Statement of Basis

Permit to Construct No. P-2013.0057
Project ID 61532

Brigham Young University Idaho
Rexburg, Idaho

Facility ID 065-00011

Final

November 18, 2016
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Permit Writer

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

ACRONYMS, UNITS, AND CHEMICAL NOMENCLATURE

AAC	acceptable ambient concentrations
AACC	acceptable ambient concentrations for carcinogens
acfm	actual cubic feet per minute
ASTM	American Society for Testing and Materials
BACT	Best Available Control Technology
BMP	best management practices
Btu	British thermal units
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CAS No.	Chemical Abstracts Service registry number
CBP	concrete batch plant
CEMS	continuous emission monitoring systems
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CI	compression ignition
CMS	continuous monitoring systems
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent emissions
COMS	continuous opacity monitoring systems
DEQ	Department of Environmental Quality
dscf	dry standard cubic feet
EL	screening emission levels
EPA	U.S. Environmental Protection Agency
FEC	Facility Emissions Cap
GHG	greenhouse gases
gph	gallons per hour
gpm	gallons per minute
gr	grains (1 lb = 7,000 grains)
HAP	hazardous air pollutants
HHV	higher heating value
HMA	hot mix asphalt
hp	horsepower
hr/yr	hours per consecutive 12 calendar month period
ICE	internal combustion engines
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
iwg	inches of water gauge
km	kilometers
lb/hr	pounds per hour
lb/qtr	pound per quarter
m	meters
MACT	Maximum Achievable Control Technology
mg/dscm	milligrams per dry standard cubic meter
MMBtu	million British thermal units
MMscf	million standard cubic feet
NAAQS	National Ambient Air Quality Standard
NESHAP	National Emission Standards for Hazardous Air Pollutants
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NSPS	New Source Performance Standards

O&M	operation and maintenance
O_2	oxygen
PAH	polyaromatic hydrocarbons
PC	permit condition
PCB	polychlorinated biphenyl
PERF	Portable Equipment Relocation Form
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers
PM_{10}	particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers
POM	polycyclic organic matter
ppm	parts per million
ppmw	parts per million by weight
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PTC	permit to construct
PTC/T2	permit to construct and Tier II operating permit
PTE	potential to emit
PW	process weight rate
RAP	recycled asphalt pavement
RFO	reprocessed fuel oil
RICE	reciprocating internal combustion engines
Rules	*Rules for the Control of Air Pollution in Idaho*
scf	standard cubic feet
SCL	significant contribution limits
SIP	State Implementation Plan
SM	synthetic minor
SM80	synthetic minor facility with emissions greater than or equal to 80% of a major source threshold
SO_2	sulfur dioxide
SO_X	sulfur oxides
T/day	tons per calendar day
T/hr	tons per hour
T/yr	tons per consecutive 12 calendar month period
T2	Tier II operating permit
TAP	toxic air pollutants
TEQ	toxicity equivalent
T-RACT	Toxic Air Pollutant Reasonably Available Control Technology
ULSD	ultra-low sulfur diesel
U.S.C.	United States Code
VOC	volatile organic compounds
yd^3	cubic yards
$\mu g/m^3$	micrograms per cubic meter

FACILITY INFORMATION

Description

Brigham Young University Idaho (BYUI, formerly Ricks College) is a four-year private university. Emissions units and activities include the central heating plant boilers, a natural gas-fired combustion turbine, emergency IC engines, coating operations, laboratories, welding operations, and storage tanks.

The Central Heating Plant was initially constructed in 1963 and included Boilers No. 1 and 2. Boiler No. 3 was added in 1966, and Boiler No. 4 was added in 1973. Boiler No. 1 was removed in 2001, the same year that Boiler No. 5 was installed. Boilers No. 2, 3, and 4 are coal-fired units, and Boiler No. 5 is a multi-fuel boiler capable of burning distillate fuel oil or gas. The ash handling system is used to transport and remove coal ash generated by the boilers.

Emergency generators located throughout the campus provide electric power when line power is not available. Welding and spray paint coating operations are used for facility maintenance purposes, including the installation, building, and repair of new equipment or structures (e.g., welding for the building and repair of stage sets at the Drama location).

In 2014-2015 the facility replaced the three existing coal-fired boilers, Boilers No. 2, 3, and 4, with two new natural gas-fired boilers, new Boilers No. 2 and 3, retrofitted existing Boiler No. 5 (which is now known as new Boiler No. 4) with a new natural gas-fired burner, and installed a natural gas-fired combustion turbine with a heat recovery steam generator (HRSG) with a duct burner. During the construction project Boiler No. 4 was retrofitted with a lower heat input burner than was proposed in the application and permitted. In addition, the diameter of the HRSG bypass stack installed was larger than originally proposed and modeled.

Permitting History

The following information was derived from a review of the permit files available to DEQ. Permit status is noted as active and in effect (A) or superseded (S).

November 6, 2014	P-2013.0057, Replacement of three existing coal-fired boilers with two new natural gas-fired boilers, the retrofitting of one existing coal-fired boiler with a natural gas-fired burner, the installation of a new natural gas-fired combustion turbine with a duct burner and a heat recovery steam generator (HRSG), and the installation of four new emergency IC engines (two of which were previously installed), Permit status (A, but will become S upon issuance of this permit)
November 15, 2013	T2-2009.0031, Discontinue use of the No. 4 boiler, Permit status (S)
June 2, 2009	T2-2009.0031, T2/PTC renewal and modification to increase Boiler Nos. 2-4 annual fuel combustion limit, replace one emergency generator, add one emergency generator, add three spray booths, and add welding operations, Permit status (S)
February 12, 2007	PTC/T2 No. P-060500, T2/PTC modification to increase the allowable sulfur content of coal used in Boiler Nos. 2-4, reduce the allowable sulfur content of No. 2 fuel oil used in Boiler No. 5, replace three emergency generators, and add three emergency generators, Permit status (S)
April 9, 2003	PTC/T2 No. T2-010511, T2/PTC renewal and modification to replace Boiler No. 1 with Boiler No. 5, and to incorporate synthetic minor limits, Permit status (S)
August 12, 1996	T2 No. 065-00011 (9506-078-2), initial T2 operating permit, Permit status (S)
September 4, 1990	PTC No. 1000-0011-001, PTC to construct four coal-fired boilers, Permit status (S)

Application Scope

This PTC is for a modification at an existing minor source facility currently operating under PTC permit number P-2013.0057 issued November 6, 2014.

The applicant has proposed to:

- Permit the "as installed" Boiler No. 4 with a heat input rating of 25.682 MMBtu/hr (instead of 55.0 MMBtu/hr as originally applied for and permitted).
- Permit the "as installed" HRSG bypass stack diameter of 54" (instead of 48" as was originally modeled and permitted).
- Model additional operation scenarios for the gas turbine and duct burners than were originally modeled and permitted.

In addition there are changes that need to be made to clarify how hourly and annual emissions were determined when combusting natural gas with ULSD fuel as backup for the boilers and gas turbines, a decrease in the annual natural gas usage based upon the smaller boiler that was installed instead of what was originally proposed, and corrections to the Subpart KKKK emissions limits based upon the correct heat input rating of the gas turbine (90 MMBtu/hr for the combined turbine, rated at 60 MMBtu/hr, and duct burner, rated at 30 MMBtu/hr, instead of 50 MMBtu/hr).

Application Chronology

June 6, 2015	DEQ received an application and an application fee.
July 1, 2015	DEQ determined that the application was incomplete.
September 1, 2015	DEQ received supplemental information from the applicant.
September 30, 2015	DEQ determined that the application was incomplete.
December 1, 2015	DEQ received supplemental information from the applicant.
December 29, 2015	DEQ determined that the application was complete.
October 17, 2016	DEQ made available the draft permit and statement of basis for peer and regional office review.
October 20, 2016	DEQ made available the draft permit and statement of basis for applicant review.
November 15, 2016	DEQ received the permit processing fee.
November 18, 2016	DEQ issued the final permit and statement of basis.

TECHNICAL ANALYSIS

Emissions Units and Control Equipment

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION

Source ID No.	Sources	Control Equipment	Emission Point ID No.
SB-2	Boiler No. 2: Manufacturer: Cleaver Brooks Model: Type "O" Burner Mfg.: Natcom Burner Model: NOS-2-54 Installation Date: 2014 Heat input rating: 55.0 MMBtu/hr Primary Fuel: Natural gas Backup Fuel: ULSD fuel	N/A	BLR2: Exit height: 80.0 ft (24.38 m) Exit diameter: 3.35 ft (1.02 m) Exit flow rate: 15,255 acfm Exit temperature: 317 °F (158.3 °C)
SB-3	Boiler No. 3: Manufacturer: Cleaver Brooks Model: Type "O" Burner Mfg.: Natcom Burner Model: NOS-2-54 Installation Date: 2014 Heat input rating: 55.0 MMBtu/hr Primary Fuel: Natural gas Backup Fuel: ULSD fuel	N/A	BLR3: Exit height: 80.0 ft (24.38 m) Exit diameter: 3.35 ft (1.02 m) Exit flow rate: 15,255 acfm Exit temperature: 317 °F (158.3 °C)
SB-4	Boiler No. 4: Manufacturer: Clever-Brooks Model: Type CBEX Elite Burner Mfg.: Cleaver-Brooks Burner Model: CBEX Elite Installation Date: 2014 Heat input rating: 25.682 MMBtu/hr Primary Fuel: Natural gas Backup Fuel: ULSD fuel	N/A	BLR4: Exit height: 80.0 ft (24.38 m) Exit diameter: 3.35 ft (1.02 m) Exit flow rate: 15,255 acfm Exit temperature: 317 °F (158.3 °C)
Unit No. 1	Combustion Turbine: Manufacturer: Solar Turbine Model: Taurus 60-7901S Manufacture Date: 2013 Heat input rating: 60 MMBtu/hr Primary Fuel: Natural gas Backup Fuel: ULSD fuel	N/A	HRSG: Exit height: 80.0 ft (24.38 m) Exit diameter: 4.5 ft (1.37 m) Exit flow rate: 254,476 acfm Exit temperature: 254 °F (123.3 °C) Bypass: Exit height: 80.0 ft (24.38 m) Exit diameter: 4.5 ft (1.37 m) Exit flow rate: 510,719 acfm Exit temperature: 950.1 °F (510.1 °C)
HRSG-1	Duct Burner: Manufacturer: Natcom Burner Model: MF-4(S)-70 HRSG Manufacture Date: 2013 Heat input rating: 30 MMBtu/hr Fuel: Natural gas only	N/A	
EG-481	Emergency IC Engine 481: Manufacturer: Volvo Model: TAD1641GE Manufacture Date: 2013 Max. rating: 757 bhp Tier rating: Tier 2 Fuel: ULSD only	N/A	EG481: Exit height: 35.0 ft (10.67 m) Exit diameter: 1.0 ft (0.31 m) Exit flow rate: 3,899 acfm Exit temperature: 893 °F (478.3 °C)

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION (continued)

Source ID No.	Sources	Control Equipment	Emission Point ID No.
EG-40084	Emergency IC Engine 40084, Central Energy Plant: Manufacturer: Volvo Model: TAD1641GE Manufacture Date: 2013 Max. rating: 757 bhp Tier rating: Tier 2 Fuel: ULSD only	N/A	EG40084: Exit height: 35.0 ft (10.67 m) Exit diameter: 1.0 ft (0.31 m) Exit flow rate: 3,899 acfm Exit temperature: 893 °F (478.3 °C)
EG-40085	Emergency IC Engine 40085, Central Energy Plant: Manufacturer: Volvo Model: TAD1641GE Manufacture Date: 2013 Max. rating: 757 bhp Tier rating: Tier 2 Fuel: ULSD only	N/A	EG40085: Exit height: 35.0 ft (10.67 m) Exit diameter: 1.0 ft (0.31 m) Exit flow rate: 3,899 acfm Exit temperature: 893 °F (478.3 °C)
EG-40002	Emergency Generator No. 40002: Caterpillar Model SR4B Diesel-fired, 438 kW, located at Kimball Building, installed before 2004	N/A	Emergency Generator No. 40002 exhaust stack
EG-40077	Emergency Generator No. 40077: Generac Model 2570000000 Diesel-fired, 100 kW, located at Hart Building, installed before 2004	N/A	Emergency Generator No. 40077 exhaust stack
EG-40082	Emergency Generator No. 40082: Generac Model 9900000000 Diesel-fired, 500 kW, located outside the Heat Plant, installed 2008	N/A	Emergency Generator No. 40082 exhaust stack
EG-40083	Emergency Generator No. 40083: Generac Model 9900000000 Diesel-fired, 500 kW, located outside the Heat Plant, installed 2008	N/A	Emergency Generator No. 40083 exhaust stack
EG-40010	Emergency Generator No. 40010: Onan Model DGBB5007082 Diesel-fired, 35 kW, located at Spori/Kirkham Building, installed before 2004	N/A	Emergency Generator No. 40010 exhaust stack
EG-40080	Emergency Generator No. 40080: Olympian Model 94A03525-S Diesel-fired, 60 kW, located at Auxiliary Services, installed before 2004	N/A	Emergency Generator No. 40080 exhaust stack
EG-40014	Emergency Generator No. 40014: Olympian Model D30P3 Diesel-fired, 30 kW, located at Austin Building, installed before 2004	N/A	Emergency Generator No. 40014 exhaust stack
EG-40016	Emergency Generator No. 40016: Generac Model 5690000000 Diesel-fired, 80 kW, located in Snow Performing Arts Center, installed 2006	N/A	Emergency Generator No. 40016 exhaust stack
EG-40004	Emergency Generator No. 40004: Onan Model 50.0DVA-15R/29163A Diesel-fired, 50 kW, located at Romney Building, installed before 2004	N/A	Emergency Generator No. 40004 exhaust stack
EG-40031	Emergency Generator 40031: Kohler Model 80R0ZJ71 Diesel-fired, 80 kW, located at the Library, installed before 2004	N/A	Emergency Generator No. 40031 exhaust stack

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION (continued)

Source ID No.	Sources	Control Equipment	Emission Point ID No.
EG-40013	Emergency Generator No. 40013: Cummins Model DGHE60-5588634 Diesel-fired, 50 kW, located at Benson Building, installed before 2004	N/A	Emergency Generator No. 40013 exhaust stack
EG-40020	Emergency Generator No. 40020: Cummins Model DFEG-5937812 Diesel-fired, 350 kW, located at Smith Building, installed 2008	N/A	Emergency Generator No. 40020 exhaust stack
EG-40015	Emergency Generator No. 40015: Generac Model 5170000000 Diesel-fired, 60 kW, located at Clark Building, installed 2005	N/A	Emergency Generator No. 40015 exhaust stack
EG-40009	Emergency Generator No. 40009: Generac Model 20A02581-S Diesel-fired, 40 kW, located at KRIC, installed before 2004	N/A	Emergency Generator No. 40009 exhaust stack
EG-40012	Emergency Generator No. 40012: Generac Model 3430000000 Diesel-fired, 80 kW, located at Ricks/Hinckley Building, installed before 2004	N/A	Emergency Generator No. 40012 exhaust stack
EG-40008	Emergency Generator No. 40008: Onan Model 5DNAA Diesel-fired, 50 kW, located at Radio Tower, installed before 2004	N/A	Emergency Generator No. 40008 exhaust stack
EG-40011	Emergency Generator No. 40011: Cummins Model DGGD5632344 Diesel-fired, 35 kW, located at the Substation, installed before 2004	N/A	Emergency Generator No. 40011 exhaust stack
EG-40018	Emergency Generator No. 40018: Generac Model 6950000000 Diesel-fired, 130 kW, located at Menan Butte, installed 2006	N/A	Emergency Generator No. 40018 exhaust stack
PFPB1	Physical Facilities #1 Spray Booth: Graco Model 220955 Airless spray gun, 5 gal/hr capacity	Pre-filter and filter system Airless spray gun	Physical Facilities #1 Spray Booth exhaust stack
PFPB2	Physical Facilities #2 Spray Booth: Graco Model 395 Airless spray gun, 5 gal/hr capacity	Pre-filter and filter system Airless spray gun	Physical Facilities #2 Spray Booth exhaust stack
ASB	Austin Spray Booth: Campbell Housefield HVLP spray gun, 1.5 gal/hr capacity	Pre-filter and filter system HVLP spray gun	Austin Spray Booth exhaust stack

Emissions Inventories

Potential to Emit

IDAPA 58.01.01 defines Potential to Emit as the maximum capacity of a facility or stationary source to emit an air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the facility or source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is state or federally enforceable. Secondary emissions do not count in determining the potential to emit of a facility or stationary source.

Using this definition of Potential to Emit an emission inventory was developed for the operations at the facility (see Appendix A) associated with this proposed project. Emissions estimates of criteria pollutant, GHG, HAP PTE were based on emission factors from AP-42, the equipment manufacturers, and process information specific to the facility for this proposed project.

Uncontrolled Potential to Emit

Using the definition of Potential to Emit, uncontrolled Potential to Emit is then defined as the maximum capacity of a facility or stationary source to emit an air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the facility or source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored or processed, shall **not** be treated as part of its design **since** the limitation or the effect it would have on emissions **is not** state or federally enforceable.

The uncontrolled Potential to Emit is used to determine if a facility is a "Synthetic Minor" source of emissions. Synthetic Minor sources are facilities that have an uncontrolled Potential to Emit for regulated air pollutants or HAP above the applicable Major Source threshold without permit limits.

The following table presents the uncontrolled Potential to Emit for regulated air pollutants as submitted by the Applicant and verified by DEQ staff. See Appendix A for a detailed presentation of the calculations and the assumptions used to determine emissions for each emissions unit. For this facility uncontrolled Potential to Emit is based upon a worst-case for operation of the boilers at the facility of 8,760 hr/yr versus proposed operation of 4,900 hr/yr.

Table 2 UNCONTROLLED POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Source	$PM_{10}/PM_{2.5}$	SO_2	NO_X	CO	VOC	CO_2e
	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
Point Sources						
Natural Gas Boiler No. 2	3.09	0.17	13.75	14.12	1.38	
Natural Gas Boiler No. 3	3.09	0.17	13.75	14.12	1.38	
Natural Gas Boiler No. 4	1.31	0.07	5.96	6.12	0.58	
Combustion Turbine	1.87	0.04	31.10	25.18	0.56	
Duct Burner	1.77	0.03	18.46	18.46	0.80	
Emergency IC Engine 481	0.06	0.0033	1.67	0.21	0.48	
Emergency IC Engine 482	0.06	0.0033	1.67	0.21	0.48	
Emergency IC Engine 483	0.06	0.0033	1.67	0.21	0.48	
Emergency IC Engine 484	0.06	0.0033	1.67	0.21	0.48	
Heat Plant Emergency IC Engine	0.223	0.208	3.120	0.673	0.255	
Kimball Building Emergency IC Engine	0.325	0.303	4.553	0.983	0.370	
Hart Building Emergency IC Engine	0.075	0.070	1.040	0.225	0.085	
Physical Facilities Emergency IC Engine	0.023	0.023	0.313	0.068	0.028	
Manwaring Center Emergency IC Engine	0.045	0.043	0.625	0.135	0.053	
Kirkham Building Emergency IC Engine	0.015	0.015	0.210	0.045	0.018	
Auxiliary Services Emergency IC Engine	0.045	0.043	0.625	0.135	0.053	
Austin Tech Building Emergency IC Engine	0.023	0.023	0.313	0.068	0.028	
Snow Performing Arts Center Emergency IC Engine	0.023	0.023	0.313	0.068	0.028	
Romney Building Emergency IC Engine	0.038	0.035	0.520	0.113	0.043	
Library Emergency IC Engine	0.060	0.055	0.833	0.180	0.068	
Benson Building Emergency IC Engine	0.038	0.035	0.520	0.113	0.043	
Smith Building Emergency IC Engine	0.010	0.023	0.840	0.105	0.295	
Clarke Building Emergency IC Engine	0.045	0.043	0.625	0.135	0.053	
Radio/Graphic Services Building Emergency IC Engine	0.030	0.028	0.418	0.090	0.035	
Spori Building Emergency IC Engine	0.020	0.018	0.260	0.058	0.023	
Ricks Building Emergency IC Engine	0.060	0.055	0.833	0.180	0.068	

Radio Tower Emergency IC Engine	0.005	0.005	0.053	0.013	0.005	
Portable Emergency IC Engine	0.185	0.173	2.600	0.560	0.213	
Substation Emergency IC Engine	0.028	0.025	0.365	0.080	0.030	
Physical Facilities #1 Spray Paint Booth	1.50	0.00	0.00	0.00	80.16	
Physical Facilities #2 Spray Paint Booth	0.02	0.00	0.00	0.00	0.66	
Austin Spray Paint Booth	0.01	0.00	0.00	0.00	0.27	
Welding Operations	0.02	0.00	0.00	0.00	0.00	
Total, Point Sources	**14.24**	**1.74**	**108.68**	**82.87**	**89.50**	**137,462**

Pre-Project Potential to Emit

Pre-project Potential to Emit is used to establish the change in emissions at a facility as a result of this project.

Pre-project emissions were taken from PTC permit P-2013.0057 issued November 6, 2014.

The following table presents the pre-project potential to emit for all criteria and GHG pollutants from all emissions units at the facility as submitted by the Applicant and verified by DEQ staff.

Table 3 PRE-PROJECT POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Source	$PM_{10}/PM_{2.5}$		SO_2		NO_X		CO		VOC		CO_2e
	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	T/yr[(b)]
Natural Gas Boiler No. 2	2.48	2.02	0.09	0.11	7.91	8.71	3.23	8.52	0.33	0.81	
Natural Gas Boiler No. 3	2.48	2.02	0.09	0.11	7.91	8.71	3.23	8.52	0.33	0.81	
Natural Gas Boiler No. 4	2.25	1.83	0.08	0.10	7.35	8.09	3.00	7.91	0.30	0.74	
Combustion Turbine	0.72	1.80	0.09	0.04	24.12	29.90	5.49	24.08	0.13	0.54	
Duct Burner	0.41	0.99	0.02	0.05	4.22	10.33	4.22	10.33	0.18	0.45	
Emergency IC Engine 40084, Central Energy Plant	0.23	0.06	0.01	0.003	6.68	1.67	0.83	0.21	1.90	0.48	
Emergency IC Engine 40085, Central Energy Plant	0.23	0.06	0.01	0.003	6.68	1.67	0.83	0.21	1.90	0.48	
Emergency IC Engine 40002, Kimball Building	1.30	0.325	1.21	0.303	18.21	4.55	3.93	0.98	1.48	0.37	
Emergency IC Engine 40077, Hart Building	0.30	0.08	0.28	0.07	4.16	1.04	0.90	0.23	0.34	0.09	
Emergency IC Engine 40082, Manwaring Center	0.18	0.05	0.17	0.043	2.50	0.63	0.54	0.14	0.21	0.05	
Emergency IC Engine 40083, Chiller Plant/BCTR/Manwaring Student Center/Facilities	0.18	0.05	0.17	0.043	2.50	0.63	0.54	0.14	0.21	0.05	
Emergency IC Engine 40010, Kirkham Building and Spori Building	0.06	0.02	0.06	0.02	0.84	0.21	0.18	0.05	0.07	0.02	
Emergency IC Engine 40080, Auxiliary Services	0.18	0.045	0.17	0.043	2.50	0.625	0.54	0.135	0.21	0.053	
Emergency IC Engine 40014, Austin Tech Building	0.09	0.023	0.09	0.023	1.25	0.313	0.27	0.068	0.11	0.028	
Emergency IC Engine 40016, Snow Performing Arts Center	0.09	0.023	0.09	0.023	1.25	0.313	0.27	0.068	0.11	0.028	
Emergency IC Engine 40004, Romney Building	0.15	0.038	0.14	0.035	2.08	0.520	0.45	0.113	0.17	0.043	
Emergency IC Engine 40031, McKay Library	0.24	0.060	0.22	0.055	3.33	0.833	0.72	0.180	0.27	0.068	
Emergency IC Engine 40013, Benson Building	0.15	0.038	0.14	0.035	2.08	0.520	0.45	0.113	0.17	0.043	
Emergency IC Engine 40020, Smith Building	0.04	0.010	0.09	0.023	3.36	0.840	0.42	0.105	1.18	0.295	
Emergency IC Engine 40015, Clarke Building	0.18	0.045	0.17	0.043	2.50	0.625	0.54	0.135	0.21	0.053	

Emergency IC Engine 40009, Radio/Graphic Services Building	0.12	0.030	0.11	0.028	1.67	0.418	0.36	0.090	0.14	0.035	
Emergency IC Engine 40012, Ricks Building	0.24	0.060	0.22	0.055	3.33	0.833	0.72	0.180	0.27	0.068	
Emergency IC Engine 40008, Radio Tower	0.02	0.005	0.02	0.005	0.21	0.053	0.05	0.013	0.02	0.005	
Emergency IC Engine 40011, Substation	0.11	0.028	0.10	0.025	1.46	0.365	0.32	0.080	0.12	0.030	
Emergency IC Engine 40018, Menan Butte Radio Tower	0.02	0.005	0.02	0.005	0.21	0.053	0.05	0.013	0.02	0.005	
Portable Emergency IC Engine	0.74	0.185	0.69	0.173	10.40	2.600	2.24	0.560	0.85	0.213	
Physical Facilities #1 Spray Paint Booth	0.341	1.50	0.00	0.00	0.00	0.00	0.00	0.00	18.30	80.16	
Physical Facilities #2 Spray Paint Booth	0.116	0.02	0.00	0.00	0.00	0.00	0.00	0.00	13.10	0.66	
Austin Spray Paint Booth	0.026	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.93	0.27	
Welding Operations	0.0025	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pre-Project Totals	**13.68**	**11.45**	**4.55**	**1.47**	**128.71**	**85.05**	**34.32**	**63.17**	**46.56**	**86.95**	**97,202**

a) Controlled average emission rate in pounds per hour is a daily average, based on the proposed daily operating schedule and daily limits.
b) Controlled average emission rate in tons per year is an annual average, based on the proposed annual operating schedule and annual limits.

Post Project Potential to Emit

Post project Potential to Emit is used to establish the change in emissions at a facility and to determine the facility's classification as a result of this project. Post project Potential to Emit includes all permit limits resulting from this project.

The following table presents the post project Potential to Emit for criteria and GHG pollutants from all emissions units at the facility as submitted by the Applicant and verified by DEQ staff. See Appendix A for a detailed presentation of the calculations of these emissions for each new emissions unit. Emissions from unmodified emissions units were carried over from the pre-project PTE in the previous table.

Table 4 POST PROJECT POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Source	$PM_{10}/PM_{2.5}$		SO_2		NO_X		CO		VOC		CO_2e
	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	lb/hr[(a)]	T/yr[(b)]	T/yr[(b)]
Natural Gas Boiler No. 2	2.48	2.02	0.09	0.11	7.91	8.71	3.23	8.52	0.33	0.81	
Natural Gas Boiler No. 3	2.48	2.02	0.09	0.11	7.91	8.71	3.23	8.52	0.33	0.81	
Natural Gas Boiler No. 4	0.60	0.50	0.04	0.04	2.93	2.36	3.00	7.34	0.16	0.39	
Combustion Turbine	0.72	1.80	0.09	0.04	24.12	29.90	5.49	24.08	0.13	0.54	
Duct Burner	0.41	0.99	0.02	0.05	4.22	10.33	4.22	10.33	0.18	0.45	
Emergency IC Engine 40084, Central Energy Plant	0.23	0.06	0.01	0.003	6.68	1.67	0.83	0.21	1.90	0.48	
Emergency IC Engine 40085, Central Energy Plant	0.23	0.06	0.01	0.003	6.68	1.67	0.83	0.21	1.90	0.48	
Emergency IC Engine 40002, Kimball Building	1.30	0.325	1.21	0.303	18.21	4.55	3.93	0.98	1.48	0.37	
Emergency IC Engine 40077, Hart Building	0.30	0.08	0.28	0.07	4.16	1.04	0.90	0.23	0.34	0.09	
Emergency IC Engine 40082, Manwaring Center	0.18	0.05	0.17	0.043	2.50	0.63	0.54	0.14	0.21	0.05	
Emergency IC Engine 40083, Chiller Plant/BCTR/Manwaring Student Center/Facilities	0.18	0.05	0.17	0.043	2.50	0.63	0.54	0.14	0.21	0.05	
Emergency IC Engine 40010, Kirkham Building and Spori Building	0.06	0.02	0.06	0.02	0.84	0.21	0.18	0.05	0.07	0.02	
Emergency IC Engine 40080, Auxiliary Services	0.18	0.045	0.17	0.043	2.50	0.625	0.54	0.135	0.21	0.053	

Emergency IC Engine 40014, Austin Tech Building	0.09	0.023	0.09	0.023	1.25	0.313	0.27	0.068	0.11	0.028	
Emergency IC Engine 40016, Snow Performing Arts Center	0.09	0.023	0.09	0.023	1.25	0.313	0.27	0.068	0.11	0.028	
Emergency IC Engine 40004, Romney Building	0.15	0.038	0.14	0.035	2.08	0.520	0.45	0.113	0.17	0.043	
Emergency IC Engine 40031, McKay Library	0.24	0.060	0.22	0.055	3.33	0.833	0.72	0.180	0.27	0.068	
Emergency IC Engine 40013, Benson Building	0.15	0.038	0.14	0.035	2.08	0.520	0.45	0.113	0.17	0.043	
Emergency IC Engine 40020, Smith Building	0.04	0.010	0.09	0.023	3.36	0.840	0.42	0.105	1.18	0.295	
Emergency IC Engine 40015, Clarke Building	0.18	0.045	0.17	0.043	2.50	0.625	0.54	0.135	0.21	0.053	
Emergency IC Engine 40009, Radio/Graphic Services Building	0.12	0.030	0.11	0.028	1.67	0.418	0.36	0.090	0.14	0.035	
Emergency IC Engine 40012, Ricks Building	0.24	0.060	0.22	0.055	3.33	0.833	0.72	0.180	0.27	0.068	
Emergency IC Engine 40008, Radio Tower	0.02	0.005	0.02	0.005	0.21	0.053	0.05	0.013	0.02	0.005	
Emergency IC Engine 40011, Substation	0.11	0.028	0.10	0.025	1.46	0.365	0.32	0.080	0.12	0.030	
Emergency IC Engine 40018, Menan Butte Radio Tower	0.02	0.005	0.02	0.005	0.21	0.053	0.05	0.013	0.02	0.005	
Portable Emergency IC Engine	0.74	0.185	0.69	0.173	10.40	2.600	2.24	0.560	0.85	0.213	
Physical Facilities #1 Spray Paint Booth	0.341	1.50	0.00	0.00	0.00	0.00	0.00	0.00	18.30	80.16	
Physical Facilities #2 Spray Paint Booth	0.116	0.02	0.00	0.00	0.00	0.00	0.00	0.00	13.10	0.66	
Austin Spray Paint Booth	0.026	0.01	0.00	0.00	0.00	0.00	0.00	0.00	3.93	0.27	
Welding Operations	0.0025	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Post Project Totals	**12.03**	**10.12**	**4.51**	**1.41**	**124.29**	**79.32**	**34.32**	**62.60**	**46.42**	**86.60**	**0.00**

a) Controlled average emission rate in pounds per hour is a daily average, based on the proposed daily operating schedule and daily limits.
b) Controlled average emission rate in tons per year is an annual average, based on the proposed annual operating schedule and annual limits.

