ambient background concentrations.