Change in Potential to Emit

The change in facility-wide potential to emit is used to determine if a public comment period may be required and to determine the processing fee per IDAPA 58.01.01.225. The following table presents the facility-wide change in the potential to emit for criteria pollutants.

Table 5 CHANGES IN POTENTIAL TO EMIT FOR REGULATED AIR POLLUTANTS

Source	$PM_{10}/PM_{2.5}$		SO_2		NO_X		CO		VOC		CO_2e
	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	lb/hr	T/yr	T/yr
Pre-Project Potential to Emit	13.68	11.45	4.55	1.47	128.71	85.05	34.32	63.17	46.56	86.95	97,202
Post Project Potential to Emit	12.03	10.12	4.51	1.41	124.29	79.32	34.32	62.60	46.42	86.60	97,202
Changes in Potential to Emit	**-1.65**	**-1.33**	**-0.04**	**-0.06**	**-4.42**	**-5.73**	**0.00**	**-0.57**	**-0.14**	**-0.35**	**0.00**

Non-Carcinogenic TAP Emissions

As a result of installing a smaller natural gas-fired boiler non-carcinogenic TAPs went down an insignificant amount as a result of the project.

Carcinogenic TAP Emissions

As a result of installing a smaller natural gas-fired boiler carcinogenic TAPs went down an insignificant amount as a result of the project.

Post Project HAP Emissions

As a result of installing a smaller natural gas-fired boiler HAPs went down an insignificant amount as a result of the project.

Ambient Air Quality Impact Analyses

As presented in the Modeling Memo in Appendix B, the estimated emission rates of PM_{10}, $PM_{2.5}$, NO_X, CO, and SO_2 from this project exceeded applicable screening emission levels (EL) and published DEQ modeling thresholds established in IDAPA 58.01.01.585-586 and in the State of Idaho Air Quality Modeling Guideline[1]. Refer to the Emissions Inventories section for additional information concerning the emission inventories.

The applicant has demonstrated pre-construction compliance to DEQ's satisfaction that emissions from this facility will not cause or significantly contribute to a violation of any ambient air quality standard. The applicant has also demonstrated pre-construction compliance to DEQ's satisfaction that the emissions increase due to this permitting action will not exceed any acceptable ambient concentration (AAC) or acceptable ambient concentration for carcinogens (AACC) for toxic air pollutants (TAP). A summary of the Ambient Air Impact Analysis for TAP is provided in Appendix A.

An ambient air quality impact analyses document has been crafted by DEQ based on a review of the modeling analysis submitted in the application. That document is part of the final permit package for this permitting action (see Appendix B).

REGULATORY ANALYSIS

Attainment Designation (40 CFR 81.313)

The facility is located in Madison County, which is designated as attainment or unclassifiable for $PM_{2.5}$, PM_{10}, SO_2, NO_2, CO, and Ozone. Refer to 40 CFR 81.313 for additional information.

Facility Classification

The AIRS/AFS facility classification codes are as follows:

For THAPs (Total Hazardous Air Pollutants) Only:

A = Use when any one HAP has actual or potential emissions $\geq$ 10 T/yr or if the aggregate of all HAPS (Total HAPs) has actual or potential emissions $\geq$ 25 T/yr.

SM80 = Use if a synthetic minor (potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable limitations) and the permit sets limits $\geq$ 8 T/yr of a single HAP or $\geq$ 20 T/yr of THAP.

SM = Use if a synthetic minor (potential emissions fall below applicable major source thresholds if and only if the source complies with federally enforceable limitations) and the potential HAP emissions are limited to < 8 T/yr of a single HAP and/or < 20 T/yr of THAP.

B = Use when the potential to emit without permit restrictions is below the 10 and 25 T/yr major source threshold

UNK = Class is unknown

[1] Criteria pollutant thresholds in Table 2, State of Idaho Guideline for Performing Air Quality Impact Analyses, Doc ID AQ-011, September 2013.

For All Other Pollutants:

A = Actual or potential emissions of a pollutant are ≥ 100 T/yr.

SM80 = Use if a synthetic minor for the applicable pollutant (potential emissions fall below 100 T/yr if and only if the source complies with federally enforceable limitations) and potential emissions of the pollutant are ≥ 80 T/yr.

SM = Use if a synthetic minor for the applicable pollutant (potential emissions fall below 100 T/yr if and only if the source complies with federally enforceable limitations) and potential emissions of the pollutant are < 80 T/yr.

B = Actual and potential emissions are < 100 T/yr without permit restrictions.

UNK = Class is unknown.

Table 6 REGULATED AIR POLLUTANT FACILITY CLASSIFICATION

Pollutant	Uncontrolled PTE (T/yr)	Permitted PTE (T/yr)	Major Source Thresholds (T/yr)	AIRS/AFS Classification
PM	14.24	10.12	**100**	B
$PM_{10}/PM_{2.5}$	14.24	10.12	**100**	B
SO_2	1.74	1.41	**100**	B
NO_X	108.68	79.32	**100**	SM
CO	82.87	62.60	**100**	B
VOC	89.50	86.60	**100**	B
HAP (single)	<10	0.42[a]	**10**	B
HAP (Total)	<25	0.241[a]	**25**	B

a) As discussed previously there was a small decrease in HAPs emissions as a result of this project. Therefore, the HAP PTEs were taken from the previous permitting project 61299.

Permit to Construct (IDAPA 58.01.01.201)

IDAPA 58.01.01.201 Permit to Construct Required

The permittee has requested that a PTC be issued to the facility for the modified emissions source. Therefore, a permit to construct is required to be issued in accordance with IDAPA 58.01.01.220. This permitting action was processed in accordance with the procedures of IDAPA 58.01.01.200-228.

Permit to Construct (IDAPA 58.01.01.210.20)

IDAPA 58.01.01.210.20 NSPS and NESHAP Sources

IDAPA 58.01.01.210.20 states that "If the owner or operator demonstrates that the toxic air pollutant from the source or modification is regulated by the Department or EPA at the time of permit issuance under 40 CFR Part 60, 40 CFR Part 61 or 40 CFR Part 63 and the permit to construct issued by the Department contains adequate provisions implementing the federal standard, no further procedures for demonstrating preconstruction compliance will be required under Section 210 for that toxic air pollutant as part of the application process." For this project there are Boilers, Emergency IC Engines, and a Combustion Turbine are being installed and all three emissions sources are regulated by NSPS or NESHAP requirements. Therefore, as discussed previously modeling for TAPs emissions increases is not required for this project.

Tier II Operating Permit (IDAPA 58.01.01.401)

IDAPA 58.01.01.401 Tier II Operating Permit

The application was submitted to convert a Tier II operating permit to a Permit to Construct (refer to the Permit to Construct section). Therefore, the procedures of IDAPA 58.01.01.400–410 were not applicable to this permitting action.

Visible Emissions (IDAPA 58.01.01.625)

IDAPA 58.01.01.625 Visible Emissions

The sources of PM_{10} emissions at this facility are subject to the State of Idaho visible emissions standard of 20% opacity. This requirement is assured by Permit Conditions 2.4, 3.4, 4.3, and 5.4.

Standards for New Sources (IDAPA 58.01.01.676)

IDAPA 58.01.01.676 Standards for New Sources

The fuel burning equipment located at this facility, with a maximum rated input of ten (10) million BTU per hour or more, are subject to a particulate matter limitation of 0.015 gr/dscf of effluent gas corrected to 3% oxygen by volume when combusting gaseous fuels and 0.050 gr/dscf of effluent gas corrected to 3% oxygen by volume for liquid fuels. Fuel-Burning Equipment is defined as any furnace, boiler, apparatus, stack and all appurtenances thereto, used in the process of burning fuel for the primary purpose of producing heat or power by indirect heat transfer. This requirement is assured by Permit Conditions 2.5, 3.5, and 4.4.

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

IDAPA 58.01.01.301 Requirement to Obtain Tier I Operating Permit

Post project facility-wide emissions from this facility do not have a potential to emit greater than 100 tons per year for any criteria pollutant, greater than 100,000 tons per year for CO_2e, or 10 tons per year for any one HAP or 25 tons per year for all HAPs combined as demonstrated previously in the Emissions Inventories Section of this analysis. Therefore, the facility is not a Tier I source in accordance with IDAPA 58.01.01.006 and the requirements of IDAPA 58.01.01.301 do not apply.

PSD Classification (40 CFR 52.21)

40 CFR 52.21 Prevention of Significant Deterioration of Air Quality

The facility is not a major stationary source as defined in 40 CFR 52.21(b)(1), nor is it undergoing any physical change at a stationary source not otherwise qualifying under paragraph 40 CFR 52.21(b)(1) as a major stationary source, that would constitute a major stationary source by itself as defined in 40 CFR 52. Therefore in accordance with 40 CFR 52.21(a)(2), PSD requirements are not applicable to this permitting action. The facility is/is not a designated facility as defined in 40 CFR 52.21(b)(1)(i)(a), and does not have facility-wide emissions of any criteria pollutant that exceed 250 T/yr.

NSPS Applicability (40 CFR 60)

Because the facility has three boilers, a gas turbine, and CI emergency IC engines, the following NSPS requirements apply to this facility:

- 40 CFR 60, Subpart Dc - Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units
- 40 CFR 60, Subpart IIII - Standards of Performance for Stationary Compression Ignition Internal Combustion Engines
- 40 CFR 60, Subpart KKKK - Standards of Performance for Stationary Combustion Turbines

There was no change in the applicability analyses for Subparts Dc and IIII as a result of this project. Therefore, refer to project 61299 for the analyses of these two subparts.

There was a change in the applicability analyses for Subpart KKKK as a result of this project. In the previous project the emissions limits from Table 1 for a gas turbine rated at 50 MMBtu/hr were incorrectly identified (the "stationary combustion turbine", which includes the duct burner, is actually rated at 90 MMBtu/hr, (the turbine, rated at 60 MMBtu/hr, and duct burner, rated at 30 MMBtu/hr, instead of 50 MMBtu/hr). Therefore, this section of the Subpart KKKK analysis was redone as follows.

§ 60.4325 What emission limits must I meet for NO_X if my turbine burns both natural gas and distillate oil (or some other combination of fuels)?

You must meet the emission limits specified in Table 1 to this subpart. If your total heat input is greater than or equal to 50 percent natural gas, you must meet the corresponding limit for a natural gas-fired turbine when you are burning that fuel. Similarly, when your total heat input is greater than 50 percent distillate oil and fuels other than natural gas, you must meet the corresponding limit for distillate oil and fuels other than natural gas for the duration of the time that you burn that particular fuel. This facility is installing a natural gas-fired turbine with ULSD fuel as backup that is rated at 60 MMBtu/hr. Therefore, the following limits from Table 1 of the Subpart apply.

Table 7 Table 1 to Subpart KKKK of Part 60—Nitrogen Oxide Emission Limits for New Stationary Combustion Turbines

Combustion turbine type	Combustion turbine heat input at peak load (HHV)	NO_X emission standard
New turbine firing natural gas	> 50 MMBtu/hr and ≤ 850 MMBtu/hr	25 ppm at 15 percent O_2 or 150 ng/J of useful output (1.2 lb/MWh).
New turbine firing fuels other than natural gas	> 50 MMBtu/h and ≤ 850 MMBtu/h	74 ppm at 15 percent O_2 or 460 ng/J of useful output (3.6 lb/MWh).
Heat recovery units operating independent of the combustion turbine	All sizes	54 ppm at 15 percent O_2 or 110 ng/J of useful output (0.86 lb/MWh).

These requirements are assured by revised Permit Condition 3.11.

NESHAP Applicability (40 CFR 61)

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

MACT Applicability (40 CFR 63)

Because the facility has boilers, CI emergency IC engines, and paint spray booths installed at the facility, the following NESHAP requirements apply to this facility:

- 40 CFR 63, Subpart ZZZZ - National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
- 40 CFR 63, Subpart HHHHHH - National Emissions Standards for Hazardous Air Pollutants: Paint Stripping and Miscellaneous Surface Coating Operations at Area Sources
- 40 CFR 63, Subpart JJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources

There was no change in the applicability analyses for Subparts ZZZZ, HHHHHH, and JJJJJJ as a result of this project. Therefore, refer to the Statement of Basis for project 61299 for the analyses of these three subparts.

Permit Conditions Review

This section describes the permit conditions for this initial permit or only those permit conditions that have been added, revised, modified or deleted as a result of this permitting action.

PERMIT SCOPE

Permit Condition 1.1 describes the modifications to the existing processes at the facility process being permitted as a result of this project.

Permit Condition 1.3 explains which previous permit for the facility is being replaced as a result of this project.

Table 1.1 was updated to reflect the new equipment being installed as a result of this project (specifically Boiler No. 4).

BOILERS NO. 2, NO. 3, AND NO. 4

Permit Condition 2.3 was modified to reflect the change in emissions from Boiler No. 4. In addition, footnotes "e" and "f" were added to the table to clarify how hourly and annual emissions were determined when combusting natural gas with ULSD fuel as backup.

Permit Condition 2.7 was modified to reflect the new natural gas usage limit as a result of installing a smaller boiler than was originally applied for by the Applicant. The new limit was calculated as 669,741.8 MMBtu/yr (annual fuel use per the Applicant for the modeling demonstration) ÷ 900 Btu/scf (per the Applicant) x 1,000,000 Btu/MMBtu ÷ 1,000,000 scf/MMscf = 744.2 MMscf/yr.

COMBUSTION TURBINE AND DUCT BURNER

Permit Condition 3.3 was modified to include footnotes "e" and "f" to clarify how hourly and annual emissions were determined when combusting natural gas with ULSD fuel as backup.

Permit Condition 3.11 was modified to correct the Subpart KKKK emissions limits for a gas turbine rated at 50 MMBtu/hr to 60 MMBtu/hr.

PUBLIC REVIEW

Public Comment Opportunity

Because this permitting action does not authorize an increase in emissions, an opportunity for public comment period was not required or provided in accordance with IDAPA 58.01.01.209.04 or IDAPA 58.01.01.404.04.

APPENDIX A – EMISSIONS INVENTORIES

Natural Gas

900 Btu/ft^3 NG				PM$_{10}$/PM$_{2.5}$					SO$_2$					NO$_x$				
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 1	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.0611	4,900	Mfgr.	0.01125	lb/MMBtu	0.619	1.52	Table 1.4-2	0.6	lb/10^6 ft^3	0.037	0.09	Mfgr.		lb/hr	2.911	7.13
Boiler 3	55.0	0.0611	4,900	Mfgr.	0.01125	lb/MMBtu	0.619	1.52	Table 1.4-2	0.6	lb/10^6 ft^3	0.037	0.09	Mfgr.		lb/hr	2.911	7.13
Turbine	60.0	0.0667	8,760	Table 3.1-2a	0.0066	lb/MMBtu	0.396	1.73	Table 3.1-2a	0.00008	lb/MMBtu	0.005	0.02	Mfgr.	0.10	lb/MMBtu	6.000	26.28
HRSG	30.0	0.0333	4,900	Mfgr.	0.0135	lb/MMBtu	0.405	0.99	Table 1.4-2	0.6	lb/10^6 ft^3	0.020	0.05	Mfgr.		lb/hr	4.215	10.33
Boiler 4 (Note 2) Natural Gas	50.0	0.0556	4,900	Mfgr.	0.01125	lb/MMBtu	0.563	1.38	Table 1.4-2	0.6	lb/10^6 ft^3	0.033	0.08	Mfgr.		lb/hr	2.700	6.62
		Blrs/Turbine/HRSG Subtotal					2.60	7.14				0.13	0.33				18.74	57.48
Heat/Chilled H$_2$O Emer. Diesel Gen.	kW	HP		Em. Factor Source	Em. Factor (g/hp-hr)	Em. Factor Units	Em. Rate (lb/hr)	500 hr/yr (TPY)	Em. Factor Source	Em. Factor[6] (15 ppm S)	Max. Fuel Usage (62.6 gal/hr)	Em. Rate (lb/hr)	500 hr/yr (TPY)	Em. Factor Source	Em. Factor (g/hp-hr)	Em. Factor Units	Em. Rate (lb/hr)	500 hr/yr (TPY)
EG481	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06	Mass Balance	0.0002115	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG482	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06	Mass Balance	0.0002115	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG483	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06	Mass Balance	0.0002115	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG484	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06	Mass Balance	0.0002115	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
Boilers 2, 3, 4, 5, HRSG, and Turbine Diesel PM$_{10}$ Emissions (see below)							7.92	1.58				0.34	0.07				47.29	9.46
All OtherExisting BYUI Sources																		
Emer. Generators (500 hr/yr ea.) (Note 3)							5.25	1.32					1.25					18.98
Paint Booths (Note 4)							0.48	1.53					--					--
Welding							0.003	0.02					--					--
Ash Handling System							1.00	0.37					--					--
		Total Future Emissions (TPY)					18.19	10.27				0.53	1.66				92.73	92.60
		Existing Permit Tot. Em. (TPY)					26.1	24.96				100.32	99.79				120.7	80
		Ex. Prmt Coal Em (9300 TPY-4.36 TPH)		Emissions for criteria pollutants from existing coal boilers are included above in Existing Permit Total Emissions.														
		Incr./Decr. Current to Future (TPY)					-7.91	-14.69				-99.79	-98.13				-27.97	12.60

Natural Gas

900 Btu/ft^3 NG				CO					VOC					Pb			
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)
Boiler 2	55.0	0.0611	4,900	Mfgr.		lb/hr	3.234	7.92	Mfgr.	0.006	lb/MMBtu	0.330	0.81	Table 1.4-2	0.0005	lb/10^6 ft^3	0.00003
Boiler 3	55.0	0.0611	4,900	Mfgr.		lb/hr	3.234	7.92	Mfgr.	0.006	lb/MMBtu	0.330	0.81	Table 1.4-2	0.0005	lb/10^6 ft^3	0.00003
Turbine	60.0	0.0667	8,760	Mfgr.	0.092	lb/MMBtu	5.490	24.05	Table 3.1-2a	0.0021	lb/MMBtu	0.126	0.55	Table 3.1-2a	N/A	lb/10^6 ft^3	N/A
HRSG	30.0	0.0333	4,900	Mfgr.		lb/hr	4.215	10.33	Table1.4-2	5.5	lb/10^6 ft^3	0.183	0.45	Table 1.4-2	0.0005	lb/10^6 ft^3	0.00002
Boiler 4 (Note 2) Natural Gas	50.0	0.0556	4,900	Mfgr.		lb/hr	3.000	7.35	Mfgr.	0.006	lb/MMBtu	0.300	0.74	Table 1.4-2	0.0005	lb/10^6 ft^3	0.00003
		Blrs/Turbine/HRSG Subtotal					19.17	57.57				1.27	3.35				0.00011
Heat/Chilled H$_2$O Emer. Diesel Gen.	kW	HP		Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	500 hr/yr (TPY)	Em. Factor Source	Em. Factor (lb/hp-hr)		Em. Rate lb/hr	500 hr/yr (TPY)				
EG481	500	757		Mfgr.	0.50	g/hp-hr	0.834	0.21	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG482	500	757		Mfgr.	0.50		0.834	0.21	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG483	500	757		Mfgr.	0.50		0.834	0.21	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG484	500	757		Mfgr.	0.50		0.834	0.21	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
Diesel Emssions (See Below)							14.52	2.90				0.03	0.01		0.0E+00		0.00021
All OtherExisting BYUI Sources																	
Emer. Generators (500 hr/yr ea.) (Note 3)								4.03					1.80				0.01
Paint Booths (Note 4)								--				35.33	74.117				--
Welding								--					--				--
Ash Handling System								--					--				--
		Total Future Emissions (TPY)					22.51	65.34				44.24	79.38				0.0005
		Existing Permit Tot. Em. (TPY)					41.67	43.84				42.95	84.21				6.23
		Ex. Prmt Coal Em (9300 TPY-4.36 TPH)					Emissions for criteria pollutants from existing coal boilers are included above in Existing Permit Total Emissions.										
		Incr./Decr. Current to Future (TPY)					-19.16	21.50				1.29	-4.83				-6.23

NG	10^6 ft3/yr	
Blr2	299.44	
Blr3	299.44	
Blr4	272.22	
Turbine	584.00	
HRSG	163.33	NG limit for Blrs (10^6 ft3/yr)
Total	1618.44	1034
Diesel	10^3 gal/yr	
Blr2	162.21	
Blr3	162.21	
Blr4	147.46	
Turbine	176.95	
HRSG	0.00	Diesel limit for Blrs (10^3 gal/yr)
Total	648.82	472

No.2 Diesel (ULSD)5

135,630 Btu/gal Diesel (BYUI Fuel Supplier)				PM$_{10}$					PM$_{2.5}$					SO$_2$					NO$_x$				
ID	Heat Input (10^6 Btu/hr)	ULSD (10^3 gal/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.4055	400	Mfgr.	0.045	lb/MMBtu	2.475	0.50	Mfgr.	0.0054	lb/MMBtu	0.297	0.00	Table 1.3-1	0.213	lb/10^3 gal	0.086	0.02	Mfgr.		lb/hr	7.910	1.58
Boiler 3	55.0	0.4055	400	Mfgr.	0.045	lb/MMBtu	2.475	0.50	Mfgr.	0.0054	lb/MMBtu	0.297	0.00	Table 1.3-1	0.213	lb/10^3 gal	0.086	0.02	Mfgr.		lb/hr	7.910	1.58
Turbine	60.0	0.4424	400	Table3.1-2a	0.012	lb/MMBtu	0.720	0.14	Table3.1-2a	0.012	lb/MMBtu	0.720	0.00	Table 3.1-2a	0.0015	lb/MMBtu	0.091	0.02	Mfgr.	0.402	lb/MMBtu	24.120	4.82
HRSG	30.0	0.2212	0		NA					NA					NA					NA			
Boiler 4	50.0	0.3687	400	Mfgr.	0.045	lb/MMBtu	2.250	0.45	Mfgr.	0.0054	lb/MMBtu	0.270	0.00	Table 1.3-1	0.213	lb/10^3 gal	0.079	0.02	Mfgr.		lb/hr	7.350	1.47
Total							7.92	1.58				1.58	0.00				0.34	0.07				47.29	9.46

135,630 Btu/gal Diesel (BYUI Fuel Supplier)				CO					VOC					Pb				
ID	Heat Input (10^6 Btu/hr)	ULSD (10^3 gal/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor Note 7		Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.4055	400	Mfgr.		lb/hr	3.024	0.60	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A		0	0.00
Boiler 3	55.0	0.4055	400	Mfgr.		lb/hr	3.024	0.60	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A		0	0.00
Turbine	60.0	0.4424	400	Mfgr.	0.0945	lb/MMBtu	5.670	1.13	Table 3.1-2a	0.00041	lb/MMBtu	0.025	0.005	Table 3.1-2a	0.000014	lb/MMBtu	0.00021	0.00004
HRSG	30.0	0.2212	0		N/A					N/A					N/A			0.00
Boiler 4	50.0	0.3687	400	Mfgr.		lb/hr	2.805	0.56	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A		0.000	0.00
Total							14.524	2.90				0.03	0.01				0.00021	0.00004

900 Btu/ft^3 NG				CO$_2$					CH$_4$					N$_2$O				
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.0611	4,900	Table 1.4-2	120,000	lb/10^6 ft^3	7,333	17,967	Table 1.4-2	2.3	lb/10^6 ft^3	0.141	0.34	Table 1.4-2	2.2	lb/10^6 ft^3	0.134	0.33
Boiler 3	55.0	0.0611	4,900	Table 1.4-2	120,000	lb/10^6 ft^3	7,333	17,967	Table 1.4-2	2.3	lb/10^6 ft^3	0.141	0.34	Table 1.4-2	2.2	lb/10^6 ft^3	0.134	0.33
Turbine	60.0	0.0667	8,760	Table 3.1-2a	110	lb/MMBtu	6,600	28,908	Table 3.1-2a	N/A	lb/MMBtu	0.000	0.00	Table 1.4-2	N/A		0.000	0.00
HRSG	30.0	0.0333	4,900	Table 1.4-2	120,000	lb/10^6 ft^3	4,000	9,800	Table 1.4-2	2.3	lb/10^6 ft^3	0.077	0.19	Table 1.4-2	2.2	lb/10^6 ft^3	0.073	0.18
Boiler 4	50.0	0.0556	4,900	Table 1.4-2	120,000	lb/10^6 ft^3	6,667	16,333	Table 1.4-2	2.3	lb/10^6 ft^3	0.128	0.31	Table 1.4-2	2.2	lb/10^6 ft^3	0.122	0.30
	Boilers Subtotal							90,975					1.19					1.14
Heat/Chilled H$_2$O Emer. Diesel Gen.	kW	HP			lb/hp-hr			500 hr/yr										
EG481	500	757	500	Table 3.3-1	1.15		871	218										
EG482	500	757	500	Table 3.3-1	1.15		871	218										
EG483	500	757	500	Table 3.3-1	1.15		871	218										
EG484	500	757	500	Table 3.3-1	1.15		871	218										
All OtherExisting BYUI Sources																		
Emer. Generators (500 hr/yr ea.) (Note 3)					1.15		2,372	593				N/A	NA					NA
Paint Booths (Note 4)								--				--	--					--
Welding								--				--	--					--
Ash Handling System								--				--	--					--
		Total FutureEmissions (TPY)						92,438					1.19					1.138
		Ex. Prmt Coal Em. (9300 TPY-4.36 TPH)		Table 1.1-20	4810		20,972	22,367	Table 1.1-19	0.06		45.4	113.6	Table 1.1-19	0.04		30.3	75.7
		Exist. Permit - Total Emissions (TPY)					30,011	39,293				45.5	113.9				30.4	76.0
		Incr./Decr. Current to Future (TPY)					-30,011	53,145					-112.7					-74.9

CO$_{2e}$			
GHG	(Note 5) Factor	GHG (Metric Tons/Yr)	CO2e (Metric Tons/Yr)
CO$_2$	1	83,860	83,860
CH4	21	1.08	23
N$_2$O	310	1.03	320
Total CO2e (TPY)		83,862	84,203
Existing CO$_{2e}$			
CO$_2$	1	35,647	32,339
CH4	21	103	1,968
N$_2$O	310	69	19,390
Total CO2e (TPY)		35,819	53,697
Metric Tons (MT) = T * 0.9072			
		90,345	90,702
		35,819	53,697
		54,526	37,006

135,630 Btu/gal Diesel (BYUI Fuel Supplier)				CO$_2$					CH$_4$					N$_2$O				
ID	Heat Input (10^6 Btu/hr)	ULSD (10^3 gal/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.4055	400	Table 1.3-12	22,300	lb/10^3 gal	9,043	1,809	Table 3.3-1	NA		0.000	0.00	Table 1.3-8	0.26	lb/10^3 gal	0.105	0.02
Boiler 3	55.0	0.4055	400	Table 1.3-12	22,300	lb/10^3 gal	9,043	1,809	Table 3.3=1	NA		0.000	0.00	Table 1.3-8	0.26	lb/10^3 gal	0.105	0.02
Turbine	60.0	0.4424	400	Table 3.1-2a	157	lb/MMBtu	9,420	1,884	Table3.1-2a	NA		0.000	0.00	Table 3.1-2a	NA		0.000	0.00
HRSG	30.0	0.2212	0		NA					NA					NA			
Boiler 4	50.0	0.3687	400	Table 1.3-12	22,300	lb/10^3 gal	8,221	1,644	Table 3.3=1	NA		0.000	0.00	Table 1.3-8	0.26	lb/10^3 gal	0.096	0.02
Total for Diesel								7145.37					0.00					0.06

CO2e			
GHG	(Note 5) Factor	GHG (Metric Tons/Yr)	CO2e (Metric Tons/Yr)
CO$_2$	1	6,482	6,482
CH4	21	0	0
N$_2$O	310	0.1	17
Total CO2e (TPY)		6,482	6,500
		6482	6,500

Note 1. Sulfur content of natural gas assumed to be 85 ppmw

Note 2. Boiler 4 is existing Boiler 5. Under current permit conditions Boiler 5 operates 8360 hr/yr on natural gas (383.877 10^6 ft^3/yr), and up to 400 hr/yr on No.2 fuel oil (128.571 10^3 gal/yr). Hourly CO$_2$, CH$_4$, and N$_2$O emissions are calculated using natural gas for 8760 hr/yr.

Note 3. Emissions from an existing 300 kW emergency generator at the Heat Plant are included in this total. This generator will be removed and replaced by two new 500 kW generators (EG482 and EG4842). Two of the 500 kW generators (EG481 and EG482) shown here as being part of this project are in fact installed at this time, but are not included in the existing generator emissions shown here because installation occurred after the last update of the Tier II permit.

Note 4. Physical Facilities #1 Spray Booth currently has no operational restriction. The emission totals for paint spray booths shown here are based on restricting this Spray Booth to 40000 gall/yr throughput (equivalent to 8000 hr/hr at 5.0 gal/hr).

Note 5. Source: Table A-1 to Subpart A Part 98 - Global Warming Potentials

Note 6. Ultra-low Sulfur Diesel, S content = 15 ppmw, 31.3 gal/hr @ 7.05 lb/gal

Note 7. All emission factors supplied by the manufacturer have been multiplied by 1.5 to provide a safety factor as boiler performance degrades over the life of the boiler. Manufacturer's emission factors are supplied in Attachment X of the permit application.

Natural Gas

900 Btu/ft^3 NG				$PM_{10}/PM_{2.5}$				
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.0611	8,360	Mfgr.	0.01125	lb/MMBtu	0.619	2.59
Boiler 3	55.0	0.0611	8,360	Mfgr.	0.01125	lb/MMBtu	0.619	2.59
Turbine	60.0	0.0667	8,760	Table 3.1-2a	0.0066	lb/MMBtu	0.396	1.73
HRSG	30.0	0.0333	8,760	Mfgr.	0.0135	lb/MMBtu	0.405	1.77
Boiler 4 (Note 2) Natural Gas	50.0	0.0556	8,360	Mfgr.	0.01125	lb/MMBtu	0.563	2.35
		Blrs/Turbine/HRSG Subtotal					2.60	11.03
Heat/Chilled H_2O Emer. Diesel Gen.	kW	HP		Em. Factor Source	Em. Factor (g/hp-hr)	Em. Factor Units	Em. Rate (lb/hr)	500 hr/yr (TPY)
EG481	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06
EG482	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06
EG483	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06
EG484	500	757	500	Mfgr.	0.14	g/hp-hr	0.234	0.06
Boilers 2, 3, 4, 5, HRSG, and Turbine Diesel PM_{10} Emissions (see below)							7.92	1.58
All OtherExisting BYUI Sources								
Emer. Generators (500 hr/yr ea.) (Note 3)							5.25	1.32
Paint Booths (Note 4)							0.48	1.53
Welding							0.003	0.02
Ash Handling System							1.00	0.37
		Total Future Emissions (TPY)					18.19	14.17
		Existing Permit Tot. Em. (TPY)					26.1	24.96
		Ex. Prmt Coal Em (9300 TPY-4.36 TPH)		Emissions for criteria pollutants from existing coal boilers are included above in Existing Permit Total Emissions.				
		Incr./Decr. Current to Future (TPY)					-7.91	-10.79

ID	SO_2 Em. Factor Source	Em. Factor (Note 1)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	NO_x Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	Table 1.4-2	0.6	lb/10^6 ft^3	0.037	0.15	Mfgr.		lb/hr	2.911	12.17
Boiler 3	Table 1.4-2	0.6	lb/10^6 ft^3	0.037	0.15	Mfgr.		lb/hr	2.911	12.17
Turbine	Table 3.1-2a	0.00008	lb/MMBtu	0.005	0.02	Mfgr.	0.10	lb/MMBtu	6.000	26.28
HRSG	Table 1.4-2	0.6	lb/10^6 ft^3	0.020	0.09	Mfgr.		lb/hr	4.215	18.46
Boiler 4 (Note 2) Natural Gas	Table 1.4-2	0.6	lb/10^6 ft^3	0.033	0.14	Mfgr.		lb/hr	2.700	11.29
Blrs/Turbine/HRSG Subtotal				0.13	0.55				18.74	80.36
Heat/Chilled H_2O Emer. Diesel Gen.	Em. Factor Source	Em. Factor[6] (15 ppm S)	Max. Fuel Usage (62.6 gal/hr)	Em. Rate (lb/hr)	500 hr/yr (TPY)	Em. Factor Source	Em. Factor (g/hp-hr)	Em. Factor Units	Em. Rate (lb/hr)	500 hr/yr (TPY)
EG481	Mass Balance	0.00021	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG482	Mass Balance	0.00021	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG483	Mass Balance	0.00021	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
EG484	Mass Balance	0.00021	lb/gal	0.013	0.00	Mfgr.	4.00	g/hp-hr	6.676	1.67
Boilers 2, 3, 4, 5, HRSG, and Turbine Diesel PM_{10} Emissions (see below)				0.34	0.07				47.29	9.46
Emer. Generators (500 hr/yr ea.) (Note 3)					1.25					18.98
Paint Booths (Note 4)					--					--
Welding					--					--
Ash Handling System					--					--
Total Future Emissions (TPY)				0.53	1.89				92.73	115.47
Existing Permit Tot. Em. (TPY)				100.32	99.79				120.7	80
Incr./Decr. Current to Future (TPY)				-99.79	-97.90				-27.97	35.47

Natural Gas

900 Btu/ft^3 NG				CO				
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.0611	8,360	Mfgr.		lb/hr	3.234	13.52
Boiler 3	55.0	0.0611	8,360	Mfgr.		lb/hr	3.234	13.52
Turbine	60.0	0.0667	8,760	Mfgr.	0.092	lb/MMBtu	5.490	24.05
HRSG	30.0	0.0333	8,760	Mfgr.		lb/hr	4.215	18.46
Boiler 4 (Note 2) Natural Gas	50.0	0.0556	8,360	Mfgr.		lb/hr	3.000	12.54
		Blrs/Turbine/HRSG Subtotal					19.17	82.08
Heat/Chilled H_2O Emer. Diesel Gen.	kW	HP		Em. Factor Source	Em. Factor (g/hp-hr)		Em. Rate (lb/hr)	500 hr/yr (TPY)
EG481	500	757		Mfgr.	0.50		0.834	0.21
EG482	500	757		Mfgr.	0.50		0.834	0.21
EG483	500	757		Mfgr.	0.50		0.834	0.21
EG484	500	757		Mfgr.	0.50		0.834	0.21
Diesel Emssions (See Below)							14.52	2.90
All OtherExisting BYUI Sources								
Emer. Generators (500 hr/yr ea.) (Note 3)								4.03
Paint Booths (Note 4)								--
Welding								--
Ash Handling System								--
		Total Future Emissions (TPY)					22.51	89.85
		Existing Permit Tot. Em. (TPY)					41.67	43.84
		Ex. Prmt Coal Em (9300 TPY-4.36 TPH)		Emissions for criteria pollutants from existing coal boilers are included above in Existing Permit Total Emissions.				
		Incr./Decr. Current to Future (TPY)					-19.16	46.01

ID	VOC Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Pb Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)
Boiler 2	Mfgr.	0.006	lbMMBtu	0.330	1.38	Table 1.4-2	0.0005	lb/10^6 ft^1	0.00003
Boiler 3	Mfgr.	0.006	lbMMBtu	0.330	1.38	Table 1.4-2	0.0005	lb/10^6 ft^4	0.00003
Turbine	Table 3.1-2a	0.0021	lbMMBtu	0.126	0.55	Table 3.1-2a	N/A	lb/10^6 ft^6	N/A
HRSG	Table1.4-2	5.5	lb/10^6 ft^3	0.183	0.80	Table 1.4-2	0.0005	lb/10^6 ft^7	0.00002
Boiler 4 (Note 2) Natural Gas	Mfgr.	0.006	lbMMBtu	0.300	1.25	Table 1.4-2	0.0005	lb/10^6 ft^8	0.00003
Blrs/Turbine/HRSG Subtotal				1.27	5.37				0.00011
Heat/Chilled H_2O Emer. Diesel Gen.	Em. Factor Source	Em. Factor (lb/hp/hr)		Em. Rate lb/hr	500 hr/yr (TPY)				
EG481	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG482	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG483	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
EG484	Table 3.3-1	0.0025		1.903	0.48		N/A		N/A
Diesel Emssions (See Below)				0.03	0.01		0.0E+00		0.00021
Emer. Generators (500 hr/yr ea.) (Note 3)					1.80				0.01
Paint Booths (Note 4)				35.33	74.117				--
Welding					--				--
Ash Handling System					--				--
Total Future Emissions (TPY)				44.24	81.39				0.0005
Existing Permit Tot. Em. (TPY)				42.95	84.21				6.23
Incr./Decr. Current to Future (TPY)				1.29	-2.82				-6.23

NG	10^6 ft3/yr	
Blr2	510.89	
Blr3	510.89	
Blr4	464.44	
Turbine	584.00	
HRSG	292.00	NG limit for Blrs (10^6 ft3/yr)
Total	2362.22	1778
Diesel	10^3 gal/yr	
Blr2	162.21	
Blr3	162.21	
Blr4	147.46	
Turbine	176.95	
HRSG	0.00	Diesel limit for Blrs (10^3 gal/yr)
Total	648.82	472

No.2 Diesel (ULSD)5

135,630 Btu/gal Diesel (BYUI Fuel Supplier)				PM_{10}				
ID	Heat Input (10^6 Btu/hr)	ULSD (10^3 gal/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.4055	400	Mfgr.	0.045	lb/MMBtu	2.475	0.50
Boiler 3	55.0	0.4055	400	Mfgr.	0.045	lb/MMBtu	2.475	0.50
Turbine	60.0	0.4424	400	Table3.1-2a	0.012	lb/MMBtu	0.720	0.14
HRSG	30.0	0.2212	0		NA			
Boiler 4	50.0	0.3687	400	Mfgr.	0.045	lb/MMBtu	2.250	0.45
Total		737.3					7.92	1.58

ID	$PM_{2.5}$ Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	SO_2 Em. Factor Source	Em. Factor	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	NO_x Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	Mfgr.	0.0054	lb/MMBtu	0.297	0.00	Table 1.3-1	0.213	lb/10^3 ga	0.086	0.02	Mfgr.		lb/hr	7.910	1.58
Boiler 3	Mfgr.	0.0054	lb/MMBtu	0.297	0.00	Table 1.3-1	0.213	lb/10^3 ga	0.086	0.02	Mfgr.		lb/hr	7.910	1.58
Turbine	Table3.1-2a	0.012	lb/MMBtu	0.720	0.00	Table 3.1-2a	0.0015	lb/MMBtu	0.091	0.02	Mfgr.	0.402	lb/MMBtu	24.120	4.82
HRSG		NA					NA					NA			
Boiler 4	Mfgr.	0.0054	lb/MMBtu	0.270	0.00	Table 1.3-1	0.213	lb/10^3 ga	0.079	0.02	Mfgr.		lb/hr	7.350	1.47
Total				1.58	0.00				0.34	0.07				47.29	9.46

135,630 Btu/gal Diesel (BYUI Fuel Supplier)				CO				
ID	Heat Input (10^6 Btu/hr)	ULSD (10^3 gal/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0.	0.4055	400	Mfgr.		lb/hr	3.024	0.60
Boiler 3	55.0	0.4055	400	Mfgr.		lb/hr	3.024	0.60
Turbine	60.0	0.4424	400	Mfgr.	0.0945	lb/MMBtu	5.670	1.13
HRSG	30.0	0.2212	0		N/A			
Boiler 4	50.0	0.3687	400	Mfgr.		lb/hr	2.805	0.56
Total							14.524	2.90

ID	VOC Em. Factor Source	Em. Factor (Note 7)	Em. Factor Units	Em. Rate (lb/hr)	Em. Rate (TPY)	Pb Em. Factor Source	Em. Factor (Note 7)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A	0	0.00
Boiler 3	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A	0	0.00
Turbine	Table 3.1-2a	0.00041	lb/MMBtu	0.025	0.005	Table 3.1-2a	0.000014 lb/MMBtu	0.00021	0.00004
HRSG		N/A					N/A		0.00
Boiler 4	Mfgr.	0.006	lb/MMBtu	0.002	0.00		N/A	0.000	0.00
Total				0.03	0.01			0.00021	0.00004

900 Btu/ft^3 NG				CO_2			
ID	Heat Input (10^6 Btu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Operation (Hr/Yr)	Em. Factor Source	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55.0	0.0611	8,760	Table 1.4-2	120,000	7,333	32,120
Boiler 3	55.0	0.0611	8,760	Table 1.4-2	120,000	7,333	32,120
Turbine	60.0	0.0667	8,760	Table 3.1-2a	157	9,420	41,260
HRSG	30.0	0.0333	8,760	Table 1.4-2	120,000	4,000	17,520
Boiler 4	50.0	0.0556	8,760	Table 1.4-2	120,000	6,667	29,200
	Boilers Subtotal						152,220
Heat/Chilled H_2O Emer. Diesel Gen.	kW	HP			lb/hp-hr		500 hr/yr
EG481	500	757	500	Table 3.3-1	1.15	871	218
EG482	500	757	500	Table 3.3-1	1.15	871	218
EG483	500	757	500	Table 3.3-1	1.15	871	218
EG484	500	757	500	Table 3.3-1	1.15	871	218
All OtherExisting BYUI Sources							
Emer. Generators (500 hr/yr ea.) (Note 3)					1.15	2,372	593
Paint Booths (Note 4)							--
Welding							--
Ash Handling System							--
		Total Future Emissions (TPY)				36,608	153,683
		Ex. Prmt Coal Em. (9300 TPY-4.36 TPH)		Table 1.1-20	4810	20,972	22,367
		Exist. Permit - Total Emissions (TPY)				30,011	52,160
		Incr./Decr. Current to Future (TPY)				6,597	101,524

ID	CH_4 Em. Factor Source	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	N_2O Em. Factor Source	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	Table 1.4-2	2.3	0.141	0.62	Table 1.4-2	2.2	0.134	0.59
Boiler 3	Table 1.4-2	2.3	0.141	0.62	Table 1.4-2	2.2	0.134	0.59
Turbine	Table 3.1-2a	N/A	0.000	0.00	Table 1.4-2	N/A	0.000	0.00
HRSG	Table 1.4-2	2.3	0.077	0.34	Table 1.4-2	2.2	0.073	0.32
Boiler 4	Table 1.4-2	2.3	0.128	0.56	Table 1.4-2	2.2	0.122	0.54
Boilers Subtotal				2.13				2.03
Emer. Generators (500 hr/yr ea.) (Note 3)			N/A	N.A				N.A
Paint Booths (Note 4)			--	--				--
Welding			--	--				--
Ash Handling System			--	--				--
Total Future Emissions (TPY)				2.13				2.034
Ex. Prmt Coal Em. (9300 TPY-4.36 TPH)	Table 1.1-19	0.06	45.4	113.6	Table 1.1-19	0.04	30.3	75.7
Exist. Permit - Total Emissions (TPY)			45.5	114.1			30.4	76.2
Incr./Decr. Current to Future (TPY)			-45.5	-112.0			-30.4	-74.2

CO_{2e}			
GHG	(Note 5) Factor	GHG (Metric Tons/Yr)	CO2e (Metric Tons/Yr)
CO_2	1	139,421	139,421
CH4	21	2	41
Total CO2e (TPY)		139,423	139,462
CH4	21	-102	-2,133
Existing CO_{2e}			
CO_2	1	47319	42928
CH4	21	104	1972
N2O	310	69	19450
Total CO2e (TPY)		47492	64350
Metric Tons (MT) = T * 0.9072			
Total Future Emissions (TPY)		139,423	139,462
Ex. Prmt Coal Em. (9300 TPY-4.36 TPH)		47,319	42,928
Incr./Decr. Current to Future (TPY)		92,104	96,534

Note 1. Sulfur content of natural gas assumed to be 85 ppmw
Note 2. Boiler 4 is existing Boiler 5. Under current permit conditions Boiler 5 operates 8360 hr/yr on natural gas (383.877 10^6 ft^3/yr), and up to 400 hr/yr on No.2 fuel oil (128.571 10^3 gal/yr). Hourly CO_2, CH_4, and N_2O emissions are calculated using natural gas for 8760 hr/yr.
Note 3. Emissions from an existing 300 kW emergency generator at the Heat Plant are included in this total. This generator will be removed and replaced by two new 500 kW generators (EG482 and EG4842). Two of the 500 kW generators (EG481 and EG482)shown here as being part of this project are in fact installed at this time, but are not included in the existing generator emissions shown here because installation occurred after the last update of the Tier II permit.
Note 4. Physical Facilities #1 Spray Booth currently has no operational restriction. The emission totals for paint spray booths shown here are based on restricting this Spray Booth to 40000 gall/yr throughput (equivalent to 8000 hr/hr at 5.0 gal/hr).
Note 5. Source: Table A-1 to Subpart A Part 98 - Global Warming Potentials
Note 6. Ultra-low Sulfur Diesel, S content = 15 ppmw, 31.3 gal/hr @ 7.05 lb/gal
Note 7. All emission factors supplied by the manufacturer have been multiplied by 1.5 to provide a safety factor as boiler performance degrades over the life of the boiler. Manufacturer's emission factors are supplied in Attachment X of the permit application.

Modeling Emission Inventory - Proposed Potential to Emit

			Fuel Oil											
	Emission Unit	Stack ID	PM10		PM2.5		SO2		NOx		CO		Lead	
			lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr Max.	lb/hr 3-hr Avg	lb/hr Max	lb/hr Annual Avg	lb/hr Max	lb/hr 8-hr Avg	lb/hr monthly Avg	lb/hr 1/4ly Avg

The lb/hr maximum emission rates for PM10, PM2.5, and NOx shown here reflect that the generators will only be tested for maximum half hour periods, i.e., EG_AUST actual maximum emission rate = 1.254 lb/hr Nox x 0.5 = 0.627 b/hr.
The annual average emission rate for the generators reflects annual operation of 500 hr/yr, i.e., EG_AUST actual maximum Nox emission rate = 1.254 lb/hr *500 hr/yr ÷ 8760 hr/yr = 0.071 lb/hr.
CO and SO2 have maximum concentrations below the significant emission threshold for the proposed project (BLR2, BLR3, BLR4, BLR5, Turbine, HRSG, EG481, EG482, EG483, and EG484). See below.
The Bypass stack and the turbine/HRSG stack will not operate at the same time. The HRSG will not operate on fuel oil.

1	Austin Bldg Paint Booth	AUST_PB	0.0260	Annual	0.0260	0.0260			0	0			Lead was not	
2	Proposed Boiler Stack	BLR2	1.2375	PM10 was	0.2970	0.0136			7.9100	0.3612			modeled.	
3	Proposed Boiler Stack	BLR3	1.2375	not	0.2970	0.0136			7.9100	0.3612				
4	Modified Existing Blr5	BLR4	1.1250	modeled.	0.2700	0.0123			7.3500	0.3356				
6	Turbine Bypass Stack	BYPASS	0.7200	no annual	0.7200	0.7200			24.1200	1.1014				
7	Auxillary Services Bldg Generator	EG_ASER	0.0873	NAAQS at	0.0873	0.0100			1.2461	0.1430				
8	Austin Bldg Generator	EG_AUST	0.0476	this time.	0.0476	0.0050			0.6270	0.0710				
9	Benson Bldg Generator	EG_BENS	0.0714		0.0714	0.0090			1.0397	0.1190				
10	Clark Bldg Generator	EG_CLRK	0.0873		0.0873	0.0100			1.2461	0.1430				
11	Hart Bldg Generator	EG_HART	0.1508		0.1508	0.0170			2.0794	0.2370				
12	Kimball Bldg Generator	EG_KIMB	0.6508		0.6508	0.0740			9.1033	1.0390				
13	Kirkham Bldg Generator	EG_KIRK	0.0317		0.0317	0.0030			0.4206	0.0480				
14	Library Bldg Generator	EG_LIBR	0.1190		0.1190	0.0140			1.6667	0.1900				
15	Manwaring Bldg Generator	EG_MAN	0.0873		0.0873	0.0100			1.2461	0.1430				
16	Physical Plant Bldg Generator	EG_PHYP	0.0476		0.0476	0.0050			0.6270	0.0710				
17	Radio Graphics Bldg Generator	EG_R_GR	0.0635		0.0635	0.0070			0.8333	0.0950				
18	Ricks Bldg Generator	EG_RIKS	0.1190		0.1190	0.0140			1.6667	0.1900				
19	Romney Bldg Generator	EG_ROMN	0.0714		0.0714	0.0090			1.0397	0.1190				
20	Smith Bldg Generator	EG_SMTH	0.0238		0.0238	0.0020			1.6826	0.1920				
21	Snow Performaing Arts Cntr Generator	EG_SNOW	0.0476		0.0476	0.0050			0.6270	0.0710				
22	Spori Bldg Generator	EG_SPRI	0.0397		0.0397	0.0050			0.5238	0.0590				
23	Auditorium Generator	EG481	0.0516		0.0516	0.0120			1.4762	0.3370				
24	Auditorium Generator	EG482	0.0516		0.0516	0.0120			1.4762	0.3370				
25	Emergency Generator Stack	EG483	0.0516		0.0516	0.0120			1.4762	0.3370				
26	Emergency Generator Stack	EG484	0.0516		0.0516	0.0120			1.4762	0.3370				
27	BLR Stk 1- Turbine / HRSG	EU01/EU01A	0.7200		0.7200	0.7200			24.1200	1.1014				
28	Physical Facilities Paint Booth 1	PFPB1	0.0850		0.0850	0.0850			0.0000	0.0000				
29	Physical Facilities Paint Booth 2	PFPB2	0.0287		0.0287	0.0288			0.0000	0.0000				

Modeling Emission Inventory - Significant Impact Modeling

			Fuel Oil											
	Emission Unit	Stack ID	PM10		PM2.5		SO2		NOx		CO		Lead	
			lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr Max.	lb/hr 3-hr Avg	lb/hr Max	lb/hr Annual Avg	lb/hr Max	lb/hr 8-hr Avg	lb/hr monthly Avg	lb/hr 1/4ly Avg
1	Proposed Boiler Stack	BLR2					0.086	0.086			3.024	3.024		
2	Proposed Boiler Stack	BLR3					0.086	0.086			3.024	3.024		
3	Modified Existing Blr5	BLR4					0.079	0.079			2.805	2.805		
5	Turbine Bypass Stack	BYPASS					0.091	0.091			5.670	5.670		
7	Auditorium Generator	EG481					0.013	0.013			0.834	0.834		
8	Auditorium Generator	EG482					0.013	0.013			0.834	0.739		
9	Emergency Generator Stack	EG483					0.013	0.013			0.834	0.739		
10	Emergency Generator Stack	EG484					0.013	0.013			0.834	0.739		
11	BLR Stk 1- Turbine / HRSG	EU01/EU01A					0.091	0.0909			5.670	5.670		
12	Existing Boiler Stack	Existing Boiler Stack					-21.5	-21.54			-5.13	-5.13		
13	Existing Boiler Stack	Existing Boiler Stack					-32.3	-32.31			-7.69	-7.69		
14	Existing Boiler Stack	Existing Boiler Stack					-37.7	-37.7			-8.98	-8.98		
15	Existing Boiler Stack	Existing Boiler Stack					-3.81	-3.81			-3.78	-3.78		

Modeling Emission Inventory - Proposed Potential to Emit

			Natural Gas											
	Emission Unit	Stack ID	PM10		PM2.5		SO2		NOx		CO		Lead	
			lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr Max.	lb/hr 3-hr Avg	lb/hr Max	lb/hr Annual Avg	lb/hr Max	lb/hr 8-hr Avg	lb/hr monthly Avg	lb/hr 1/4ly Avg

The lb/hr maximum emission rates for PM10, PM2.5, and NOx shown here reflect that the generators will only be tested for maximum half hour periods, i.e., EG_AUST actual maximum emission rate = 1.254 lb/hr Nox x 0.5 = 0.627 b/hr.
The annual average emission rate for the generators reflects annual operation of 500 hr/yr, i.e., EG_AUST actual maximum Nox emission rate = 1.254 lb/hr *500 hr/yr ÷ 8760 hr/yr = 0.071 lb/hr.
CO and SO2 have maximum concentrations below the significant emission threshold for the proposed project (BLR2, BLR3, BLR4, BLR5, Turbine, HRSG, EG481, EG482, EG483, and EG484). See below.
The Bypass stack and the turbine/HRSG stack will not operate at the same time. The HRSG will not operate on fuel oil.

1	Austin Bldg Paint Booth	AUST_PB	0.026	Annual	0.026	0.026			0	0			Lead was not	
2	Proposed Boiler Stack	BLR2	0.825	PM10 was	0.825	0.825			2.911	2.911			modeled.	
3	Proposed Boiler Stack	BLR3	0.825	not	0.825	0.825			2.911	2.911				
4	Modified Existing Blr5	BLR4	0.750	modeled.	0.750	0.750			2.700	2.700				
6	Turbine Bypass Stack	BYPASS	0.396	no annual	0.396	0.396			6.000	6.000				
7	Auxillary Services Bldg Generator	EG_ASER	0.090	NAAQS at	0.087	0.010			1.246	0.143				
8	Austin Bldg Generator	EG_AUST	0.045	this time.	0.048	0.005			0.627	0.071				
9	Benson Bldg Generator	EG_BENS	0.075		0.071	0.009			1.040	0.119				
10	Clark Bldg Generator	EG_CLRK	0.090		0.087	0.010			1.246	0.143				
11	Hart Bldg Generator	EG_HART	0.150		0.151	0.017			2.079	0.237				
12	Kimball Bldg Generator	EG_KIMB	0.650		0.651	0.074			9.103	1.039				
13	Kirkham Bldg Generator	EG_KIRK	0.032		0.032	0.003			0.421	0.048				
14	Library Bldg Generator	EG_LIBR	0.119		0.119	0.014			1.667	0.190				
15	Manwaring Bldg Generator	EG_MAN	0.087		0.087	0.010			1.246	0.143				
16	Physical Plant Bldg Generator	EG_PHYP	0.048		0.048	0.005			0.627	0.071				
17	Radio Graphics Bldg Generator	EG_R_GR	0.063		0.063	0.007			0.833	0.095				
18	Ricks Bldg Generator	EG_RIKS	0.119		0.119	0.014			1.667	0.190				
19	Romney Bldg Generator	EG_ROMN	0.071		0.071	0.009			1.040	0.119				
20	Smith Bldg Generator	EG_SMTH	0.024		0.024	0.002			1.683	0.192				
21	Snow Performaing Arts Cntr Generator	EG_SNOW	0.048		0.048	0.005			0.627	0.071				
22	Spori Bldg Generator	EG_SPRI	0.040		0.040	0.005			0.524	0.059				
23	Auditorium Generator	EG481	0.052		0.052	0.012			1.476	0.337				
24	Auditorium Generator	EG482	0.052		0.052	0.012			1.476	0.337				
25	Emergency Generator Stack	EG483	0.052		0.052	0.012			1.476	0.337				
26	Emergency Generator Stack	EG484	0.052		0.052	0.012			1.476	0.337				
27	BLR Stk 1- Turbine / HRSG	EU01/EU01A	1.045		1.045	1.045			16.215	16.215				
28	Physical Facilities Paint Booth 1	PFPB1	0.085		0.085	0.085			0	0				
29	Physical Facilities Paint Booth 2	PFPB2	0.029		0.029	0.029			0	0				

Modeling Emission Inventory - Significant Impact Modeling

			Natural Gas											
	Emission Unit	Stack ID	PM10		PM2.5		SO2		NOx		CO		Lead	
			lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr 24-hr Avg	lb/hr Annual Avg	lb/hr Max.	lb/hr 3-hr Avg	lb/hr Max	lb/hr Annual Avg	lb/hr Max	lb/hr 8-hr Avg	lb/hr monthly Avg	lb/hr 1/4ly Avg
1	Proposed Boiler Stack	BLR2					0.037	0.037			3.234	3.234		
2	Proposed Boiler Stack	BLR3					0.037	0.037			3.234	3.234		
3	Modified Existing Blr5	BLR4					0.033	0.034			3.000	3.000		
5	Turbine Bypass Stack	BYPASS					0.005	0.136			5.490	5.490		
7	Auditorium Generator	EG481					0.013	0.013			0.739	0.739		
8	Auditorium Generator	EG482					0.013	0.013			0.739	0.739		
9	Emergency Generator Stack	EG483					0.013	0.013			0.739	0.739		
10	Emergency Generator Stack	EG484					0.013	0.013			0.739	0.739		
11	BLR Stk 1- Turbine / HRSG	EU01/EU01A					0.030	0.030			15.195	15.195		
12	Existing Boiler Stack	Existing Boiler Stack					-21.540	-21.540			-5.130	-5.130		
13	Existing Boiler Stack	Existing Boiler Stack					-32.310	-32.310			-7.690	-7.690		
14	Existing Boiler Stack	Existing Boiler Stack					-37.700	-37.700			-8.980	-8.980		
15	Existing Boiler Stack	Existing Boiler Stack					-3.810	-3.810			-3.780	-3.780		

Table 1 PRE-PROJECT POTENTIAL TO EMIT FOR NSR REGULATED POLLUTANTS

Emission Unit		PM10/PM2.5 T/yr	SO2 T/yr	NO2 T/yr	CO T/yr	VOC T/yr	PB T/yr
AUST_PB	Austin Bldg Paint Booth	0.01					
BLR2	Proposed Boiler Stack						
BLR3	Proposed Boiler Stack						
BLR4	Modified Existing Blr5						
BLR5	Proposed Boiler Stack						
BOILER2	Existing Boiler Stack	4.950	22.980	9.630	5.470	0.050	0.003
BOILER3	Existing Boiler Stack	5.780	34.460	14.440	8.210	0.080	0.004
BOILER4	Existing Boiler Stack	9.480	40.210	16.850	9.570	0.100	0.005
BOILER5	Existing Boiler Stack	1.540	0.890	20.490	16.900	1.110	0.000
BYPASS	Turbine Bypass Stack						
EG_ASER	Auxillary Services Bldg Generator	0.045	0.043	0.625	0.135	0.053	4.8E-07
EG_AUST	Austin Bldg Generator	0.023	0.023	0.313	0.068	0.028	2.6E-07
EG_BENS	Benson Bldg Generator	0.038	0.035	0.520	0.113	0.043	4.0E-07
EG_CLRK	Clark Bldg Generator	0.045	0.043	0.625	0.135	0.053	4.8E-07
EG_HART	Hart Bldg Generator	0.075	0.070	1.040	0.225	0.085	7.8E-07
EG_HEAT	Heat Plant Bldg Generator	0.223	0.208	3.120	0.673	0.255	2.4E-06
EG_KIMB	Kimball Bldg Generator	0.325	0.303	4.553	0.983	0.370	3.4E-06
EG_KIRK	Kirkham Bldg Generator	0.015	0.015	0.210	0.045	0.018	1.8E-07
EG_LIBR	Library Bldg Generator	0.060	0.055	0.833	0.180	0.068	6.4E-07
EG_MAN	Manwaring Bldg Generator	0.045	0.043	0.325	0.135	0.053	4.8E-07
EG_PHYP	Physical Plant Bldg Generator	0.023	0.023	0.313	0.068	0.028	2.6E-07
EG_PORT	Portable Generator	0.185	0.173	2.600	0.560	0.213	1.9E-06
EG_RADT	Radio Tower Generator	0.005	0.005	0.053	0.013	0.005	5.0E-08
EG_R_GR	Radio Graphics Bldg Generator	0.030	0.028	0.418	0.090	0.035	3.4E-07
EG_RIKS	ricks Bldg Generator	0.060	0.055	0.833	0.180	0.068	6.4E-07
EG_ROMN	Romney Bldg Generator	0.038	0.035	0.520	0.113	0.043	4.0E-07
EG_SMTH	Smith Bldg Generator	0.010	0.023	0.840	0.105	0.295	2.8E-06
EG_SNOW	Snow Performaing Arts Cntr Generator	0.023	0.023	0.313	0.068	0.028	2.6E-07
EG_SPRI	Spori Bldg Generator	0.020	0.018	0.260	0.058	0.023	2.0E-07
EG481	Auditorium Generator	0.370	0.340	5.200	1.120	0.420	
EG482	Auditorium Generator	0.370	0.340	5.200	1.120	0.420	
EG483	Emergency Generator Stack						
EG484	Emergency Generator Stack						
EU01	BLR Stk 1- Turbine						
EU01A	BLR Stk 1- HRSG						
PFPB1	Physical Facilities Paint Booth 1	1.500					
PFPB2	Physical Facilities Paint Booth 2	0.020					
	Total	25.31	100.44	90.12	46.34	3.94	0.01

Natural Gas

Natural Gas em. Factors	Heat Input (MMBtu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	1,3-Butadiene			Acetaldehyde			Acrolein			Benzene		
			Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.06111		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 3	55	0.06111		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 4	50	0.05556		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Turbine	60	0.0667	4.30E-07	2.87E-08	1.26E-07	4.00E-05	2.67E-06	1.17E-05	6.40E-06	4.27E-07	1.87E-06	1.20E-05	8.00E-07	3.50E-06
HRSG	30	0.0333		0.00E+00	0.00E+00		0.00E+00	0.00E+00			0.00E+00			0.00E+00
All Other BYU-I Sources														
Emergency Generators				–	7.00E-05		–	1.37E-03		–	1.66E-04		–	1.67E-03
Paint Booths				–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–
Total				2.87E-08	7.01E-05		2.67E-06	1.38E-03		4.27E-07	1.67E-04		8.00E-07	1.67E-03

Natural Gas em. Factors	Ethylbenzene			Formaldehyde			Naphthalene			PAH			Propylene Oxide		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 3		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 4		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Turbine	3.20E-05	2.13E-06	5.23E-06	7.10E-04	8.91E-11	3.90E-10	1.30E-06	8.67E-08	3.80E-07	2.20E-06	1.47E-07	6.42E-07	2.90E-05	1.93E-06	8.47E-06
HRSG			0.00E+00			0.00E+00			0.00E+00			0.00E+00			0.00E+00
All Other BYU-I Sources															
Emergency Generators		–	–		–	2.31E-03		–	1.52E-04		–	–		–	–
Paint Booths		–	2.08E-01		–	1.70E-02		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–		–	–
Total		2.13E-06	2.08E-01		8.91E-11	1.93E-02		8.67E-08	1.52E-04		1.47E-07	6.42E-07		1.93E-06	8.47E-06

Natural Gas em. Factors	Toluene			Xylenes			Bis(2-ethylhexyl)phthalate (DEHP)			Xylenes		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 3		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Boiler 4		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
Turbine	1.30E-04	8.67E-06	3.80E-05	6.40E-05	4.27E-06	1.87E-05		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
All Other BYU-I Sources												
Emergency Generators		–	–		–	5.10E-04		–	–		–	–
Paint Booths		–	6.00E-02		–	–		–	1.02E-01		–	2.38E-01
Welding		–	–		–	–		–	–		–	–
Total		8.67E-06	6.00E-02		4.27E-06	5.28E-04		0.00E+00	1.02E-01		0.00E+00	2.38E-01

6.31E-01

Natural Gas em. Factors	Heat Input (MMBtu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	2-Methylnaphthalene			3-Methylchloranthrene			7,12-Dimethylbenz(a)anthracene			Acenaphthene		
			Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.06111	2.40E-05	1.47E-06	3.59E-06	1.80E-06	1.10E-07	2.70E-07	1.60E-05	9.78E-07	2.40E-06	1.80E-06	1.10E-07	2.70E-07
Boiler 3	55	0.06111	2.40E-05	1.47E-06	3.59E-06	1.80E-06	1.10E-07	2.70E-07	1.60E-05	9.78E-07	2.40E-06	1.80E-06	1.10E-07	2.70E-07
Boiler 4	50	0.05556	2.40E-05	1.33E-06	3.27E-06	1.80E-06	1.00E-07	2.45E-07	1.60E-05	8.89E-07	2.18E-06	1.80E-06	1.00E-07	2.45E-07
Turbine	60	0.0667		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	30	0.0333	2.40E-05	8.00E-07	1.96E-06	1.80E-06	6.00E-08	1.47E-07	1.60E-05	5.33E-07	1.31E-06	1.80E-06	6.00E-08	1.47E-07
All Other BYU-I Sources														
Emergency Generators				–	–		–	–		–	–		–	2.50E-06
Paint Booths				–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–
Total				5.07E-06	1.24E-05		3.80E-07	9.31E-07		3.38E-06	8.28E-06		3.80E-07	3.43E-06

Natural Gas em. Factors	Acenaphthylene			Anthracene			Benzo(a)anthracene			Benzo(a)pyrene			Benzo(b)fluoranthene		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	1.80E-06	1.10E-07	2.70E-07	2.40E-06	1.47E-07	3.59E-07	1.80E-06	1.10E-07	2.70E-07	1.20E-06	7.33E-08	1.80E-07	1.80E-06	1.10E-07	2.70E-07
Boiler 3	1.80E-06	1.10E-07	2.70E-07	2.40E-06	1.47E-07	3.59E-07	1.80E-06	1.10E-07	2.70E-07	1.20E-06	7.33E-08	1.80E-07	1.80E-06	1.10E-07	2.70E-07
Boiler 4	1.80E-06	1.00E-07	2.45E-07	2.40E-06	1.33E-07	3.27E-07	1.80E-06	1.00E-07	2.45E-07	1.20E-06	6.67E-08	1.63E-07	1.80E-06	1.00E-07	2.45E-07
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	1.80E-06	6.00E-08	1.47E-07	2.40E-06	8.00E-08	1.96E-07	1.80E-06	6.00E-08	1.47E-07	1.20E-06	4.00E-08	9.80E-08	1.80E-06	6.00E-08	1.47E-07
All Other BYU-I Sources															
Emergency Generators		–	9.00E-06		–	3.14E-06		–	3.00E-06		–	3.36E-07		–	–
Paint Booths		–	–		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–		–	–
Total		3.80E-07	9.93E-06		5.07E-07	4.58E-06		1.80E-07	1.93E-06		2.53E-07	9.57E-07		1.80E-07	9.31E-07

Natural Gas em. Factors	Benzo(g,h,i)perylene			Benzo(k)fluoranthene			Chrysene			Dibenzo(a,h)anthracene			Dichlorobenzene			Fluoranthene		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	1.20E-06	7.33E-08	1.80E-07	1.80E-06	1.10E-07	2.70E-07	1.80E-06	1.10E-07	2.70E-07	1.20E-06	7.33E-08	1.80E-07	1.20E-03	7.33E-05	1.80E-04	3.00E-06	1.83E-07	4.49E-07
Boiler 3	1.20E-06	7.33E-08	1.80E-07	1.80E-06	1.10E-07	2.70E-07	1.80E-06	1.10E-07	2.70E-07	1.20E-06	7.33E-08	1.80E-07	1.20E-03	7.33E-05	1.80E-04	3.00E-06	1.83E-07	4.49E-07
Boiler 4	1.20E-06	6.67E-08	1.63E-07	1.80E-06	1.00E-07	2.45E-07	1.80E-06	1.00E-07	2.45E-07	1.20E-06	6.67E-08	1.63E-07	1.20E-03	6.67E-05	1.63E-04	3.00E-06	1.67E-07	4.08E-07
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	1.20E-06	4.00E-08	9.80E-08	1.80E-06	6.00E-08	1.47E-07	1.80E-06	6.00E-08	1.47E-07	1.20E-06	4.00E-08	9.80E-08	1.20E-03	4.00E-05	9.80E-05	3.00E-06	1.00E-07	2.45E-07
All Other BYU-I Sources																		
Emergency Generators		–	1.00E-06		–	–		–	–		–	1.00E-06		–	–		–	1.35E-05
Paint Booths		–	–		–	–		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–		–	–		–	–
Total		2.53E-07	1.62E-06		1.80E-07	9.31E-07		3.80E-07	9.31E-07		2.53E-07	1.62E-06		2.53E-04	6.21E-04		6.33E-07	1.51E-05

Natural Gas em. Factors	Heat Input (MMBtu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Dichlorobenzene			Fluoranthene			Fluorene			Hexane		
			Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.06111	1.20E-03	7.33E-05	1.80E-04	3.00E-06	1.83E-07	4.49E-07	2.80E-06	1.71E-07	4.19E-07	1.80E+00	1.10E-01	2.70E-01
Boiler 3	55	0.06111	1.20E-03	7.33E-05	1.80E-04	3.00E-06	1.83E-07	4.49E-07	2.80E-06	1.71E-07	4.19E-07	1.80E+00	1.10E-01	2.70E-01
Boiler 4	50	0.05556	1.20E-03	6.67E-05	1.63E-04	3.00E-06	1.67E-07	4.08E-07	2.80E-06	1.56E-07	3.81E-07	1.80E+00	1.00E-01	2.45E-01
Turbine	60	0.0667		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	30	0.0333	1.20E-03	4.00E-05	9.80E-05	3.00E-06	1.00E-07	2.45E-07	2.80E-06	9.33E-08	2.29E-07	1.80E+00	6.00E-02	1.47E-01
All Other BYU-I Sources														
Emergency Generators				–	–		–	1.35E-05		–	5.20E-05		–	–
Paint Booths				–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–
Total				2.53E-04	6.21E-04		6.33E-07	1.51E-05		5.91E-07	5.34E-05		3.80E-01	9.31E-01

Natural Gas em. Factors	Indeno(1,2,3-cd)pyrene			Phenanathrene			Pyrene			Toluene		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	1.80E-06	1.10E-07	2.70E-07	1.70E-05	1.04E-06	2.55E-06	5.00E-06	3.06E-07	7.49E-07	3.40E-03	2.08E-04	5.09E-04
Boiler 3	1.80E-06	1.10E-07	2.70E-07	1.70E-05	1.04E-06	2.55E-06	5.00E-06	3.06E-07	7.49E-07	3.40E-03	2.08E-04	5.09E-04
Boiler 4	1.80E-06	1.00E-07	2.45E-07	1.70E-05	9.44E-07	2.31E-06	5.00E-06	2.78E-07	6.81E-07	3.40E-03	1.89E-04	4.63E-04
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	1.80E-06	6.00E-08	1.47E-07	1.70E-05	5.67E-07	1.39E-06	5.00E-06	1.67E-07	4.08E-07	3.40E-03	1.13E-04	2.78E-04
All Other BYU-I Sources												
Emergency Generators		–	5.00E-07		–	5.25E-05		–	8.50E-06		–	7.31E-04
Paint Booths		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–
Total		3.80E-07	1.43E-06		3.59E-06	6.13E-05		1.06E-06	1.11E-05		7.18E-04	2.49E-03

9.34E-01

Natural Gas Metals em. Factors

Natural Gas em. Factors	Heat Input (MMBtu/hr)	Nat. Gas Usage (10^6 ft^3/hr)	Arsenic			Beryllium			Cadmium			Chromium			Cobalt		
			Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.06111	2.00E-04	1.22E-05	2.99E-05	1.20E-05	7.33E-07	1.80E-06	1.10E-03	6.72E-05	1.65E-04	1.40E-03	8.56E-05	2.10E-04	8.40E-05	5.13E-06	1.26E-05
Boiler 3	55	0.06111	2.00E-04	1.22E-05	2.99E-05	1.20E-05	7.33E-07	1.80E-06	1.10E-03	6.72E-05	1.65E-04	1.40E-03	8.56E-05	2.10E-04	8.40E-05	5.13E-06	1.26E-05
Boiler 4	50	0.05556	2.00E-04	1.11E-05	2.72E-05	1.20E-05	6.67E-07	1.63E-06	1.10E-03	6.11E-05	1.50E-04	1.40E-03	7.78E-05	1.91E-04	8.40E-05	4.67E-06	1.14E-05
Turbine	60	0.0667	1.10E-05	7.33E-07	3.21E-06	3.10E-07	2.07E-08	9.05E-08	4.80E-06	3.20E-07	1.40E-06	1.10E-05	7.33E-07	3.21E-06		0.00E+00	0.00E+00
HRSG	30	0.0333	2.00E-04	6.67E-06	1.63E-05	1.20E-05	4.00E-07	9.80E-07	1.10E-03	3.67E-05	8.98E-05	1.40E-03	4.67E-05	1.14E-04	8.40E-05	2.80E-06	6.86E-06
All Other BYU-I Sources																	
Emergency Generators				–	–		–	–		–	–		–	–		–	–
Paint Booths				–	–		–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–		–	–
Total				4.30E-05	1.07E-04		2.55E-06	6.30E-06		2.33E-04	5.70E-04		2.96E-04	7.27E-04		1.77E-05	4.34E-05

Natural Gas em. Factors	Manganese			Mercury			Nickel			Selenium		
	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	3.80E-04	2.32E-05	5.69E-05	2.60E-04	1.59E-05	3.89E-05	2.10E-03	1.28E-04	3.14E-04	2.40E-05	1.47E-06	3.59E-06
Boiler 3	3.80E-04	2.32E-05	5.69E-05	2.60E-04	1.59E-05	3.89E-05	2.10E-03	1.28E-04	3.14E-04	2.40E-05	1.47E-06	3.59E-06
Boiler 4	3.80E-04	2.11E-05	5.17E-05	2.60E-04	1.44E-05	3.54E-05	2.10E-03	1.17E-04	2.86E-04	2.40E-05	1.33E-06	3.27E-06
Turbine	7.90E-04	5.27E-05	2.31E-04	1.20E-06	8.00E-08	3.50E-07	4.60E-06	3.07E-07	1.34E-06	2.50E-05	1.67E-06	7.30E-06
HRSG	3.80E-04	1.27E-05	3.10E-05	2.60E-04	8.67E-06	2.12E-05	2.10E-03	7.00E-05	1.72E-04	2.40E-05	8.00E-07	1.96E-06
All Other BYU-I Sources												
Emergency Generators		–	–		–	–		–	–		–	–
Paint Booths		–	–		–	–		–	–		–	–
Welding		–	4.00E-03		–	–		–	–		–	–
Total		1.13E-04	4.41E-03		5.50E-05	1.35E-04		4.44E-04	1.09E-03		6.73E-06	1.97E-05

7.12E-03

ULSD em. Factors

ULSD em. Factors	Heat Input (MMBtu/hr)	ULSD (10^3 gal/hr)	Arsenic			Beryllium			Cadmium			Chromium			Cobalt		
			Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.4055	4.00E+00	2.20E-04	4.40E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05		0.00E+00	0.00E+00
Boiler 3	55	0.4055	4.00E+00	2.20E-04	4.40E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05		0.00E+00	0.00E+00
Boiler 4	50	0.4424	4.00E+00	2.00E-04	4.00E-05	3.00E+00	1.50E-04	3.00E-05	3.00E+00	1.50E-04	3.00E-05	3.00E+00	1.50E-04	3.00E-05		0.00E+00	0.00E+00
Turbine	60	0.4424		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	0	0.0000	4.00E+00	0.00E+00	0.00E+00	3.00E+00	0.00E+00	0.00E+00	3.00E+00	0.00E+00	0.00E+00	3.00E+00	0.00E+00	0.00E+00		0.00E+00	0.00E+00
All Other BYU-I Sources																	
Emergency Generators				–	–		–	–		–	–		–	–		–	–
Paint Booths				–	–		–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–		–	–
Total				6.40E-04	1.28E-04		4.80E-04	9.60E-05		4.80E-04	9.60E-05		4.80E-04	9.60E-05		0.00E+00	0.00E+00

ULSD em. Factors	Manganese			Mercury			Nickel			Selenium		
	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^{12} Btu)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	6.00E+00	3.30E-04	6.60E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05	1.50E+01	8.25E-04	1.65E-04
Boiler 3	6.00E+00	3.30E-04	6.60E-05	3.00E+00	1.65E-04	3.30E-05	3.00E+00	1.65E-04	3.30E-05	1.50E+01	8.25E-04	1.65E-04
Boiler 4	6.00E+00	3.00E-04	6.00E-05	3.00E+00	1.50E-04	3.00E-05	3.00E+00	1.50E-04	3.00E-05	1.50E+01	7.50E-04	1.50E-04
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	6.00E+00	0.00E+00	0.00E+00	3.00E+00	0.00E+00	0.00E+00	3.00E+00	0.00E+00	0.00E+00	1.50E+01	0.00E+00	0.00E+00
All Other BYU-I Sources												
Emergency Generators		–	–		–	–		–	–		–	–
Paint Booths		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–
Total		9.60E-04	1.92E-04		4.80E-04	9.60E-05		4.80E-04	9.60E-05		2.40E-03	4.80E-04

1.28E-03

ULSD em. Factors	Heat Input (MMBtu/hr)	ULSD (10^3 gal/hr)	Benzene			Ethylbenzene			Formaldehyde			Naphthalene			1,1,1-Trichloroethane		
			Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.4055	2.14E-04	8.68E-05	1.74E-05	6.36E-05	2.58E-05	5.16E-06	3.30E-02	1.34E-02	2.68E-03	1.13E-03	4.58E-04	9.16E-05	2.36E-04	9.57E-05	1.91E-05
Boiler 3	55	0.4055	2.14E-04	8.68E-05	1.74E-05	6.36E-05	2.58E-05	5.16E-06	3.30E-02	1.34E-02	2.68E-03	1.13E-03	4.58E-04	9.16E-05	2.36E-04	9.57E-05	1.91E-05
Boiler 4	50	0.4424	2.14E-04	9.47E-05	1.89E-05	6.36E-05	2.81E-05	5.63E-06	3.30E-02	1.46E-02	2.92E-03	1.13E-03	5.00E-04	1.00E-04	2.36E-04	1.04E-04	2.09E-05
Turbine	60	0.4424		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	0	0.0000	2.14E-04	0.00E+00	0.00E+00	6.36E-05	0.00E+00	0.00E+00	3.30E-02	0.00E+00	0.00E+00	1.13E-03	0.00E+00	0.00E+00	2.36E-04	0.00E+00	0.00E+00
All Other BYU-I Sources																	
Emergency Generators				–	–		–	–		–	–		–	–		–	–
Paint Booths				–	–		–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–		–	–
Total				2.68E-04	5.36E-05		7.97E-05	1.59E-05		4.14E-02	8.27E-03		1.42E-03	2.83E-04		2.96E-04	5.92E-05

ULSD em. Factors	Toluene			O-Xylene			Acenaphthene			Acenaphthylene			Benz(a)anthracene		
	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	6.20E-03	2.51E-03	5.03E-04	1.09E-04	4.42E-05	8.84E-06	2.11E-05	8.56E-06	1.71E-06	2.53E-07	1.03E-07	2.05E-08	4.01E-06	1.63E-06	3.25E-07
Boiler 3	6.20E-03	2.51E-03	5.03E-04	1.09E-04	4.42E-05	8.84E-06	2.11E-05	8.56E-06	1.71E-06	2.53E-07	1.03E-07	2.05E-08	4.01E-06	1.63E-06	3.25E-07
Boiler 4	6.20E-03	2.74E-03	5.49E-04	1.09E-04	4.82E-05	9.64E-06	2.11E-05	9.33E-06	1.87E-06	2.53E-07	1.12E-07	2.24E-08	4.01E-06	1.77E-06	3.55E-07
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	6.20E-03	0.00E+00	0.00E+00	1.09E-04	0.00E+00	0.00E+00	2.11E-05	0.00E+00	0.00E+00	2.53E-07	0.00E+00	0.00E+00	4.01E-06	0.00E+00	0.00E+00
All Other BYU-I Sources															
Emergency Generators		–	–		–	–		–	–		–	–		–	–
Paint Booths		–	–		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–		–	–
Total		7.77E-03	1.55E-03		1.37E-04	2.73E-05		2.64E-05	5.29E-06		3.17E-07	6.34E-08		5.03E-06	1.01E-06

ULSD em. Factors	Benzo(b,k)fluoranthene			Chrysene			Dibenzo(a,h)perylene			Fluoranthene			Fluorene		
	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	1.48E-06	6.00E-07	1.20E-07	2.38E-06	9.65E-07	1.93E-07	2.26E-06	9.16E-07	1.83E-07	4.84E-06	1.96E-06	3.93E-07	4.47E-06	1.81E-06	3.63E-07
Boiler 3	1.48E-06	6.00E-07	1.20E-07	2.38E-06	9.65E-07	1.93E-07	2.26E-06	9.16E-07	1.83E-07	4.84E-06	1.96E-06	3.93E-07	4.47E-06	1.81E-06	3.63E-07
Boiler 4	1.48E-06	6.55E-07	1.31E-07	2.38E-06	1.05E-06	2.11E-07	2.26E-06	1.00E-06	2.00E-07	4.84E-06	2.14E-06	4.28E-07	4.47E-06	1.98E-06	3.95E-07
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	1.48E-06	0.00E+00	0.00E+00	2.38E-06	0.00E+00	0.00E+00	2.26E-06	0.00E+00	0.00E+00	4.84E-06	0.00E+00	0.00E+00	4.47E-06	0.00E+00	0.00E+00
All Other BYU-I Sources															
Emergency Generators		–	–		–	–		–	–		–	–		–	–
Paint Booths		–	–		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–		–	–
Total		1.86E-06	3.71E-07		2.98E-06	5.97E-07		2.83E-06	5.67E-07		6.07E-06	1.21E-06		5.60E-06	1.12E-06

ULSD em. Factors	Heat Input (MMBtu/hr)	ULSD (10^3 gal/hr)	Benzo(b,k)fluoranthene			Chrysene			Dibenzo(a,h)perylene			Fluoranthene			Fluorene		
			Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	55	0.4055	1.48E-06	6.00E-07	1.20E-07	2.38E-06	9.65E-07	1.93E-07	2.26E-06	9.16E-07	1.83E-07	4.84E-06	1.96E-06	3.93E-07	4.47E-06	1.81E-06	3.63E-07
Boiler 3	55	0.4055	1.48E-06	6.00E-07	1.20E-07	2.38E-06	9.65E-07	1.93E-07	2.26E-06	9.16E-07	1.83E-07	4.84E-06	1.96E-06	3.93E-07	4.47E-06	1.81E-06	3.63E-07
Boiler 4	50	0.4424	1.48E-06	6.55E-07	1.31E-07	2.38E-06	1.05E-06	2.11E-07	2.26E-06	1.00E-06	2.00E-07	4.84E-06	2.14E-06	4.28E-07	4.47E-06	1.98E-06	3.95E-07
Turbine	60	0.2212		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	30	0.3687	1.48E-06	0.00E+00	0.00E+00	2.38E-06	0.00E+00	0.00E+00	2.26E-06	0.00E+00	0.00E+00	4.84E-06	0.00E+00	0.00E+00	4.47E-06	0.00E+00	0.00E+00
All Other BYU-I Sources																	
Emergency Generators				–	–		–	–		–	–		–	–		–	–
Paint Booths				–	–		–	–		–	–		–	–		–	–
Welding				–	–		–	–		–	–		–	–		–	–
Total				1.86E-06	3.71E-07		2.98E-06	5.97E-07		2.83E-06	5.67E-07		6.07E-06	1.21E-06		5.60E-06	1.12E-06

ULSD em. Factors	Indo(1,2,3-cd)pyrene			Phenanthrene			Pyrene			OCDD		
	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
Boiler 2	2.14E-06	8.68E-07	1.74E-07	1.05E-05	4.26E-06	8.52E-07	4.25E-06	1.72E-06	3.45E-07	3.10E-09	1.26E-09	2.51E-10
Boiler 3	2.14E-06	8.68E-07	1.74E-07	1.05E-05	4.26E-06	8.52E-07	4.25E-06	1.72E-06	3.45E-07	3.10E-09	1.26E-09	2.51E-10
Boiler 4	2.14E-06	9.47E-07	1.89E-07	1.05E-05	4.64E-06	9.29E-07	4.25E-06	1.88E-06	3.76E-07	3.10E-09	1.37E-09	2.74E-10
Turbine		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00		0.00E+00	0.00E+00
HRSG	2.14E-06	0.00E+00	0.00E+00	1.05E-05	0.00E+00	0.00E+00	4.25E-06	0.00E+00	0.00E+00	3.10E-09	0.00E+00	0.00E+00
All Other BYU-I Sources												
Emergency Generators		–	–		–	–		–	–		–	–
Paint Booths		–	–		–	–		–	–		–	–
Welding		–	–		–	–		–	–		–	–
Total		2.68E-06	5.36E-07		1.32E-05	2.63E-06		5.33E-06	1.07E-06		1.89E-09	7.77E-10

6.89E-06

New Emergency Generator Engines	kW	HP	Benzene			Toluene			Xylenes			1,3-Butadiene			Formaldehyde		
			Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)
EG401	500	757	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03
EG402	500	757	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03
EG403	500	757	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03
EG404	500	757	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03
				3.17E-02	7.92E-03		1.39E-02	3.47E-03		9.68E-03	2.42E-03		1.33E-03	3.32E-04		4.01E-02	1.00E-02

New Emergency Generator Engines	Acetaldehyde			Acrolein			Naphthalene			Benzene			Toluene		
	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)
EG401	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04
EG402	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04
EG403	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04
EG404	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04	9.33E-04	7.92E-03	1.98E-03	4.09E-04	3.47E-03	8.68E-04
		2.60E-02	6.51E-03		3.14E-03	7.85E-04		2.88E-03	7.20E-04		3.17E-02	7.92E-03		1.39E-02	3.47E-03

New Emergency Generator Engines	Xylenes			1,3-Butadiene			Formaldehyde			Acetaldehyde			Acrolein		
	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)
EG401	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04
EG402	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04
EG403	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04
EG404	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04
		9.68E-03	2.42E-03		1.33E-03	3.32E-04		4.01E-02	1.00E-02		2.60E-02	6.51E-03		3.14E-03	7.85E-04

New Emergency Generator Engines	kW	HP	Xylenes			1,3-Butadiene			Formaldehyde			Acetaldehyde			Acrolein			Naphthalene		
			Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)	Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)
EG401	500	757	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04
EG402	500	757	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04
EG403	500	757	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04
EG404	500	757	2.85E-04	2.42E-03	6.05E-04	3.91E-05	3.32E-04	8.30E-05	1.18E-03	1.00E-02	2.50E-03	7.67E-04	6.51E-03	1.63E-03	9.25E-05	7.85E-04	1.96E-04	8.48E-05	7.20E-04	1.80E-04
				9.68E-03	2.42E-03		1.33E-03	3.32E-04		4.01E-02	1.00E-02		2.60E-02	6.51E-03		3.14E-03	7.85E-04		2.88E-03	7.20E-04

2.08E-02

Total All TAPs 1.67 TPY

Fluorene		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
2.80E-06	1.71E-07	4.19E-07
2.80E-06	1.71E-07	4.19E-07
2.80E-06	1.56E-07	3.81E-07
	0.00E+00	0.00E+00
2.80E-06	9.33E-08	2.29E-07
	–	5.20E-05
	–	–
	–	–
	5.91E-07	5.34E-05

Hexane		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
1.80E+00	1.10E-01	2.70E-01
1.80E+00	1.10E-01	2.70E-01
1.80E+00	1.00E-01	2.45E-01
	0.00E+00	0.00E+00
1.80E+00	6.00E-02	1.47E-01
	–	–
	–	–
	–	–
	3.80E-01	9.33E-01

Indeno(1,2,3-cd)pyrene		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
1.80E-06	1.10E-07	2.70E-07
1.80E-06	1.10E-07	2.70E-07
1.80E-06	1.00E-07	2.45E-07
	0.00E+00	0.00E+00
1.80E-06	6.00E-08	1.47E-07
	–	5.00E-07
	–	–
	–	–
	3.80E-07	1.43E-06

Phenanathrene		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
1.70E-05	1.04E-06	2.55E-06
1.70E-05	1.04E-06	2.55E-06
1.70E-05	9.44E-07	2.31E-06
	0.00E+00	0.00E+00
1.70E-05	5.67E-07	1.39E-06
	–	5.35E-05
	–	–
	–	–
	3.59E-06	6.33E-05

Pyrene		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
5.00E-06	3.06E-07	7.49E-07
5.00E-06	3.06E-07	7.49E-07
5.00E-06	2.78E-07	6.81E-07
	0.00E+00	0.00E+00
5.00E-06	1.67E-07	4.08E-07
	–	8.50E-06
	–	–
	–	–
	1.06E-06	1.11E-05

Toluene		
Em. Factor (lb/10^6 ft^3)	Em. Rate (lb/hr)	Em. Rate (TPY)
3.40E-03	2.08E-04	5.09E-04
3.40E-03	2.08E-04	5.09E-04
3.40E-03	1.89E-04	4.63E-04
	0.00E+00	0.00E+00
3.40E-03	1.13E-04	2.78E-04
	–	7.33E-04
	–	–
	–	–
	7.18E-04	2.49E-03

0.934

Indo(1,2,3-cd)pyrene		
Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
2.14E-06	8.68E-07	1.74E-07
2.14E-06	8.68E-07	1.74E-07
2.14E-06	9.47E-07	1.89E-07
	0.00E+00	0.00E+00
2.14E-06	0.00E+00	0.00E+00
	–	–
	–	–
	–	–
	2.68E-06	5.36E-07

Phenanthrene		
Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
1.05E-05	4.26E-06	8.52E-07
1.05E-05	4.26E-06	8.52E-07
1.05E-05	4.64E-06	9.29E-07
	0.00E+00	0.00E+00
1.05E-05	0.00E+00	0.00E+00
	–	–
	–	–
	–	–
	1.32E-05	2.63E-06

Pyrene		
Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
4.25E-06	1.72E-06	3.45E-07
4.25E-06	1.72E-06	3.45E-07
4.25E-06	1.88E-06	3.76E-07
	0.00E+00	0.00E+00
4.25E-06	0.00E+00	0.00E+00
	–	–
	–	–
	–	–
	5.33E-06	1.07E-06

OCDD		
Em. Factor (lb/10^3 gal)	Em. Rate (lb/hr)	Em. Rate (TPY)
3.10E-09	1.26E-09	2.51E-10
3.10E-09	1.26E-09	2.51E-10
3.10E-09	1.37E-09	2.74E-10
	0.00E+00	0.00E+00
3.10E-09	0.00E+00	0.00E+00
	–	–
	–	–
	–	–
	3.89E-09	7.77E-10

1.03E-02

Naphthalene		
Em. Factor (lb/MMBtu)	Em. Rate (lb/hr)	Em. Rate (TPY)
8.48E-05	7.20E-04	1.80E-04
8.48E-05	7.20E-04	1.80E-04
8.48E-05	7.20E-04	1.80E-04
8.48E-05	7.20E-04	1.80E-04
	2.88E-03	7.20E-04

6.44E-02

Attachment 1 - Boiler #4 Design Parameters and Emission Rates

Cleaver-Brooks Boiler Expected Emission Data

	Producing Steam Firing	Nat Gas		
	BACKGROUND INFORMATION		Boiler Model	CBEX Elite
Date	02/24/15		Altitude (feet)	5000
Author	L.C. Banks		Operating Pressure (psig)	125.00
Customer	BYO idaho		Furnace Volume (cuft)	289.80
City & State	—		Furnace Heat Release (btu/hr/cu ft)	99,561
			Heating Surface (sqft)	2404
			Nox System	30

Nat Gas		Firing Rate			
		70%	80%	90%	100%
Horsepower		459	525	590	656
Input, Btu/hr		18,873,000	21,311,000	23,987,000	26,682,000
CO	ppm	10	10	10	10
	lb/MMBtu	0.0075	0.0075	0.0075	0.0075
	lb/hr	0.14	0.16	0.18	0.20
	tpy	0.620	0.700	0.788	0.876
NOx	ppm	30	30	30	30
	lb/MMBtu	0.0350	0.0350	0.0350	0.0350
	lb/hr	0.66	0.75	0.84	0.93
	tpy	2.893	3.267	3.677	4.090
NO	ppm	25.5	25.5	25.5	25.5
	lb/MMBtu	0.030	0.030	0.030	0.030
	lb/hr	0.56	0.63	0.71	0.79
	tpy	2.31	2.61	2.94	3.27
NO_2	ppm	4.5	4.5	4.5	4.5
	lb/MMBtu	0.005	0.005	0.005	0.005
	lb/hr	0.10	0.11	0.13	0.14
	tpy	0.58	0.65	0.74	0.82
SOx	ppm	0.34	0.34	0.34	0.34
	lb/MMBtu	0.0006	0.0006	0.0006	0.0006
	lb/hr	0.0111	0.0125	0.0141	0.0157
	tpy	0.049	0.055	0.062	0.069
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.067	0.076	0.085	0.095
VOCs does not include any background VOC emissions.	tpy	0.294	0.332	0.374	0.416
PM10(Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.035	0.040	0.045	0.050
	tpy	0.154	0.174	0.196	0.218
PM10(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.105	0.119	0.134	0.149
	tpy	0.462	0.522	0.587	0.653
PM2.5(Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.035	0.040	0.045	0.050
	tpy	0.154	0.174	0.196	0.218
PM2.5(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.105	0.119	0.134	0.149
	tpy	0.462	0.522	0.587	0.653
Exhaust Data					
Temperature, F		396	402	408	414
Flow	ACFM	7,881	7,983	9,051	10,140
	SCFM (70 Degrees Fah.)	4,157	4,180	4,705	5,234
	DSCFM	3,742	3,712	4,178	4,648
	lb/hr	18,707	18,811	21,174	23,553
Velocity	ft/sec	41.81	42.35	48.02	53.80
	ft/min	2,509	2,541	2,881	3,228

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O , by volume in exhaust gas is 17.24 % O2, by volume 2.47
4) Water vapor in exhaust gas is 98.91 lbs/MMBtu of fuel fired
5) CO2 produced is 116.31 lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material. PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1.

14) Fuel High Heating Value = 1000 Btu/FT^3

Attachment 1 - Boiler #4 Design Parameters and Emission Rates

	Cleaver-Brooks Boiler Expected Emission Data				
	Producing Steam Firing		**Nat Gas**		
	BACKGROUND INFORMATION			Boiler Model	CBEX Elite
Date	02/24/15			Altitude (feet)	5000
Author	L.C. Banks			Operating Pressure (psig)	125.00
Customer	BYO Idaho			Furnace Volume (cuft)	289.80
City & State	---			Furnace Heat Release (btu/hr/cu ft)	99,561
				Heating Surface (sqft)	2404
				Nox System	30
Nat Gas		Firing Rate			
		40%	50%	60%	100%
Horsepower		262	328	393	656
Input, Btu/hr		10,722,000	13,250,000	15,909,000	26,682,000
CO	ppm	10	10	10	10
	lb/MMBtu	0.0075	0.0075	0.0075	0.0075
	lb/hr	0.08	0.10	0.12	0.20
	tpy	0.352	0.435	0.522	0.876
NOx	ppm	30	30	30	30
	lb/MMBtu	0.0350	0.0350	0.0350	0.0350
	lb/hr	0.38	0.46	0.56	0.93
	tpy	1.644	2.031	2.439	4.090
NO	ppm	25.5	25.5	25.5	25.5
	lb/MMBtu	0.030	0.030	0.030	0.030
	lb/hr	0.32	0.39	0.47	0.79
	tpy	1.31	1.62	1.95	3.27
NO_2	ppm	4.5	4.5	4.5	4.5
	lb/MMBtu	0.005	0.005	0.005	0.005
	lb/hr	0.06	0.07	0.08	0.14
	tpy	0.33	0.41	0.49	0.82
SOx	ppm	0.34	0.34	0.34	0.34
	lb/MMBtu	0.0006	0.0006	0.0006	0.0006
	lb/hr	0.0063	0.0078	0.0094	0.0157
	tpy	0.028	0.034	0.041	0.069
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.038	0.047	0.057	0.095
VOCs does not include any background VOC emissions.	tpy	0.167	0.207	0.248	0.416
PM10(Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.020	0.025	0.030	0.050
	tpy	0.087	0.108	0.130	0.218
PM10(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.060	0.074	0.089	0.149
	tpy	0.262	0.324	0.389	0.653
PM2.5(Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.020	0.025	0.030	0.050
	tpy	0.087	0.108	0.130	0.218
PM2.5(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.060	0.074	0.089	0.149
	tpy	0.262	0.324	0.389	0.653
Exhaust Data					
Temperature, F		377	384	390	414
Flow	ACFM	4,379	4,856	5,873	10,140
	SCFM (70 Degrees Fah.)	2,362	2,599	3,121	5,234
	DSCFM	2,126	2,308	2,771	4,648
	lb/hr	10,627	11,696	14,043	23,553
Velocity	ft/sec	23.23	25.76	31.16	53.80
	ft/min	1,394	1,546	1,869	3,228

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O', by volume in exhaust gas is 17.24 % O2, by volume 2.47
4) Water vapor in exhaust gas is 98.91 lbs/MMBtu of fuel fired
5) CO2 produced is 116.31 lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.
   PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1.

14) Fuel High Heating Value = 1000 Btu/FT^3

Attachment 1 - Boiler #4 Design Parameters and Emission Rates

Cleaver-Brooks Boiler Expected Emission Data

Producing Steam Firing — **Nat Gas**

BACKGROUND INFORMATION

Date	02/24/15	Boiler Model	CBEX Elite
Author	L.C. Banks	Altitude (feet)	5000
Customer	BYO Idaho	Operating Pressure (psig)	125.00
City & State	---	Furnace Volume (cuft)	289.80
		Furnace Heat Release (btu/hr/cu ft)	99,561
		Heating Surface (sqft)	2404
		Nox System	30

Nat Gas		Firing Rate			
		10%	20%	30%	100%
Horsepower		66	131	197	656
Input, Btu/hr		2,665,000	5,273,000	7,913,000	26,682,000
CO	ppm	10	10	10	10
	lb/MMBtu	0.0075	0.0075	0.0075	0.0075
	lb/hr	0.02	0.04	0.06	0.20
	tpy	0.088	0.173	0.260	0.876
NOx	ppm	30	30	30	30
	lb/MMBtu	0.0350	0.0350	0.0350	0.0350
	lb/hr	0.09	0.18	0.28	0.93
	tpy	0.409	0.808	1.213	4.090
NO	ppm	25.5	25.5	25.5	25.5
	lb/MMBtu	0.030	0.030	0.030	0.030
	lb/hr	0.08	0.16	0.24	0.79
	tpy	0.33	0.65	0.97	3.27
NO_2	ppm	4.5	4.5	4.5	4.5
	lb/MMBtu	0.005	0.005	0.005	0.005
	lb/hr	0.01	0.03	0.04	0.14
	tpy	0.08	0.16	0.24	0.82
SOx	ppm	0.34	0.34	0.34	0.34
	lb/MMBtu	0.0006	0.0006	0.0006	0.0006
	lb/hr	0.0016	0.0031	0.0047	0.0157
	tpy	0.007	0.014	0.020	0.069
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.009	0.019	0.028	0.095
VOCs does not include any background VOC emissions.	tpy	0.042	0.082	0.123	0.416
PM10(Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.005	0.010	0.015	0.050
	tpy	0.022	0.043	0.065	0.218
PM10(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.015	0.029	0.044	0.149
	tpy	0.065	0.129	0.194	0.653
PM2.5(Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.005	0.010	0.015	0.050
	tpy	0.022	0.043	0.065	0.218
PM2.5(Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.015	0.029	0.044	0.149
	tpy	0.065	0.129	0.194	0.653
Exhaust Data					
Temperature, F		359	365	371	414
Flow	ACFM	1,064	1,889	2,857	10,140
	SCFM (70 Degrees Fah.)	587	1,034	1,552	5,234
	DSCFM	528	918	1,378	4,648
	lb/hr	2,641	4,654	6,985	23,553
Velocity	ft/sec	5.65	10.02	15.16	53.80
	ft/min	339	601	909	3,228

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O , by volume in exhaust gas is 17.24 % O2, by volume 2.47
4) Water vapor in exhaust gas is 98.91 lbs/MMBtu of fuel fired
5) CO2 produced is 116.31 lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material. PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1.

14) Fuel High Heating Value = 1000 Btu/FT^3

Attachment 1 - Boiler #4 Design Parameters and Emission Rates

Cleaver-Brooks Boiler Expected Emission Data

Producing Steam Firing #2 Oil

	BACKGROUND INFORMATION	Boiler Model	CBEX Elite
Date	02/24/15	Altitude (feet)	5000
Author	L.C. Banks	Operating Pressure (psig)	125
Customer	BYO idaho	Furnace Volume (cuft)	289.80
City & State	—	Furnace Heat Release (btu/hr/cu ft)	95,460
		Heating Surface (sqft)	1905
		Nox System	30

#2 Oil		Firing Rate			
		13%	50%	75%	100%
Horsepower		82	328	492	656
Input , Btu/hr		2,532,000	12,704,000	19,116,000	25,583,000
CO	ppm	10	10	10	10
	lb/MMBtu	0.008	0.008	0.008	0.008
	lb/hr	0.020	0.098	0.148	0.198
	tpy	0.086	0.431	0.649	0.868
NOx	ppm	90	90	90	90
	lb/MMBtu	0.115	0.115	0.115	0.115
	lb/hr	0.29	1.45	2.19	2.93
	tpy	1.270	6.372	9.588	12.831
NO	ppm	86	86	86	86
	lb/MMBtu	0.109	0.109	0.109	0.109
	lb/hr	0.28	1.38	2.08	2.78
	tpy	1.206	6.053	9.108	12.190
NO_2	ppm	5	5	5	5
	lb/MMBtu	0.006	0.006	0.006	0.006
	lb/hr	0.01	0.07	0.11	0.15
	tpy	0.063	0.319	0.479	0.642
SOx	ppm	270	270	270	270
	lb/MMBtu	0.479	0.479	0.479	0.479
	lb/hr	1.212	6.083	9.154	12.250
	tpy	5.310	26.645	40.093	53.656
VOCs	ppm	3	3	3	3
(Non-Methane Only)	lb/MMBtu	0.0014	0.0014	0.0014	0.0014
	lb/hr	0.004	0.018	0.027	0.037
VOCs does not include any	tpy	0.016	0.079	0.120	0.160
background VOC emissions.					
PM10(Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0143	0.0143	0.0143	0.0143
	lb/hr	0.04	0.18	0.273	0.37
	tpy	0.158	0.795	1.196	1.601
PM10(Condensable)	lb/MMBtu	0.0093	0.0093	0.0093	0.0093
	lb/hr	0.024	0.118	0.178	0.238
	tpy	0.103	0.517	0.777	1.040
PM2.5(Filtable)	lb/MMBtu	0.0143	0.0143	0.0143	0.0143
	lb/hr	0.04	0.18	0.27	0.37
	tpy	0.158	0.795	1.196	1.601
PM2.5(Condensable)	lb/MMBtu	0.0093	0.0093	0.0093	0.0093
	lb/hr	0.024	0.118	0.178	0.238
	tpy	0.103	0.517	0.777	1.040
Exhaust Data					
Temperature, F		359	384	399	414
Flow	ACFM	975	5,041	7,726	10,528
	SCFM (70 Degrees Fah.)	538	2,698	4,060	5,434
	DSCFM	503	2,522	3,795	5,078
	lb/hr	2,420	12,143	18,272	24,454
Velocity	ft/sec	5	27	41	56
	ft/min	310	1,605	2,459	3,351

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.

Oil emission levels are based on the following fuel constituent levels:

Ash Content	0.0100	%, by weight
Conradson Carbon Residue	0.3500	%, by weight
Fuel-bound Nitrogen Content	0.01500	%, by weight
Sulfur Content	0.5000	%, by weight

2) If any of the actual fuel constituent levels are different than indicated above, the emissions will change.

3.) Boilers rated above 40 hp , emission data is based on a burner turndown of 4 to 1.

4) Emission data based on actual boiler efficiency.

5) % H2O , by volume in exhaust gas is 10.50 % O2, by volume 3.94

6) Percent water vapor in exhaust gas is 62.57 lbs/MMBtu of fuel fired

7) CO2 produced is 159.95 lbs/MMBtu of fuel fired

8) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.

9) Heat input is based on high heating value (HHV).

10.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year

11.) Exhaust data is based on a clean and properly sealed boiler.

APPENDIX B – AMBIENT AIR QUALITY IMPACT ANALYSES

MEMORANDUM

DATE: October 17, 2016

TO: Darrin Pampaian, P.E., Permit Coordinator/Permit Writer, Air Program

FROM: Darrin Mehr, Analyst, Air Program

PROJECT: P-2013.0057 PROJ 61532 – PTC Application for Brigham Young University – Idaho for Permit Revisions Due to Boiler Design and Combustion Turbine Bypass Stack Design Changes for the Facility in Rexburg, Idaho.

SUBJECT: Demonstration of Compliance with IDAPA 58.01.01.203.02 (NAAQS) and 203.03 (TAPs)

Contents

Acronyms, Units, and Chemical Nomenclature

AAC	Acceptable Ambient Concentration of a Non-Carcinogenic TAP
AACC	Acceptable Ambient Concentration of a Carcinogenic TAP
ACFM	Actual cubic feet per minute
AERMAP	The terrain data preprocessor for AERMOD
AERMET	The meteorological data preprocessor for AERMOD
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
Appendix W	40 CFR 51, Appendix W – Guideline on Air Quality Models
ARM	Ambient Ratio Method
BPIP	Building Profile Input Program
BRC	Below Regulatory Concern
Btu/hr	British Thermal Units per hour
BYUI	Brigham Young University - Idaho
CFR	Code of Federal Regulations
CMAQ	Community Multi-Scale Air Quality Modeling System
CO	Carbon Monoxide
DEQ	Idaho Department of Environmental Quality
EL	Emissions Screening Level of a TAP
EPA	United States Environmental Protection Agency
fps	Feet per second
FTP	File Transfer Protocol
GEP	Good Engineering Practice
hr	Hours
HRSG	Heat Recovery Steam Generator
Idaho Air Rules	Rules for the Control of Air Pollution in Idaho, located in the Idaho Administrative Procedures Act 58.01.01
ISCST3	Industrial Source Complex Short Term 3 dispersion model
ISR	In-Stack Ratio
K	Kelvin
m	Meters
m/s	Meters per second
MMBtu	Million British Thermal Units
NAAQS	National Ambient Air Quality Standards
NED	National Elevation Dataset
NO	Nitrogen Oxide
NO_2	Nitrogen Dioxide
NO_x	Oxides of Nitrogen
NEI	National Emissions Inventory
NWS	National Weather Service
O_3	Ozone
Pb	Lead
PM_{10}	Particulate matter with an aerodynamic particle diameter less than or equal to a nominal 10 micrometers
$PM_{2.5}$	Particulate matter with an aerodynamic particle diameter less than or equal to a nominal 2.5 micrometers
ppb	Parts Per Billion
PRIME	Plume Rise Model Enhancement

PTC	Permit to Construct
PTE	Potential to Emit
SIL	Significant Impact Level
SO_2	Sulfur Dioxide
TAP	Toxic Air Pollutant
tons/year	Ton(s) per year
T/yr	Tons per year
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
VCU	Vapor Control Unit
VOCs	Volatile Organic Compounds
$\mu g/m^3$	Micrograms per cubic meter

1.0 Summary

1.1 General Project Summary

On June 5, 2015, Brigham Young University – Idaho (BYUI) submitted an application for revisions to the facility's Permit to Construct (PTC) P-2013.0057 Project 61299, issued November 6, 2014. Subsequent to installation of the emissions units, the facility and DEQ evaluated changes between certain equipment specifications in the 2014 PTC and the actual as-built specifications and DEQ requested that BYUI verify NAAQS compliance due to the changes. The most important items addressed in this project include:

1. Assuring compliance with ambient air quality standards for a physical change involving use of a 54-inch diameter combustion turbine bypass stack in place of the 48-inch diameter stack used for the initial PTC analyses. Dispersion of the exhaust stream is negatively affected with the larger diameter stack.
2. A new 25,000 pound per hour steam boiler capable of firing on natural gas and distillate fuel oil was installed instead of the proposed replacement of the permitted burner on the existing 43,000 pound per hour steam boiler.
3. DEQ requested additional verification of ambient air impacts for the operations of the natural gas and distillate fuel oil fired combustion turbine and a supplemental burner fired solely on natural gas. This involved multiple scenarios reflecting different load conditions and modulation of exhaust streams and air pollutant emissions between the two exhaust stacks dedicated to these sources. The two stacks in question are referred to as the Bypass stack and the Heat Recovery Steam Generator (HRSG) stack.

Project 61299's overall project description is listed below, as presented in DEQ's November 3, 2014, modeling memorandum[1]. Extensive changes to the facility were requested for the 2014 project.

> "BYUI is proposing to replace three existing coal-fired boilers (Boilers No. 2, 3, and 4) with two new natural gas-fired boilers (new Boilers No. 2 and 3), retrofit existing Boiler No. 5 (will then be labeled as Boiler No. 4) with a new natural gas-fired burner, and to install a natural gas-fired combustion turbine with a heat recovery steam generator (HRSG), including a natural gas-fired duct burner. The project also includes the addition of two 757 brake horsepower (bhp) diesel-fired emergency IC engines powering electrical generators, the replacement of one 300 kW diesel-fired emergency generator with two 757 bhp diesel-fired emergency IC engines powering electrical generators, and removal of an ash handling system that was associated with coal use in the existing boilers."

Project-specific air quality impact analyses involving atmospheric dispersion modeling of requested facility-wide allowable emissions were submitted to DEQ to demonstrate that the facility would not cause or significantly contribute to a violation of any ambient air quality standard (IDAPA 58.01.01.203.02 and 203.03 [Idaho Air Rules Section 203.02 and 203.03]). Mr. Al Oestmann, BYUI's permitting consultant, submitted analyses and applicable information and data to enable DEQ to evaluate potential impacts to ambient air.

The DEQ review summarized by this memorandum addressed only the rules, policies, methods, and data pertaining to the pollutant dispersion modeling analyses used to demonstrate that the estimated emissions associated with operation of the facility as modified will not cause or significantly contribute to a violation of the applicable air quality standards. This review did not evaluate compliance with other rules or analyses that do not pertain to the air impact analyses. This modeling review also did not evaluate the accuracy of emissions estimates. Evaluation of emissions estimates was the responsibility of the permit writer and is addressed in the main body of the DEQ Statement of Basis.

The submitted air quality impact analyses: 1) utilized appropriate methods and models according to established DEQ/EPA rules, policies, guidance, and procedures; 2) was conducted using reasonably accurate or conservative model parameters and input data (review of emissions estimates was addressed by the DEQ permit writer); 3) adhered to established DEQ guidelines for new source review dispersion modeling; 4) showed either a) that predicted pollutant concentrations from emissions associated with the facility as modeled were below Significant Impact Levels (SILs) or other applicable regulatory thresholds; or b) that predicted pollutant concentrations from applicable emissions associated with the project as modeled, when appropriately combined with co-contributing sources and background concentrations, were below applicable National Ambient Air Quality Standards (NAAQS) at ambient air locations where and when the project has a significant impact; 5) showed that Toxic Air Pollutant (TAP) emissions increases associated with the project do not result in increased ambient air impacts exceeding allowable TAP increments. Table 1 presents key assumptions and results to be considered in the development of the permit.

Table 1. KEY CONDITIONS USED IN MODELING ANALYSES

Criteria/Assumption/Result	Explanation/Consideration
General Emissions Rates Emissions rates used in the air impact analyses, as listed in this memorandum, represent maximum potential emissions as given by design capacity or as limited by the issued permit for the specific pollutant and averaging period.	Compliance has not been demonstrated for emissions rates greater than those used in the air impact analyses.
Scope of the Project and Analyses This project is a revision to the initial PTC issued in November 2014. The emissions from the combustion turbine will be emitted in varying levels between two stacks: 1) a bypass stack; or 2) an uncontrolled Heat Recovery Steam Generator (HRSG) that is essentially a boiler that will remove heat energy from the exhaust, causing the exhaust and volumetric flow rate to be lower than if emitted from the Bypass stack. Neither stack is equipped with add-on emission controls. The exhaust stream from the combustion turbine was analyzed with the following apportionments: • 100% Bypass Stack • 25% Bypass Stack/75% HRSG Stack; • 50% Bypass Stack/50% HRSG Stack; • 75% Bypass Stack/25% HRSG Stack; and • 100% HRSG Stack. The HRSG is also equipped with a Supplemental Burner fired on natural gas only. The permittee submitted an air impact analysis scenario where the Supplemental Burner is operated at 100% capacity and emits through the HRSG stack while the Combustion Turbine is operating at 100% capacity and also emits through the HRSG stack. The Supplemental Burner does not exhaust from the larger diameter Bypass stack. The Supplemental Burner and Combustion Turbine were modeled as operating concurrently with Boilers 2, 3, and 4 all at rated capacity.	The combustion turbine was modeled at operation capacity of 100% only for both natural gas firing and distillate fuel oil firing. BYUI appropriately demonstrated compliance with applicable NAAQS using multiple operating scenarios splitting the air pollutant emissions and the exhaust flow between the Bypass stack and the HRSG stack. The impact analyses did not account for a scenario where the Combustion Turbine and the Supplemental Burner were both fired on natural gas and the Combustion Turbine exhausted through the Bypass Stack while the Supplemental Burner exhausted through the HRSG stack.

Heat Recovery Steam Generator and Supplemental Burner Operations The Heat Recovery Steam Generator (HRSG) is not a true emissions unit, or at least it is not an independent unit. It is a process unit for capturing heat generated by either the Turbine AND/OR the Supplemental Burner. A single stack emits the exhaust from the Turbine and/or the Supplemental Burner after passing through the HRSG that provides heat to the BYUI campus. BYUI modeled the emissions from both the Turbine and Supplemental Burner while BOTH emissions units were fired on natural gas. A scenario was never modeled for combustion of distillate fuel oil in the Turbine while the Supplemental Burner was operating, which is limited to natural gas firing only. Operational Restriction: • The scenario of concurrent operation of the Supplemental Burner and Turbine while both units were fired on natural gas demonstrated compliance with applicable NAAQS. • A scenario of concurrent operation of the Supplemental Burner and the Turbine while the Turbine is fired on distillate fuel oil was not modeled to demonstrate compliance with applicable NAAQS (fuel oil NOx emission rate is 24.12 lb/hr versus 6.00 lb/hr on natural gas).	The Supplemental (or "Duct") Burner is fired exclusively on natural gas. The Supplemental Burner was only modeled for concurrent operation with the Combustion Turbine and Boilers 2, 3, and 4 while all aforementioned emissions units were fired on natural gas. No air impact analyses were performed for short-term average NOx and PM_{10} emissions reflecting concurrent operation of the Combustion Turbine, Boilers 2, 3, and 4 while fired on No. 2 distillate fuel oil with the Supplemental Burner (natural gas-fired only). Short term average NOx and PM_{10} emissions for the Combustion Turbine and Boilers 2, 3, and 4 are greater for distillate fuel firing than natural gas. This creates an operational restriction. Use of the Supplemental Burner while these other emissions units combust distillate fuel oil is not supported by the ambient impact analyses.
Operation of Boilers Boilers 2, 3, and 4 were modeled using restricted hours of operation. Maximum annual emissions were based on maximum hourly emissions (calculated at 100% rated capacity) and an operational rate of 4,900 hours per year on natural gas, combined with the emissions calculated at 100% rated capacity and the operational rate of 48 hours/year when combusting fuel oil.	NAAQS compliance was not demonstrated for annual emissions resulting from greater hours of operation on these fuel types.
Operation of Combustion Turbine The Combustion Turbine will not have annual emissions greater than those calculated from the estimated maximum hourly emissions calculated at 100% rated capacity and the assumed operational rate of 4,900 hours per year on natural gas, combined with the emissions calculated at 100% rated capacity and the operational rate of 48 hours/year when combusting fuel oil.	NAAQS compliance was not demonstrated for annual emissions resulting from greater hours of operation on these fuel types.
Operation of Supplemental Burner The Supplemental (or Duct) Burner will not have annual emissions greater than those calculated from the estimated maximum hourly emissions calculated at 100% rated capacity and the assumed operational rate of 4,900 hours per year on natural gas.	NAAQS compliance was not demonstrated for annual emissions resulting from greater hours of operation.
Emergency Generator Engines Emergency generator engine operational rates and characteristics were derived from the 24-hr $PM_{2.5}$ and PM_{10} NAAQS modeling analyses. Modeling was not required for the emergency generator	Emergency generator testing and maintenance operations limiting assumptions reflected in the modeling files included: • 0.5 hours per day at a frequency of once per month; • Annual operation level of 500 hours per year (recent changes to internal DEQ Stationary Source Permitting policy limits operations to 100 hours per

engines for the 1-hour NO_2 NAAQS. The distillate fuel oil-fired emergency electrical generator engines are exempted from the 1-hour NO_2 NAAQS demonstration per DEQ policy. The policy is readily available for public view in Appendix A of the DEQ Modeling Guideline[2].	year for emergency generators, so the 500 hours per year approach is very conservative); and, • Concurrent operation of emergency generators during testing was not requested nor supported in the DEQ-generated external emissions rates files.
TAPs. No TAPs were included in the modeling analyses.	TAP emissions increases resulting from the project were below emissions screening levels (ELs). There is no increase in TAPs above the levels contained in the previous project-PP-2013.0057, Project 61299, issued November 6, 2014. TAPs specifically regulated by 40 CFR 60, 61, or 63 are not subject to regulation under Idaho Air Rules Section 210.
1-hour, 3-hour, 24-hr, and annual SO_2 NAAQS DEQ did not formally review the SO_2 NAAQS analyses. Current enforceable potential emissions are at 1.47 tons per year as established in PTC P-2013.0057 Project 61299, issued November 6, 2014. Potential SO_2 emissions will remain unchanged in this project from those used in Project 61299. DEQ is confident that SO_2 ambient impacts are compliant with applicable NAAQS. Ultra- low sulfur distillate fuel oil is combusted in all BYUI emissions units.	DEQ's modeling BRC policy[4] applies to minor New Source Review projects. The project's potential emissions on an annual basis are compared to the BRC threshold, and emissions of that pollutant are exempted from the ambient impact analyses if they are below the BRC threshold. Facility-wide PTE of SO_2 emissions are below this threshold. In addition to the BRC policy, the BYU-Idaho's modeling analyses supporting the November 6, 2014 PTC relied on significant impact level (SIL) analyses for SO_2 emissions for the 1-hour and annual averaging periods. The SIL analyses accounted for the distillate fuel oil combustion emissions from three new dual fuel boilers, a dual fuel combustion turbine, and four new emergency generator engines and the removal of all coal combustion emissions from the facility. The SIL impacts from those analyses are not anticipated to be increased by a large enough margin to exceed the SILs. The previous project's impacts were predicted to be: • 1-hr average SO_2 SIL impact of 1.7 $\mu g/m^3$, versus the SIL of 7.9 $\mu g/m^3$, and • Annual average SO_2 SIL impact of 0.00 $\mu g/m^3$, versus the SIL of 1 $\mu g/m^3$. An SO_2 NAAQS analysis was not triggered for the previous ambient impact analyses.

1.2 Summary of Submittals and Actions

June 5, 2015: A PTC application was received.

July 1, 2015: The PTC application was declared incomplete.

August 31, 2015: DEQ received a response to the incompleteness determination.

September 18, 2015: DEQ received additional modeling support documentation via email.

September 30, 2015: DEQ declared the application incomplete.

November 30, 2015: DEQ received a response submittal to the incompleteness determination.

December 29, 2015: DEQ declared the permit application complete.

January 4 & 7, 2016: DEQ emailed the applicant and consultant a notification that annual average

PM$_{2.5}$ and annual average NO_2 NAAQS demonstrations had issues to resolve to demonstrate compliance with the NAAQS. Potential to emit verification was also requested.

January 26 & 27, 2016: DEQ received permit application addendum materials including revised modeling files.

February 23, 2016: DEQ obtained additional modeling files from the applicant's designated FTP site.

2.0 Background Information

This section provides background information applicable to the project and the site where the facility is located. It also provides a brief description of the applicable air impact analyses requirements for the project.

2.1 Project Description

PTC P-2013.0057, Project 61299, issued November 6, 2014 is the current PTC for the facility. The November 3, 2014 PTC project:

1) permitted the replacement of three existing coal-fired boilers (removed Boilers No. 2, 3, and 4) with two new dual fuel-fired (natural gas and distillate fuel oil) boilers (new Boilers No. 2 and 3);
2) retrofitted existing Boiler No. 5 (renamed as Boiler No. 4) with a new natural gas-fired burner; and,
3) to install a natural gas-fired combustion turbine with a heat recovery steam generator (HRSG), including a natural gas-fired duct burner. The project also included the addition of two 757 brake horsepower (bhp) diesel-fired emergency IC engines powering electrical generators, the replacement of one 300 kW diesel-fired emergency generator with two 757 bhp diesel-fired emergency IC engines powering electrical generators, and removal of an ash handling system that was associated with coal use in the existing boilers.

This PTC authorized the installation of two 55 million British Thermal Unit per hour (MMBtu/hr) dual fuel boilers, a 43,000 pound per hour dual fuel-fired boiler, a combustion turbine, a duct (or Supplemental) burner, and a heat recovery steam generator emissions unit. It also removed the facility's existing capability to combust coal as a fuel in all three of the facility's existing coal-fired boilers (Boilers 2, 3 and 4). New Boilers 2, 3, and 4 were permitted with natural gas as a primary fuel and distillate fuel oil as a backup fuel. DEQ requested that BYUI evaluate changes between certain equipment specifications relied on in the 2014 PTC and the actual as-built specifications. The air impact analyses also included additional operating scenarios modulating between two individual stacks at varying loads of the combustion turbine. The most important items addressed in this permitting project include:

1. Evaluating ambient air quality standard compliance for the case of a 54-inch diameter combustion turbine bypass stack in place of the 48-inch diameter stack used for the initial PTC analyses. Dispersion of the exhaust stream is negatively affected with the larger diameter stack.
2. A new 25,000 pound per hour steam boiler capable of firing on natural gas and oil was installed instead of the permitted burner replacement on the existing 43,000 pound per hour steam boiler.
3. DEQ requested additional verification of air quality standard compliance for the operations of the natural gas and distillate fuel oil fired combustion turbine and a supplemental burner that is fired solely on natural gas, with multiple scenarios reflecting different load conditions having the

potential to modulate the exhaust streams between two stacks dedicated to these sources. The two stacks in question are referred to as the Bypass stack and the Heat Recovery Steam Generator (HRSG) stack, both of which release emissions uncontrolled to the atmosphere. The operational modes reflected included the following conditions for the stacks:

- 100% HRSG and 0% Bypass;
- 0% HRSG and 100% Bypass;
- 50% HRSG and 50% Bypass;
- 25% HRSG and 75% Bypass;
- 75% HRSG and 25% Bypass; and,
- 100% Supplemental Burner exhausted through the HRSG stack.

Two independent dissimilar stacks with two distinct fuel type options with five operating conditions on distillate fuel oil and six operating conditions on natural gas yields eleven cases evaluated for NAAQS compliance with this project.

2.2 Proposed Location and Area Classification

The BYUI facility is located in Rexburg, within Madison County, Idaho. This area is designated as an attainment or unclassifiable area for sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), lead (Pb), ozone (O_3), particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM_{10}), and particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$). The area is not classified as non-attainment for any criteria pollutants.

2.3 Air Impact Analyses Required for All Permits to Construct

Idaho Air Rules Sections 203.02 and 203.03:

> *No permit to construct shall be granted for a new or modified stationary source unless the applicant shows to the satisfaction of the Department all of the following:*
>
> ***02. NAAQS.*** *The stationary source or modification would not cause or significantly contribute to a violation of any ambient air quality standard.*
>
> ***03. Toxic Air Pollutants.*** *Using the methods provided in Section 210, the emissions of toxic air pollutants from the stationary source or modification would not injure or unreasonably affect human or animal life or vegetation as required by Section 161. Compliance with all applicable toxic air pollutant carcinogenic increments and toxic air pollutant non-carcinogenic increments will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586.*

Atmospheric dispersion modeling, using computerized simulations, is used to demonstrate compliance with both NAAQS and TAPs. Idaho Air Rules Section 202.02 states:

> ***03. Estimates of Ambient Concentrations.*** *All estimates of ambient concentrations shall be based on the applicable air quality models, data bases, and other requirements specified in 40 CFR 51 Appendix W (Guideline on Air Quality Models).*

2.4 Significant Impact Level and Cumulative NAAQS Impact Analyses

The Significant Impact Level (SIL) analysis for a new facility or proposed modification to a facility involves modeling estimated criteria air pollutant emissions from the facility or modification to determine the potential impacts to ambient air. Air impact analyses are required by Idaho Air Rules to be conducted according to methods outlined in 40 CFR 51, Appendix W (Guideline on Air Quality Models). Appendix W requires that facilities be modeled using emissions and operations representative of design capacity or as limited by a federally enforceable permit condition.

A facility or modification is considered to have a significant impact on air quality if maximum modeled impacts to ambient air exceed the established SIL listed in Idaho Air Rules Section 006 (referred to as a significant contribution in Idaho Air Rules) or as incorporated by reference as per Idaho Air Rules Section 107.03.b.

If modeled maximum pollutant impacts to ambient air from the emissions sources associated with a new facility or modification exceed the SILs, then a cumulative NAAQS impact analysis is necessary to demonstrate compliance with NAAQS and Idaho Air Rules Section 203.02.

Table 2. APPLICABLE REGULATORY LIMITS				
Pollutant	**Averaging Period**	**Significant Impact Levels[a] ($\mu g/m^3$)[b]**	**Regulatory Limit[c] ($\mu g/m^3$)**	**Modeled Design Value Used[d]**
PM_{10}[e]	24-hour	5.0	150[f]	Maximum 6th highest[g]
$PM_{2.5}$[h]	24-hour	1.2	35[i]	Mean of maximum 8th highest[j]
	Annual	0.3	12[k]	Mean of maximum 1st highest[l]
Carbon monoxide (CO)	1-hour	2,000	40,000[m]	Maximum 2nd highest[n]
	8-hour	500	10,000[m]	Maximum 2nd highest[n]
Sulfur Dioxide (SO_2)	1-hour	3 ppb[o] (7.8 $\mu g/m^3$)	75 ppb[p] (196 $\mu g/m^3$)	Mean of maximum 4th highest[q]
	3-hour	25	1,300[m]	Maximum 2nd highest[n]
Nitrogen Dioxide (NO_2)	1-hour	4 ppb (7.5 $\mu g/m^3$)	100 ppb[s] (188 $\mu g/m^3$)	Mean of maximum 8th highest[t]
	Annual	1.0	100[r]	Maximum 1st highest[n]
Lead (Pb)	3-month[u]	NA	0.15[r]	Maximum 1st highest[n]
	Quarterly	NA	1.5[r]	Maximum 1st highest[n]
Ozone (O_3)	8-hour	40 TPY VOC[v]	75 ppb[w]	Not typically modeled

a. Idaho Air Rules Section 006 (definition for significant contribution) or as incorporated by reference as per Idaho Air Rules Section 107.03.b.
b. Micrograms per cubic meter.
c. Incorporated into Idaho Air Rules by reference, as per Idaho Air Rules Section 107.
d. The maximum 1st highest modeled value is always used for the significant impact analysis unless indicated otherwise. Modeled design values are calculated for each ambient air receptor.
e. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
f. Not to be exceeded more than once per year on average over 3 years.
g. Concentration at any modeled receptor when using five years of meteorological data.
h. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
i. 3-year mean of the upper 98th percentile of the annual distribution of 24-hour concentrations.
j. 5-year mean of the 8th highest modeled 24-hour concentrations at the modeled receptor for each year of meteorological data modeled. For the SIL analysis, the 5-year mean of the 1st highest modeled 24-hour impacts at the modeled receptor for each year.
k. 3-year mean of annual concentration.
l. 5-year mean of annual averages at the modeled receptor.
m. Not to be exceeded more than once per year.
n. Concentration at any modeled receptor.
o. Interim SIL established by EPA policy memorandum.
p. 3-year mean of the upper 99th percentile of the annual distribution of maximum daily 1-hour concentrations.
q. 5-year mean of the 4th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of 1st highest modeled 1-hour impacts for each year is used.
r. Not to be exceeded in any calendar year.
s. 3-year mean of the upper 98th percentile of the annual distribution of maximum daily 1-hour concentrations.
t. 5-year mean of the 8th highest daily 1-hour maximum modeled concentrations for each year of meteorological data modeled. For the significant impact analysis, the 5-year mean of maximum modeled 1-hour impacts for each year is used.
u. 3-month rolling average.
v. An annual emissions rate of 40 ton/year of VOCs is considered significant for O_3.
w. Annual 4th highest daily maximum 8-hour concentration averaged over three years. The O_3 standard was revised (the notice was signed by the EPA Administrator on October 1, 2015) to 70 ppb. However, this standard will not be applicable for permitting purposes until it is incorporated by reference *sine die* into Idaho Air Rules.

If the cumulative NAAQS impact analysis indicates a violation of the standard, the permit may not be issued if the proposed project has a significant contribution (exceeding the SIL) to the modeled violation. This evaluation is made specific to both time and space. If the SIL analysis indicates the facility/modification has an impact exceeding the SIL, the facility might not have a significant contribution to a violation if impacts are below the SIL at the specific receptor showing the violation during the time periods when a modeled violation occurred.

Compliance with Idaho Air Rules Section 203.02 is generally demonstrated if: a) all modeled impacts of the SIL analysis are below the applicable SIL or other level determined to be inconsequential to NAAQS compliance; or b) modeled design values of the cumulative NAAQS impact analysis (modeling all emissions from the facility and co-contributing sources, and adding a background concentration) are less than applicable NAAQS at receptors where impacts from the proposed facility/modification exceeded the SIL or other identified level of consequence; or c) if the cumulative NAAQS analysis showed NAAQS violations, the impact of proposed facility/modification to any modeled violation was inconsequential (typically assumed to be less than the established SIL) for that specific receptor and for the specific modeled time when the violation occurred.

2.5 Toxic Air Pollutant Analyses

Emissions of toxic substances are generally addressed by Idaho Air Rules Section 161:

> *Any contaminant which is by its nature toxic to human or animal life or vegetation shall not be emitted in such quantities or concentrations as to alone, or in combination with other contaminants, injure or unreasonably affect human or animal life or vegetation.*

Permitting requirements for toxic air pollutants (TAPs) from new or modified sources are specifically addressed by Idaho Air Rules Section 203.03 and require the applicant to demonstrate to the satisfaction of DEQ the following:

> *Using the methods provided in Section 210, the emissions of toxic air pollutants from the stationary source or modification would not injure or unreasonably affect human or animal life or vegetation as required by Section 161. Compliance with all applicable toxic air pollutant carcinogenic increments and toxic air pollutant non-carcinogenic increments will also demonstrate preconstruction compliance with Section 161 with regards to the pollutants listed in Sections 585 and 586.*

Per Section 210, if the total project-wide emissions increase of any TAP associated with a new source or modification exceeds screening emission levels (ELs) of Idaho Air Rules Section 585 or 586, then the ambient impact of the emissions increase must be estimated. If ambient impacts are less than applicable Acceptable Ambient Concentrations (AACs) for non-carcinogens of Idaho Air Rules Section 585 and Acceptable Ambient Concentrations for Carcinogens (AACCs) of Idaho Air Rules Section 586, then compliance with TAP requirements has been demonstrated.

Idaho Air Rules Section 210.20 states that if TAP emissions from a specific source are regulated by the Department or EPA under 40 CFR 60, 61, or 63, then a TAP impact analysis under Section 210 is not required for that TAP.

3.0 Analytical Methods and Data

This section describes the methods and data used in analyses to demonstrate compliance with applicable air quality standards or other air impact requirements.

3.1 Emission Source Data

Emissions rates of criteria pollutants for the BYUI facility were provided for various applicable averaging periods by the facility's consultant, Al Oestmann. Review and approval of estimated emissions was the responsibility of the DEQ permit writer, and is not addressed in this modeling memorandum. DEQ modeling review included verification that the application's potential emissions rates were properly used in the model. The rates listed in Section 3.1.1 of this memorandum represent the maximum allowable rate as averaged over the specified period.

Emissions rates used in the dispersion modeling analyses submitted in the permit application should be reviewed by the DEQ permit writer against those in the emissions inventory of the permit application. All modeled criteria air pollutant and TAP emissions rates must be equal to or greater than the facility's emissions calculated in the PTC application or requested permit allowable emission rates.

3.1.1 Criteria Pollutant Emissions Rates

Significant impact analyses were not submitted for this project. The previous project, P-61299, relied on SIL analyses to exempt the boiler replacement project from cumulative impact analyses for SO_2 and CO. The current project's facility-wide CO emissions exceed the BRC modeling threshold, based on the rate equal to 10% of the significant emission rate of 100 tons per year for CO. The CO BRC threshold is 10 tons per year, so a modeling analysis is required for CO. DEQ elected to perform a brief review of the CO NAAQS analyses based on the relatively low hourly facility-wide emissions rate of 34.4 lb/hr facility-wide emissions inventory based on the project's electronic emissions inventory spreadsheet.

In consideration of SO_2 emissions, the current enforceable SO_2 emissions for the BYUI facility are 1.47 tons per year, and this project does not request any increase, based on Appendix N of this project's November 30, 2015 modeling report. The SO_2 PTE values were applied by DEQ modeling staff for application of the DEQ permitting policy for the SO_2 BRC modeling threshold of 4 tons per year. The submitted SO_2 NAAQS demonstration was not reviewed by DEQ modeling staff for this project.

Lead emissions were not modeled for this project. The facility's electronic spreadsheet for the emission inventory listed a post-project potential to emit of approximately 0.01 tons per year of lead emissions, or about 20 pounds per year. This is below the DEQ BRC modeling threshold of 120 pounds per year, and lead modeling was not required.

Table 3 lists emissions rates used in the short-term cumulative NAAQS impact analyses. Emissions were modeled for 24 hours per day except for the emergency electrical generator engine, where PM_{10} and $PM_{2.5}$ emissions were modeled with each engine operating for ½ hour per month, non-concurrently with any other emergency generator engine. This operational schedule was implemented in the model by using an external emission rate input file for the generator engines. These files are the same files used in the 2014 permitting project analyses.

The 100% load condition emissions rates were split between the Bypass and HRSG stacks according to the percentages in each of the five exhaust split cases for each fuel type, with all emission units operating on that fuel type only. The exhaust apportionment between the two stacks included:

- 100% Bypass Stack
- 25% Bypass Stack/75% HRSG Stack;
- 50% Bypass Stack/50% HRSG Stack;
- 75% Bypass Stack/25% HRSG Stack; and
- 100% HRSG Stack.

The Supplemental Burner case is an additional separate natural gas-specific scenario where 100% of the Turbine and Supplemental Burner emissions are emitted from the HRSG stack. There are no additional modeling analyses supporting the scenario of Supplemental Burner operations emitting through the HRSG stack while the Combustion Turbine emits through the Bypass stack.

Table 4 lists emissions rates for annual cumulative NAAQS impact analyses. Emissions were modeled for 8,760 hours per year. Limitations on potential to emit are inherently present in the modeled hourly rate because the annual requested quantity of emissions were divided equally over 8,760 hours per year for the annual average NAAQS ambient air impact analyses. Emergency generator engines were modeled with average hourly emissions rates calculated by dividing 100% rated capacity emissions for 500 hours per year of operation by 8,760 hours per year.

A single operating scenario was presented for the annual average impacts. The annual average ambient impact analyses account for total annual emissions based on summing the emissions for fuel oil combustion (for backup) and natural gas combustion (as the primary fuel) as limited by the requested hours of operation per year at 100% rated capacity and the emissions for each fuel type, and dividing the total annual emissions by 8,760 hours per year to derive an annual average-based hourly emission rate for the ambient air impact analyses. This is an appropriate method for modeling emissions for an annual average ambient standard.

Table 3. SHORT TERM CRITERIA POLLUTANT EMISSIONS FOR CUMULATIVE NAAQS IMPACT ANALYSES

Source ID	Description	Emission Rates (lb/hr[a])							
		NOx[b] 1-hr		$PM_{2.5}$[c] 24-hr		PM_{10}[d] 24-hr		CO[k]	
		Scenario		Scenario		Scenario		Scenario	
		Fuel Oil[e]	Natural Gas[f]	Fuel Oil[e]	Natural Gas[f]	Fuel Oil[e]	Natural Gas[f]	Fuel Oil[e]	Natural Gas[f]
BLR2	Boiler No. 2	7.910	2.911	0.2970	0.8250	2.475	0.620	3.23	3.23
BLR3	Boiler No. 3	7.910	2.911	0.2970	0.8250	2.475	0.620	3.23	3.23
BLR4	Boiler No. 4	7.350	2.700	0.192	0.7500	2.25	0.200	3.00	3.00
HRSG	Turbine HRSG stack	24.12	10.22[g]	0.720	0.801[j]	0.720	0.801[j]	6.60	5.49
BYPASS	Turbine Bypass Stack	24.12	6.00[g]	0.7200	0.3960	0.7200	0.3960	6.60	5.49
EG_ASER[h]	Auxiliary Services Bldg Generator	NA[i]	NA[i]	0.0873	0.0873	0.0873	0.0873	0.702	0.702
EG_AUST[h]	Austin Bldg Generator	NA[i]	NA[i]	0.0476	0.0476	0.0476	0.0476	0.351	0.351
EG_BENS[h]	Benson Bldg Generator	NA[i]	NA[i]	0.0714	0.0714	0.0714	0.0714	0.585	0.585
EG_CLRK[h]	Clark Bldg Generator	NA[i]	NA[i]	0.0873	0.0873	0.0873	0.0873	0.702	0.702
EG_HART[h]	Hart Bldg Generator	NA[i]	NA[i]	0.1508	0.1508	0.1508	0.1508	1.17	1.17
EG_KIMB[h]	Kimball Bldg Generator	NA[i]	NA[i]	0.6508	0.6508	0.6508	0.6508	5.109	5.109
EG_KIRK[h]	Kirkham Bldg Generator	NA[i]	NA[i]	0.0318	0.0318	0.0318	0.0318	0.234	0.234
EG_LIBR[h]	Library Bldg Generator	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	0.936	0.936
EG_MAN[h]	Manwaring Bldg Generator	NA[i]	NA[i]	0.0873	0.0873	0.0873	0.0873	0.702	0.702
EG_PHYP[h]	Physical Plant Bldg Generator	NA[i]	NA[i]	0.0476	0.0476	0.0476	0.0476	0.351	0.351
EG_R_GR[h]	Radio Graphics Bldg Generator	NA[i]	NA[i]	0.0635	0.0635	0.0635	0.0635	0.468	0.468
EG_RIKS[h]	Ricks Bldg Generator	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	0.936	0.936
EG_ROMN[h]	Romney Bldg Generator	NA[i]	NA[i]	0.0714	0.0714	0.0714	0.0714	0.0585	0.0585
EG_SMTH[h]	Smith Bldg Generator	NA[i]	NA[i]	0.0238	0.0238	0.0238	0.0238	0.546	0.546
EG_SNOW[h]	Snow Performing Arts Center Generator	NA[i]	NA[i]	0.0476	0.0476	0.0476	0.0476	0.351	0.351
EG_SPRI[h]	Spori Bldg Generator	NA[i]	NA[i]	0.0397	0.0397	0.0397	0.0397	0.299	0.299
EG481[h]	Emergency IC Engine 481	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	4.479	4.479
EG482[h]	Emergency IC Engine 482	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	4.479	4.479
EG483[h]	Emergency IC Engine 483	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	4.479	4.479
EG484[h]	Emergency IC Engine 484	NA[i]	NA[i]	0.1190	0.1190	0.1190	0.1190	4.479	4.479
AUST_PB	Austin Spray Booth	0.000	0.000	0.0260	0.0260	0.0260	0.0260	0	0
PFPB1	Physical Facilities Paint Booth 1	0.000	0.000	0.085	0.085	0.085	0.085	0	0
PFPB2	Physical Facilities Paint Booth 2	0.000	0.000	0.029	0.029	0.029	0.029	0	0

[a] Pounds/hour emissions for specified averaging period.
[b] Oxides of nitrogen.
[c] Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers. Emissions represent allowable daily emissions divided by 24 hour/day, except for emergency generators (see footnote "h").
[d] Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers. Emissions represent allowable daily emissions divided by 24 hour/day, except for emergency generator engines (see footnote "h").
[e] Boilers and turbine fired on distillate fuel oil exclusively.
[f] Boilers and turbine fired on natural gas exclusively.
[g] Maximum emissions for each source emitting through the HRSG stack are 6.0 lb/hr NOx for the Combustion Turbine and 4.2 lb/hr NOx for the Supplemental Burner.
[h] Emissions represent ½ hour of operation averaged over a single hour period. Emissions were modeled intermittently using an external emissions file based on the applicant-requested operational engine testing schedule of ½ hour per month during daylight hours only. The external emissions file was generated by using randomly selected hours of operation in accordance with the testing schedule and the file overwrites any emission rate and exhaust parameter values included in the model's general Source setup.
[i] NA indicates this emissions unit emits this pollutant, but the emissions of this pollutant were not modeled for NAAQS compliance. Emergency generator engine NOx emissions are exempt from modeling requirements if operated less than 100 hours per year.
[j] A $PM_{2.5}$ emission rate was modeled to represent the combustion turbine at 100% load and Supplemental Burner at 100% load exhausting to the HRSG stack. Note this is conservative because the electronic Appendix B spreadsheet lists the Turbine hourly PTE on natural gas at 0.396 lb/hr and the Supplemental Burner on natural gas at 0.270 lb/hr, for a total HRSG stack emission rate of 0.666 lb/hr of $PM_{2.5}$ and PM_{10}. '
[k] Carbon monoxide.

Table 4. ANNUAL CRITERIA POLLUTANT EMISSIONS FOR CUMULATIVE NAAQS IMPACT ANALYSES			
Source ID	Description	Emission Rates (lb/hr)[a,e]	
		NOx[b]	$PM_{2.5}$[c]
BLR2	Boiler No. 2	1.67	0.347
BLR3	Boiler No. 3	1.67	0.347
BLR4	Boiler No. 4	0.54	0.112
HRSG (stack)[e]	Turbine/HRSG stack	10.22[g]	0.801[f]
BYPASS (stack)	Turbine Bypass Stack	6.10	0.400
EG_ASER[d]	Auxiliary Services Bldg Generator	0.18	0.0130
EG_AUST[d]	Austin Bldg Generator	0.09	0.0071
EG_BENS[d]	Benson Bldg Generator	0.15	0.0106
EG_CLRK[d]	Clark Bldg Generator	0.18	0.0130
EG_HART[d]	Hart Bldg Generator	0.31	0.0224
EG_KIMB[d]	Kimball Bldg Generator	1.35	0.0966
EG_KIRK[d]	Kirkham Bldg Generator	0.06	0.0047
EG_LIBR[d]	Library Bldg Generator	0.25	0.0177
EG_MAN[d]	Manwaring Bldg Generator	0.18	0.0130
EG_PHYP[d]	Physical Plant Bldg Generator	0.09	0.0071
EG_R_GR[d]	Radio Graphics Bldg Generator	0.12	0.0094
EG_RIKS[d]	Ricks Bldg Generator	0.25	0.0177
EG_ROMN[d]	Romney Bldg Generator	0.15	0.0106
EG_SMTH[d]	Smith Bldg Generator	0.25	0.0035
EG_SNOW[d]	Snow Performing Arts Center Generator	0.09	0.0071
EG_SPRI[d]	Spori Bldg Generator	0.08	0.0059
EG481[d]	Emergency IC Engine 481	0.38	0.0136
EG482[d]	Emergency IC Engine 482	0.38	0.0136
EG483[d]	Emergency IC Engine 483	0.38	0.0136
EG484[d]	Emergency IC Engine 484	0.38	0.0136
AUST_PB	Austin Spray Booth	0.00	0.0260
PFPB1	Physical Facilities Paint Booth 1	0.00	0.0850
PFPB2	Physical Facilities Paint Booth 2	0.00	0.0290

a. Pounds/hour emissions rates represent total annual emissions divided by 8,760 hour/year to give an annual average hourly rate.
b. Oxides of nitrogen.
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
d. Emissions represent 500 hours of operation per year, averaged over 8,760 hours.
e. Emissions rate represents 4900 hours per year at 100% rated capacity on natural gas plus 48 hours per year at 100% rated capacity on distillate fuel oil, with the summation of these emissions averaged over 8,760 hours per year.
f. Combination of Supplemental Burner and Combustion Turbine while operating on natural gas. The modeled emission rate is higher than the calculated average hourly emission in BYUI's emissions inventory of 0.547 lb/hr $PM_{2.5}$, annual average, and 8.49 lb/hr NOx, annual average (note BYUI also included the 0.58 T/yr of NOx attributed to 48 hours per year of distillate fuel oil in the 8.49 lb/hr emission inventory value. BYUI's annual average modeling is conservative for the HRSG stack emissions.

Modeling Applicability

Facility-wide potential emissions of PM_{10}, $PM_{2.5}$, NOx, CO, and SO_2, exceed modeling thresholds stated in the *Idaho Air Quality Modeling Guideline*[2], thereby requiring a NAAQS impact analysis in accordance to Idaho Air Rules Section 202.01.c.ii. DEQ did not review the SO_2 NAAQS analyses on the basis that this project's facility-wide potential SO_2 emissions are below the DEQ policy BRC modeling threshold of 4.0 T/yr.

Facility-wide lead emissions will be well below the BRC modeling threshold of 120 pounds per year, and in fact will be nearly negligible considering the elimination of coal combustion required in Project 61299, resulting in a reduction of approximately 6.23 T/yr of lead. Lead modeling was not required.

Ozone (O_3) differs from other criteria pollutants in that it is not typically emitted directly into the atmosphere. O_3 is formed in the atmosphere through reactions of VOCs, NOx, and sunlight. Atmospheric dispersion models used in stationary source air permitting analyses cannot be used to estimate O_3 impacts resulting from VOC and NOx emissions from an industrial facility. O_3 concentrations resulting from area-wide emissions are predicted by using more complex airshed models such as the Community Multi-Scale Air Quality (CMAQ) modeling system. Use of the CMAQ model is very resource intensive and DEQ asserts that performing a CMAQ analysis for a particular permit application is not typically a reasonable or necessary requirement for air quality permitting.

Addressing secondary formation of O_3 has been somewhat addressed in EPA regulation and policy. As stated in a letter from Gina McCarthy of EPA to Robert Ukeiley, acting on behalf of the Sierra Club (letter from Gina McCarthy, Assistant Administrator, United States Environmental Protection Agency, to Robert Ukeiley, January 4, 2012):

> *. . . footnote 1 to sections 51.166(I)(5)(I) of the EPA's regulations says the following: "No de minimis air quality level is provided for ozone. However, any net emission increase of 100 tons per year or more of volatile organic compounds or nitrogen oxides subject to PSD would be required to perform an ambient impact analysis, including the gathering of air quality data."*
>
> *The EPA believes it unlikely a source emitting below these levels would contribute to such a violation of the 8-hour ozone NAAQS, but consultation with an EPA Regional Office should still be conducted in accordance with section 5.2.1.c. of Appendix W when reviewing an application for sources with emissions of these ozone precursors below 100 TPY."*

Allowable emissions estimates of VOCs and NOx are below the 100 tons/year threshold, and DEQ determined it was not appropriate or necessary to require a quantitative source specific O_3 impact analysis.

Intermittent Emissions Sources

Emissions from the testing of emergency generator engines (source IDs of the form EG_XXXX in the model input files) are intermittent sources that only operate on an infrequent basis. The internal combustion (IC) engines are only used for emergency conditions and during periodic operational testing and maintenance. As such, these sources are difficult to model in a way that accounts for impacts in a reasonably accurate but conservative manner.

For air quality standards that use the maximum observed concentration or second highest concentration as the compliance design value, regulatory assessment of pollutant impacts from intermittent sources can be appropriately modeled assuming continual operation. This assumption is appropriate because the source could be reasonably expected to operate during worst-case conditions, and the highest impact is the value used to evaluate compliance. For NAAQS having an averaging period longer than 1 hour (e.g., 8-hour, 24-hour, or annual NAAQS), short-term emissions can often be smeared or distributed over the longer averaging period, calculating an average emissions rate for the period of interest.

The main challenge of accurately modeling intermittent sources to evaluate the potential for violating the 1-hour NO_2 NAAQS arises because of the probabilistic nature of the standard. The probabilistic form of the NAAQS causes the operational frequency of an intermittent source to be a key consideration in the compliance evaluation. For example, if the only source at a facility is an intermittent source that operates once every quarter or four times per year, it is nearly impossible for the source to cause or contribute to a violation of the 1-hour NO_2 standard unless the background NO_2 concentration periodically exceeds the standard. For this example, the source does not operate frequently enough (four times each year) to impact the design concentration, which is the 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations. The 1-hour NO_2 design value at any specific ambient air location is estimated through dispersion modeling by using the 5-year average of the eighth highest of the daily 1-hour maximum concentrations from each year. However, if the facility has additional NOx sources of substantial magnitude, the contribution of the NOx emissions from even a very infrequent NOx source could measurably affect compliance with the 1-hour NO_2 NAAQS at some downwind locations.

Demonstrating NAAQS compliance for permitting purposes typically involves modeling permit allowable emissions over all allowable operation times, which often is continual operation (8,760 hours per year). If a source is allowed to operate during any particular hour of the year, then modeling is performed by assessing the impacts for each hour of the year. Modeling an intermittent source by assuming continual operation would artificially skew the distribution, thereby over-representing the source's impact. However, specific hours during which an intermittent source will operate are usually unknown.

The EPA provided guidance on modeling intermittent NO_2 sources in a March 2011 memorandum from Tyler Fox, leader of the air quality modeling group, to regional air directors.[3] The memo identifies the problem with modeling intermittent sources as a continuous source:

> We are concerned that assuming continuous operations for intermittent emissions would effectively impose an additional level of stringency beyond that intended by the level of the standard itself. As a result, we feel that it would be inappropriate to implement the 1-hour NO_2 standard in such a manner and recommend that compliance demonstrations for the 1-hour NO_2 NAAQS be based on emission scenarios that can logically be assumed to be *relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-hour concentrations* [emphasis added]. EPA believes that existing modeling guidelines provide sufficient discretion for reviewing authorities to exclude certain types of intermittent emissions from compliance demonstrations for the 1-hour NO_2 standard under these circumstances.

DEQ developed a guidance policy[5] in 2013 on modeling intermittent sources for compliance with the 1-hour NO_2 NAAQS. The following was stated from the policy:

> Upon a review of other states' application of the Tyler Fox memo, comments from the public and Idaho industry, an internal review of Idaho sources, NO_2 background levels, and various sample model runs; DEQ has determined that Nitrogen Oxides (NO_x) emissions from the intermittent operational testing of engines powering emergency generators or fire-suppression water pumps may be excluded from the project-specific significant impact level (SIL) analysis and the cumulative NAAQS analysis for 1-hour NO_2, providing the annual hours of operation from testing and maintenance are less than or equal to 100 hours.
>
> This determination is applicable to minor source air permitting projects and is not limited to any specific number of engines present at a facility. The Director may require deviation from this guidance if deemed appropriate to assure compliance with 1-hour NO_2 NAAQS and IDAPA 58.01.01.203 or 01.403. DEQ will determine how emergency engines are included in permits for major sources, specifically those applicable to the Prevention of Significant Deterioration (PSD) program, on a case-by-case basis.

This project's permit application was prepared following issuance of DEQ's guidance policy[5] on modeling intermittent sources for compliance with the 1-hour NO_2 NAAQS. Impacts from testing of the generators were not accounted for in the 1-hour NO_2 NAAQS ambient impact analyses as allowed by this policy. Although this policy is applicable to the 1-hour NO_2 NAAQS for emergency generator it is not applicable to any other NAAQS. BYUI's current project used an intermittent source approach to account for the emergency generators' ambient impacts for the 24-hour PM_{10} and $PM_{2.5}$ NAAQS. The scenario reflected randomly selecting hours of operation, based on the established testing schedule of one 30-minute test every month, performed only during daylight times.

"Daylight" hours were determined for each month based on the latest sunrise and earliest sunset in Rexburg[6] for each month of the year based on 2008 data. The monthly variation for "daylight" hours used in the modeling analyses is shown in Table 5. DEQ confirmed that the sunrise and sunset times for any calendar day vary by at most a minute over the five-year period from 2008 through 2012. External emissions rate files were constructed by DEQ for the generators to account for specific hours when testing will occur. This is the same external emission rate file used in the previous permitting project for the initial construction of the Combustion Turbine—Project P-61299. DEQ generated 1-hour NO_2, 24-hour PM_{10} and 24-hour $PM_{2.5}$ external emission rate files for that project.

Table 5. LATEST SUNRISE AND EARLIEST SUNSET IN REXBURG

Hour Ending: **Month**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
January																								
February																								
March																								
April																								
May																								
June																								
July																								
August																								
September																								
October																								
November																								
December																								

Secondary Particulate Formation

The impact from secondary particulate formation resulting from emissions of NOx, SO_2, and/or VOCs was assumed by DEQ to be negligible on the basis of the magnitude of emissions and the short distance from emissions sources to modeled receptors where maximum PM_{10} and $PM_{2.5}$ impacts were predicted.

3.1.2 Toxic Air Pollutant Emissions Rates

TAP emissions regulations under Idaho Air Rules Section 220 are only applicable for new or modified sources constructed after July 1, 1995. The proposed project did not result in any increases in emissions of TAPs from any TAP-applicable sources.

BYUI's consultant assured that all TAP emissions increases from Project 61299 were from sources where the specific TAP is regulated by 40 CFR 60, 61, or 63. TAPs from these sources are not subject to regulation by Idaho Air Rules Section 210, as explained in Section 2.5 of this memorandum. There are no changes to the TAPs emissions rates for this project and TAPs modeling was not required.

3.1.3 Emissions Release Parameters

Table 6 provides exhaust parameters, also referred to as emissions release parameters, including stack height, stack diameter, exhaust temperature, and exhaust velocity for point sources.

Table 6. POINT SOURCE STACK PARAMETERS USED IN MODELING

Release Point	Description	UTM[a] Coordinates		Stack Height (m)	Stack Gas Flow Temp (K)[c]	Stack Flow Velocity (m/sec)[d]	Stack Diam (m)
		Easting (m)[b]	Northing (m)				
AUST_PB	Austin Spray Booth	436870.2	4851750.3	7.21	294.1	0.00[e]	1.53
BLR2	Boiler No. 2	436788.3	4851830.3	24.38	422.0	14.00	1.02
BLR3	Boiler No. 3	436788.3	4851837.3	24.38	422.0	14.00	1.02
BLR4	Boiler No. 4	436788.4	4851844.4	24.38	422.0	14.00	1.02
HRSG	Turbine/HRSG stack	436783.4	4851821.7	24.38	422.0	25.72	1.22
BYPASS	Turbine Bypass Stack	436792.5	4851821.7	24.38	783.2	40.77	1.37
EG_ASER	Auxiliary Services Bldg Generator	437010.2	4851560.3	2.44	588.6 (582.43)	0.001[e]	0.203
EG_AUST	Austin Bldg Generator	436868.2	4851745.3	1.83	588.6 (582.43)	0.001[e]	0.076
EG_BENS	Benson Bldg Generator	437026.2	4851679.3	2.13	588.6 (582.43)	0.001[e]	0.076
EG_CLRK	Clark Bldg Generator	437160.2	4852176.3	2.44	588.6 (582.43)	41.09	0.076
EG_HART	Hart Bldg Generator	436906.2	4852157.3	2.13	588.6 (582.43)	41.95	0.051
EG_KIMB	Kimball Bldg Generator	437164.2	4851771.3	3.81	588.6 (582.35)[g]	29.11[f] (11.24)[g]	0.203
EG_KIRK	Kirkham Bldg Generator	437115.2	4852272.3	6.1	588.6 (582.35)[g]	0.001[e]	0.076
EG_LIBR	Library Bldg Generator	437032.2	4852147.3	2.44	588.6 (582.35)[g]	0.001[e]	0.076
EG_MAN	Manwaring Bldg Generator	436999.2	4851990.3	6.1	588.6 (582.35)[g]	0.001[e]	0.076
EG_PHYP	Physical Plant Bldg Generator	436802.2	4851721.3	1.83	588.6 (582.35)[g]	0.001[e]	0.076
EG_R_GR	Radio Graphics Bldg Generator	437329.2	4851865.3	2.44	588.6 (582.35)[g]	0.001[e]	0.343
EG_RIKS	Ricks Bldg Generator	437216.2	4851594.3	1.83	588.6 (582.35)[g]	0.001[e]	0.076
EG_ROMN	Romney Bldg Generator	437033.2	4852234.3	2.74	588.6 (582.35)[g]	0.001[e]	0.344
EG_SMTH	Smith Bldg Generator	437132.2	4852038.3	2.54	588.6 (582.35)[g]	0.001[e]	0.152
EG_SNOW	Snow Performing Arts Center Generator	436921.2	4852287.3	2.13	588.6 (582.35)[g]	0.001[e]	0.344
EG_SPRI	Spori Bldg Generator	437110.2	4852259.3	2.44	588.6 (582.35)[g]	0.001[e]	0.076
EG481	Emergency IC Engine 481	436817.1	4851882.3	10.67	588.7 (582.43)[g]	25.23 (7.69)[g]	0.305
EG482	Emergency IC Engine 482	436817.1	4851871.6	10.67	588.7 (582.43)[g]	25.23 (7.69)[g]	0.305
EG483	Emergency IC Engine 483	436817.1	4851844.0	10.67	588.7 (582.43)[g]	25.23 (7.69)[g]	0.305
EG484	Emergency IC Engine 484	436817.0	4851830.0	10.67	588.7	25.23	0.305

Table 6. POINT SOURCE STACK PARAMETERS USED IN MODELING							
Release Point	Description	UTM[a] Coordinates		Stack Height (m)	Stack Gas Flow Temp (K)[c]	Stack Flow Velocity (m/sec)[d]	Stack Diam (m)
		Easting (m)[b]	Northing (m)				
					(582.43)[g]	(7.69)[g]	
PFPB1	Physical Facilities Paint Booth 1	436765.2	4851735.3	10.46	294.1	16.17	0.61
PFPB2	Physical Facilities Paint Booth 2	436765.2	4851724.3	10.46	294.1	16.17	0.61

a. Universal Transverse Mercator.
b. Meters.
c. Kelvin.
d. Meters/second.
e. Horizontal or rain-capped release. Value set to 0.001 to negate momentum flux for plume rise.
f. Source emits horizontally, but plume rise calculations from the previous permitting action demonstrated that buoyancy flux dominated plume rise equations, so the actual flow could be used in modeling.
g. Conservative parameters were applied in the annual average NO_2 and $PM_{2.5}$ NAAQS ambient impact analyses.

Combustion Turbine and Supplemental Burner

The Combustion Turbine is an emission unit equipped with two stacks. This turbine operates at any number of varying splits of its exhaust through those two stacks (bypass and HRSG). An additional emission unit called the Supplemental Burner (or Duct Burner) emits through the HRSG stack only. The Supplemental Burner does not emit through the Bypass stack. The Supplemental Burner may operate concurrently at any operational rate with the Combustion Turbine, which will operate at only 100% capacity. Operation of the Supplemental Burner at various partial firing capacity levels was shown in the exhaust flow rate and exit temperature sheet from RMH to vary only slightly from the 100% Supplemental Burner firing rate case, so the 100% firing case provides the most conservative exhaust parameters. The "Expected Cogeneration Stack Flow Rates" documentation indicates that 25% to 100% firing rates of the Supplemental Burner have very little effect on the exhaust flow rate from the HRSG stack. Refer to the Normal Operation Case (NG) row at 35 degrees Fahrenheit (°F) and all rows for the Normal Operation Case (NG) with Duct Burner Modulation as shown in Figure 1. Note there is no exhaust flow from the Bypass stack. DEQ accepts the Combustion Turbine and Supplemental Burner exhaust parameter documentation as accurate or conservative.

Figure 1. Modeling Report Appendix A – Relevant Section

BYU-IDAHO - EXPECTED COGENERATION STACK FLOW RATES

Outside Air °F	Estimated Demand pph steam	Turbine Load %	Bypass Stack %	HRSG %	Turbine Flow lbm/hr	Exhaust Temp °F	Density lb/ft3	Turbine Flow ACFM	Bypass Stack Flow ACFM	Supplemental Firing %	HRSG Flow lbm/hr	HRSG Temp °F	HRSG Density lb/ft3	HRSG Stack Flow ACFM
Normal Operation Case (NG)														
13	50000	100%	0%	100%	154004	1066	0.021	122577	0	100%	154004	260	0.044	57863
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	100%	149319	260	0.044	56103
59	22458	100%	12%	88%	143329	1082	0.021	115276	14338	0%	125502	279	0.043	48397
70	17329	100%	32%	68%	139567	1088	0.021	112687	36550	0%	94298	278	0.043	36315
87	7300	100%	72%	28%	134217	1099	0.020	109137	78074	0%	38201	276	0.043	14672
105	7300	100%	72%	28%	127863	1113	0.020	104904	75046	0%	36393	275	0.043	13958
Load Follow Case 50% (NG)														
13	50000	50%	0%	100%	98570	1066	0.021	78455	0	100%	98570	260	0.044	37035
35	50000	50%	0%	100%	96015	1073	0.021	76772	0	100%	96015	260	0.044	36075
59	22458	50%	12%	88%	92751	1082	0.021	74598	9278	0%	81215	260	0.044	30514
70	17329	50%	32%	68%	90678	1088	0.021	73214	23747	0%	61266	257	0.045	22923
87	7300	50%	72%	28%	87746	1099	0.020	71350	51042	0%	24974	255	0.045	9318
105	7300	50%	72%	28%	84220	1113	0.020	69097	49431	0%	23971	255	0.045	8944
Normal Operation Case (NG) with Duct Burner Modulation														
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	25%	149319	271	0.044	56959
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	50%	149319	266	0.044	56570
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	75%	149319	262	0.044	56259
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	100%	149319	259	0.044	56025

Following issuance of the initial PTC for the Combustion Turbine/HRSG project, BYUI notified DEQ that the stack diameter of the as-built Bypass stack was larger than the initial modeled stack diameter and the new dual fuel-fired Boiler 4 would have a lower heat input than permitted. DEQ then requested BYUI provide additional analyses to verify NAAQS compliance that reflected the as-built specifications of permitted equipment and that an expanded number of operational scenarios be analyzed to support this project. This project addresses exhaust modulation of the Combustion Turbine between the Bypass and HRSG stacks at 0%, 25%, 50%, 75% and 100% for each of these two stacks. A separate scenario for operation of the Supplemental Burner was provided by BYUI. BYUI's application states that the Combustion Turbine does not operate at any load level below 100% capacity. This assumption simplified the analysis by not addressing emissions and release parameters as a function of operational level of the turbine. Release parameters were determined based on the ambient conditions, and ambient conditions determine how BYUI uses the Combustion Turbine exhaust to either exhaust the emission uncontrolled via the Bypass Stack or uncontrolled via the HRSG stack to utilize the heat energy content to provide heat to the campus.

BYUI's modeling report provided exhaust parameter support documentation. Justification was required for modeled exhaust parameters for the multiple operating scenarios. A number of outside air temperatures were analyzed. An engineering firm, RMH Group, Inc., (RMH) that worked with the project design engineering firm (Heath Engineering) calculated exit temperature and flow rate design data. This data was provided to justify that BYUI modeled accurate or conservative release parameters for the new turbine and supplemental burner emissions units. This documentation was included in Appendix A (Expected Cogen Flows) of the November 30, 2015 modeling report. RMH's cover letter indicated that the turbine manufacturer, Solar Turbines, and the Heat Recovery Steam Generator (HRSG) manufacturer, Cleaver Brooks, provided performance data for the emissions units. Exit temperatures were based on this performance data, and these exit temperatures were used as the basis for estimating the effect of temperature on the exhaust stream volumetric flow rates for the HRSG stack and the Bypass stack using the ideal gas law relationship to calculate the effect of the exhaust stream gas density. These are the exhaust parameters that vary based on atmospheric conditions. DEQ accepted this documentation for exhaust parameter justification.

The Combustion Turbine is an emission unit equipped with two stacks. This turbine operates at any number of varying splits of its exhaust through those two stacks (bypass and HRSG). Electricity is generated when the turbine exhaust is routed to the Bypass stack and steam to heat the campus is generated when the turbine exhaust is routed to the HRSG (basically a boiler). There is a variable split between these two stacks depending on the university's needs. An additional emission unit called the Supplemental Burner (or Duct Burner) creates additional heat capacity and emits through the HRSG stack only. The Supplemental Burner does not emit through the Bypass stack. The Supplemental Burner may operate concurrently at any operational rate with the Combustion Turbine. However, the Combustion Turbine will operate at only 100% capacity. Operation of the Supplemental Burner at various partial firing capacity levels of 25% to 75% showed exhaust parameters varied only slightly from the 100% Supplemental Burner firing rate case, so the 100% firing case provides the most conservative exhaust parameters and highest emission rates, and was the only case modeled. Refer to the Normal Operation Case (NG) row at 35 degrees Fahrenheit (°F) and all rows for the Normal Operation Case (NG) with Duct Burner Modulation as shown in Figure 3.

DEQ requested that BYUI model all operational levels of the Combustion Turbine. BYUI's consultants have stated that BYUI only intends to operate this emissions unit at 100% capacity. DEQ requested that BYUI substantiate that the modeling reflects the 100% load capacity conditions and submit additional modeling analyses if partial load operations are warranted. The support documentation provided by BYUI's equipment vendors is intended to support BYU's claim that the 100% load condition was appropriately or conservatively applied in this project's analyses. See Attachment A of this memorandum to review BYUI's support documentation for the assumption that modeling emissions calculated at a constant heat input rate of 60 MMBtu/hr for all hours of each day, including all seasons of the year, is adequately conservative for the purposes of demonstrating compliance with applicable NAAQS. The documentation in Attachment A indicates that only at extremely cold temperatures does the turbine have actual capability to combust higher quantities of fuel than the stated rated heat input rating of 60 MMBtu/hr. For temperatures above approximately minus 10 °F, the heat input capacity appears to be reduced but the load condition specified remains the full load condition. Net power output and heat input both decreased. To verify whether the Combustion Turbine is actually operated at a Full (or 100%) load at all times, the combustion air intake temperature and either the fuel input rate or the net power output of the generator must be monitored in a set number of time intervals to relatively accurately identify the average parameters which ideally could be compared against the RMH Group data in Attachment A of this memorandum. Additional specific temperatures within the -9.8 °F to 91.7 °F range could be added to develop a more robust set of heat input and net power output versus turbine air inlet temperature.

DEQ modeling staff confirmed the 48-inch diameter for the HRSG stack and the 54-inch Bypass Stack from the September 10, 2015 Performance Test Report[7]. Stack release heights were modeled at 80 feet above grade for both the HRSG and Bypass stacks. The HRSG stack heights were not supported with additional documentation, such as as-built drawings or equipment specification lists or on-site measurement verification by staff. Figure 2 shows the September 2015 Google earth Street View® image of the new Heat Plant building and sources under construction. This structure is BPIP model ID "HEAT3" with a tier height of 45 feet above grade. Absent an actual physical measurement of the stack height above the roofline and an as-built construction blueprint of this portion of the Heat Plant building, this image is the only information available for DEQ modeling staff to evaluate whether the stacks were constructed to the modeled heights. Provided the modeled structure tier height is accurate, DEQ interprets the stack heights for Boilers 2, 3, and 4, and the HRSG and Bypass stacks to be appropriately modeled.

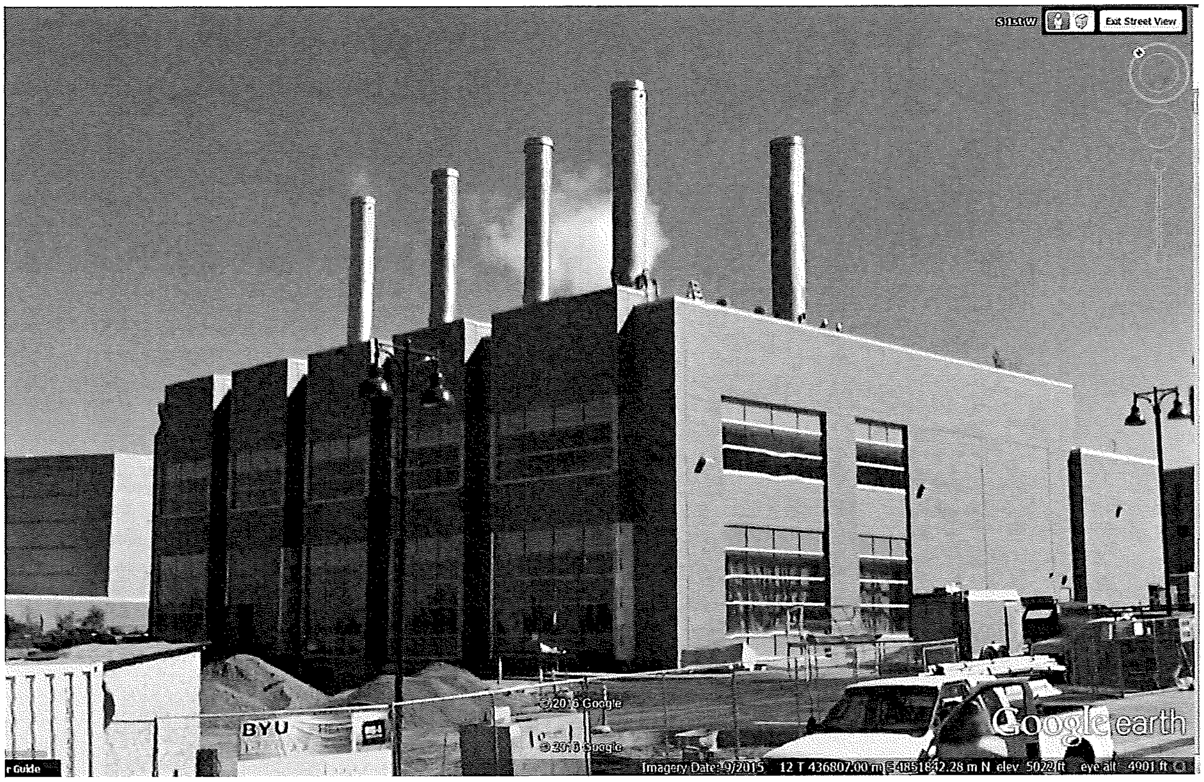


Figure 2: Google earth Image of BYUI New Heat Plant Building with Boilers 2, 3, 4, Bypass and HRSG Exhaust Stacks, September 2015

DEQ accepts the Combustion Turbine and Supplemental Burner exhaust parameter documentation as accurate or conservative.

BYU-IDAHO – EXPECTED COGENERATION STACK FLOW RATES

Outside Air °F	Estimated Demand pph steam	Turbine Load %	Bypass Stack %	HRSG %	Turbine Flow lbm/hr	Exhaust Temp °F	Density lb/ft3	Turbine Flow ACFM	Bypass Stack Flow ACFM	Supplemental Firing %	HRSG Flow lbm/hr	HRSG Temp °F	HRSG Density lb/ft3	HRSG Stack Flow ACFM
Normal Operation Case (NG)														
13	50000	100%	0%	100%	154004	1066	0.021	122577	0	100%	154004	260	0.044	57863
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	100%	149319	260	0.04[illegible]	56103
59	22458	100%	12%	88%	143329	1082	0.021	115276	14338	0%	125502	279	0.043	48397
70	17329	100%	32%	68%	139567	1088	0.021	112687	36550	0%	94298	278	0.043	36315
87	7300	100%	72%	28%	134217	1099	0.020	109137	78074	0%	38201	276	0.043	14672
105	7300	100%	72%	28%	127863	1113	0.020	104904	75046	0%	36393	275	0.043	13958
Load Follow Case 50% (NG)														
13	50000	50%	0%	100%	98570	1066	0.021	78455	0	100%	98570	260	0.044	37035
35	50000	50%	0%	100%	96015	1073	0.021	76772	0	100%	96015	260	0.044	36075
59	22458	50%	12%	88%	92751	1082	0.021	74598	9278	0%	81215	260	0.044	30514
70	17329	50%	32%	68%	90678	1088	0.021	73214	23747	0%	61266	257	0.045	22923
87	7300	50%	72%	28%	87746	1099	0.020	71350	51042	0%	24974	255	0.045	9318
105	7300	50%	72%	28%	84220	1113	0.020	69097	49431	0%	23971	255	0.045	8944
Normal Operation Case (NG) with Duct Burner Modulation														
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	25%	149319	271	0.044	56959
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	50%	149319	266	0.044	56570
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	75%	149319	262	0.04[illegible]	56259
35	50000	100%	0%	100%	149319	1073	0.021	119393	0	100%	149319	259	0.044	56025

Figure 3. Modeling Report Appendix A – Relevant Section

Dual Fuel-Fired Boilers No. 2, 3, and 4
Boilers 2 and 3 are identical emissions units. Release parameter support data consisted of a summary sheet specifying make and model. Note that these boilers are likely to be manufactured by Cleaver Brooks. They are industrial water tube O-Type boilers with a 53.9 MMBtu/hr heat input rating for both distillate fuel oil and natural gas. Each boiler is equipped with an economizer and the listed exhaust flow rate reflecting passing of the exhaust through the economizer of 15,255 actual cubic feet per minute (ACFM) and exit temperature of 317 degrees Fahrenheit (°F) were not listed for a specific fuel type. Stack diameter, release height, and vertical and uninterrupted release orientation were not supported with any design documentation (construction plans or specifications listings, or documentation of as-built parameters based on physical measurement by BYUI or construction entity staff).

Boiler 4 is rated at 26.7 million Btu/hr heat input at 100% load while fired on natural gas, and 25.6 MMBtu/hr heat input at 100% load while fired on distillate fuel oil. These ratings are based on higher heating value of the fuel per the supplied documentation. Cleaver Brooks design specification sheets listed an exit temperature of 414 °F and an exhaust flow rates at 100% load for natural gas of 10,140 ACFM for natural gas and 10,528 ACFM for distillate fuel oil. BYUI's impact analyses used the 10,528 ACFM value for both natural gas and fuel oil scenarios. There is only a 4% difference in flow rates so this difference is inconsequential to the results of the air impact analyses. Based on the listed exit velocity of 3,351 feet per minute and the 10,528 ACFM flow rate, the manufacturer's design stack diameter was 2.0 feet. BYUI modeled a 2.33 feet diameter stack which results in a more conservative exit velocity than an internal stack diameter of 2.0 feet provides. No additional documentation was provided for the modeled stack release height of 80 feet.

See Figure 3 above and the Bypass and HRSG exhaust parameter section for DEQ's findings on the substantiation of the physical release heights for the boilers' stacks.

Diesel-fired Emergency Generator Engines
The new engines, with model IDs EG481, EG482, EG483, and EG484, that were initially permitted in Project 61299 are each rated at 1000 kiloWatts of electricity (kW) output or 787 brake horsepower (bhp). The modeling report contains the GENERAC manufacturer equipment specifications sheet. Each unit is equipped with two 8-inch diameter stacks. The total volumetric flow rate for both stacks combined at 100% standby power generation load is 7,106 actual cubic feet per minute (ACFM) at 893 °F. BYUI modeled each of these generators with a single stack with an equivalent diameter of 1.0 feet based on the cross-sectional area of two 8-inch diameter stacks. Modeled flow rate was reduced to an assumed value of 1,190.6 ACFM, which reduced exit velocity of the exhaust from the single stack to 7.7 meters per second (m/s). The stack release height was 35 feet above grade with a vertical uninterrupted release orientation. Exit temperature was reduced to a value of 588.7 °F by BYUI's consultant. This information was applied to the annual average NO_2 and $PM_{2.5}$ NAAQS runs, which used slightly lower exit temperatures and significantly lower exit velocities for these engines than BYUI's justification documentation lists. The external emission rate input file generated by DEQ based on BYUI's consultant's input for the 2014 PTC project was used again for this project and this external emission rate file applied a 600 °F exit temperature and 25 m/s exit velocity for these engines. The external emission rate file was used for short term averaging period NAAQS impact analyses, whereas the annual average NAAQS analyses did not use this external emission rate files because the annual quantity of requested emissions were simply averaged over 8,760 hours per year, so different release parameters were used for the same emissions unit depending on whether an external emission rate file was used for the NAAQS analyses. BYUI's consultant applied more conservative assumptions to the annual average analyses release parameters and DEQ, and the modeled values are acceptable based upon the GENERAC specification sheet documentation, assuming the stacks may have additional exhaust piping length to extend to 35 feet release above grade.

The Kimball Building generator engine exhausts with a horizontal release. Al Oestmann, BYUI's modeling consultant provided plume rise justification calculations to show that this generator could be modeled as an uninterrupted vertically released point source because thermal buoyancy of the hot exhaust would cause plume rise to dominate the momentum and thermal buoyancy components of the total plume rise of the exhaust stream.

A number of other emergency generator engines were modeled with the assumption of minimized exhaust flow rate either because they exhausted horizontally or the flow rate justification data was not available for submittal with this application. The external emission rate file that was generated for previous project was not changed in any way for this project. Thus, exhaust parameters developed in 2013 were used in this project for the 24-hour PM_{10} and $PM_{2.5}$ NAAQS.

Paint Booths
Appendix M to the November 30, 2015 modeling report contained the exhaust parameter justification for the Physical Facilities paint spray booths (model IDs PFPB1 and PFPB2). A partial copy of a design drawing equipment specification listed a 3-horsepower fan providing 10,000 actual cubic feet per minute (ACFM) at 1.0 inch external static pressure, which matches the modeled flow rate. A fan diameter of 24 inches listed in this same equipment specification matches the modeled value. Additional information contained in Appendix M places the fan diameter at 30 inches rather than 24 inches. Documentation supporting the release heights of these stacks was not provided. BYUI modeled these two stacks as vertical, uninterrupted releases with termination heights of 34.3 feet above grade. This provides release heights 10 feet above the Physical Plant Building (BPIP modeling ID "PHYSPLT") where they are located. Exit temperature was assumed to be constant at 69.7 degrees Fahrenheit.

The Austin Paint Booth was modeled as a minimized exit flow velocity of 0.001 meter per second. This negates the requirement to justify a flow rate and the need to substantiate the large modeled stack diameter of 5 feet. The source was modeled with a release height of 23.7 feet above grade. The stack base elevation was set at 3.4 meters below the base elevation of the Austin Building (BPIP model ID "AUSTIN") resulting in an effective release height of around ½ the height of the building, so this is a conservative setup. Exit temperature was assumed to be 69.7 degrees Fahrenheit. These parameters are accepted as adequately accurate by DEQ.

DEQ determined that the modeled exhaust parameters are appropriate or conservative for this ambient impact analysis.

3.2 Background Concentrations

A background concentration tool was used to establish ambient background concentrations for this project. A beta version of the background concentration tool was developed by the Northwest International Air Quality Environmental Science and Technology Consortium (NW Airquest) and provided through Washington State University (located at http://lar.wsu.edu/nw-airquest/lookup.html). The tool uses regional scale modeling of pollutants in Washington, Oregon, and Idaho, with modeling results adjusted according to available monitoring data. The background is added to the design value for each pollutant and averaging period. Table 7 lists the background concentration values provided by DEQ for the BYUI facility location.

Table 7. BACKGROUND CONCENTRATIONS	
Pollutant and Averaging Period	**Background Concentrations Used in Modeling ($\mu g/m^3$)[a]**
NO_2[b], 1-hour	26.3 (14 ppb[e])
NO_2, annual	17 ppb (32 $\mu g/m^3$)
PM_{10}[c] 24-hour	61, extreme values removed
$PM_{2.5}$[d] 24-hour	13
$PM_{2.5}$ annual	5
Ozone (O_3) – for PVMRM[f]	57 ppb
CO[g], 1-hour	3,065.9
CO, 8-hour	1,075.4

a. Micrograms/cubic meter.
b. Nitrogen dioxide,
c. Particulate matter with a mean aerodynamic diameter of 10 micrometers or less.
d. Particulate matter with a mean aerodynamic diameter of 2.5 micrometers or less.
e. Parts per billion.
f. Plume Volume Molar Ratio Method.
g. Carbon monoxide.

O_3 Background Concentrations

Background Ozone (O_3) concentrations are also needed for 1-hour NO_2 modeling. Conversion of NO to NO_2 is addressed in the modeling by using the Plume Volume Molar Ratio Method (PVMRM), which requires the use of representative O_3 concentrations. DEQ obtained a background O_3 value of 57 ppb by using the NW AIRQUEST design value tool.

3.3 NAAQS Impact Modeling Methodology

This section describes the modeling methods used by the applicant to demonstrate preconstruction compliance with applicable air quality standards.

3.3.1 General Overview of NAAQS Analyses

Al Oestmann performed project-specific air impact analyses that were determined by DEQ to be reasonably representative of the proposed facility as described in the application. Results of the submitted analyses demonstrate compliance with applicable air quality standards to DEQ's satisfaction, provided the facility is operated as described in the submitted application and in this memorandum.

Table 8 provides a brief description of parameters used in the modeling analyses.

3.3.2 Modeling protocol and Methodology

A modeling protocol was not submitted to DEQ prior to receipt of the application. Al Oestmann intended the project's modeling demonstration to be addressed in a general manner by the protocol for Project 61299. That protocol was submitted by Trinity Consultants on behalf of BYUI. Conditional protocol approval was provided to BYUI on April 23, 2013 for Project 61299. Assumptions that differed from that protocol and approval were discussed between Al Oestmann and DEQ as issues arose. DEQ determined that this project's ambient impact analyses were generally conducted using data and methods specified by the *Idaho Air Quality Modeling Guideline.*[2]

Table 8. MODELING PARAMETERS		
Parameter	**Description/Values**	**Documentation/Addition Description**
General Facility Location	Rexburg, Idaho	The area is an attainment or unclassified area for all criteria pollutants.
Model	AERMOD	AERMOD with the PRIME downwash algorithm, version14134.
Meteorological Data	Rexburg surface data, Boise upper air data	See Section 3.3.4 of this memorandum for additional details of the meteorological data.
Terrain	Considered	3-dimensional receptor coordinates were obtained from USGS National Elevation Dataset (NED) files and were used to establish elevation of ground level receptors. AERMAP was used to determine each receptor elevation and hill height scale.
Building Downwash	Considered	Plume downwash was considered for the structures associated with the facility. BPIP-PRIME was used to evaluate building dimensions for consideration of downwash effects in AERMOD.
Receptor Grid	**Cumulative NAAQS Impact Analyses**	
	Grid 1	25-meter spacing in a 1,075 meter (easting) by 1,375 meter (northing) grid centered on the facility.
	Grid 2	50-meter spacing in a 2,100 meter (easting) by 2,350 meter (northing) grid centered on Grid 1.

3.3.3 Model Selection

Idaho Air Rules Section 202.02 requires that estimates of ambient concentrations be based on air quality models specified in 40 CFR 51, Appendix W (Guideline on Air Quality Models). The refined, steady state, multiple-source, Gaussian dispersion model AERMOD was promulgated as the replacement model for ISCST3 in December 2005. AERMOD retains the single straight line trajectory of ISCST3, but includes more advanced algorithms to assess turbulent mixing processes in the planetary boundary layer for both convective and stable stratified layers.

AERMOD version 14134 was used by Al Oestmann for the modeling analyses to evaluate impacts of the facility. This version was the current version at the time the application was received by DEQ.

3.3.4 Meteorological Data

DEQ provided BYUI's consultant with model-ready meteorological data processed from the Madison County/Rexburg National Weather Service (NWS) surface station data and Boise upper air data for 2008-2012. These data were processed by DEQ using AERMET version 12345, AERMINUTE version 11325, and AERSURFACE version 13016. DEQ determined these data were reasonably representative for the BYU-Idaho site.

3.3.5 Effects of Terrain on Modeled Impacts

The model setup with regard to receptor grid, building layout, and source locations was unchanged from the setup used in the previous project. DEQ modeling staff did not perform a detailed review of this documentation for the current project. The AERMAP-generated base elevations for emissions sources and buildings in the model setup are also based on Project 61299's supporting analyses and documentation. The following is taken from the DEQ modeling memorandum for Project 61299[1]:

> Terrain data were extracted from United States Geological Survey (USGS) National Elevation Dataset (NED) files in the WGS84 datum (approximately equal to the NAD83 datum). Trinity used 1/3 arc-second (about 10-meter resolution) data files. The NED files encompassed the area between 43.8144 and 44.1341 degrees latitude and between -111.7830 and -112.2210 degrees

longitude (dataset download numbers 12216059, 88505608, and 90440142), and between 43.4950 and 43.8145 degrees latitude and -111.3450 and -111.7831 degrees longitude (dataset download number 0627519).

The terrain preprocessor AERMAP Version 11103 was used to extract the elevations from the NED files and assign them to receptors in the modeling domain in a format usable by AERMOD. AERMAP also determined the hill-height scale for each receptor. The hill-height scale is an elevation value based on the surrounding terrain which has the greatest effect on that individual receptor. AERMOD uses those heights to evaluate whether the emissions plume has sufficient energy to travel up and over the terrain or if the plume will travel around the terrain.

The receptor elevations, hill height scale values, and base elevations for buildings and emission sources were accepted as adequately accurate by DEQ for this project as submitted.

3.3.6 Facility Layout

BYUI is a college campus with numerous structures and emissions sources scattered throughout. DEQ verified proper identification of buildings on the site by comparing a graphical representation of the modeling input file to aerial photographs on Google Earth. Some of the buildings were shifted several meters from how they appear in Google Earth. The Physical Plant and the Austin Building, which each house a paint spray booth, are offset to the southwest by approximately 12 meters from the Google earth image location. Other structures appear to be offset by a lesser distance. The locations of the stacks for emissions units appeared to be offset by the same distances as the buildings. This is not a critical error because the emissions sources and receptors appear to be offset by a corresponding amount, so modeled impacts will not be measurably affected. Ambient air is considered to be everywhere exterior to the buildings, so the distance to ambient air is not affected by the offset. The Heat Plant Building houses the most important sources to the impact analyses, namely the boilers, combustion turbine, and the supplemental burner. The distance between the Heat Plant Building and the neighboring Physical Plant Building matches between the model's BPIP setup and Google earth imagery.

Figure 4 shows the building and emissions sources from part of the BYUI campus overlaid on a Google Earth image.

3.3.7 Effects of Building Downwash on Modeled Impacts

Potential downwash effects on emissions plumes were accounted for in the model by using building dimensions and locations (locations of building corners, base elevation, and building heights). Dimensions and orientation of proposed buildings were used as input to the Building Profile Input Program for the Plume Rise Model Enhancements downwash algorithm (BPIP-PRIME) to calculate direction-specific dimensions and Good Engineering Practice (GEP) stack height information for input to AERMOD.

Section 3.3.6 of this memorandum indicated that the building locations appeared to be off by a few meters for many structures on the BYUI site. Because the emissions sources in the vicinity of those buildings also appeared to be shifted, the downwash affects will still be properly accounted for in the model. Because ambient air is considered to be everywhere exterior to the buildings these slight shifts in location do not increase distances of the source and building to discrete receptors located in ambient air. Figures 4 and 5 depict the most important emissions sources and exhaust stacks for this project.

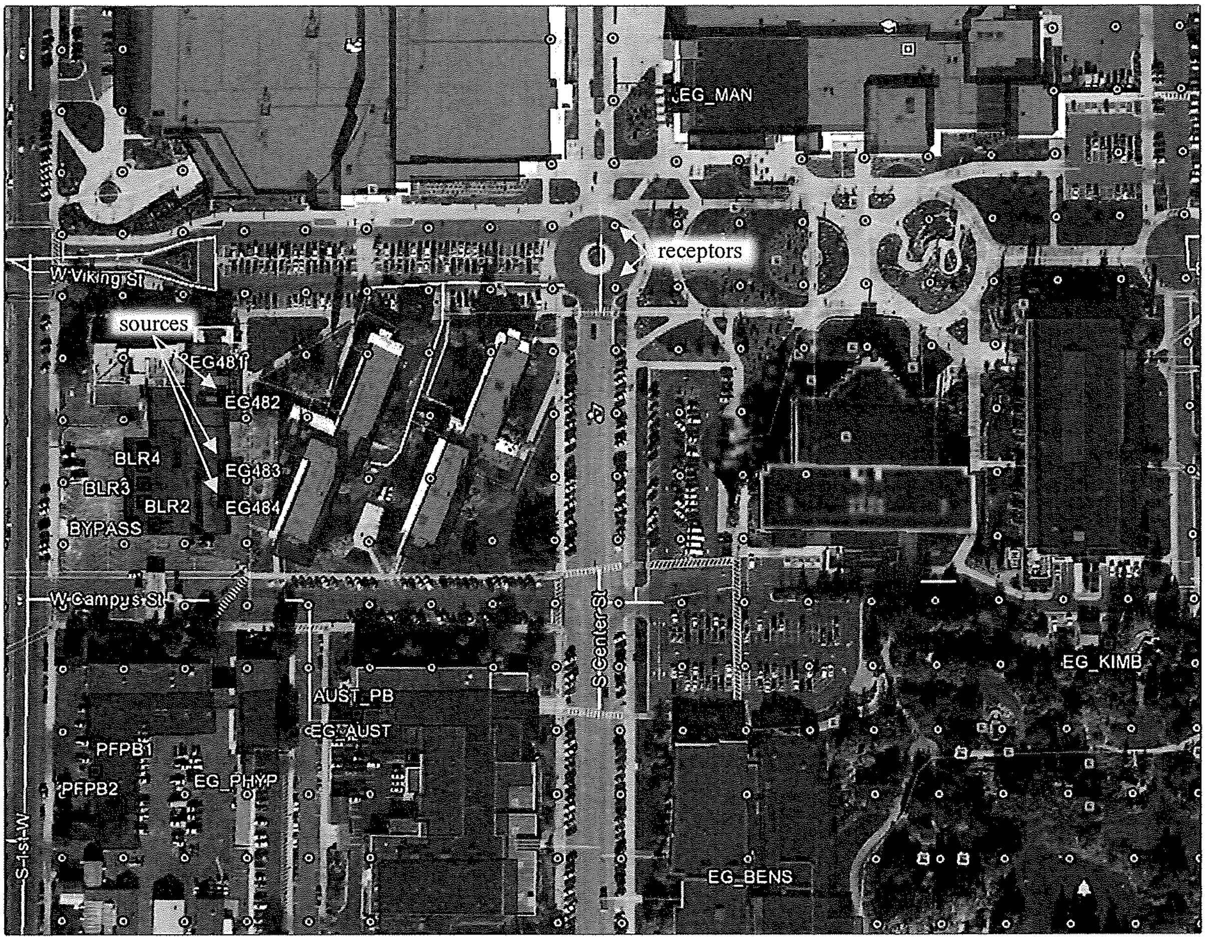


Figure 4: Modeled Building Locations Overlaid on Google Earth Map. Modeled buildings are shown in purple shading. Emissions sources are red squares with the source labeled beside it.

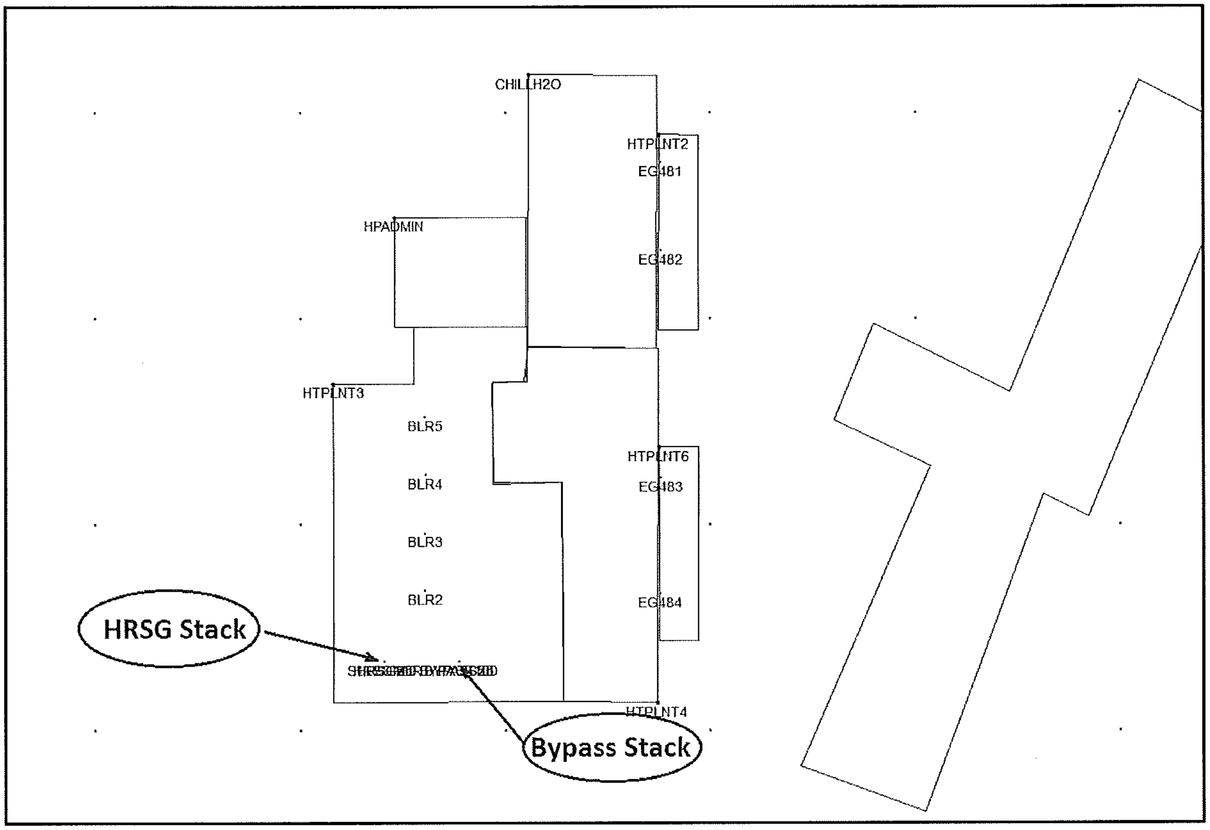


Figure 5: Location of Stacks for Boilers, Turbine/Supplemental Buner HRSG, and Turbine Bypass on the BYU-Idaho Heat Plant Building. Boiler 5 will not be constructed as a part of this project.

3.3.8 Ambient Air Boundary

Ambient air is defined in Section 006 of the Idaho Air Rules as "that portion of the atmosphere, external to buildings, to which the general public has access." Ambient air was considered to be all areas external to buildings for the BYUI campus. DEQ concurred with this interpretation.

3.3.9 Receptor Network

Table 8 describes the receptor grid used in the submitted analyses. The receptor grid met the minimum recommendations specified in the *Idaho Air Quality Modeling Guideline*[2]. DEQ determined this grid assured maximum impacts were reasonably resolved by the model considering: 1) types of sources modeled; 2) modeled impacts and the modeled concentration gradient; 3) conservatism of the methods and data used as inputs to the analyses; 4) potential for continual exposures or exposure to sensitive receptors.

3.3.10 NOx Chemistry

The NAAQS compliance demonstration relied on the Tier 3 approach for NOx chemistry in the 1-hour NO_2 impact analyses, in accordance with recent EPA guidance. The Tier 3 approach recommends the use of either the Ozone Limiting Method (OLM) or the Plume Volume Molar Ratio Method (PVMRM) to account for the conversion of NO to NO_2 in the atmosphere. BYUI's consultant elected to use PVMRM for 1-hour NO_2 impact analyses.

In-Stack NO_2 to NO_x Ratio

In-stack NO_2 to NOx ratios are used in the NOx chemistry algorithms of OLM and PVMRM. This value is the fraction of NOx that is NO_2 at the point of release to the atmosphere. EPA guidance recommends use of a default ratio of 0.5 when representative source-specific data are not available.

BYUI's impact analyses used conservative NO_2 to NO_x in-stack ratios (ISR) for the modeled combustion emission sources, especially considering that the previous permitting project utilized NO_2 to NO_x ISRs of 0.10 for boilers and the combustion turbine on either fuel type. Source-specific ISRs are listed in the subsections below.

Combustion Turbine

The combustion turbine manufacturer, Solar Turbines Incorporated, provided the estimated NO_2 to NO_x ISR for firing No. 2 distillate fuel oil as 0.3, via a November 30, 2015, email to BYUI's consultant, Al Oestmann. The natural gas firing scenario NO_2 to NO_x ISR was modeled at two different ratios – 0.20 and 0.25. The reason for applying different ISRs is not known, but the 0.20 ISR value is considered by DEQ to be adequately conservative for the natural gas scenario.

Documentation for the natural gas and distillate fuel oil NO_2 to NO_x ISRs was obtained from a spreadsheet from the State of Alaska Department of Environmental Conservation (DEC). The spreadsheet was titled "NO_2-NOx Instack Ratios from Source Tests 8-23-13.xlxs" and was included in BYUI's November 30, 2015 application submittal. The 100% operating load condition ISRs ranged from a low value of 0.02 to a high value of 0.31, with an arithmetic mean value of 0.11. DEQ agrees that the minimum ISR value applied in the model of 0.20 for natural gas operation is accurate or conservative for the ambient air impact analyses. The distillate fuel oil firing ISR did not have the quantity of source test results to determine an appropriate NO_2 to NOx value in the Alaska DEC spreadsheet. A sing turbine operating at loads ranging from 40% to 80% indicated that the ISR ranged from 0.08 at 80% load to 0.28 at 40% load. DEQ concurs that applying a 0.30 NO_2 to NOx ISR for a combustion turbine operating at 100% load only was a conservative approach in the BYUI analyses.

The annual average NO_2 NAAQS modeling analyses applied a 0.30 NO_2 to NOx ISR for the combination of natural gas and distillate fuel oil firing in the combustion turbine. DEQ asserts that is a conservative assumption.

Supplemental (or Duct) Burner

The Supplemental Burner was modeled with a 0.20 NO_2 to NOx ISR for the natural gas firing in the 1-hour average NO_2 NAAQS modeling analyses. DEQ determined this value was adequately conservative for the 100% load case modeled, based on the very limited data presented by the Alaska DEC spreadsheet on natural gas-fired heaters and boilers. The Alaska data provided two data points with the ISR of 0.05 at 60% load and 0.34 at 40% load, which supports a lower ISR value at 100% load for the Supplemental Burner.

The annual average NO_2 NAAQS modeling analyses applied a 0.30 NO_2 to NOx ISR for the natural gas firing in the Supplemental Burner. DEQ asserts that is a conservative assumption.

Dual Fuel-Fired Boilers No. 2, 3, and 4

The NO_2 to NOx ISR applied in the BYUI ambient impact analyses for the natural gas firing scenario was

0.25. All boilers were modeled at 100% load, and the 0.25 ISR value is regarded by DEQ as a conservative or accurate value for the 100% load case considering EPA in-stack ratio database, available on EPA's website at: https://www3.epa.gov/scram001/no2_isr_database.htm. The ISR value used in the submitted analyses for distillate fuel oil combustion in the boilers for distillate fuel oil combustion scenarios was 0.30. DEQ determined this is an accurate or conservative value for distillate fuel oil-fired boilers modeled at the 100% load case.

The annual average NO_2 NAAQS modeling analyses applied a 0.30 NO_2 to NOx ISR for the combination of natural gas and distillate fuel oil firing. DEQ asserts that is a conservative assumption.

Diesel-Fired Electrical Generator Engines

BYUI modeled the generator engines for the annual NO_2 NAAQS using a 0.20 ISR value for all engines. The Alaska DEC spreadsheet included in the application supports this value as a conservative ISR value. The ISR values for five different internal combustion diesel engines ranged from 0.03 to 0.11 for operating loads ranging from 40% to 100%. DEQ determined that BYUI used conservative ISR value for all generator engines considering they were modeled at 100% load conditions.

4.0 NAAQS Impact Modeling Results

4.1 Results for Significant Impact Level Analyses

The permit application for this project did not present any significant impact level (SIL) analyses. All criteria air pollutants were modeled in cumulative impact analyses. DEQ did not review the SO_2 NAAQS compliance demonstrations because current and future potential emissions are below the BRC modeling thresholds as described in Section 4.2.

4.2 Results for Cumulative Impact Analyses

A cumulative NAAQS impact analysis was performed for all criteria air pollutants and averaging periods except lead. Lead emissions were estimated to be 1 pound per year post-project, which is below Level I/II site-specific modeling applicability thresholds. DEQ review of the NAAQS ambient air impact analyses does not include the 1-hour SO_2, 3-hour SO_2, 24-hour SO_2, and annual SO_2 NAAQS based on the DEQ permitting policy for exclusion of NAAQS compliance demonstration for facility-wide potential/allowable emissions quantities that are defined as BRC (less than 10% of the significant emission rate). The BYUI facility's current SO_2 potential to emit is 1.47 tons per year, per PTC No. P-20123.0057, Project 61299's Statement of Basis, dated November 6, 2014. Potential SO_2 emissions are below the BRC threshold of 4.0 tons per year.

DEQ reviewed the cumulative NAAQS analyses provided by BYUI for 24-hour $PM_{2.5}$, annual $PM_{2.5}$, 24-hour PM_{10}, 1-hour NO_2, annual NO_2, 1-hour CO, and 8-hour CO. The cumulative NAAQS impact analyses consisted of modeling potential/allowable emissions from all sources at the BYUI facility actually installed at the facility. The DEQ-provided NW AIRQUEST background concentration value was then added to the modeled design value, and the results were compared to the NAAQS. Table 9 provides results from the cumulative NAAQS analyses, listing the highest impact from multiple operational scenarios reflecting various split in turbine emissions rates and exhaust flow rates from the Combustion Turbine HRSG Stack or Combustion Turbine Bypass Stack with concurrent operation of the three boilers. A natural gas-fired Supplemental Burner provides additional heat input capacity, if needed, to the HRSG during natural gas combustion operations. Individual fuel firing scenarios were provided for fuel oil combustion and natural gas (all boilers and the Combustion Turbine have dual fuel capability).

Table 9. RESULTS FOR CUMULATIVE IMPACT ANALYSES							
Pollutant	**Averaging Period**	**Design Impact Modeling Scenario**	**Modeled Design Value Concentration (μg/m³)[a]**	**Background Concentration (μg/m³)**	**Total Ambient Impact (μg/m³)**	**NAAQS[b] (μg/m³)**	**Percent of NAAQS**
Backup Distillate Fuel Oil Scenario							
$PM_{2.5}$[c]	24-hour	Bypass50/HRSG50	5.6[h, p] in modeling files (6.0 in modeling report)	13	18.6[p]	35	53%
	Annual	Bypass75/HRSG25	6.2[i, r]	5	11.2	12	93%
PM_{10}[d]	24-hour	Bypass50/HRSG50	39.8[j]	61	100.8	150	67%
NO_2[e]	1-hour	Bypass50/HRSG50	117.2[m]	26.3	143.5	188	76%
	Annual	Bypass50/HRSG50	39.8[o]	3.9	43.7	100	44%
CO[g]	1-hour	All scenarios	11,642.9[q]	3,065.9	14,708.8	40,000	37%
	8-hour	All scenarios	2,544.6[q]	1,075.4	3620.0	10,000	36%
Natural Gas Scenario and Natural Gas-Fired Supplemental Burner Operating Scenario							
$PM_{2.5}$	24-hour	Bypass50/HRSG50	7.8[h, p] in modeling files (6.5 in modeling report)	13	20.8[p]	35	59%
	Annual	Bypass75/HRSG25	6.2[i, r]	5	11.2	12	93%
PM_{10}	24-hour	Supplemental[l]	9.3[i]	61	70.3	150	47%
NO_2	1-hour	Supplemental Burner & Nat Gas fired Turbine	82.1[m,n]	26.3	108.4	188	58%
	Annual	Supplemental Burner and Nat Gas-fired Turbine[k]	77.0[o]	3.9	80.9	188	43%
CO	1-hour	All scenarios	11,642.9[q]	3,065.9	14,708.8	40,000	37%
	8-hour	All scenarios	2,544.6[q]	1,075.4	3620.0	10,000	36%

[a] Micrograms/cubic meter.
[b] National ambient air quality standards.
[c] Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
[d] Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
[e] Nitrogen dioxide.
[f] Sulfur dioxide.
[g] Carbon monoxide.
[h] Modeled design value is the maximum 5-year mean of 8th highest 24-hour values from each year of a 5-year meteorological dataset.
[i] Modeled design value is the maximum 5-year mean of annual average values from each year of a 5-year meteorological dataset.
[j] Modeled design value is the maximum of 6th highest 24-hour values from a 5-year meteorological dataset.
[k] The annual operations account for 48 hours of distillate fuel oil operation for the combustion turbine and each boiler (Boiler 2, Boiler 3, and Boiler 4) at rated heat input capacity. The balance of the annual operating hours for Boilers 2, 3, and 4 was limited to 4,900 hours per year while fired on natural gas at rated capacity. Natural gas combustion in the turbine was assumed to be 8,760 hours per year at rated heat input capacity in addition to the 48 hours per year on distillate fuel oil. Emergency generator engines used 500 hour per year each engine.
[l] Supplemental Burner Case reflects Turbine and Supplemental Burner emissions combined and emitted from HRSG stack and operating concurrently with all boilers. External emission rate file determines each emergency generator emission scenario.
[m] Modeled design value is the maximum 5-year mean of 8th highest daily 1-hour maximum impacts for each year of a 5-year meteorological dataset.
[n] The modeling report lists the design impact as 65.7 $\mu g/m^3$, 1-hour average, for the natural gas scenario. This value is based on the Bypass25/HRSG75 scenario. The Supplemental Burner scenario produces higher ambient impacts and establishes the natural gas scenario design concentration.
[o] Modeled design value is the maximum annual average value of five individual years of meteorological data.
[p] The electronic modeling files submitted by BYU-Idaho in the November 30, 2015 submittal are the last 24-hour average $PM_{2.5}$, and 1-hr, 3-hr, 24-hr and annual SO_2 project impacts and these files provide supported ambient impacts which will be used by DEQ to establish NAAQS compliance rather than the model report values.
[q] Attributed to the Physical Plant Emergency Generator engine in all Combustion Turbine and Bypass/HRSG stack scenarios.
[r] The annual impacts are the same for both scenarios because allowable fuel usage for both natural gas and fuel oil operations are reflect d in the modeled emissions rates.

4.3 Results for TAPs Impact Analyses

Dispersion modeling was not required to demonstrate compliance with TAP increments specified by Idaho Air Rules Section 585 and 586.

5.0 Conclusions

The ambient air impact analyses and other air quality analyses submitted with the PTC demonstrated to DEQ's satisfaction that emissions from the proposed modifications to the BYUI facility will not cause or significantly contribute to a violation of any ambient air quality standard or otherwise unacceptably impact air quality.

References:

1. DEQ Memorandum, "Demonstration of Compliance with IDAPA 58.01.01.203.02 (NAAQS) and 203.03 (TAPs) as it Relates to Air Quality Impact Analyses, P-2013.0057 PROJ 61299, Tier II to PTC Conversion & Boiler Replacement Project," Kevin Schilling, Stationary Source Modeling Coordinator, Air Program, Idaho DEQ, to Darrin Pampaian, P.E., Permit Writer, Air Program, Idaho DEQ, November 3, 2014.

2. *State of Idaho Guideline for Performing Air Quality Impact Analyses.* Idaho Department of Environmental Quality. September 2013. State of Idaho DEQ Air Doc. ID AQ-011. Available at http://www.deq.idaho.gov/media/1029/modeling-guideline.pdf.

3. *Additional Clarification Regarding Application of Appendix W Modeling Guidance for 1-hour NO_2 National Ambient Air Quality Standard*, Tyler Fox, Air Quality Modeling Group, C439-01, Environmental Protection Agency, March 1, 2011.

4. DEQ Memorandum, "Policy on NAAQS Compliance Demonstration Requirements of IDAPA 58.01.01.203.02 and 01.40.02," Tiffany Floyd, Administrator, Air Quality Division, DEQ, to Air Quality Permitting Staff, June 10, 2014.

5. DEQ Memorandum, "DEQ Guidance for Minor New Source Review Modeling of 1-hour NO_2 from Intermittent Testing of Emergency Engines," State of Idaho Department of Environmental Quality, September 2013.

6. Rise and Set for the Sun for 2008, Rexburg, Idaho, Location W111 47, N43 39, Astronomical Applications Dept., U.S. Naval Observatory, Washington, DC, accessible at http://aa.usno.navy.mil/data/docs/RS_OneYear.php.

7. Test Report titled *NOx Compliance Test Conducted for Brigham Young University Idaho Central Energy Plant Combustion Turbine and Duct Burner*, TETCO, American Fork, UT 84003, Testing Date September 10, 2015 and Test Report Dated September 24, 2015.

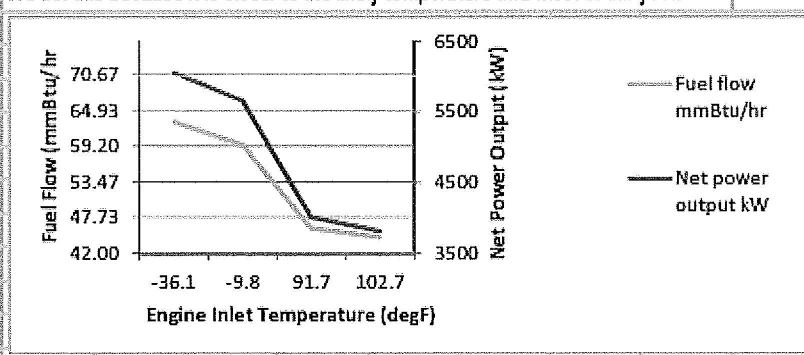
Attachment A

BYU Idaho Turbine Fuel Usage Compared With Ambient Temperature

RMH GROUP
engineering + design

The RMH Group
12600 W. Colfax Ave., Suite A-400 Lakewood, CO 80215 main 303.239.0909 - fax 303.235.0218

Job Name	BYU Idaho - Cogen		
Job No.	18655	Sheet No.	1 of 2
Calculated By	DS & RO	Date	1/13/2016
Checked By		Date	
Subject	Turbine fuel use compared with outside temperature		

1	Purpose:	The purpose of this calculation is to show the relationship between fuel use and electricity output						
2		at different temperatures.						
3								
4	Problem:	The generator is set for full output at all times. When output increases during colder temperatures, does						
5		the fuel use go up also? Does efficiency increase? What is the relationship of these variables'						
6								
7	Reference:	Solar Turbines Engine Performance Code, Rev 4.8.1.10.4			See page 2 of this report.			
8		Data for Nominal Performance At Location						
9								
10	Method:	The report values used are listed below, a graph was made to better represent the data, and a resulting						
11		conclusion is recorded to answer the question by DEQ.						
12								
13	Data:	Engine Inlet Temp	deg F	-36.1	-9.8	91.7	102.7	
14		Net power output	kW	6060	5660	4013	3813	
15		Fuel flow	mmBtu/hr	63.09	59.37	46.01	44.55	
16		Thermal Efficiency	%	32.778	32.532	29.760	29.205	
17		Other values from the report are not listed but are available on page two of this calculation.						
18								
19	Calculation:	Engine Inlet Temp	deg F	-36.1	-9.8	91.7	102.7	
20		Ratio of kW to Fuel use:		96.05	95.33	87.22	85.59	
21								
22		Using the ratio at 91.7 degrees F to set the intervals on the vertical axes we can see the relationship.						
23		We set this because it is closer to the likely temperature thru most of the year.						
24–34								
35	Conclusion:	The result of this comparison of power output and fuel useage at different temperatures show that						
36		there is both and increase in fuel useage and a significant boost in efficiency. The attached report						
37		contains the data that can extrapolate the increase in fuel useage with decrease in temperatures.						

W:\Jobs18\18655\Calcs\Elec\[Calcsht - Turbine Fuel Use v Temp.xlsx]Sheet1 Version 1215

RMH GROUP
engineering + design

The RMH Group
12600 W. Colfax Ave., Suite A-400 Lakewood, CO 80215 main 303.239.0909 - fax 303.235.0218

Job Name	BYU Idaho - Cogen		
Job No.	18655	Sheet No.	2 of 2
Calculated By	DS & RO	Date	1/13/2016
Checked By		Date	
Subject	Turbine fuel use compared with outside temperature		

SOLAR TURBINES INCORPORATED — DATE RUN: 27-Aug-13
ENGINE PERFORMANCE CODE REV. 4.8.1.10.4 — RUN BY: Richard Traywick
JOB ID:

TAURUS 60-T8015
GSC
STANDARD
GAS
7TP-15 REV. 2.1
BS-2091
BS-2091

DATA FOR NOMINAL PERFORMANCE

Fuel Type — SD NATURAL GAS

Elevation	feet	4865
Inlet Loss	in H2O	5.0
Exhaust Loss	in H2O	0

Engine Inlet Temp.**	deg F	-36.1	-9.8	51.7	102.7
Relative Humidity	%	65.0	65.7	18.0	9.4
Elevation Loss	kW	1177	1100	781	743
Inlet Loss	kW	138	131	101	98
Exhaust Loss	kW	0	0	0	0
Gearbox Efficiency		0.9800	0.9800	0.9800	0.9800
Generator Efficiency		0.9640	0.9640	0.9640	0.9640
Based On 1.0 Power Factor					
Specified Load*	kW	FULL	FULL	FULL	FULL
Net Output Power*	kW	6060	5660	4011	3813
Fuel Flow	mmBtu/hr	63.09	59.37	46.01	44.55
Heat Rate*	Btu/kW-hr	10410	10488	11465	11683
Therm Eff*	%	32.776	32.532	29.760	29.205
Inlet Air Flow	lbm/hr	159025	154659	130808	127981
Engine Exhaust Flow	lbm/hr	161676	157137	132701	129809
PCD	psiG	153.2	148.7	123.9	120.8
Compensated PTIT	deg F	1250	1250	1250	1250
PT Exit Temperature	deg F	916	924	981	990
Exhaust Temperature	deg F	916	924	981	990

FUEL GAS COMPOSITION (VOLUME PERCENT)
LHV (Btu/Scf) = 919.2 SG = 0.5970 , W.I. @60F (Btu/Scf) = 1215.6

Methane (CH4)	= 92.7499
Ethane (C2H6)	= 4.1600
Propane (C3H8)	= 0.8400
N-Butane (C4H10)	= 0.1600
N-Pentane (C5H12)	= 0.0400
Hexane (C6H14)	= 0.0400
Carbon Dioxide (CO2)	= 0.4400
Hydrogen Sulfide (H2S)	= 0.0001
Nitrogen (N2)	= 1.5300

STANDARD CONDITIONS FOR GAS VOLUMES: Temperature: 60 deg F Pressure: 29.92 in Hg
NORMAL CONDITIONS FOR GAS VOLUMES: Temperature: 32 deg F Pressure: 29.92 in Hg

APPENDIX C – FACILITY DRAFT COMMENTS

The following comments were received from the facility on October 31, 2016:

Facility Comment: Our comment period has passed and I received no comments from our staff and consultants.

DEQ Response: None required.

APPENDIX D – PROCESSING FEE

PTC Prcessing Fee Calculation Worksheet

Instructions:
Fill in the following information and answer the following questions with a Y or N. Enter the emissions increases and decreases for each pollutant in the table.

Company: Brigham Young University Idaho
Address: 525 S. Center St.
City: Rexburg
State: ID
Zip Code: 83460
Facility Contact: Kyle Williams
Title: Director, FM Maint. & Oper.
AIRS No.: 065-00011

N Does this facility qualify for a general permit (i.e. concrete batch plant, hot-mix asphalt plant)? Y/N

Y Did this permit require engineering analysis? Y/N

N Is this a PSD permit Y/N (IDAPA 58.01.01.205.04)

Emissions Inventory			
Pollutant	Annual Emissions Increase (T/yr)	Annual Emissions Reduction (T/yr)	Annual Emissions Change (T/yr)
NO_X	0.0	5.73	-5.7
SO_2	0.0	0.06	-0.1
CO	0.0	0.57	-0.6
PM10	0.0	1.33	-1.3
VOC	0.0	0.35	-0.4
TAPS/HAPS	0.0	0	0.0
Total:	0.0	8.04	**-8.0**
Fee Due	**$ 1,000.00**		

Comments: