Statement of Basis

Permit to Construct No. P-2012.0057
Project ID 61323

St. Luke's Meridian Medical Center
Meridian, Idaho

Facility ID 001-00182

Final

May 13, 2015

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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
CFR	Code of Federal Regulations
CI	compression ignition
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent emissions
DEQ	Department of Environmental Quality
EL	screening emission levels
EPA	U.S. Environmental Protection Agency
GHG	greenhouse gases
gr/dscf	grains (1 lb = 7,000 grains) per dry standard cubic feet
HAP	hazardous air pollutants
hp	horsepower
IDAPA	a numbering designation for all administrative rules in Idaho promulgated in accordance with the Idaho Administrative Procedures Act
lb/hr	pounds per hour
MACT	Maximum Achievable Control Technology
MMBtu/hr	million British thermal units per hour
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
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
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTC	permit to construct
PTE	potential to emit
RICE	reciprocating internal combustion engines
Rules	*Rules for the Control of Air Pollution in Idaho*
SLMMC	Saint Luke's Meridian Medical Center
scf	standard cubic feet
SO_2	sulfur dioxide
SO_x	sulfur oxides
T/yr	tons per consecutive 12 calendar month period
TAP	toxic air pollutants
ULSD	ultra-low sulfur diesel
VOC	volatile organic compounds

FACILITY INFORMATION

Description

Saint Luke's Meridian Medical Center (SLMMC) is a general medical and surgical hospital located at 520 S. Eagle Rd. in Meridian, Idaho.

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 Permit status is noted as active and in effect (A) or superseded (S).

April 12, 2013	PTC No. P-2012.0057 Project No. 61106, PTC modification. Permit status (A, but will become S upon issuance of this permit)
February 13, 2006	P-050041, revision, Permit status (S)

Application Scope

This PTC is for a minor modification at an existing minor facility.

The applicant has proposed to:

- Remove stack height requirements from PTC No. P-2012.0057 Proj No. 61106, issued April 12, 2013 for the Hurst natural-gas fired boilers Nos. 1 and 2.
- Change the operating requirements for the emergency generator engines by maximizing the operating loads and increase the diesel fuel consumptions for the emergency generator engines Nos. 1 and 2 during testing and maintenance.
- Change the emergency generator engines diesel fuel monitoring requirements.
- Add five natural gas-fired boilers to the facility with rated heat input capacities that are between 2.5-4.2 MMBtu/hr.

Application Chronology

January 30, 2014	DEQ received an application and an application fee.
February 14 – March 3, 2014	DEQ provided an opportunity to request a public comment period on the application and proposed permitting action.
June 13, 2014	DEQ determined the application was incomplete
July 15, 2014	DEQ received additional information from the applicant.
August 14, 2014	DEQ determined that the application was complete.
October 15, 2014	DEQ received additional information from the applicant.
April 8, 2015	DEQ received additional information via an email from the facility's consultant (CH2MHILL) in which it requested to remove the request in the original application to operate the two emergency generator engines concurrently since the modeling does not support this operating condition – see Trim Record # (2015AAG502).
April 30, 2015	DEQ made available the draft permit and statement of basis for peer and regional office review.
May 5, 2015	DEQ made available the draft permit and statement of basis for applicant review.
May 18, 2015	DEQ received the permit processing fee.

TECHNICAL ANALYSIS

Emissions Units and Control Equipment

Table 1 EMISSIONS UNIT AND CONTROL EQUIPMENT INFORMATION

Sources	Control Equipment	Emission Point ID No.
Boiler No. 1 Manufacturer: Hurst Rated steam rate (lb/hr): 12,075 Manufacturer's Serial No.: S1750-150-15 Model No.: S4-GA2-350-150 Burner Type: Industrial Combustion Burner No.: AM-913-165 Fuel flow gas (maximum MMBtu/hr): 11.7 ULSD fuel oil flow (gallons per hour): 105 (Permit Limit is 84) Manufacture Date: Unknown Heat input rating: 11.7 MMBtu/hr Fuel: Natural gas and ULSD	Uncontrolled	Height (ft): 35 Diameter (ft): 1.7 Flow rate (acfm): 5,085 Exit temperature (°F): 450
Boiler No. 2 Manufacturer: Hurst Rated steam rate (lb/hr): 12,075 Manufacturer's Serial No.: S1750-150-16 Model No.: S4-GA2-350-150 Burner Type: Industrial Combustion Burner No.: AM-913-166 Fuel flow gas (maximum MMBtu/hr): 11.7 ULSD fuel oil flow (gallons per hour): 105 (Permit Limit is 84) Manufacture Date: Unknown Heat input rating: 11.7 MMBtu/hr Fuel: Natural gas and ULSD		Height (ft): 35 Diameter (ft): 1.7 Flow rate (acfm): 5,085 Exit temperature (°F): 450
Boiler No. 3 Manufacturer: Kewanee Model: M-505-KG Installation Date: 1996 Rating: 150 HP Heat input rating: 6.3 MMBtu/hr Fuel: Natural gas		Boilers nos. 3-6 exhaust to a common stack with the following stack parameters: Height (ft): 69.5 Diameter (ft): 2.0 Flow rate (acfm): 7,427.0 Exit temperature (°F): 200
Boiler No. 4 Manufacturer: Kewanee Model: M-505-KG Installation Date: 1996 Rating: 150 HP Heat input rating: 6.3 MMBtu/hr Fuel: Natural gas		
Boiler No. 5 Manufacturer: Kewanee Model: M-505-KG Installation Date: 1998 Rating: 150 HP Heat input rating: 6.3 MMBtu/hr Fuel: Natural gas		
Boiler No. 6 Manufacturer: Kewanee		

Model: M-505-KG Installation Date: 1998 Rating: 150 HP Heat input rating: 6.3 MMBtu/hr Fuel: Natural gas		
Boiler No. 7 Manufacturer: Hurst Model: VIX-G-100-150 Serial No.: VIX217-150-32 Installation Date: 2013 Heat input rating: 4.2 MMBtu/hr Fuel: Natural gas		Height (ft): 54 Diameter (ft): 2.0 Flow rate (acfm): 1,235 Exit temperature (°F): 200
Boiler No. 8 Manufacturer: Hurst Model: VIX-G-100-150 Serial No.: VIX217-150-33 Installation Date: 2013 Heat input rating: 4.2 MMBtu/hr Fuel: Natural gas		Height (ft): 54 Diameter (ft): 2.0 Flow rate (acfm): 1,235 Exit temperature (°F): 200
Boiler No. 9 Manufacturer: Lochinvar Model: FBN2500 Installation Date: 2013 Heat input rating: 2.5 MMBtu/hr Fuel: Natural gas		Height (ft): 54 Diameter (ft): 2.0 Flow rate (acfm): 1,235 Exit temperature (°F): 200
Boiler No. 10 Manufacturer: Lochinvar Model: FBN2500 Installation Date: 2013 Heat input rating: 2.5 MMBtu/hr Fuel: Natural gas		Height (ft): 54 Diameter (ft): 2.0 Flow rate (acfm): 1,235 Exit temperature (°F): 200
Boiler No.11 Manufacturer: Lochinvar Model: FBN2500 Installation Date: 2013 Heat input rating: 2.5 MMBtu/hr Fuel: Natural gas		Height (ft): 54 Diameter (ft): 2.0 Flow rate (acfm): 1,235 Exit temperature (°F): 200
Office Generator, Gen 1 Manufacturer: Detroit Diesel Rated output capacity: 918 kW (1,231 hp) Model No.: R163-7K08 Manufacture Date: Unknown Heat input rating: Unknown MMBtu/hr Fuel: ULSD		Height (ft): 20 Diameter (ft): 1 Flow rate (acfm): 13,582 Exit temperature (°F): 927
Plant Generator, Gen 2 Manufacturer: Caterpillar Rated output capacity: 1,750 kW (2,346 hp) Model No.: SR4B Serial No.: 7GM00824 Manufacture Date: Unknown Heat input rating: Unknown MMBtu/hr Fuel: ULSD		Height (ft): 59 Diameter (ft): 1 Flow rate (acfm): 8,490 Exit temperature (°F): 799

Emissions Inventories

Potential to Emit

IDAPA 58.01.01 defines Potential to Emit (PTE) 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 PTE an emission inventory was developed for the boilers and generators (IC engines) operations at the facility (see Appendix A) associated with this proposed project.

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.

The following table presents the pre-project potential to emit taken from the statement of basis of P-2012.0057 Proj 61106, issued April 12, 2013 for all criteria and GHG (CO_2e) pollutants from all emissions units at the facility. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

Table 2 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)
Plant Generator #2(diesel fuel)	0.38	0.02	0.01	0.005	13.03	0.65	5.83	0.29	0.62	0.03	
Office Generator #1(diesel fuel)	0.24	0.01	0.006	0.003	13.57	0.68	3.61	0.18	0.38	0.02	
Boiler #1 (Hurst)(Dual fuel)c	0.087	0.38	0.018	0.03	1.67	5.02	0.96	4.22	0.063	0.28	
Boiler #2 (Hurst)(Dual fuel)c	0.087	0.38	0.018	0.03	1.67	5.02	0.96	4.22	0.063	0.28	
Boiler #3 (Kewanee)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #4 (Kewanee)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #5 (Kewanee)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #6 (Kewanee)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Pre-Project Totals	**0.984**	**1.63**	**0.07**	**0.13**	**32.42**	**22.21**	**13.44**	**18.02**	**1.26**	**1.21**	**26,304**

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 determined by DEQ staff. See Appendix A for a detailed presentation of the calculations of these emissions for each emissions unit.

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

	$PM_{10}/PM_{2.5}$		SO_2		NO_x		CO		VOC		CO_2e
Source	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)]
Plant Generator #2(diesel fuel)	0.81	0.04	0.02	0.0011	26.75	1.34	11.97	0.60	1.27	0.063	
Office Generator #1(diesel fuel)[c]	0.10	0.005	0.01	0.0004	11.32	0.57	0.88	0.044	0.23	0.012	
Boiler #1 (Hurst)(NG fuel)	0.087	0.38	0.007	0.03	1.15	5.02	0.96	4.22	0.06	0.28	
Boiler #1 (Hurst)(diesel fuel)	0.08	0.002	0.018	0.004	1.67	0.04	0.42	0.01	0.02	0.0005	
Boiler #2 (Hurst)(NG fuel)[d]	0.087	0.38	0.007	0.03	1.15	5.02	0.96	4.22	0.06	0.28	
Boiler #2 (Hurst)(diesel fuel)[d]	0.08	0.002	0.018	0.004	1.67	0.04	0.42	0.01	0.02	0.0005	
Boiler #3 (Kewanee)(NG fuel)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #4 (Kewanee))(NG fuel)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #5 (Kewanee))(NG fuel)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #6 (Kewanee))(NG fuel)	0.05	0.21	0.004	0.02	0.62	2.71	0.52	2.28	0.034	0.15	
Boiler #7 (Hurst))(NG fuel)	0.02	0.09	0.01	0.03	0.37	1.62	0.16	0.68	0.11	0.46	
Boiler #8 (Hurst))(NG fuel)	0.02	0.09	0.01	0.03	0.37	1.62	0.16	0.68	0.11	0.46	
Boiler #9 (Lochinvar))(NG fuel)	0.02	0.08	0.002	0.01	0.08	0.34	0.03	0.11	0.01	0.06	
Boiler #10 (Lochinvar))(NG fuel)	0.02	0.08	0.002	0.01	0.08	0.34	0.03	0.11	0.01	0.06	
Boiler #11 (Lochinvar))(NG fuel)	0.02	0.08	0.002	0.01	0.08	0.34	0.03	0.11	0.01	0.06	
Post-Project Totals	**1.28**	**1.67**	**0.08**	**0.18**	**43.19**	**22.03**	**16.27**	**15.66**	**1.95**	**2.04**	**28,385**

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.
c) Criteria air pollutant emission factors (except SO_2) are from the manufacturer at 75% load (see manufacturer data sheet in Appendix C of the PTC application, January 30, 2014).
d) The greater of the two values (lb/hr) and (T/yr) for the two fuels are used for the boiler in the summation of the Post-Project Totals in Table 3. Only one dual fuel boiler (Boiler #1 or Boiler #2) will operate at a time.

The emission rates from the 11 boilers were calculated by using emissions factors from AP-42, Tables 1.4-1, 1.4-2, and 1.3-6. Emissions rates from the two generator engines were estimated based on emissions factors from the manufacturer (except for SO_2) and from AP-42 Tables 3.4-1 and 3.4-2. Also, emission rates for the generator engines were based on the increase in Generator engine No. 1 load from 53% to 75%; and increase of fuel throughput for the generator engine from 30.3 to 36.3 gallons per hour (gal/hr) based on the manufacturer specification sheet in Appendix C of the PTC application, submitted on January 30, 2014. In addition, Generator engine No. 2 increased the load from 33% to 80%; and increase of the diesel fuel throughput from 49 to 100.57 gal/hr based on Caterpillar performance data in Appendix C of the PTC application submitted on January 30, 2014 – see Trim Record No. (2014AAG242).

The increase in diesel fuel throughput for the emergency generator engines are included as a new limits for the generator engines and they replaced the old fuel consumption limits existed in PTC No. P-2012.0057 Project No. 61106, issued on 4/12/13.

It should be noted that Table 3 above includes the emission estimates from the five new natural gas fired boilers nos. 7-11, with capacities between 2.5 to 4.2 MMBtu/hr. This information was received from the facility as an addendum on July 15, 2014. This information showed an increase in emissions of criteria air pollutants and TAPs (see Appendix A).

<u>Change in Potential to Emit</u>

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 4 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	0.984	1.63	0.07	0.13	32.42	22.21	13.44	18.02	1.26	1.21	26,304
Post Project Potential to Emit	1.28	1.67	0.08	0.18	43.19	22.03	16.27	15.66	1.95	2.04	28,385
Changes in Potential to Emit	**0.296**	**0.04**	**0.01**	**0.05**	**10.77**	**-0.18**	**2.83**	**-2.36**	**0.69**	**0.83**	**2,081**

TAP Emissions

Some of the PTEs for TAP were exceeded as a result of this project. Therefore, modeling is required for formaldehyde, arsenic, cadmium, chromium, and nickel, as identified in Appendix A, because screening ELs identified in IDAPA 58.01.01.586 were exceeded.

Modeling was performed for formaldehyde, arsenic, cadmium, and nickel.

Post Project HAP Emissions

The total HAP emissions are 0.43 tons per year. See Appendix A for a detailed presentation of the calculations of the HAP emissions for each emissions unit.

Ambient Air Quality Impact Analyses

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 $PM_{2.5}$, PM_{10}, NO_2, and TAP emissions is provided in Appendix B.

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 Ada 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

"Synthetic Minor" classification for criteria pollutants is defined as the uncontrolled Potential to Emit for criteria pollutants are above the applicable major source thresholds and the Potential to Emit for criteria pollutants fall below the applicable major source thresholds. The facility has an uncontrolled potential to emit for PM_{10}, $PM_{2.5}$, SO_2, NO_x, CO, and VOC emissions are less than the Major Source thresholds of 100 T/yr for each pollutant. In addition, as demonstrated in Appendix A, the facility has uncontrolled potential HAP emissions of less than the Major Source threshold of 10 T/yr and for all HAP combined less than the Major Source threshold of 25 T/yr. Therefore, this facility is designated as a SM facility.

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 proposed new emissions sources and modifications to the permit conditions of the existing emissions sources. 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.

Tier II Operating Permit (IDAPA 58.01.01.401)

IDAPA 58.01.01.401 ....Tier II Operating Permit

The application was submitted for a permit to construct (refer to the Permit to Construct section), and an optional Tier II operating permit has not been requested. 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 permittee shall not discharge any air pollutant into the atmosphere from any point of emission for a period or periods aggregating more than three minutes in any 60-minute period which is greater than 20% opacity as required by IDAPA 58.01.01.625. Opacity shall be determined by the procedures contained in IDAPA 58.01.01.625.

The visible emissions rules under IDAPA 58.01.01.625 apply to the boilers and generators.

Fuel-Burning Equipment

IDAPA 58.01.01.676 ....Standards for New Sources, and

IDAPA 58.01.01.677 ....Standards for Minor and Existing Sources

The permittee shall not discharge to the atmosphere from any fuel-burning equipment particulate matter in excess of 0.015 grains per dry standard cubic foot (gr/dscf) of effluent gas corrected to 3% oxygen by volume for gas or 0.05 gr/dscf of effluent gas corrected to 3% oxygen by volume for liquid fuel.

These rules apply to the Boilers Nos. 1-11 existing at the facility.

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 PM_{10}, SO_2, NO_x, CO, VOC, and HAP or 10 tons per year for any one HAP or 25 tons per year for all HAP 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)

The existing two Hurst dual-fired boilers nos. 1 and 2 are subject to 40 CFR Part 60 Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units, as each boiler is rated at heat input capacity of 11.7 MMBtu/hr and each was constructed after June 9, 1989. The requirements of the NSPS Subpart Dc were addressed in the PTC No. P-2012.0057 Proj 61106, issued on April 12, 2013, and these requirements are carried over to this permit. The other boilers (nos. 3 to 11) are not subject to the NSPS requirements of 40 CFR Part 60 because each boiler is rated at heat input capacity of less than 10 MMBtu/hr.

NESHAP Applicability (40 CFR 61)

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

MACT Applicability (40 CFR 63)

40 CFR 63, Subpart ZZZZ.................................National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The facility maintains and operates two emergency internal combustion engines. Generator engine No. 1, a Detroit Diesel (Model R163-7KO6) with an engine power rating of 1,231 bhp, installed prior to June 12, 2006. Generator engine No. 2, a Caterpillar (Model: 3512 DITA) with an engine power rating of 2,346 bhp, installed prior to June 12, 2006. This facility is classified as an area source of HAP emissions defined as PTE 10 tons per year T/yr or less for any single HAP or PTE less than 25 T/yr for total HAPs.

§ 63.6580 What is the purpose of subpart ZZZZ?

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

§ 63.6585 Am I subject to this subpart?

In accordance with 40 CFR 63.6585, SLMMC is subject to this subpart since it owns and operates stationary RICE at an area source of HAP emissions.

In accordance with 40 CFR 63.6590(a)(1)(iii), the stationary RICE located at area sources constructed before 6/12/2006 are considered existing RICE. At SLMMC, this includes emergency generator engines Nos. 1and 2.

In addition, pursuant to 40 CFR 63.6485(f) The emergency stationary RICE listed in paragraphs (f)(1) through (3) of this section are not subject to this subpart. The stationary RICE must meet the definition of an emergency stationary RICE in §63.6675, which includes operating according to the provisions specified in §63.6640(f).

(1) Existing residential emergency stationary RICE located at an area source of HAP emissions that do not operate or are not contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in §63.6640(f)(2)(ii) and (iii) and that do not operate for the purpose specified in §63.6640(f)(4)(ii).

(2) Existing commercial emergency stationary RICE located at an area source of HAP emissions that do not operate or are not contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in §63.6640(f)(2)(ii) and (iii) and that do not operate for the purpose specified in §63.6640(f)(4)(ii).

(3) Existing institutional emergency stationary RICE located at an area source of HAP emissions that do not operate or are not contractually obligated to be available for more than 15 hours per calendar year for the purposes specified in §63.6640(f)(2)(ii) and (iii) and that do not operate for the purpose specified in §63.6640(f)(4)(ii).

The §63.6640(f)(2)(ii) and (iii); and §63.6640(f)(4)(ii) of Subpart ZZZZ don't apply to SLMMC.

In accordance with 40 CFR 63.6675 (What definitions apply to this Subpart?), the existing institutional emergency RICE means the following: "an emergency stationary RICE used in institutional establishments such as medical centers, nursing homes, research centers, institutions of higher education, correctional facilities, elementary and secondary schools, libraries, religious establishments, police stations, and fire stations."

The two generator engines are existing institutional emergency stationary RICE located at an area source of HAP emissions. Therefore, Subpart ZZZZ does not apply to these IC engines based on the definition. Thus, permit conditions associated with Subpart ZZZZ in PTC No. P-2012.0057 Proj 61106, issued on April 12, 2013, are removed and are not included for this permitting action. Other permit conditions found in the PTC issued on April 12, 2013 (i.e., opacity, fuel sulfur content, fuel use limit, and limits on testing hours) remain in the permit.

40 CFR 63 Subpart JJJJJJ ....NESHAP for Industrial, Commercial and Institutional Boilers Area Sources

§ 63.11193 Am I subject to this subpart?

You are subject to this subpart if you own or operate an industrial, commercial, or institutional boiler as defined in § 63.11237 that is located at, or is part of, an area source of hazardous air pollutants (HAP), as defined in § 63.2, except as specified in § 63.11195.

The requirements of this subpart do not apply to SLMMC because the facility is an area source that owns or operates boilers that meet the excluded definitions in 40 CFR 63.11195.

§ 63.11195 Are any boilers not subject to this subpart?

The types of boilers listed in paragraphs (a) through (k) of this section are not subject to this subpart and to any requirements in this subpart.

The SLMMC's boilers fall under a category included in this section and; therefore, are not subject to this subpart and to any requirements in this subpart.

(e) A gas-fired boiler as defined in this subpart

(f) A hot water heater as defined in this subpart

§ 63.11237 What definitions apply to this subpart?

Terms used in this subpart are defined in the Clean Air Act, in § 63.2 (the General Provisions), and in this section as follows. The definition in this section that apply to SLMMC is as follows:

Gas-fired boiler includes any boiler that burns gaseous fuels not combined with any solid fuels and burns liquid fuel only during periods of gas curtailment, gas supply interruption, startups, or periodic testing on liquid fuel. Periodic testing of liquid fuel shall not exceed a combined total of 48 hours during any calendar year.

Hot water heater means a closed vessel with a capacity of no more than 120 U.S. gallons in which water is heated by combustion of gaseous, liquid, or biomass fuel and hot water is withdrawn for use external to the vessel. Hot water boilers (*i.e.,* not generating steam) combusting gaseous, liquid, or biomass fuel with a heat input capacity of less than 1.6 million Btu per hour are included in this definition. The 120 U.S. gallon capacity threshold to be considered a hot water heater is independent of the 1.6 million Btu per hour heat input capacity threshold for hot water boilers. Hot water heater also means a tankless unit that provides on-demand hot water.

According to the PTC application that DEQ received from SLMMC on 1/30/14 and PTC addendum received on 7/15/14, all of the boilers at SLMMC are included in the definitions above. All boilers at the facility are fired with natural gas fuel. Boilers Nos. 1 and 2 (Hurst), however, have the ability to fire diesel fuel, but this option will only be used in an emergency situation if the natural gas supply to the hospital is disrupted. Any operational testing SLMMC does with Boiler Nos. 1 and 2 operating with diesel fuel will be limited to less than 48 hours during any calendar year. Pursuant to 40 CFR 63.11237, bullet No. 2 in Permit Condition 2.5 limits SLMMC for the hours of operations during testing the boilers on diesel fuel oil. Permit Condition 2.11 is to monitor and record the hours of operations of the boilers during operational testing on diesel fuel.

Permit Conditions Review

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

Boilers

The following permit conditions have been removed from PTC No. P-2012.0057 Proj 61106, issued April 12, 2013:

Old Permit Condition 2.9:

"Stack Heights

The stack heights for Boilers Nos. 1 and 2 shall be raised to 35 feet, as measured from the ground underneath the stack, within sixty days of permit issuance."

Modeling has demonstrated that the current constructed stack heights of 20 feet (6.1 meters) for Boilers Nos. 1 and 2 will not cause any predicted exceedance of the National Ambient Air Quality Standards (NAAQS).

Old Permit Condition 2.16, Excess Emissions:

" ***Excess Emissions***

The permittee shall comply with the procedures and requirements of IDAPA 58.01.01.130-136 for excess emissions from the boilers and the generators due to startup, shutdown, scheduled maintenance, safety measures, upset and breakdowns."

This permit condition is deleted from the PTC because it is redundant with that found in the PTC's General Provisions.

Old Permit Condition 2.17:

Reporting Requirements

*"**NSPS Reporting Requirements***

In accordance with 40 CFR 60.48c, the permittee shall submit to DEQ and to EPA a semi-annual report that shall be postmarked by the 30th day following the end of the reporting period. The report shall include records of fuel supplier certification containing 1) the name of the oil supplier, and 2) a statement from the oil supplier that the oil compiles with the specifications under the definition of distillate oil in 40 CFR 60.41c. The report shall include a statement, signed by the permittee, that the records of fuel supplier certifications submitted represent all the fuel oil combusted during the period."

New Permit Condition 2.15 is written in the same wording as it was stated in the old permit condition No. 2.17, issued April 12, 2013, but without the wording "and to EPA" because DEQ got a full delegation of the NSPS Subpart Dc in July 25, 20111. Therefore, DEQ deleted the "and to EPA" reporting existed in that permit condition.

Additionally, on May 11, 2015, the permittee submitted the following comments on the facility draft PTC that was sent for their review on May 5, 2015 – see TRIM record No. 2015AAG668:

"The following comments include:

1) Page7, Condition 2.10, first bullet: request to change..."maintain records of the amount of natural gas combusted"... to "maintain monthly records"...

2) Page 8, Condition 2.15, first sentence: request to change..."the permittee shall submit to DEQ a semi-annual report"...to "the permittee shall submit to DEQ an annual report"..."

DEQ addressed the permittee's request and changed the monitoring and recordkeeping requirements for Boilers Nos. 1 and 2 when they operate on natural gas from daily to monthly and the semi-annual reporting to annual reporting. The permittee's request is based on EPA letters that were sent to the hospital on April 2, 2007 and on November 14, 2006.

Emergency Generator Engines Nos. 1 and 2

Old Permit Condition 3.6:

"Fuel Use Limit During Testing and Maintenance

The IC engines shall not exceed the following amounts of ULSD during testing and maintenance:

- *Plant IC Engine 49 gallons per hour*
- *Office IC Engine 30.3 gallons per hour*

The amount used may be determined by measuring the initial amount in the ULSD container that is used to supply fuel to the IC engine, testing for one hour or less, then measuring the amount that remains in the container. Both IC engines cannot be tested at the same time if the fuel supply container is the same."

New Permit Condition 3.5:

Fuel Use Limit During Testing and Maintenance and Diesel Fuel Meter

- The IC engines shall not exceed the following amounts of ULSD during testing and maintenance:
  - Plant IC generator engine No. 2: 100.6 gallons per hour
  - Office IC generator engine No.1: 36.3 gallons per hour

Modeling of increase in emission rates resulted from the increase in the diesel fuel throughputs for the generator engines will not cause any predicted exceedance of the NAAQS.

The amount of diesel fuel used by each of the two engines during testing and maintenance were deleted and replaced with the following in Permit condition 3.5:

Within 180 days of issuance of this permit, the permittee shall install, calibrate, maintain, and operate a diesel fuel flow meter for each of the IC engines to measure the fuel burned in gallons per hour during testing and maintenance operation. The flow meter shall be installed in accordance with the manufacturer specifications.

Compliance with this permit condition is assured by Permit Condition 3.9 (Fuel Burning Throughput Monitoring), which states the following: The permittee shall monitor and record the hourly fuel consumption of each IC engine (when the engines are operated that day) to demonstrate compliance with the Fuel Use Limit During Testing and Maintenance.

"Old Permit Conditions 3.5, 3.7 through 3.12, and 3.14 through 3.17:

All of these permit conditions are deleted from the PTC because the 40 CFR 63 Subpart ZZZZ is not applicable to the generator engines – for more information about the applicability of Subpart ZZZZ to the generator engines, refer to the MACT Applicability section of this statement of basis.

New Permit Condition 3.6:

Ambient Air Exclusion Zone During Testing and Maintenance of Generator Engine 2

- The permittee shall establish an ambient air exclusion zone around St. Luke's Plant IC engine building during maintenance and testing of the emergency generator engine 2. The exclusion zone shall be the area extended 65 feet on the east and west side of the Plant IC engine building. St. Luke's shall set up a temporary physical barrier using a yellow caution tape to control public access to this area during the maintenance and testing of the emergency generator engine 2. Once the maintenance or testing is complete, the temporary exclusion zone may be removed.

- The permittee shall maintain records of the established exclusion zone during each testing of the emergency generator engine 2. The records shall be signed by the facility's responsible official.

All monitoring and recordkeeping documentation required by this permit shall be maintained in accordance with the Monitoring and Recordkeeping General Provisions.

This permit condition was included in the permit to demonstrate compliance with the 1-hour NO_2 NAAQS, an ambient air exclusion zone is required around SLMMC's Plant building during testing and maintenance of Plant generator engine No. 2. The exclusion zone, which was proposed by the permittee, will be the area extended 65 feet on the east and west side of Gen engine No. 2, which is the primary contributor to the high NO_2 concentrations. The facility will establish a temporary barrier using caution tape to control public access to the area during operation of the generator engine No. 2. For more information about NAAQS compliance with the 1-hour NO_2, refer to DEQ's modeling memo in Appendix B.

Old Permit Condition 3.13:

"Testing Hours Limits

The IC engines are allowed to be tested once each month for 1 hour between 7:00 AM and 6:00 PM, and once each year for up to 8 hours during the same time interval."

New Permit Condition 3.7:

Limits on Maintenance or Testing Hours

- The emergency generator engines are allowed to be tested once each month for 1-hour between 7:00 am- 6:00 pm.
- The emergency generator engines shall not operate concurrently during maintenance or testing.

Operations of the IC engines for 8 hours per year permit condition was deleted from the old permit because it can't support compliance with the 24-hour average $PM_{10}/PM_{2.5}$ NAAQS.

The second bullet for this permit condition dictates that the IC engines will not operate concurrently during testing or maintenance because compliance with 1-hour NO_2 NAAQS can't be met. On April 8, 2015, the SLMMC's consultant (CH2MHILL) requested from DEQ to remove the request to operate the two IC engines concurrently Therefore, this permit condition was included as a condition for this permitting action – refer to Trim Record # (2015AAG502).

Old Permit Conditions 3.14

"Monitoring and Recordkeeping Requirements

Hours of Operation Monitoring for the IC Engines

The permittee shall monitor and record the calendar date, hours of operation per month, and hours of operation per any consecutive 12-month period for each of the IC engines. Notation shall be made for time periods of operation that an IC engine is used for emergency use and for the time periods of operation that an IC engine is being operated for non-emergency purposes.

A compilation of the most recent five years of records shall remain on site and shall be made available to DEQ representatives upon request."

New Permit Condition 3.8:

Hours of Operation Monitoring for the IC Engines

The permittee shall monitor and record the calendar date and hours of operation per month when each of the IC engines is operated that month to demonstrate compliance with the Limits on Maintenance or Testing Hours.

The hours of operation monitoring per any consecutive 12-month period for each of the IC engines was deleted from the permit for this permitting action.

PUBLIC REVIEW

Public Comment Opportunity

An opportunity for public comment period on the application was provided in accordance with IDAPA 58.01.01.209.01.c or IDAPA 58.01.01.404.01.c. During this time, there were no comments on the application and there was not a request for a public comment period on DEQ's proposed action. Refer to the chronology for public comment opportunity dates.

APPENDIX A – EMISSIONS INVENTORIES

Attachment D - Emission Estimates

St Lukes Meridian Medical Center
Comparing New Emission Estimates with Existing Estimates

Existing Baseline PTE

Criteria Pollutants	PM10		PM2.5		CO		NOx		SOx		Lead		VOC	
Emissions Unit Name	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**
Plant Gen (Gen 2, Cat) - 2346 HP	0.380	0.020	0.380	0.020	5.83	0.29	13.03	0.65	0.0100	0.0005			0.62	0.03
Office Gen (Gen 1, Detroit) - 1231 HP	0.240	0.010	0.240	0.010	3.61	0.18	13.57	0.68	0.0060	0.0003			0.38	0.02
Boiler #1 Hurst (Dual)	0.087	0.38	0.087	0.38	0.96	4.22	1.67	5.02	0.018	0.030			0.063	0.28
Boiler #2 Hurst (Dual)	0.087	0.38	0.087	0.38	0.96	4.22	1.67	5.02	0.018	0.030			0.063	0.28
Boiler #3 Kewanee (NG)	0.047	0.21	0.047	0.21	0.520	2.28	0.619	2.71	0.004	0.02			0.034	0.15
Boiler #4 Kewanee (NG)	0.047	0.21	0.047	0.21	0.520	2.28	0.619	2.71	0.004	0.02			0.034	0.15
Boiler #5 Kewanee (NG)	0.047	0.21	0.047	0.21	0.520	2.28	0.619	2.71	0.004	0.02			0.034	0.15
Boiler #6 Kewanee (NG)	0.047	0.21	0.047	0.21	0.520	2.28	0.619	2.71	0.004	0.02			0.034	0.15
Total	0.98	1.61	0.98	1.61	13.44	18.02	32.42	22.21	0.07	0.13			1.26	1.21

New Baseline PTE

Criteria Pollutants	PM10		PM2.5		CO		NOx		SOx [2]		Lead		VOC [3]	
Emissions Unit Name	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**
Plant Gen (Gen 2, Cat) - 2346 HP	0.81	0.04	0.78	0.04	11.97	0.60	26.75	1.34	0.02	0.0011			1.27	0.063
Office Gen (Gen 1, Detroit) - 1231 HP	0.10	0.005	0.10	0.005	0.88	0.044	11.32	0.57	0.0077	0.0004			0.23	0.012
Boiler #1 Hurst (NG) [1,2]	**0.087**	**0.38**	**0.087**	**0.38**	**0.96**	**4.22**	1.15	**5.02**	0.007	**0.03**	**5.74E-06**	**2.51E-05**	**0.06**	**0.28**
Boiler #1 Hurst (Diesel) [1,2]	0.08	0.002	0.02	0.001	0.42	0.010	**1.67**	0.04	**0.018**	0.0004	5.77E-07	1.38E-08	0.02	0.0005
Boiler #2 Hurst (NG) [2]														
Boiler #2 Hurst (Diesel) [2]														
Boiler #3 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.02	3.09E-06	1.36E-05	0.034	0.15
Boiler #4 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.02	3.09E-06	1.36E-05	0.034	0.15
Boiler #5 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.02	3.09E-06	1.36E-05	0.034	0.15
Boiler #6 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.02	3.09E-06	1.36E-05	0.034	0.15
Boiler #7 Hurst (NG)	0.020	0.088	0.020	0.088	0.155	0.681	0.370	1.619	0.007	0.029	2.06E-06	9.02E-06	0.105	0.460
Bioler #8 Hurst (NG)	0.020	0.088	0.020	0.088	0.155	0.681	0.370	1.619	0.007	0.029	2.06E-06	9.02E-06	0.105	0.460
Boiler #9 Lochinvar (NG)	0.019	0.082	0.019	0.082	0.025	0.110	0.078	0.339	0.002	0.008	1.23E-06	5.37E-06	0.013	0.059
Boiler #10 Lochinvar (NG)	0.019	0.082	0.019	0.082	0.025	0.110	0.078	0.339	0.002	0.008	1.23E-06	5.37E-06	0.013	0.059
Boile4 #11 Lochinvar (NG)	0.019	0.082	0.019	0.082	0.025	0.110	0.078	0.339	0.002	0.008	1.23E-06	5.37E-06	0.013	0.059
Total	1.28	1.67	1.26	1.67	16.27	15.66	43.19	22.03	0.08	0.18	2.59E-05	1.13E-04	1.95	2.04

Note

[1] Will use the greater of the two values (lb/hr) and (ton/yr) for the two fuels for the boiler in the sumation

[2] Only one duel fired boiler (Boiler #1 or Boiler #2) will operate at a time

Net Change in Emissions PTE

Criteria Pollutants	PM10		PM2.5		CO		NOx		SOx [2]		Lead		VOC	
Emissions Unit Name	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**
Plant Gen (Gen 2, Cat) - 2346 HP	0.43	0.02	0.40	0.02	6.14	0.31	13.72	0.69	0.011	0.0006	-	-	0.65	0.03
Office Gen (Gen 1, Detroit) - 1231 HP	(0.14)	(0.005)	(0.14)	(0.005)	(2.73)	(0.14)	(2.25)	(0.11)	0.0017	0.0001	-	-	(0.15)	(0.01)
Boiler #1 Hurst (ULSD & NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.74E-06	2.51E-05	0.00	0.00
Boiler #2 Hurst (ULSD & NG)	(0.09)	(0.38)	(0.09)	(0.38)	(0.96)	(4.22)	(1.67)	(5.02)	(0.02)	(0.03)	-	-	(0.06)	(0.28)
Boiler #3 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #4 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #5 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #6 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #7 Hurst (NG)	0.02	0.09	0.02	0.09	0.16	0.68	0.37	1.62	0.01	0.03	2.06E-06	9.02E-06	0.11	0.46
Bioler #8 Hurst (NG)	0.02	0.09	0.02	0.09	0.16	0.68	0.37	1.62	0.01	0.03	2.06E-06	9.02E-06	0.11	0.46
Boiler #9 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Boiler #10 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Boile4 #11 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Total Increase/Decrease	0.30	0.06	0.27	0.06	2.83	(2.36)	10.77	(0.19)	0.014	0.05	2.59E-05	1.13E-04	0.44	(0.25)
Level I Threshold	0.22		0.05	0.35	15.00		0.20	1.20	0.21	1.20	0.019			
Exceed Level I Threshold	Yes		Yes	No	No		Yes		No	No	No			

Level I Threshold comes from State of Idaho Guideline for Performing Air Quality Impact Analyses, Table 2, July 2011

Level I Threshold for lead is 14 lb/month. 14 lb/month x 12 month / 8,760 hours = 0.019 lb/hr

St Lukes Meridian Medical Center
New Criteria Pollutant Summary

Criteria Pollutants	PM10		PM2.5		CO		NOx		SOx		Lead		VOC	
Emissions Unit Name	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**
Plant Generator - 2346 HP	0.81	0.04	0.78	0.04	11.97	0.60	26.75	1.34	0.0213	0.0011			1.27	0.06
Office Generator - 1231 HP	0.10	0.005	0.10	0.005	0.88	0.04	11.32	0.57	0.0077	0.0004			0.23	0.01
Boiler #1 Hurst (NG)	**0.087**	**0.38**	**0.087**	**0.38**	**0.96**	**4.22**		**5.02**		**0.030**	**5.74E-06**	**2.51E-05**	**0.063**	**0.28**
Boiler #1 Hurst (ULSD)							**1.67**		**0.018**					
Boiler #2 Hurst (NG)	**0.087**	**0.38**	**0.087**	**0.38**	**0.96**	**4.22**		**5.02**		**0.030**	**5.74E-06**	**2.51E-05**	**0.063**	**0.28**
Boiler #2 Hurst (ULSD)							**1.67**		**0.018**					
Boiler #3 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.016	3.09E-06	1.36E-05	0.034	0.15
Boiler #4 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.016	3.09E-06	1.36E-05	0.034	0.15
Boiler #5 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.016	3.09E-06	1.36E-05	0.034	0.15
Boiler #6 Kewanee (NG)	0.047	0.21	0.047	0.21	0.52	2.28	0.62	2.71	0.004	0.016	3.09E-06	1.36E-05	0.034	0.15
Boiler #7 Hurst (NG)	0.020	0.09	0.020	0.09	0.16	0.68	0.37	1.62	0.007	0.029	2.06E-06	9.02E-06	0.105	0.46
Bioler #8 Hurst (NG)	0.020	0.09	0.020	0.09	0.16	0.68	0.37	1.62	0.007	0.029	2.06E-06	9.02E-06	0.105	0.46
Boiler #9 Lochinvar (NG)	0.019	0.08	0.019	0.08	0.03	0.11	0.08	0.34	0.002	0.008	1.23E-06	5.37E-06	0.013	0.06
Boiler #10 Lochinvar (NG)	0.019	0.08	0.019	0.08	0.03	0.11	0.08	0.34	0.002	0.008	1.23E-06	5.37E-06	0.013	0.06
Boile4 #11 Lochinvar (NG)	0.019	0.08	0.019	0.08	0.03	0.11	0.08	0.34	0.002	0.008	1.23E-06	5.37E-06	0.013	0.06
Totals	**1.28**	**1.67**	**1.26**	**1.67**	**16.27**	**15.66**	**43.19**	**22.03**	**0.080**	**0.18**	**2.59E-05**	**1.13E-04**	**1.95**	**2.04**

Note:
For Boilers #1 and #2, only one can operate at any given time. Therefore, for total emissions, only one of the boilers (Boiler #1 or Boiler #2) emission will be added. Since the two boilers are identical, either of the boilers emissions will be used.

St Lukes Meridian Medical Center
Toxic and Hazardous Air Pollutants Summary

TAPs/HAPs	CAS	Plant Generator (Gen 2) (lb/hr)	Plant Generator (Gen 2) (ton/yr)	Office Generator (Gen 1) (lb/hr)	Office Generator (Gen 1) (ton/yr)	Boiler #1 NG (lb/hr)	Boiler #1 NG (ton/yr)	Boiler #1 ULSD (lb/hr)	Boiler #1 ULSD (ton/yr)	Boiler #2 NG (lb/hr)	Boiler #2 NG (ton/yr)	Boiler #2 ULSD (lb/hr)	Boiler #2 ULSD (ton/yr)
2-Methylnaphthalen	91-57-6					2.75E-07	1.21E-06			2.75E-07	1.21E-06		
3-Methylchloranthre	56-49-5					2.06E-08	9.04E-08			2.06E-08	9.04E-08		
7,12-Dimethylbenz	57-97-6					1.84E-07	8.04E-07			1.84E-07	8.04E-07		
Acenaphthene	83-32-9					2.06E-08	9.04E-08	9.66E-09	4.23E-08	2.06E-08	9.04E-08	9.66E-09	4.23E-08
Acenaphthylene	208-96-8					2.06E-08	9.04E-08	1.16E-10	5.07E-10	2.06E-08	9.04E-08	1.16E-10	5.07E-10
Acetaldehyde	75-07-0	4.05E-06	1.77E-05	1.46E-06	6.40E-06								
Acrolein	107-02-8	1.27E-06	5.56E-06	4.57E-07	2.00E-06								
Anthracene	120-12-7					2.75E-08	1.21E-07	5.59E-10	2.45E-09	2.75E-08	1.21E-07	5.59E-10	2.45E-09
Benzene	71-43-2	1.26E-04	5.40E-04	4.50E-06	1.97E-04	2.41E-05	1.06E-04	9.80E-06	4.29E-07	2.41E-05	1.06E-04	9.80E-06	4.29E-07
Dichlorobenzene	106-46-7					1.38E-05	6.03E-05			1.38E-05	6.03E-05		
Ethylbenzene	100-41-4							2.91E-08	1.28E-07			2.01E-08	1.28E-07
Fluoranthene	206-44-0					3.44E-08	1.51E-07	2.22E-09	9.71E-09	3.44E-08	1.51E-07	2.22E-09	9.71E-09
Fluorene	86-73-7					3.21E-08	1.41E-07	2.05E-09	8.97E-09	3.21E-08	1.41E-07	2.05E-09	8.97E-09
Formaldehyde	50-00-0	1.27E-05	5.56E-05	4.56E-06	2.00E-05	8.60E-04	3.77E-03	1.51E-05	6.62E-05	8.60E-04	3.77E-03	1.51E-05	6.62E-05
Hexane	110-54-3					2.06E-02	9.04E-02	0.00E+00	0.00E+00	2.06E-02	9.04E-02	0.00E+00	0.00E+00
Naphthalene	91-20-3	2.09E-05	9.16E-05	7.54E-06	3.30E-05	7.00E-06	3.06E-05	5.17E-07	2.27E-06	7.00E-06	3.06E-05	5.17E-07	2.27E-06
Phenanthrene	85-01-8					1.95E-07	8.54E-07	4.81E-09	2.11E-08	1.95E-07	8.54E-07	4.81E-09	2.11E-08
Pyrene	129-00-0					5.74E-08	2.51E-07	1.95E-09	8.52E-09	5.74E-08	2.51E-07	1.95E-09	8.52E-09
Toluene	108-88-3	4.52E-05	1.98E-04	1.63E-06	7.14E-06	3.90E-05	1.71E-04	2.84E-06	1.24E-05	3.90E-05	1.71E-04	2.84E-06	1.24E-05
o-Xylene	1330-20-7	3.10E-05	1.36E-04	1.12E-06	4.90E-06			4.99E-08	2.19E-07			4.99E-08	2.19E-07
HAPS Metals													
Arsenic	7440-38-2					2.29E-06	1.00E-05	2.56E-07	1.12E-06	2.29E-06	1.00E-05	2.56E-07	1.12E-06
Beryllium	7440-41-7					1.38E-07	6.03E-07	1.92E-07	8.42E-07	1.38E-07	6.03E-07	1.92E-07	8.42E-07
Cadmium	7440-43-9					1.26E-05	5.53E-05	1.92E-07	8.42E-07	1.26E-05	5.53E-05	1.92E-07	8.42E-07
Chromium	7440-47-3					1.61E-05	7.03E-05	1.92E-07	8.42E-07	1.61E-05	7.03E-05	1.92E-07	8.42E-07
Cobalt	7440-48-4					9.64E-07	4.22E-06			9.64E-07	4.22E-06		
Manganese	7439-96-5					4.36E-06	1.91E-05	3.85E-07	1.68E-06	4.36E-06	1.91E-05	3.85E-07	1.68E-06
Mercury	7439-97-6					2.98E-06	1.31E-05	1.92E-07	8.42E-07	2.98E-06	1.31E-05	1.92E-07	8.42E-07
Nickel	7440-02-0					2.41E-05	1.06E-04	1.92E-07	8.42E-07	2.41E-05	1.06E-04	1.92E-07	8.42E-07
Selenium	7782-49-2					2.75E-07	1.21E-06	9.62E-07	4.21E-06	2.75E-07	1.21E-06	9.62E-07	4.21E-06

TAPs/HAPs	Boiler #3 (NG) (lb/hr)	Boiler #3 (NG) (ton/yr)	Boiler #4 (NG) (lb/hr)	Boiler #4 (NG) (ton/yr)	Boiler #5 (NG) (lb/hr)	Boiler #5 (NG) (ton/yr)	Boiler #6 (NG) (lb/hr)	Boiler #6 (NG) (ton/yr)	Boiler #7 (NG) (lb/hr)	Boiler #7 (NG) (ton/yr)
2-Methylnaphthalen	1.49E-07	6.51E-07	1.49E-07	6.51E-07	1.49E-07	6.51E-07	1.49E-07	6.51E-07	9.88E-08	4.33E-07
3-Methylchloranthre	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	7.41E-09	3.25E-08
7,12-Dimethylbenz	9.90E-08	4.34E-07	9.90E-08	4.34E-07	9.90E-08	4.34E-07	9.90E-08	4.34E-07	6.59E-08	2.89E-07
Acenaphthene	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	7.41E-09	3.25E-08
Acenaphthylene	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	1.11E-08	4.86E-08	7.41E-09	3.25E-08
Acetaldehyde										
Acrolein										
Anthracene	1.49E-08	6.51E-08	1.49E-08	6.51E-08	1.49E-08	6.51E-08	1.49E-08	6.51E-08		
Benzene	1.30E-05	5.69E-05	1.30E-05	5.69E-05	1.30E-05	5.69E-05	1.30E-05	5.69E-05	8.66E-06	3.79E-05
Dichlorobenzene	7.43E-06	3.25E-05	7.43E-06	3.25E-05	7.43E-06	3.25E-05	7.43E-06	3.25E-05	4.94E-06	2.16E-05
Ethylbenzene										
Fluoranthene	1.86E-08	8.13E-08	1.86E-08	8.13E-08	1.86E-08	8.13E-08	1.86E-08	8.13E-08		
Fluorene	1.73E-08	7.59E-08	1.73E-08	7.59E-08	1.73E-08	7.59E-08	1.73E-08	7.59E-08		
Formaldehyde	4.64E-04	2.03E-03	4.64E-04	2.03E-03	4.64E-04	2.03E-03	4.64E-04	2.03E-03	3.09E-04	1.35E-03
Hexane	1.11E-02	4.86E-02	1.11E-02	4.86E-02	1.11E-02	4.86E-02	1.11E-02	4.86E-02	7.41E-03	3.25E-02
Naphthalene	3.78E-06	1.65E-05	3.78E-06	1.65E-05	3.78E-06	1.65E-05	3.78E-06	1.65E-05	2.51E-06	1.10E-05
Phenanthrene	1.05E-07	4.61E-07	1.05E-07	4.61E-07	1.05E-07	4.61E-07	1.05E-07	4.61E-07		
Pyrene	3.09E-08	1.35E-07	3.09E-08	1.35E-07	3.09E-08	1.35E-07	3.09E-08	1.35E-07		
Toluene	2.10E-05	9.22E-05	2.10E-05	9.22E-05	2.10E-05	9.22E-05	2.10E-05	9.22E-05	1.40E-05	6.13E-05
o-Xylene										
HAPS Metals										
Arsenic	1.24E-06	5.42E-06	1.24E-06	5.42E-06	1.24E-06	5.42E-06	1.24E-06	5.42E-06	7.21E-03	3.61E-06
Beryllium	7.43E-08	3.25E-07	7.43E-08	3.25E-07	7.43E-08	3.25E-07	7.43E-08	3.25E-07	4.94E-08	2.16E-07
Cadmium	6.81E-06	2.98E-05	6.81E-06	2.98E-05	6.81E-06	2.98E-05	6.81E-06	2.98E-05	4.63E-06	1.08E-05
Chromium	8.66E-06	3.80E-05	8.66E-06	3.80E-05	8.66E-06	3.80E-05	8.66E-06	3.80E-05	5.76E-06	2.52E-05
Cobalt	5.20E-07	2.28E-06	5.20E-07	2.28E-06	5.20E-07	2.28E-06	5.20E-07	2.28E-06	3.46E-07	1.51E-06
Manganese	2.35E-06	1.03E-05	2.35E-06	1.03E-05	2.35E-06	1.03E-05	2.35E-06	1.03E-05	1.56E-06	6.86E-06
Mercury	1.61E-06	7.05E-06	1.61E-06	7.05E-06	1.61E-06	7.05E-06	1.61E-06	7.05E-06	1.07E-06	4.69E-06
Nickel	1.30E-05	5.69E-05	1.30E-05	5.69E-05	1.30E-05	5.69E-05	1.30E-05	5.69E-05	8.65E-06	3.79E-05
Selenium	1.49E-07	6.51E-07	1.49E-07	6.51E-07	1.49E-07	6.51E-07	1.49E-07	6.51E-07	9.88E-08	4.33E-07

TAPs/HAPs	Boiler #8 (NG) (lb/hr)	Boiler #8 (NG) (ton/yr)	Boiler #9 (NG) (lb/hr)	Boiler #9 (NG) (ton/yr)	Boiler #10 (NG) (lb/hr)	Boiler #10 (NG) (ton/yr)	Boiler #11 (NG) (lb/hr)	Boiler #11 (NG) (ton/yr)	Facility Wide Total (lb/hr)	Facility Wide Total (ton/yr)	EL (lb/hr)	Exceeds EL	AAC (mg/m3)	AACC (ug/m3)
2-Methylnaphthalen	9.88E-08	4.33E-07	5.88E-08	2.58E-07	5.88E-08	2.58E-07	5.88E-08	2.58E-07	1.24E-06	5.45E-06				
3-Methylchloranthre	7.41E-09	3.25E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	9.33E-08	4.09E-07				
7,12-Dimethylbenz	6.59E-08	2.89E-07	3.92E-08	1.72E-07	3.92E-08	1.72E-07	3.92E-08	1.72E-07	8.29E-07	3.63E-06				
Acenaphthene	7.41E-09	3.25E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	9.33E-08	4.09E-07				
Acenaphthylene	7.41E-09	3.25E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	4.41E-09	1.93E-08	9.33E-08	4.09E-07				
Acetaldehyde									5.51E-06	2.41E-05	3.00E-03	Below		4.50E-01
Acrolein									1.72E-06	7.56E-06	0.017	Below	0.0125	
Anthracene									8.69E-08	3.81E-07				
Benzene	8.66E-06	3.79E-05	5.15E-06	2.25E-05	5.15E-06	2.25E-05	5.15E-06	2.25E-05	2.79E-04	1.22E-03	8.00E-04	Below		1.20E-01
Dichlorobenzene	4.04E-06	2.16E-05	2.94E-06	1.29E-05	2.94E-06	1.29E-05	2.94E-06	1.29E-05	6.22E-05	2.72E-04	30	Below	22.5	
Ethylbenzene									2.91E-08	1.28E-07	29	Below	21.75	
Fluoranthene									1.09E-07	4.76E-07				
Fluorene									1.01E-07	4.44E-07				
Formaldehyde	3.09E-04	1.35E-03	1.84E-04	8.05E-04	1.84E-04	8.05E-04	1.84E-04	8.05E-04	3.90E-03	1.71E-02	5.10E-04	Exceeds		7.70E-02
Hexane	7.41E-03	3.25E-02	4.41E-03	1.93E-02	4.41E-03	1.93E-02	4.41E-03	1.93E-02	9.33E-02	4.09E-01	12	Below	9	
Naphthalene	2.51E-06	1.10E-05	1.50E-06	6.56E-06	1.50E-06	6.56E-06	1.50E-06	6.56E-06	6.00E-05	2.63E-04	3.33	Below	2.5	
Phenanthrene									6.16E-07	2.70E-06				
Pyrene									1.81E-07	7.93E-07				
Toluene	1.40E-05	6.13E-05	8.33E-06	3.65E-05	8.33E-06	3.65E-05	8.33E-06	3.65E-05	2.38E-04	1.04E-03	25	Below	18.75	
o-Xylene									4.23E-05	1.86E-04	29	Below	21.75	
HAPS Metals														
Arsenic	7.21E-03	3.61E-06	4.29E-03	2.15E-06	4.29E-03	2.15E-06	4.29E-03	2.15E-06	2.73E-02	4.54E-05	1.50E-06	Exceeds		2.30E-04
Beryllium	4.94E-08	1.29E-07	2.94E-08	1.29E-07	2.94E-08	1.29E-07	2.94E-08	1.29E-07	6.22E-07	2.04E-06	2.80E-05	Below		4.20E-03
Cadmium	4.63E-06	1.08E-05	2.70E-06	1.18E-05	2.70E-06	1.18E-05	2.70E-06	1.18E-05	5.70E-05	2.50E-04	3.70E-06	Exceeds		5.60E-04
Chromium	5.76E-06	2.52E-05	3.43E-06	1.50E-05	3.43E-06	1.50E-05	3.43E-06	1.50E-05	7.25E-05	3.18E-04	5.60E-07	Exceeds		8.30E-05
Cobalt	3.46E-07	9.02E-07	2.06E-07	9.02E-07	2.06E-07	9.02E-07	2.06E-07	9.02E-07	4.35E-06	1.85E-05	3.30E-03	Below	0.0025	
Manganese	1.56E-06	6.86E-06	9.31E-07	4.08E-06	9.31E-07	4.08E-06	9.31E-07	4.08E-06	1.97E-05	8.62E-05	6.70E-02	Below	0.05	
Mercury	1.07E-06	4.69E-06	6.37E-07	2.79E-06	6.37E-07	2.79E-06	6.37E-07	2.79E-06	1.35E-05	5.90E-05				
Nickel	8.65E-06	3.79E-05	5.15E-06	2.25E-05	5.15E-06	2.25E-05	5.15E-06	2.25E-05	1.09E-04	4.77E-04	2.70E-05	Exceeds		4.20E-03
Selenium	9.88E-08	4.33E-07	5.88E-08	2.58E-07	5.88E-08	2.58E-07	5.88E-08	2.58E-07	1.24E-06	5.45E-06	1.30E-02	Below	0.01	
Total HAPs (ton/yr)										0.43				

Note:
For Boilers #1 and #2, only one can operate at any given time. Therefore, for total emissions, only one of the boilers (Boiler #1 or Boiler #2) emission will be added. Since the two boilers are identical, either of the boilers emissions will be used.

St Lukes Meridian Medical Center

Greenhouse Gas Emissions Summary

Criteria Pollutants		CO_2	CO_2	N_2O	N_2O	CH_4	CH_4	Total on Mass Basis		CO2e	CO2e
Emissions Unit Name	**Stack ID**	Metric Tons/Yr	Short Tons/Yr	Metric Tons/Yr	Short Tons/Yr	Metric Tons/Yr	Short Tons/Yr	Metric Tons/Yr	Short Tons/Yr	Metric Tons/Yr	Short Tons/Yr
Plant Generator - 2346 HP	GEN1	627	691	0.0051	0.0056	0.025	0.028	627	691	629	694
Office Generator - 1231 HP	GEN2	332	366	0.0027	0.0030	0.013	0.015	332	366	333	367
Boiler #1 Hurst (ULSD)	BOILER1	41	45	0.000	0.000	0.00	0.00	41	45	41	45
Boiler #1 Hurst (NG)	BOILER1	**5,482**	**6,043**	**0.010**	**0.011**	**0.10**	**0.11**	**5,482**	**6,043**	**5,487**	**6,049**
Boiler #2 Hurst (ULSD)	BOILER2	41	45	0.000	0.000	0.00	0.00	41	45	41	45
Boiler #2 Hurst (NG)	BOILER2	**5,482**	**6,043**	**0.010**	**0.011**	**0.10**	**0.11**	**5,482**	**6,043**	**5,487**	**6,049**
Boiler #3 Kewanee (NG)	BOILER3	2,958	3,260	0.006	0.006	0.06	0.06	2,958	3,261	2,961	3,264
Boiler #4 Kewanee (NG)	BOILER4	2,958	3,260	0.006	0.006	0.06	0.06	2,958	3,261	2,961	3,264
Boiler #5 Kewanee (NG)	BOILER5	2,958	3,260	0.006	0.006	0.06	0.06	2,958	3,261	2,961	3,264
Bioler #6 Kewanee (NG)	BOILER6	2,958	3,260	0.006	0.006	0.06	0.06	2,958	3,261	2,961	3,264
Boiler #7 Hurst (NG)	BOILER7	1,968	2,169	0.004	0.004	0.04	0.04	1,968	2,169	1,970	2,171
Bioler #8 Hurst (NG)	BOILER8	1,968	2,169	0.004	0.004	0.04	0.04	1,968	2,169	1,970	2,171
Boiler #9 Lochinvar (NG)	BOILER9	1,171	1,291	0.002	0.002	0.02	0.02	1,171	1,291	1,173	1,293
Boiler #10 Lochinvar (NG)	BOILER10	1,171	1,291	0.002	0.002	0.02	0.02	1,171	1,291	1,173	1,293
Boile4 #11 Lochinvar (NG)	BOILER11	1,171	1,291	0.002	0.002	0.02	0.02	1,171	1,291	1,173	1,293
	Total	**25,723**	**28,354**	**0.054**	**0.060**	**0.51**	**0.56**	**25,723**	**28,355**	**25,751**	**28,385**
GHG Title V Thresholds									**100**		**100,000**
									Above threshold		Below threshold

Notes:

In order to be subject to the Title V permitting requirements per the GHG federal tailoring rule, sources that emit or have the potential to emit of at least 100,000 tons per year of CO2e **and** emit or have the potential to emit 100 tons per year GHG on a mass basis become subject to Title V permitting requirements. Although, the St. Luke Meridian facility is above the 100 ton per year GHG per mass basis it is below the 100,000 ton per year CO2e. Therefore, the St. Luke Meridian facility is not subject to the Title V permitting requirements.

St Luke's Meridian
Modeling Input

Source	Criteria Pollutants PM10 (24-hour) (lb/hr)	PM2.5 (24-hour) (lb/hr)	NO2 (1 hour) (lb/hr)	TAPs Formaldehyde (ton/yr)	Arsenic (ton/yr)	Cadmium (ton/yr)	Chromium* (ton/yr)	Chromium* (lb/hr)	Nickel (ton/yr)
Generator 1	0.036	0.035	11.32	2.00E-05	0	0	0	0	0
Generator 2	0.281	0.260	26.75	5.55E-05	0	0	0	0	0
Boiler 1	0.087	0.087	1.67	3.77E-03	1.00E-05	5.53E-05	7.03E-05	1.61E-05	1.06E-04
Boiler 2									
Boiler 3-6	0.188	0.188	2.48	0.008	2.17E-05	1.19E-04	1.52E-04	3.47E-05	2.28E-04
Boiler 7	0.020	0.020	0.37	1.35E-03	3.61E-06	1.98E-05	2.52E-05	5.76E-06	3.79E-05
Boiler 8	0.020	0.020	0.37	1.35E-03	3.61E-06	1.98E-05	2.52E-05	5.76E-06	3.79E-05
Boiler 9	0.019	0.019	0.08	8.05E-04	2.15E-06	1.18E-05	1.50E-05	3.43E-06	2.25E-05
Boiler 10	0.019	0.019	0.08	8.05E-04	2.15E-06	1.18E-05	1.50E-05	3.43E-06	2.25E-05
Boiler 11	0.019	0.019	0.08	8.05E-04	2.15E-06	1.18E-05	1.50E-05	3.43E-06	2.25E-05

Note: For Generator 1 and Generator 2, the maximum operating time for testing is 8 hours. Averaged the total hourly pollutant rate over the 24-hour averaging period. Applied to PM2.5 and PM10 emissions only.
* Chromium is compared to the 24-hour AAC therefore, lb/hr concentrations are used.

St. Lukes Regional Medical Center - Meridian (Generator #2)

Generator Name	1750 Kw
Manufacturer	Cat
Engine Power Rating (kW)	1,750
Engine Power Rating (hp)	2,346
Fuel Type	Distillate #2
- maximum sulfur content (%)	0.0015
Maximum Firing Rate (gals/hr)*	100.57
(MMBtu/hr)	14.08
Maximum Hours of Operation	100
Maximum Firing Rate (gals/yr)	61,450
Annual Operation Limit (hrs/yr)	100
Annual Firing Rate (gals/yr)	61,450
Heat Value of Fuel (Btu/gal)	140,000

Assume: 1 hp = 7000 Btu/hr

Source: AP-42, Section 3.3, Footnote a to table 3.3-1

*Increase from 33% load at 49 gph to 80% load at 100.57 gph (See CAT data sheet)

Assume: Uncontrolled PTE is equal to Controlled PTE

		Uncontrolled Potential to Emit				Controlled Potential to Emit		
Pollutant	CAS No.	Emission Factor (lb/MMBtu)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)[1]		0.1	1.41	141	0.070	1.41	141	0.07
PM_{10}[2]		0.0573	0.81	81	0.040	0.81	81	0.04
$PM_{2.5}$[2]		0.0555	0.78	78	0.039	0.78	78	0.04
Nitrogen Oxides (NOx)[1,3]		1.9	26.75	2,675	1.34	26.75	2,675	1.34
NO2 (80% of NOx)			21.40	2,140	1.07	21.40	2,140	1.07
Sulfur Oxides[1,4]		0.0015	0.021	2.1	0.001	0.02	2.1	0.001
Carbon Monoxide (CO)[1]		0.85	11.97	1,197	0.60	11.97	1,197	0.60
TOC[1,5]		0.09	1.27	127	0.063	1.27	127	0.06

			Uncontrolled Potential to Emit			Controlled Potential to Emit				
Toxics[6]	CAS Number	Emission Factor (lb/MMBtu)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585 /586 - EL (lb/hr)	PTE Emission Rate vs. EL
Benzene	71-43-2	7.76E-04	1.25E-04	1.09E+00	5.46E-04	1.25E-04	1.09E+00	5.46E-04	8.00E-04	Below
Formaldehyde	50-00-0	7.89E-05	1.27E-05	1.11E-01	5.55E-05	1.27E-05	1.11E-01	5.55E-05	5.10E-04	Below
Naphthalene	91-20-3	1.30E-04	2.09E-05	1.83E-01	9.15E-05	2.09E-05	1.83E-01	9.15E-05	9.10E-05	Below
Toluene	108-88-3	2.81E-04	4.52E-05	3.96E-01	1.98E-04	4.52E-05	3.96E-01	1.98E-04	2.50E+01	Below
o-Xylenes	1330-20-7	1.93E-04	3.10E-05	2.72E-01	1.36E-04	3.10E-05	2.72E-01	1.36E-04	2.90E+01	Below
Acetaldehyde	75-07-0	2.52E-05	4.05E-06	3.55E-02	1.77E-05	4.05E-06	3.55E-02	1.77E-05	3.00E-03	Below
Acrolein	107-02-8	7.88E-06	1.27E-06	1.11E-02	5.55E-06	1.27E-06	1.11E-02	5.55E-06	1.70E-02	Below
Benz(a)anthracene	56-55-3	6.22E-07	1.00E-07	8.76E-04	4.38E-07	1.00E-07	8.76E-04	4.38E-07		
Benzo(b)fluoranthene	205-99-2	1.11E-06	1.78E-07	1.56E-03	7.81E-07	1.78E-07	1.56E-03	7.81E-07		
Benzo(k)fluoranthene	205-82-3	2.18E-07	3.50E-08	3.07E-04	1.53E-07	3.50E-08	3.07E-04	1.53E-07		
Chrysene	218-01-9	1.53E-06	2.46E-07	2.15E-03	1.08E-06	2.46E-07	2.15E-03	1.08E-06		
Dibenzo(a,h)anthracene	53-70-3	3.46E-07	5.56E-08	4.87E-04	2.44E-07	5.56E-08	4.87E-04	2.44E-07		
Indeno(1,2,3-cd)pyrene	193-39-5	4.14E-07	6.65E-08	5.83E-04	2.91E-07	6.65E-08	5.83E-04	2.91E-07		
Benzo(a)pyrene	50-32-8	2.57E-07	4.13E-08	3.62E-04	1.81E-07	4.13E-08	3.62E-04	1.81E-07		
Total PAH[7]			7.23E-07	6.33E-03	3.17E-06	7.23E-07	6.33E-03	3.17E-06	2.00E-06	Below

[1] PM, NOx, CO, SOx, and TOC emission factors are derived from EPA AP-42, Table 3.4-1

[2] PM_{10} and $PM_{2.5}$ emission factors are derived from EPA AP-42, Table 3.4-2

[3] Plant generator is documented in the August 17, 2001 Technical Memorandum prepared by IDEQ as using a controlled Nox emission rate due to a 4-degree engine retard.

[4] SO_2 emission factor multiplied by percent sulfur content of fuel (EPA AP-42 Table 3.4-1) EF = 8.09E-03 x 0.0015 = 1.21E-05

[5] TOC emission factor is used to estimate VOCs.

[6] Toxic emission factors are derived from EPA AP-41, Table 3.4-3 and Table 3.4-4.

[7] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

Note: Toxic emission factors derived from EPA AP-42 Tables 3.4-3 and 3.4-4.

GHG Emissions			
Pollutant[8]	Emissions (metric tons)	GWP	CO2e
CO_2	627.19	1	627.188
CH_4	0.0254	21	0.534
N_2O	0.00509	310	1.577
Total	627.22		629.30

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

CO2 = Annual CO2 mass emissions in Metric Tons	=	627.19
Fuel = Volume of fuel used (gallons)	=	61,450
HHV = High Heat Value from Table C-1 (mmBTU/short ton	=	0.138
EFCO2 = Emission factor (kg/mmBTU)	=	73.96

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0254
N2O = Annual N2O mass emissions in Metric Tons	=	0.00509
Fuel = Volume of fuel used (gallons)	=	61,450
HHV = High Heat Value from Table C-1 (mmBTU/short ton	=	0.138
EFCH4 = Emission factor (kg/mmBTU)	=	3.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	6.00E-04

Notes

[8] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Generator #1)

Generator Name	**800 kW**
Manufacturer	**Detroit Diesel**
Engine Power Rating (kW)	918
Engine Power Rating (hp)	1,231
Fuel Type	Distillate #2
- maximum sulfur content	0.0015
Maximum Firing Rate (gals/hr)	36.3
Maximum Heat Input Rating (MMBtu/hr)	5.08
Maximum Hours of Operation	100
Maximum Firing Rate (gals/yr)	
Annual Operation Limit (hrs/yr)	100
Annual Firing Rate (gals/yr)	32,550
Heat Value of Fuel (Btu/gal)	140,000

Assume: 1 hp = 7000 Btu/hr
Source: AP-42, Section 3.3, Footnote a to table 3.3-1

Increased load from 43% (30.3 gal/hr) to 75% load

Assume: Uncontrolled PTE is equal to Controlled PTE

				Uncontrolled Potential to Emit			Controlled Potential to Emit		
Pollutant	CAS No.	Manufacturer Emission Rate at 75% load [1] (g/hr)	Emission Factor [2] (lb/MMBtu)	Emission Rate [3] (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM) [4]		47.00	0.1	0.10	10	0.005	0.10	10	0.005
PM_{10} [4]		47.00	0.0573	0.10	10	0.005	0.10	10	0.005
$PM_{2.5}$ [4]		47.00	0.0555	0.10	10	0.005	0.10	10	0.005
Nitrogen Oxides (NOx)		5135	3.2	11.32	1132	0.57	11.32	1,132	0.57
NO2 (80% of NOx)				9.06	906	0.45	9.06	906	0.45
Sulfur Oxides		1170.00	0.0015	0.0077	0.77	0.00038	0.008	1	0.000
Carbon Monoxide (CO)		398	0.85	0.88	88	0.04	0.88	88	0.04
TOC [5]		106.5	0.09	0.23	23	0.012	0.23	23	0.012

			Uncontrolled Potential to Emit			Controlled Potential to Emit				
Toxics [6]	CAS Number	Emission Factor (lb/MMBtu)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.58 5/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Benzene	71-43-2	7.76E-04	4.50E-05	3.94E-01	1.97E-04	4.50E-05	3.94E-01	1.97E-04	8.00E-04	Below
Formaldehyde	50-00-0	7.89E-05	4.58E-06	4.01E-02	2.00E-05	4.58E-06	4.01E-02	2.00E-05	5.10E-04	Below
Naphthalene	91-20-3	1.30E-04	7.54E-06	6.61E-02	3.30E-05	7.54E-06	6.61E-02	3.30E-05	9.10E-05	Below
Toluene	108-88-3	2.81E-04	1.63E-05	1.43E-01	7.14E-05	1.63E-05	1.43E-01	7.14E-05	2.50E+01	Below
o-Xylenes	1330-20-7	1.93E-04	1.12E-05	9.81E-02	4.90E-05	1.12E-05	9.81E-02	4.90E-05	2.90E+01	Below
Acetaldehyde	75-07-0	2.52E-05	1.46E-06	1.28E-02	6.40E-06	1.46E-06	1.28E-02	6.40E-06	3.00E-03	Below
Acrolein	107-02-8	7.88E-06	4.57E-07	4.00E-03	2.00E-06	4.57E-07	4.00E-03	2.00E-06	1.70E-02	Below
Benz(a)anthracene	56-55-3	6.22E-07	3.61E-08	3.16E-04	1.58E-07	3.61E-08	3.16E-04	1.58E-07		
Benzo(b)fluoranthene	205-99-2	1.11E-06	6.44E-08	5.64E-04	2.82E-07	6.44E-08	5.64E-04	2.82E-07		
Benzo(k)fluoranthene	205-82-3	2.18E-07	1.26E-08	1.11E-04	5.54E-08	1.26E-08	1.11E-04	5.54E-08		
Chrysene	218-01-9	1.53E-06	8.88E-08	7.78E-04	3.89E-07	8.88E-08	7.78E-04	3.89E-07		
Dibenzo(a,h)anthracene	53-70-3	3.46E-07	2.01E-08	1.76E-04	8.79E-08	2.01E-08	1.76E-04	8.79E-08		
Indeno(1,2,3-cd)pyrene	193-39-5	4.14E-07	2.40E-08	2.10E-04	1.05E-07	2.40E-08	2.10E-04	1.05E-07		
Benzo(a)pyrene	50-32-8	2.57E-07	1.49E-08	1.31E-04	6.53E-08	1.49E-08	1.31E-04	6.53E-08		
Total PAH [7]			2.61E-07	2.29E-03	1.14E-06	2.61E-07	2.29E-03	1.14E-06	2.00E-06	Below

[1] Criteria pollutant emissino factors are from manufacturer at 75% load (see manufacturer data sheet)

[2] Criteria pollutant emission factors are derived from EPA AP-42, Table 3.4-1 and Table 3.4-2

[3] Used manufacturer emission rate at 75% load to caluculate emissions for all criterai pollutants except sulfur oxides

[4] Assumed PM_{10} and $PM_{2.5}$ emission rate equal PM emission rate at 75% load

[5] Assumed hydro carbon (HC) emission rate in manufacturer data sheet at 75% load equals VOC emission rate

[6] Toxic emission factors are derived from EPA AP-41, Table 3.4-3 and Table 3.4-4.

[7] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

Note: Toxic emission factors derived from EPA AP-42 Tables 3.4-3 and 3.4-4.

GHG Emissions			
Compound [7]	Emissions (metric tons)	GWP	CO2e
CO_2	332.22	1	332.221
CH_4	0.0135	21	0.283
N_2O	0.00270	310	0.835
Total	332.24		333.34

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:
CO2 = 1x10-3 x Fuel x HHV x EF

CO2 = Annual CO2 mass emissions in Metric Tons	=	332.22
Fuel = Volume of fuel used (gallons)	=	32,550
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138
EFCO2 = Emission factor (kg/mmBTU)	=	73.96

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:
CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0135
N2O = Annual N2O mass emissions in Metric Tons	=	0.00270
Fuel = Volume of fuel used (gallons)	=	32,550
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138
EFCH4 = Emission factor (kg/mmBTU)	=	3.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	6.00E-04

Notes

[7] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Duel fired boiler)

Boiler (MMBtu/hr)	**11.7**
Manufacturer	**Hurst**
Fuel Type (Primary)	**Natural Gas**
Fuel Type (Backup)	**ULSD**
Maximum Heat Input Rating (Btu/hr)	**11,700,000**
Natural Gas*	
Maximum Operation Limit (hrs/yr)	**8,760**
Maximum Firing Rate (MMcf/yr)	**100**
Heat Value of NG (Btu/scf)	**1,020**
Maximum Firing Rate (MMcf/hr)	**1.15E-02**
Ultra Low Sulfur Diesel**	
Maximum Operating Limit (hrs/yr)	**48**
NG Operating Hours (hrs/yr)	**8,760**
Sulfur Content in Fuel (%)	**0.0015**
Maximum Fuel Usage (gal/hr)	**84**
Maximum Fuel Usage (gal/yr)	**4,011**
Heat Value of ULSD (Btu/scf)	**140,000**

* Note: Assumed 8760 annual hours of operation at 100% natural gas

** Ultra low sulfur diesel (ULSD) is 0.0015% sulfur content

			NG Uncontrolled Potential to Emit[1]			ULSD Uncontrolled Potential to Emit[1]			Worst Case		
Criteria Pollutant	Natural Gas Emission Factor (lb/10[6] scf)[2]	ULSD Emission Factor (lb/Mgal)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)[4]	Emission Rate (lb/yr)[5]	Emission Rate (ton/yr)[5]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)[6]	7.6	2.0	0.087	**764**	**0.38**	**0.167**	8	0.00	0.167	764	0.38
PM_{10}[6,7]	7.6	1.0	**0.087**	**764**	**0.38**	0.084	4	0.00	0.087	764	0.38
$PM_{2.5}$[6,7]	7.6	0.25	**0.087**	**764**	**0.38**	0.021	1	0.00	0.087	764	0.38
Nitrogen Oxides (NOx)	100.0	20.0	1.147	**10,048**	**5.02**	**1.671**	80	0.04	1.671	10,048	5.02
Sulfur Oxides	0.6	0.2	0.007	**60**	**0.03**	**0.018**	1	0.000	0.018	60	0.03
Carbon Monoxide (CO)	84.0	5.0	**0.964**	**8,441**	**4.22**	0.418	20	0.01	0.964	8,441	4.22
VOC	5.5	0.252	**0.063**	**553**	**0.28**	0.021	1	0.00	0.063	553	0.28
Lead	0.0005		**5.74E-06**	**0.050**	**2.51E-05**	5.77E-07	2.77E-05	1.38E-08	5.74E-06	0.050	2.51E-05

				NG Uncontrolled Potential to Emit			ULSD Uncontrolled Potential to Emit			Worst Case				
Toxics	CAS No.	NG Emission Factor[8] (lb/10[6] scf)	ULSD Emission Factor[9] (lb/Mgal)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)[4]	Emission Rate (lb/yr)[5]	Emission Rate (ton/yr)[5]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05		2.75E-07	2.41E-03	1.21E-06	0	0	0	2.75E-07	2.41E-03	1.21E-06		
3-Methylchloranthrene	56-49-5	1.80E-06		2.06E-08	1.81E-04	9.04E-08	0	0	0	2.06E-08	1.81E-04	9.04E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05		1.84E-07	1.61E-03	8.04E-07	0	0	0	1.84E-07	1.61E-03	8.04E-07		
Acenaphthene	83-32-9	1.80E-06	2.11E-05	2.06E-08	1.81E-04	9.04E-08	9.66E-09	8.46E-05	4.23E-08	2.06E-08	1.81E-04	9.04E-08		
Acenaphthylene	203-96-8	1.80E-06	2.53E-07	2.06E-08	1.81E-04	9.04E-08	1.16E-10	1.01E-06	5.07E-10	2.06E-08	1.81E-04	9.04E-08		
Anthracene	120-12-7	2.40E-06	1.22E-06	2.75E-08	2.41E-04	1.21E-07	5.59E-10	4.89E-06	2.45E-09	2.75E-08	2.41E-04	1.21E-07		
Benzo(a)anthracene	56-55-3	1.80E-06	4.01E-06	2.06E-08	1.81E-04	9.04E-08	1.84E-09	1.61E-05	8.04E-09	2.06E-08	1.81E-04	9.04E-08		
Benzene	71-43-2	2.10E-03	2.14E-04	2.41E-05	2.11E-01	1.06E-04	9.80E-08	8.58E-04	4.29E-07	2.41E-05	2.11E-01	1.06E-04	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06		1.38E-08	1.21E-04	6.03E-08	0	0	0	1.38E-08	1.21E-04	6.03E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.48E-06	2.06E-08	1.81E-04	9.04E-08	6.78E-10	5.94E-06	2.97E-09	2.06E-08	1.81E-04	9.04E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	2.26E-06	1.38E-08	1.21E-04	6.03E-08	1.03E-09	9.07E-06	4.53E-09	1.38E-08	1.21E-04	6.03E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.48E-06	2.06E-08	1.81E-04	9.04E-08	6.78E-10	5.94E-06	2.97E-09	2.06E-08	1.81E-04	9.04E-08		
Chrysene	218-01-9	1.80E-06	2.38E-06	2.06E-08	1.81E-04	9.04E-08	1.09E-09	9.55E-06	4.77E-09	2.06E-08	1.81E-04	9.04E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	1.67E-06	1.38E-08	1.21E-04	6.03E-08	7.65E-10	6.70E-06	3.35E-09	1.38E-08	1.21E-04	6.03E-08		
Dichlorobenzene	25321-22-6	1.20E-03		1.38E-05	1.21E-01	6.03E-05	0	0	0	1.38E-05	1.21E-01	6.03E-05		
Ethylbenzene	100-41-4		6.36E-05	0	0	0	2.91E-08	2.55E-04	1.28E-07	2.91E-08	2.55E-04	1.28E-07	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	4.84E-06	3.44E-08	3.01E-04	1.51E-07	2.22E-09	1.94E-05	9.71E-09	3.44E-08	3.01E-04	1.51E-07		
Fluorene	86-73-7	2.80E-06	4.47E-06	3.21E-08	2.81E-04	1.41E-07	2.05E-09	1.79E-05	8.97E-09	3.21E-08	2.81E-04	1.41E-07		
Formaldehyde	50-00-0	7.50E-02	3.30E-02	**8.60E-04**	7.54E+00	3.77E-03	1.51E-05	1.32E-01	6.62E-05	**8.60E-04**	7.54E+00	3.77E-03	**5.10E-04**	**Exceeds**
Hexane	110-54-3	1.80E+00		2.06E-02	1.81E+02	9.04E-02	0	0	0	2.06E-02	1.81E+02	9.04E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	2.14E-06	2.06E-08	1.81E-04	9.04E-08	9.80E-10	8.58E-06	4.29E-09	2.06E-08	1.81E-04	9.04E-08		
Naphthalene	91-20-3	6.10E-04	1.13E-03	7.00E-06	6.13E-02	3.06E-05	5.17E-07	4.53E-03	2.27E-06	7.00E-06	6.13E-02	3.06E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-05	1.95E-07	1.71E-03	8.54E-07	4.81E-09	4.21E-05	2.11E-08	1.95E-07	1.71E-03	8.54E-07		
Pyrene	129-00-0	5.00E-06	4.25E-06	5.74E-08	5.02E-04	2.51E-07	1.95E-09	1.70E-05	8.52E-09	5.74E-08	5.02E-04	2.51E-07		
Toluene	108-88-3	3.40E-03	6.20E-03	3.90E-05	3.42E-01	1.71E-04	2.84E-06	2.49E-02	1.24E-05	3.90E-05	3.42E-01	1.71E-04	2.50E+01	Below
o-Xylene	1330-20-7		1.09E-04	0	0	0	4.99E-08	4.37E-04	2.19E-07	4.99E-08	4.37E-04	2.19E-07	2.90E+01	Below
PAH[12]				1.31E-07	1.09E-03	5.43E-07	6.03E-09	2.89E-07	2.80E-08	1.31E-07	1.09E-03	5.43E-07	2.00E-06	Below

Toxic-Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)	ULSD Emission Factor [11] (lb/10^{12} BTU)	NG Uncontrolled Potential to Emit: Emission Rate (lb/hr)	NG Uncontrolled Potential to Emit: Emission Rate (lb/yr)	NG Uncontrolled Potential to Emit: Emission Rate (ton/yr)	ULSD Uncontrolled Potential to Emit: Emission Rate (lb/hr) [4]	ULSD Uncontrolled Potential to Emit: Emission Rate (lb/yr) [5]	ULSD Uncontrolled Potential to Emit: Emission Rate (ton/yr) [5]	Worst Case: Emission Rate (lb/hr)	Worst Case: Emission Rate (lb/yr)	Worst Case: Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	4.00E+00	2.29E-06	2.01E-02	1.00E-05	2.56E-07	2.25E-03	1.12E-06	2.29E-06	2.01E-02	1.00E-05	**1.50E-06**	**Exceeds**
Barium	7440-39-3	4.40E-03		5.05E-05	4.42E-01	2.21E-04				5.05E-05	4.42E-01	2.21E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	3.00E+00	1.38E-07	1.21E-03	6.03E-07	1.92E-07	1.68E-03	8.42E-07	1.92E-07	1.68E-03	8.42E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	3.00E+00	1.26E-05	1.11E-01	5.53E-05	1.92E-07	1.68E-03	8.42E-07	1.26E-05	1.11E-01	5.53E-05	**3.70E-06**	**Exceeds**
Chromium	7440-47-3	1.40E-03	3.00E+00	1.61E-05	1.41E-01	7.03E-05	1.92E-07	1.68E-03	8.42E-07	1.61E-05	1.41E-01	7.03E-05	**5.60E-07**	**Exceeds**
Cobalt	7440-48-4	8.40E-05		9.64E-07	8.44E-03	4.22E-06				9.64E-07	8.44E-03	4.22E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04	6.00E+00	9.75E-06	8.54E-02	4.27E-05	3.85E-07	3.37E-03	1.68E-06	9.75E-06	8.54E-02	4.27E-05	6.70E-02	Below
Lead			9.00E+00				5.77E-07	5.05E-03	2.53E-06	5.77E-07	5.05E-03	2.53E-06		
Manganese	7439-96-5	3.80E-04	6.00E+00	4.36E-06	3.82E-02	1.91E-05	3.85E-07	3.37E-03	1.68E-06	4.36E-06	3.82E-02	1.91E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	3.00E+00	2.98E-06	2.61E-02	1.31E-05	1.92E-07	1.68E-03	8.42E-07	2.98E-06	2.61E-02	1.31E-05	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		1.26E-05	1.11E-01	5.53E-05				1.26E-05	1.11E-01	5.53E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	3.00E+00	2.41E-05	2.11E-01	1.06E-04	1.92E-07	1.68E-03	8.42E-07	2.41E-05	2.11E-01	1.06E-04	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	1.50E+01	2.75E-07	2.41E-03	1.21E-06	9.62E-07	8.42E-03	4.21E-06	9.62E-07	8.42E-03	4.21E-06	1.30E-02	Below
Vanadium	1314-62-1	3.30E-03		3.79E-05	3.32E-01	1.66E-04				3.79E-05	3.32E-01	1.66E-04	3.00E-03	Below
Zinc	7440-66-6	2.90E-02	4.00E+00	3.33E-04	2.91E+00	1.46E-03	2.56E-07	2.25E-03	1.12E-06	3.33E-04	2.91E+00	1.46E-03	6.67E-01	Below

Notes:

[1] Uncontrolled emissions based on potential worst case

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Criteria pollutants for industrial boilers firing No 2 Fuel oil use, EPA AP-42, Section 1.3, tables 1.3-1, 1.3-3, and 1.3-6

[4] For ULSD, pound per hour based on 48 hours of operation over 8,760 hours per year

[5] For ULSD, annual emissions based on 500 hours per year

[6] For Natural Gas, PM emission factor equals PM10 and PM2.5

[7] For No 2 Fuel Oil, emission factors for PM, PM10, and PM2.5 come from Table 1.3-6.

[8] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[9] Toxic Air Pollutants (EPA AP-42, Section 1.3 , Table 1.3-9).

[10] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

[11] Metals from Natural Gas Combustion (EPA AP-42, Section 1.3 Fuel Oil Combustion, Table 1.3-10).

[12] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

GHG Emissions Compound [13]	NG Emissions (metric tons)	ULSD Emissions (metric tons)	GWP	NG CO2e	ULSD CO2e
CO_2	5481.91	40.94	1	5481.91	40.94
CH_4	0.10	0.00	21	2.17	0.03
N_2O	0.010	0.000	310	3.20	0.10
Total	5482.02	40.94		5487.28	41.08

		ULSD & NG (ULSD)	(NG)
For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:			
CO2 = 1x10-3 x Fuel x HHV x EF			
CO2 = Annual CO2 mass emissions in Metric Tons	=	40.94	5481.91
Fuel = Volume of fuel used (standard cubic feet)	=		100,482,353
Fuel = Volume of fuel used (gallons)	=	4,011	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	73.96	53.07
For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:			
CH4, N2O = 1x10-3 x Fuel x HHV x EF			
CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0017	0.1033
N2O = Annual N2O mass emissions in Metric Tons	=	0.00033	0.01033
Fuel = Volume of fuel used (standard cubic feet)	=		100,482,353
Fuel = Volume of fuel used (gallons)	=	4,011	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	3.00E-03	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	6.00E-04	1.00E-04

Notes

[13] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Duel fired boiler)

Boiler (MMBtu/hr)	**11.7**
Manufacturer	**Hurst**
Fuel Type (Primary)	**Natural Gas**
Fuel Type (Backup)	**ULSD**
Maximum Heat Input Rating (Btu/hr)	**11,700,000**
Natural Gas*	
Maximum Operation Limit (hrs/yr)	**8,760**
Maximum Firing Rate (MMcf/yr)	**100**
Heat Value of NG (Btu/scf)	**1,020**
Maximum Firing Rate (MMcf/hr)	**1.15E-02**
Ultra Low Sulfur Diesel**	
Maximum Operating Limit (hrs/yr)	**48**
NG Operating Hours (hrs/yr)	**8,760**
Sulfur Content in Fuel (%)	**0.0015**
Maximum Fuel Usage (gal/hr)	**84**
Maximum Fuel Usage (gal/yr)	**4,011**
Heat Value of ULSD (Btu/scf)	**140,000**

* Note: Assumed 8760 annual hours of operation at 100% natural gas

** Ultra low sulfur diesel (ULSD) is 0.0015% sulfur content

			NG Uncontrolled Potential to Emit[1]			ULSD Uncontrolled Potential to Emit[1]			Worst Case		
Criteria Pollutant	Natural Gas Emission Factor ($lb/10^6$ scf)[2]	ULSD Emission Factor (lb/Mgal)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)[4]	Emission Rate (lb/yr)[5]	Emission Rate (ton/yr)[5]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)[6]	7.6	2.0	0.087	**764**	**0.38**	**0.167**	8	0.004	0.167	764	0.38
PM_{10}[6,7]	7.6	1.0	**0.087**	**764**	**0.38**	0.084	4	0.002	0.087	764	0.38
$PM_{2.5}$[6,7]	7.6	0.25	**0.087**	**764**	**0.38**	0.021	1	0.001	0.087	764	0.38
Nitrogen Oxides (NOx)	100.0	20.0	1.147	**10,048**	**5.02**	**1.671**	80	0.04	1.671	10,048	5.02
Sulfur Oxides	0.6	0.2	0.007	**60**	**0.03**	**0.018**	1	0.0004	0.018	60	0.03
Carbon Monoxide (CO)	84.0	5.0	**0.964**	**8,441**	**4.22**	0.418	20	0.01	0.964	8,441	4.22
VOC	5.5	0.252	**0.063**	**553**	**0.28**	0.021	1	0.001	0.063	553	0.28
Lead	0.0005		**5.74E-06**	**0.050**	**2.51E-05**	5.77E-07	2.77E-05	1.38E-08	5.74E-06	0.050	2.51E-05

				NG Uncontrolled Potential to Emit			ULSD Uncontrolled Potential to Emit			Worst Case				
Toxics	CAS No.	NG Emission Factor[8] ($lb/10^6$ scf)	ULSD Emission Factor[9] (lb/Mgal)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	Emission Rate (lb/hr)[4]	Emission Rate (lb/yr)[5]	Emission Rate (ton/yr)[5]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05		2.75E-07	2.41E-03	1.21E-06	0.00E+00	0.00E+00	0.00E+00	2.75E-07	2.41E-03	1.21E-06		
3-Methylchloranthrene	56-49-5	1.80E-06		2.06E-08	1.81E-04	9.04E-08	0.00E+00	0.00E+00	0.00E+00	2.06E-08	1.81E-04	9.04E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05		1.84E-07	1.61E-03	8.04E-07	0.00E+00	0.00E+00	0.00E+00	1.84E-07	1.61E-03	8.04E-07		
Acenaphthene	83-32-9	1.80E-06	2.11E-05	2.06E-08	1.81E-04	9.04E-08	9.66E-09	8.46E-05	4.23E-08	2.06E-08	1.81E-04	9.04E-08		
Acenaphthylene	203-96-8	1.80E-06	2.53E-07	2.06E-08	1.81E-04	9.04E-08	1.16E-10	1.01E-06	5.07E-10	2.06E-08	1.81E-04	9.04E-08		
Anthracene	120-12-7	2.40E-06	1.22E-06	2.75E-08	2.41E-04	1.21E-07	5.59E-10	4.89E-06	2.45E-09	2.75E-08	2.41E-04	1.21E-07		
Benzo(a)anthracene	56-55-3	1.80E-06	4.01E-06	2.06E-08	1.81E-04	9.04E-08	1.84E-09	1.61E-05	8.04E-09	2.06E-08	1.81E-04	9.04E-08		
Benzene	71-43-2	2.10E-03	2.14E-04	2.41E-05	2.11E-01	1.06E-04	9.80E-08	8.58E-04	4.29E-07	2.41E-05	2.11E-01	1.06E-04	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06		1.38E-08	1.21E-04	6.03E-08	0.00E+00	0.00E+00	0.00E+00	1.38E-08	1.21E-04	6.03E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.48E-06	2.06E-08	1.81E-04	9.04E-08	6.78E-10	5.94E-06	2.97E-09	2.06E-08	1.81E-04	9.04E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	2.26E-06	1.38E-08	1.21E-04	6.03E-08	1.03E-09	9.07E-06	4.53E-09	1.38E-08	1.21E-04	6.03E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.48E-06	2.06E-08	1.81E-04	9.04E-08	6.78E-10	5.94E-06	2.97E-09	2.06E-08	1.81E-04	9.04E-08		
Chrysene	218-01-9	1.80E-06	2.38E-06	2.06E-08	1.81E-04	9.04E-08	1.09E-09	9.55E-06	4.77E-09	2.06E-08	1.81E-04	9.04E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	1.67E-06	1.38E-08	1.21E-04	6.03E-08	7.65E-10	6.70E-06	3.35E-09	1.38E-08	1.21E-04	6.03E-08		
Dichlorobenzene	25321-22-6	1.20E-03		1.38E-05	1.21E-01	6.03E-05	0.00E+00	0.00E+00	0.00E+00	1.38E-05	1.21E-01	6.03E-05		
Ethylbenzene	100-41-4		6.36E-05	0.00E+00	0.00E+00	0.00E+00	2.91E-08	2.55E-04	1.28E-07	2.91E-08	2.55E-04	1.28E-07	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	4.84E-06	3.44E-08	3.01E-04	1.51E-07	2.22E-09	1.94E-05	9.71E-09	3.44E-08	3.01E-04	1.51E-07		
Fluorene	86-73-7	2.80E-06	4.47E-06	3.21E-08	2.81E-04	1.41E-07	2.05E-09	1.79E-05	8.97E-09	3.21E-08	2.81E-04	1.41E-07		
Formaldehyde	50-00-0	7.50E-02	3.30E-02	**8.60E-04**	7.54E+00	3.77E-03	1.51E-05	1.32E-01	6.62E-05	**8.60E-04**	7.54E+00	3.77E-03	**5.10E-04**	**Exceeds**
Hexane	110-54-3	1.80E+00		2.06E-02	1.81E+02	9.04E-02	0.00E+00	0.00E+00	0.00E+00	2.06E-02	1.81E+02	9.04E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	2.14E-06	2.06E-08	1.81E-04	9.04E-08	9.80E-10	8.58E-06	4.29E-09	2.06E-08	1.81E-04	9.04E-08		
Naphthalene	91-20-3	6.10E-04	1.13E-03	7.00E-06	6.13E-02	3.06E-05	5.17E-07	4.53E-03	2.27E-06	7.00E-06	6.13E-02	3.06E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-05	1.95E-07	1.71E-03	8.54E-07	4.81E-09	4.21E-05	2.11E-08	1.95E-07	1.71E-03	8.54E-07		
Pyrene	129-00-0	5.00E-06	4.25E-06	5.74E-08	5.02E-04	2.51E-07	1.95E-09	1.70E-05	8.52E-09	5.74E-08	5.02E-04	2.51E-07		
Toluene	108-88-3	3.40E-03	6.20E-03	3.90E-05	3.42E-01	1.71E-04	2.84E-06	2.49E-02	1.24E-05	3.90E-05	3.42E-01	1.71E-04	2.50E+01	Below
o-Xylene	1330-20-7		1.09E-04	0.00E+00	0.00E+00	0.00E+00	4.99E-08	4.37E-04	2.19E-07	4.99E-08	4.37E-04	2.19E-07	2.90E+01	Below
PAH[12]				1.31E-07	1.09E-03	5.43E-07	6.03E-09	2.89E-07	2.80E-08	1.31E-07	1.09E-03	5.43E-07	2.00E-06	Below

Toxic-Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)	ULSD Emission Factor [11] (lb/10^{12} BTU)	NG Uncontrolled Potential to Emit Emission Rate (lb/hr)	NG Uncontrolled Potential to Emit Emission Rate (lb/yr)	NG Uncontrolled Potential to Emit Emission Rate (ton/yr)	ULSD Uncontrolled Potential to Emit Emission Rate (lb/hr) [4]	ULSD Uncontrolled Potential to Emit Emission Rate (lb/yr) [5]	ULSD Uncontrolled Potential to Emit Emission Rate (ton/yr) [5]	Worst Case Emission Rate (lb/hr)	Worst Case Emission Rate (lb/yr)	Worst Case Emission Rate (ton/yr)	IDAPA 58.01.01.5 85/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	4.00E+00	2.29E-06	2.01E-02	1.00E-05	**2.56E-07**	**2.25E-03**	1.12E-06	**2.29E-06**	2.01E-02	1.00E-05	**1.50E-06**	**Exceeds**
Barium	7440-39-3	4.40E-03		5.05E-05	4.42E-01	2.21E-04				5.05E-05	4.42E-01	2.21E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	3.00E+00	1.38E-07	1.21E-03	6.03E-07	1.92E-07	1.68E-03	8.42E-07	1.92E-07	1.68E-03	8.42E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	3.00E+00	1.26E-05	1.11E-01	5.53E-05	**1.92E-07**	1.68E-03	8.42E-07	**1.26E-05**	1.11E-01	5.53E-05	**3.70E-06**	**Exceeds**
Chromium	7440-47-3	1.40E-03	3.00E+00	1.61E-05	1.41E-01	7.03E-05	**1.92E-07**	1.68E-03	8.42E-07	**1.61E-05**	1.41E-01	7.03E-05	**5.60E-07**	**Exceeds**
Cobalt	7440-48-4	8.40E-05		9.64E-07	8.44E-03	4.22E-06	0.00E+00	0.00E+00	0.00E+00	9.64E-07	8.44E-03	4.22E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04	6.00E+00	9.75E-06	8.54E-02	4.27E-05	3.85E-07	3.37E-03	1.68E-06	9.75E-06	8.54E-02	4.27E-05	6.70E-02	Below
Lead			9.00E+00				5.77E-07	5.05E-03	2.53E-06	5.77E-07	5.05E-03	2.53E-06		
Manganese	7439-96-5	3.80E-04	6.00E+00	4.36E-06	3.82E-02	1.91E-05	3.85E-07	3.37E-03	1.68E-06	4.36E-06	3.82E-02	1.91E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	3.00E+00	2.98E-06	2.61E-02	1.31E-05	1.92E-07	1.68E-03	8.42E-07	2.98E-06	2.61E-02	1.31E-05	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		1.26E-05	1.11E-01	5.53E-05				1.26E-05	1.11E-01	5.53E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	3.00E+00	2.41E-05	2.11E-01	1.06E-04	1.92E-07	1.68E-03	8.42E-07	2.41E-05	2.11E-01	1.06E-04	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	1.50E+01	2.75E-07	2.41E-03	1.21E-06	9.62E-07	8.42E-03	4.21E-06	9.62E-07	8.42E-03	4.21E-06	1.30E-02	Below
Vanadium	1314-62-1	3.30E-03		3.79E-05	3.32E-01	1.66E-04				3.79E-05	3.32E-01	1.66E-04	3.00E-03	Below
Zinc	7440-66-6	2.90E-02	4.00E+00	3.33E-04	2.91E+00	1.46E-03	2.56E-07	2.25E-03	1.12E-06	3.33E-04	2.91E+00	1.46E-03	6.67E-01	Below

Notes:

[1] Uncontrolled emissions based on potential worst case

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Criteria pollutants for industrial boilers firing No 2 Fuel oil use, EPA AP-42, Section 1.3, tables 1.3-1, 1.3-3, and 1.3-6

[4] For ULSD, pound per hour based on 500 hours of operation over 8,760 hours per year

[5] For ULSD, annual emissions based on 500 hours per year

[6] For Natural Gas, PM emission factor equals PM10 and PM2.5

[7] For No 2 Fuel Oil, emission factors for PM, PM10, and PM2.5 come from Table 1.3-6.

[8] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[9] Toxic Air Pollutants (EPA AP-42, Section 1.3 , Table 1.3-9).

[10] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

[11] Metals from Natural Gas Combustion (EPA AP-42, Section 1.3 Fuel Oil Combustion, Table 1.3-10).

[12] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

GHG Emissions Compound [13]	NG Emissions (metric tons)	ULSD Emissions (metric tons)	GWP	NG CO2e	ULSD CO2e
CO_2	5481.91	40.94	1	5481.91	40.94
CH_4	0.10	0.00	21	2.17	0.03
N_2O	0.010	0.000	310	3.20	0.10
Total	5482.02	40.94		5487.28	41.08

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		ULSD & NG (ULSD)	(NG)
CO2 = Annual CO2 mass emissions in Metric Tons	=	40.94	5481.91
Fuel = Volume of fuel used (standard cubic feet)	=		100,482,353
Fuel = Volume of fuel used (gallons)	=	4,011	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	73.96	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

		(ULSD)	(NG)
CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0017	0.1033
N2O = Annual N2O mass emissions in Metric Tons	=	0.00033	0.01033
Fuel = Volume of fuel used (standard cubic feet)	=		100,482,353
Fuel = Volume of fuel used (gallons)	=	4,011	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.138	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	3.00E-03	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	6.00E-04	1.00E-04

Notes

[13] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	6.313
Manufacturer	Kewanee
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	6,313,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	54
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	6.19E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

		NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	**Natural Gas Emission Factor ($lb/10^6$ scf)[2]**	**Emission Rate (lb/hr)**	**Emission Rate (lb/yr)**	**Emission Rate (ton/yr)**
Total Particulate Matter (PM)	7.6	0.047	412	0.21
PM_{10}	7.6	0.047	412	0.21
$PM_{2.5}$	7.6	0.047	412	0.21
Nitrogen Oxides (NOx)	100.0	0.619	5,422	2.71
Sulfur Oxides	0.6	0.004	33	0.02
Carbon Monoxide (CO)	84.0	0.520	4,554	2.28
VOC	5.5	0.034	298	0.15
Lead	0.0005	3.09E-06	0.03	1.36E-05

			NG Uncontrolled Potential to Emit				
Toxics	**CAS No.**	**NG Emission Factor[3] ($lb/10^6$ scf)**	**Emission Rate (lb/hr)**	**Emission Rate (lb/yr)**	**Emission Rate (ton/yr)**	**IDAPA 58.01.01.585/586 - EL (lb/hr)**	**PTE Emission Rate vs. EL**
2-Methylnaphthalene	91-57-6	2.40E-05	1.49E-07	1.30E-03	6.51E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05	9.90E-08	8.67E-04	4.34E-07		
Acenaphthene	83-32-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Acenaphthylene	203-96-8	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Anthracene	120-12-7	2.40E-06	1.49E-08	1.30E-04	6.51E-08		
Benz(a)anthracene	56-55-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzene	71-43-2	2.10E-03	1.30E-05	1.14E-01	5.69E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	7.43E-09	6.51E-05	3.25E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Chrysene	218-01-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Dichlorobenzene	25321-22-6	1.20E-03	7.43E-06	6.51E-02	3.25E-05		
Ethylbenzene	100-41-4		0	0	0	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.86E-08	1.63E-04	8.13E-08		
Fluorene	86-73-7	2.80E-06	1.73E-08	1.52E-04	7.59E-08		
Formaldehyde	50-00-0	7.50E-02	4.64E-04	4.07E+00	2.03E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	1.11E-02	9.76E+01	4.88E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Naphthalene	91-20-3	6.10E-04	3.78E-06	3.31E-02	1.65E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-07	9.22E-04	4.61E-07		
Pyrene	129-00-0	5.00E-06	3.09E-08	2.71E-04	1.36E-07		
Toluene	108-88-3	3.40E-03	2.10E-05	1.84E-01	9.22E-05	2.50E+01	Below
o-Xylene	1330-20-7		0	0	0	2.90E+01	Below
PAH[4]			7.06E-08	5.86E-04	2.93E-07	2.00E-06	Below

Toxic -Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)[5]		NG Uncontrolled Potential to Emit Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04		1.24E-06	1.08E-02	5.42E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03		2.72E-05	2.39E-01	1.19E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05		7.43E-08	6.51E-04	3.25E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03		**6.81E-06**	5.96E-02	2.98E-05	**3.70E-06**	Exceeds
Chromium	7440-47-3	1.40E-03		**8.66E-06**	7.59E-02	3.80E-05	**5.60E-07**	Exceeds
Cobalt	7440-48-4	8.40E-05		5.20E-07	4.55E-03	2.28E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04		5.26E-06	4.61E-02	2.30E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04		2.35E-06	2.06E-02	1.03E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04		1.61E-06	1.41E-02	7.05E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		6.81E-06	5.96E-02	2.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03		1.30E-05	1.14E-01	5.69E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05		1.49E-07	1.30E-03	6.51E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02		1.79E-04	1.57E+00	7.86E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[4] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[5] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound [6]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	2957.89	1	2957.89
CH_4	0.06	21	1.17
N_2O	0.006	310	1.73
Total	2957.95		2960.79

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF		**NG**
CO2 = Annual CO2 mass emissions in Metric Tons	=	2957.89
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0557
N2O = Annual N2O mass emissions in Metric Tons	=	0.00557
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[6] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	**6.313**
Manufacturer	**Kewanee**
Fuel Type (Primary)	**Natural Gas**
Maximum Heat Input Rating (Btu/hr)	**6,313,000**
Natural Gas*	
Maximum Operation Limit (hrs/yr)	**8,760**
Maximum Firing Rate (MMcf/yr)	**54**
Heat Value of NG (Btu/scf)	**1,020**
Maximum Firing Rate (MMcf/hr)	**6.19E-03**

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

Criteria Pollutant	Natural Gas Emission Factor (lb/10^6 scf)[2]	NG Uncontrolled Potential to Emit[1]		
		Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.047	412	0.21
PM_{10}	7.6	0.047	412	0.21
$PM_{2.5}$	7.6	0.047	412	0.21
Nitrogen Oxides (NOx)	100.0	0.619	5,422	2.71
Sulfur Oxides	0.6	0.004	33	0.02
Carbon Monoxide (CO)	84.0	0.520	4,554	2.28
VOC	5.5	0.034	298	0.15
Lead	0.0005	3.09E-06	0.03	1.36E-05

Toxics	CAS No.	NG Emission Factor[3] (lb/10^6 scf)	NG Uncontrolled Potential to Emit			IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
			Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)		
2-Methylnaphthalene	91-57-6	2.40E-05	1.49E-07	1.30E-03	6.51E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05	9.90E-08	8.67E-04	4.34E-07		
Acenaphthene	83-32-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Acenaphthylene	203-96-8	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Anthracene	120-12-7	2.40E-06	1.49E-08	1.30E-04	6.51E-08		
Benz(a)anthracene	56-55-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzene	71-43-2	2.10E-03	1.30E-05	1.14E-01	5.69E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	7.43E-09	6.51E-05	3.25E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Chrysene	218-01-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Dibenz(a,h)anthracene	53-70-3	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Dichlorobenzene	25321-22-6	1.20E-03	7.43E-06	6.51E-02	3.25E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.86E-08	1.63E-04	8.13E-08		
Fluorene	86-73-7	2.80E-06	1.73E-08	1.52E-04	7.59E-08		
Formaldehyde	50-00-0	7.50E-02	4.64E-04	4.07E+00	2.03E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	1.11E-02	9.76E+01	4.88E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Naphthalene	91-20-3	6.10E-04	3.78E-06	3.31E-02	1.65E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-07	9.22E-04	4.61E-07		
Pyrene	129-00-0	5.00E-06	3.09E-08	2.71E-04	1.36E-07		
Toluene	108-88-3	3.40E-03	2.10E-05	1.84E-01	9.22E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[4]			7.06E-08	5.86E-04	2.93E-07	2.00E-06	Below

Toxic -Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)[5]		NG Uncontrolled Potential to Emit Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04		1.24E-06	1.08E-02	5.42E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03		2.72E-05	2.39E-01	1.19E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05		7.43E-08	6.51E-04	3.25E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03		**6.81E-06**	5.96E-02	2.98E-05	**3.70E-06**	Exceeds
Chromium	7440-47-3	1.40E-03		**8.66E-06**	7.59E-02	3.80E-05	**5.60E-07**	Exceeds
Cobalt	7440-48-4	8.40E-05		5.20E-07	4.55E-03	2.28E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04		5.26E-06	4.61E-02	2.30E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04		2.35E-06	2.06E-02	1.03E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04		1.61E-06	1.41E-02	7.05E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		6.81E-06	5.96E-02	2.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03		1.30E-05	1.14E-01	5.69E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05		1.49E-07	1.30E-03	6.51E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02		1.79E-04	1.57E+00	7.86E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[4] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[5] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound [6]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	2957.89	1	2957.89
CH_4	0.06	21	1.17
N_2O	0.006	310	1.73
Total	2957.95		2960.79

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	2957.89
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0557
N2O = Annual N2O mass emissions in Metric Tons	=	0.00557
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[6] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	6.313
Manufacturer	Kewanee
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	6,313,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	54
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	6.19E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

		NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	**Natural Gas Emission Factor ($lb/10^6$ scf)[2]**	**Emission Rate (lb/hr)**	**Emission Rate (lb/yr)**	**Emission Rate (ton/yr)**
Total Particulate Matter (PM)	7.6	0.047	412	0.21
PM_{10}	7.6	0.047	412	0.21
$PM_{2.5}$	7.6	0.047	412	0.21
Nitrogen Oxides (NOx)	100.0	0.619	5,422	2.71
Sulfur Oxides	0.6	0.004	33	0.02
Carbon Monoxide (CO)	84.0	0.520	4,554	2.28
VOC	5.5	0.034	298	0.15
Lead	0.0005	3.09E-06	0.03	1.36E-05

			NG Uncontrolled Potential to Emit				
Toxics	**CAS No.**	**NG Emission Factor [3] ($lb/10^6$ scf)**	**Emission Rate (lb/hr)**	**Emission Rate (lb/yr)**	**Emission Rate (ton/yr)**	**IDAPA 58.01.01.585/586 - EL (lb/hr)**	**PTE Emission Rate vs. EL**
2-Methylnaphthalene	91-57-6	2.40E-05	1.49E-07	1.30E-03	6.51E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05	9.90E-08	8.67E-04	4.34E-07		
Acenaphthene	83-32-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Acenaphthylene	203-96-8	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Anthracene	120-12-7	2.40E-06	1.49E-08	1.30E-04	6.51E-08		
Benz(a)anthracene	56-55-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzene	71-43-2	2.10E-03	1.30E-05	1.14E-01	5.69E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	7.43E-09	6.51E-05	3.25E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Chrysene	218-01-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Dichlorobenzene	25321-22-6	1.20E-03	7.43E-06	6.51E-02	3.25E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.86E-08	1.63E-04	8.13E-08		
Fluorene	86-73-7	2.80E-06	1.73E-08	1.52E-04	7.59E-08		
Formaldehyde	50-00-0	7.50E-02	4.64E-04	4.07E+00	2.03E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	1.11E-02	9.76E+01	4.88E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Naphthalene	91-20-3	6.10E-04	3.78E-06	3.31E-02	1.65E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-07	9.22E-04	4.61E-07		
Pyrene	129-00-0	5.00E-06	3.09E-08	2.71E-04	1.36E-07		
Toluene	108-88-3	3.40E-03	2.10E-05	1.84E-01	9.22E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH [4]			7.06E-08	5.86E-04	2.93E-07	2.00E-06	Below

NG Uncontrolled Potential to Emit	

Toxic -Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)[5]		Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04		1.24E-06	1.08E-02	5.42E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03		2.72E-05	2.39E-01	1.19E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05		7.43E-08	6.51E-04	3.25E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03		**6.81E-06**	5.96E-02	2.98E-05	**3.70E-06**	Exceeds
Chromium	7440-47-3	1.40E-03		**8.66E-06**	7.59E-02	3.80E-05	**5.60E-07**	Exceeds
Cobalt	7440-48-4	8.40E-05		5.20E-07	4.55E-03	2.28E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04		5.26E-06	4.61E-02	2.30E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04		2.35E-06	2.06E-02	1.03E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04		1.61E-06	1.41E-02	7.05E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		6.81E-06	5.96E-02	2.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03		1.30E-05	1.14E-01	5.69E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05		1.49E-07	1.30E-03	6.51E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02		1.79E-04	1.57E+00	7.86E-04	6.67E-01	Below

Notes:
[1] Uncontrolled potential emissions are equal to actual emissions.
[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).
[3] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).
[4] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene
[5] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound [6]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	2957.89	1	2957.89
CH_4	0.06	21	1.17
N_2O	0.006	310	1.73
Total	2957.95		2960.79

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:
CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	2957.89
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:
CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0557
N2O = Annual N2O mass emissions in Metric Tons	=	0.00557
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes
[6] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O
GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	6.313
Manufacturer	Kewanee
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	6,313,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	54
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	6.19E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

		NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	Natural Gas Emission Factor ($lb/10^6$ scf)[2]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.047	412	0.21
PM_{10}	7.6	0.047	412	0.21
$PM_{2.5}$	7.6	0.047	412	0.21
Nitrogen Oxides (NOx)	100.0	0.619	5,422	2.71
Sulfur Oxides	0.6	0.004	33	0.02
Carbon Monoxide (CO)	84.0	0.520	4,554	2.28
VOC	5.5	0.034	298	0.15
Lead	0.0005	3.09E-06	0.03	1.36E-05

			NG Uncontrolled Potential to Emit				
Toxics	CAS No.	NG Emission Factor[3] ($lb/10^6$ scf)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	1.49E-07	1.30E-03	6.51E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene	57-97-6	1.60E-05	9.90E-08	8.67E-04	4.34E-07		
Acenaphthene	83-32-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Acenaphthylene	203-96-8	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Anthracene	120-12-7	2.40E-06	1.49E-08	1.30E-04	6.51E-08		
Benz(a)anthracene	56-55-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzene	71-43-2	2.10E-03	1.30E-05	1.14E-01	5.69E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	7.43E-09	6.51E-05	3.25E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Chrysene	218-01-9	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	7.43E-09	6.51E-05	3.25E-08		
Dichlorobenzene	25321-22-6	1.20E-03	7.43E-06	6.51E-02	3.25E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.86E-08	1.63E-04	8.13E-08		
Fluorene	86-73-7	2.80E-06	1.73E-08	1.52E-04	7.59E-08		
Formaldehyde	50-00-0	7.50E-02	4.64E-04	4.07E+00	2.03E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	1.11E-02	9.76E+01	4.88E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	1.11E-08	9.76E-05	4.88E-08		
Naphthalene	91-20-3	6.10E-04	3.78E-06	3.31E-02	1.65E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	1.05E-07	9.22E-04	4.61E-07		
Pyrene	129-00-0	5.00E-06	3.09E-08	2.71E-04	1.36E-07		
Toluene	108-88-3	3.40E-03	2.10E-05	1.84E-01	9.22E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[4]			7.06E-08	5.86E-04	2.93E-07	2.00E-06	Below

NG Uncontrolled Potential to Emit

Toxic -Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)[5]		Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04		1.24E-06	1.08E-02	5.42E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03		2.72E-05	2.39E-01	1.19E-04	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05		7.43E-08	6.51E-04	3.25E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03		**6.81E-06**	5.96E-02	2.98E-05	**3.70E-06**	Exceeds
Chromium	7440-47-3	1.40E-03		**8.66E-06**	7.59E-02	3.80E-05	**5.60E-07**	Exceeds
Cobalt	7440-48-4	8.40E-05		5.20E-07	4.55E-03	2.28E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04		5.26E-06	4.61E-02	2.30E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04		2.35E-06	2.06E-02	1.03E-05	6.70E-02	Below
Mercury	7439-97-6	2.60E-04		1.61E-06	1.41E-02	7.05E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03		6.81E-06	5.96E-02	2.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03		1.30E-05	1.14E-01	5.69E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05		1.49E-07	1.30E-03	6.51E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02		1.79E-04	1.57E+00	7.86E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[4] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[5] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound [6]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	2957.89	1	2957.89
CH_4	0.06	21	1.17
N_2O	0.006	310	1.73
Total	2957.95		2960.79

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF		**NG**
CO2 = Annual CO2 mass emissions in Metric Tons	=	2957.89
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF		
CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0557
N2O = Annual N2O mass emissions in Metric Tons	=	0.00557
Fuel = Volume of fuel used (standard cubic feet)	=	54,217,529
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[6] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	4.2
Manufacturer	Hurst
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	4,200,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	36
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	4.12E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas
Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

			NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	Natural Gas Emission Factor (lb/10^6 scf)[2]	Natural Gas Emission Factor (lb/MMBtu)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.0048	0.020	177	0.09
PM_{10}	7.6	0.0048	0.020	177	0.09
$PM_{2.5}$	7.6	0.0048	0.020	177	0.09
Nitrogen Oxides (NOx)	100.0	0.088	0.370	3,238	1.62
Sulfur Oxides[4]	0.6	0.0016	0.007	58	0.03
Carbon Monoxide (CO)	84.0	0.037	0.155	1,361	0.68
VOC	5.5	0.025	0.105	920	0.46
Lead	0.0005		2.06E-06	0.02	9.02E-06

			NG Uncontrolled Potential to Emit				
Toxics	CAS No.	NG Emission Factor[5] (lb/10^6 scf)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	9.88E-08	8.66E-04	4.33E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	7.41E-09	6.49E-05	3.25E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene		1.60E-05	6.59E-08	5.77E-04	2.89E-07		
Acenaphthene	83-32-9	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Acenaphthylene	203-96-8	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Anthracene	120-12-7	2.40E-06	9.88E-09	8.66E-05	4.33E-08		
Benz(a)anthracene	56-55-3	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Benzene	71-43-2	2.10E-03	8.65E-06	7.57E-02	3.79E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	4.94E-09	4.33E-05	2.16E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	4.94E-09	4.33E-05	2.16E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Chrysene	218-01-9	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	4.94E-09	4.33E-05	2.16E-08		
Dichlorobenzene	25321-22-6	1.20E-03	4.94E-06	4.33E-02	2.16E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.24E-08	1.08E-04	5.41E-08		
Fluorene	86-73-7	2.80E-06	1.15E-08	1.01E-04	5.05E-08		
Formaldehyde	50-00-0	7.50E-02	3.09E-04	2.71E+00	1.35E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	7.41E-03	6.49E+01	3.25E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Naphthalene	91-20-3	6.10E-04	2.51E-06	2.20E-02	1.10E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	7.00E-08	6.13E-04	3.07E-07		
Pyrene	129-00-0	5.00E-06	2.06E-08	1.80E-04	9.02E-08		
Toluene	108-88-3	3.40E-03	1.40E-05	1.23E-01	6.13E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[6]			4.69E-08	3.90E-04	1.95E-07	2.00E-06	Below

			NG Uncontrolled Potential to Emit				
Toxic -Metals	CAS Number	NG Emission Factor[10] (lb/10^6 scf)[7]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	8.24E-07	7.21E-03	3.61E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03	1.81E-05	1.59E-01	7.94E-05	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	4.94E-08	4.33E-04	2.16E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	4.53E-06	3.97E-02	1.98E-05	3.70E-06	Exceeds
Chromium	7440-47-3	1.40E-03	5.76E-06	5.05E-02	2.52E-05	5.60E-07	Exceeds
Cobalt	7440-48-4	8.40E-05	3.46E-07	3.03E-03	1.51E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04	3.50E-06	3.07E-02	1.53E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04	1.56E-06	1.37E-02	6.85E-06	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	1.07E-06	9.38E-03	4.69E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03	4.53E-06	3.97E-02	1.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	8.65E-06	7.57E-02	3.79E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	9.88E-08	8.66E-04	4.33E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02	1.19E-04	1.05E+00	5.23E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Provided by manufacturer

[4] Equation for emission factor provided by manufacturer is 1.05 x % suflur. Assume the use of ULSD (0.0015 percent).

[5] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[6] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[7] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound[8]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	1967.87	1	1967.87
CH_4	0.04	25	0.93
N_2O	0.004	298	1.11
Total	1967.91		1969.90

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	1967.87
Fuel = Volume of fuel used (standard cubic feet)	=	36,070,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0371
N2O = Annual N2O mass emissions in Metric Tons	=	0.00371
Fuel = Volume of fuel used (standard cubic feet)	=	36,070,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[8] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	4.2
Manufacturer	Hurst
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	4,200,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	36
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	4.12E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 18, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

			NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	Natural Gas Emission Factor ($lb/10^6$ scf)[2]	Natural Gas Emission Factor (lb/MMBtu)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.0048	0.020	177	0.09
PM_{10}	7.6	0.0048	0.020	177	0.09
$PM_{2.5}$	7.6	0.0048	0.020	177	0.09
Nitrogen Oxides (NOx)	100.0	0.088	0.370	3,238	1.62
Sulfur Oxides[4]	0.6	0.0016	0.007	58	0.03
Carbon Monoxide (CO)	84.0	0.037	0.155	1,361	0.68
VOC	5.5	0.025	0.105	920	0.46
Lead	0.0005		2.06E-06	0.02	9.02E-08

			NG Uncontrolled Potential to Emit				
Toxics	CAS No.	NG Emission Factor[5] ($lb/10^6$ scf)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	9.88E-08	8.66E-04	4.33E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	7.41E-09	6.49E-05	3.25E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene		1.60E-05	6.59E-08	5.77E-04	2.89E-07		
Acenaphthene	83-32-9	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Acenaphthylene	203-96-8	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Anthracene	120-12-7	2.40E-06	9.88E-09	8.66E-05	4.33E-08		
Benz(a)anthracene	56-55-3	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Benzene	71-43-2	2.10E-03	8.65E-06	7.57E-02	3.79E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	4.94E-09	4.33E-05	2.16E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	4.94E-09	4.33E-05	2.16E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Chrysene	218-01-9	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	4.94E-09	4.33E-05	2.16E-08		
Dichlorobenzene	25321-22-6	1.20E-03	4.94E-06	4.33E-02	2.16E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	1.24E-08	1.08E-04	5.41E-08		
Fluorene	86-73-7	2.80E-06	1.15E-08	1.01E-04	5.05E-08		
Formaldehyde	50-00-0	7.50E-02	3.09E-04	2.71E+00	1.35E-03	5.10E-04	Below
Hexane	110-54-3	1.80E+00	7.41E-03	6.49E+01	3.25E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	7.41E-09	6.49E-05	3.25E-08		
Naphthalene	91-20-3	6.10E-04	2.51E-06	2.20E-02	1.10E-05	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	7.00E-08	6.13E-04	3.07E-07		
Pyrene	129-00-0	5.00E-06	2.06E-08	1.80E-04	9.02E-08		
Toluene	108-88-3	3.40E-03	1.40E-05	1.23E-01	6.13E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[6]			4.69E-08	3.90E-04	1.95E-07	2.00E-06	Below

			NG Uncontrolled Potential to Emit				
Toxic -Metals	CAS Number	NG Emission Factor[10] ($lb/10^6$ scf)[7]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	8.24E-07	7.21E-03	3.61E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03	1.81E-05	1.59E-01	7.94E-05	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	4.94E-08	4.33E-04	2.16E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	4.53E-06	3.97E-02	1.98E-05	3.70E-06	Exceeds
Chromium	7440-47-3	1.40E-03	5.76E-06	5.05E-02	2.52E-05	5.60E-07	Exceeds
Cobalt	7440-48-4	8.40E-05	3.46E-07	3.03E-03	1.51E-06	3.30E-03	Below
Copper	7440-50-8	8.50E-04	3.50E-06	3.07E-02	1.53E-05	6.70E-02	Below
Manganese	7439-96-5	3.80E-04	1.56E-06	1.37E-02	6.85E-06	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	1.07E-06	9.38E-03	4.69E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03	4.53E-06	3.97E-02	1.98E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	8.65E-06	7.57E-02	3.79E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	9.88E-08	8.66E-04	4.33E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02	1.19E-04	1.05E+00	5.23E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Provided by manufacturer

[4] Equation for emission factor provided by manufacturer is 1.05 x % sulfur. Assume the use of ULSD (0.0015 percent).

[5] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[6] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[7] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound[8]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	1967.87	1	1967.87
CH_4	0.04	25	0.93
N_2O	0.004	298	1.11
Total	1967.91		1969.90

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	1967.87
Fuel = Volume of fuel used (standard cubic feet)	=	36,070,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0371
N2O = Annual N2O mass emissions in Metric Tons	=	0.00371
Fuel = Volume of fuel used (standard cubic feet)	=	36,070,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[8] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	2.5
Manufacturer	Luchinvar
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	2,500,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	21
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	2.45E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas
Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

			NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	Natural Gas Emission Factor ($lb/10^6$ scf)[2]	Natural Gas Emission Factor (lb/MMBtu)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.0	0.019	163	0.08
PM_{10}	7.6	0.0	0.019	163	0.08
$PM_{2.5}$	7.6	0.0	0.019	163	0.08
Nitrogen Oxides (NOx)	100.0	0.031	0.078	679	0.34
Sulfur Oxides	0.6	0.0007	0.002	15	0.01
Carbon Monoxide (CO)	84.0	0.01	0.025	219	0.11
VOC	5.5	0.0	0.013	118	0.06
Lead	0.0005		1.23E-06	0.01	5.37E-06

			NG Uncontrolled Potential to Emit				
Toxics	CAS No.	NG Emission Factor[4] ($lb/10^6$ scf)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	5.88E-08	5.15E-04	2.58E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene		1.60E-05	3.92E-08	3.44E-04	1.72E-07		
Acenaphthene	83-32-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Acenaphthylene	203-96-8	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Anthracene	120-12-7	2.40E-06	5.88E-09	5.15E-05	2.58E-08		
Benz(a)anthracene	56-55-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Benzene	71-43-2	2.10E-03	5.15E-06	4.51E-02	2.25E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	2.94E-09	2.58E-05	1.29E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Chrysene	218-01-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Dichlorobenzene	25321-22-6	1.20E-03	2.94E-06	2.58E-02	1.29E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	7.35E-09	6.44E-05	3.22E-08		
Fluorene	86-73-7	2.80E-06	6.86E-09	6.01E-05	3.01E-08		
Formaldehyde	50-00-0	7.50E-02	1.84E-04	1.61E+00	8.05E-04	5.10E-04	Below
Hexane	110-54-3	1.80E+00	4.41E-03	3.86E+01	1.93E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Naphthalene	91-20-3	6.10E-04	1.50E-06	1.31E-02	6.55E-06	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	4.17E-08	3.65E-04	1.83E-07		
Pyrene	129-00-0	5.00E-06	1.23E-08	1.07E-04	5.37E-08		
Toluene	108-88-3	3.40E-03	8.33E-06	7.30E-02	3.65E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[5]			2.79E-08	2.32E-04	1.16E-07	2.00E-06	Below

			NG Uncontrolled Potential to Emit				
Toxic -Metals	CAS Number	NG Emission Factor[10] ($lb/10^6$ scf)[6]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	4.90E-07	4.29E-03	2.15E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03	1.08E-05	9.45E-02	4.72E-05	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	2.94E-08	2.58E-04	1.29E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.70E-06	Below
Chromium	7440-47-3	1.40E-03	3.43E-06	3.01E-02	1.50E-05	5.60E-07	Exceeds
Cobalt	7440-48-4	8.40E-05	2.06E-07	1.80E-03	9.02E-07	3.30E-03	Below
Copper	7440-50-8	8.50E-04	2.08E-06	1.83E-02	9.13E-06	6.70E-02	Below
Manganese	7439-96-5	3.80E-04	9.31E-07	8.16E-03	4.08E-06	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	6.37E-07	5.58E-03	2.79E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	5.15E-06	4.51E-02	2.25E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	5.88E-08	5.15E-04	2.58E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02	7.11E-05	6.23E-01	3.11E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Provided by manufacturer

[4] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[5] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[6] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound[7]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	1171.35	1	1171.35
CH_4	0.02	25	0.55
N_2O	0.002	298	0.66
Total	1171.37		1172.56

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:
CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	1171.35
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:
CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0221
N2O = Annual N2O mass emissions in Metric Tons	=	0.00221
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[7] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	2.5
Manufacturer	Luchinvar
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	2,500,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	21
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	2.45E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

Criteria Pollutant	Natural Gas Emission Factor (lb/10^6 scf)[2]	Natural Gas Emission Factor (lb/MMBtu)[3]	NG Uncontrolled Potential to Emit[1] Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.0	0.019	163	0.08
PM_{10}	7.6	0.0	0.019	163	0.08
$PM_{2.5}$	7.6	0.0	0.019	163	0.08
Nitrogen Oxides (NOx)	100.0	0.031	0.078	679	0.34
Sulfur Oxides	0.6	0.0007	0.002	15	0.01
Carbon Monoxide (CO)	84.0	0.01	0.025	219	0.11
VOC	5.5	0.0	0.013	118	0.06
Lead	0.0005		1.23E-06	0.01	5.37E-06

Toxics	CAS No.	NG Emission Factor[4] (lb/10^6 scf)	NG Uncontrolled Potential to Emit Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	5.88E-08	5.15E-04	2.58E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene		1.60E-05	3.92E-08	3.44E-04	1.72E-07		
Acenaphthene	83-32-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Acenaphthylene	203-96-8	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Anthracene	120-12-7	2.40E-06	5.88E-09	5.15E-05	2.58E-08		
Benz(a)anthracene	56-55-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Benzene	71-43-2	2.10E-03	5.15E-06	4.51E-02	2.25E-05	8.00E-04	Below
Benzo(a)pyrene	50-32-8	1.20E-06	2.94E-09	2.58E-05	1.29E-08	2.00E-06	Below
Benzo(b)fluoranthene	205-99-2	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Benzo(g,h,i)perylene	191-24-2	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Chrysene	218-01-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Dichlorobenzene	25321-22-6	1.20E-03	2.94E-06	2.58E-02	1.29E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	7.35E-09	6.44E-05	3.22E-08		
Fluorene	86-73-7	2.80E-06	6.86E-09	6.01E-05	3.01E-08		
Formaldehyde	50-00-0	7.50E-02	1.84E-04	1.61E+00	8.05E-04	5.10E-04	Below
Hexane	110-54-3	1.80E+00	4.41E-03	3.86E+01	1.93E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Naphthalene	91-20-3	6.10E-04	1.50E-06	1.31E-02	6.55E-06	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	4.17E-08	3.65E-04	1.83E-07		
Pyrene	129-00-0	5.00E-06	1.23E-08	1.07E-04	5.37E-08		
Toluene	108-88-3	3.40E-03	8.33E-06	7.30E-02	3.65E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH[5]			2.79E-08	2.32E-04	1.16E-07	2.00E-06	Below

Toxic -Metals	CAS Number	NG Emission Factor[10] (lb/10^6 scf)[6]	NG Uncontrolled Potential to Emit Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
Arsenic	7440-38-2	2.00E-04	4.90E-07	4.29E-03	2.15E-06	1.50E-06	Below
Barium	7440-39-3	4.40E-03	1.08E-05	9.45E-02	4.72E-05	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	2.94E-08	2.58E-04	1.29E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.70E-06	Below
Chromium	7440-47-3	1.40E-03	3.43E-06	3.01E-02	1.50E-05	5.60E-07	Exceeds
Cobalt	7440-48-4	8.40E-05	2.06E-07	1.80E-03	9.02E-07	3.30E-03	Below
Copper	7440-50-8	8.50E-04	2.08E-06	1.83E-02	9.13E-06	6.70E-02	Below
Manganese	7439-96-5	3.80E-04	9.31E-07	8.16E-03	4.08E-06	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	6.37E-07	5.58E-03	2.79E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	5.15E-06	4.51E-02	2.25E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	5.88E-08	5.15E-04	2.58E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02	7.11E-05	6.23E-01	3.11E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Provided by manufacturer

[4] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[5] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[6] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound[7]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	1171.35	1	1171.35
CH_4	0.02	25	0.55
N_2O	0.002	298	0.66
Total	1171.37		1172.56

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	1171.35
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0221
N2O = Annual N2O mass emissions in Metric Tons	=	0.00221
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[7] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

St. Lukes Regional Medical Center - Meridian (Boilers burning Natural Gas)

Boiler (MMBtu/hr)	2.5
Manufacturer	Luchinvar
Fuel Type (Primary)	Natural Gas
Maximum Heat Input Rating (Btu/hr)	2,500,000
Natural Gas*	
Maximum Operation Limit (hrs/yr)	8,760
Maximum Firing Rate (MMcf/yr)	21
Heat Value of NG (Btu/scf)	1,020
Maximum Firing Rate (MMcf/hr)	2.45E-03

* Note: Assumed 8760 annual hours of operation at 100% natural gas

Stack exhaust temperature and flow rate were not available for this boiler. Kewanee is no longer in business and online specifications are incomplete. St Luke's service provider, West Tech Boilers, was contacted on July 16, 2012 but did not have the exit stack temperature or exit stack flow rate data. Therefore, stack flow rate and temperature were based on engineering judgement for a similar sized boiler operating exclusively on natural gas. Stack parameters were derived from the Conagra Foods PTC dated May 4, 2012 for a B-Eagle 5.0 MMBtu/hr boiler.

			NG Uncontrolled Potential to Emit[1]		
Criteria Pollutant	Natural Gas Emission Factor (lb/10^6 scf)[2]	Natural Gas Emission Factor (lb/MMBtu)[3]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)
Total Particulate Matter (PM)	7.6	0.0	0.019	163	0.08
PM_{10}	7.6	0.0	0.019	163	0.08
$PM_{2.5}$	7.6	0.0	0.019	163	0.08
Nitrogen Oxides (NOx)	100.0	0.031	0.078	679	0.34
Sulfur Oxides	0.6	0.0007	0.002	15	0.01
Carbon Monoxide (CO)	84.0	0.01	0.025	219	0.11
VOC	5.5	0.0	0.013	118	0.06
Lead	0.0005		1.23E-06	0.01	5.37E-06

			NG Uncontrolled Potential to Emit				
Toxics	CAS No.	NG Emission Factor [4] (lb/10^6 scf)	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
2-Methylnaphthalene	91-57-6	2.40E-05	5.88E-08	5.15E-04	2.58E-07		
3-Methylchloranthrene	56-49-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08	2.50E-06	Below
7,12-Dimethylbenz(a)anthracene		1.60E-05	3.92E-08	3.44E-04	1.72E-07		
Acenaphthene	83-32-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Acenaphthylene	203-96-8	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Anthracene	120-12-7	2.40E-06	5.88E-09	5.15E-05	2.58E-08		
Benz(a)anthracene	56-55-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
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Benzo(g,h,i)perylene	191-24-2	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Benzo(k)fluoranthene	205-82-3	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Chrysene	218-01-9	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Dibenz(a,h)anthracene	53.70-3	1.20E-06	2.94E-09	2.58E-05	1.29E-08		
Dichlorobenzene	25321-22-6	1.20E-03	2.94E-06	2.58E-02	1.29E-05		
Ethylbenzene	100-41-4		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
Fluoranthene	206-44-0	3.00E-06	7.35E-09	6.44E-05	3.22E-08		
Fluorene	86-73-7	2.80E-06	6.86E-09	6.01E-05	3.01E-08		
Formaldehyde	50-00-0	7.50E-02	1.84E-04	1.61E+00	8.05E-04	5.10E-04	Below
Hexane	110-54-3	1.80E+00	4.41E-03	3.86E+01	1.93E-02	1.20E+01	Below
Indeno(1,2,3-cd)pyrene	193-39-5	1.80E-06	4.41E-09	3.86E-05	1.93E-08		
Naphthalene	91-20-3	6.10E-04	1.50E-06	1.31E-02	6.55E-06	9.10E-05	Below
Phenanthrene	85-01-8	1.70E-05	4.17E-08	3.65E-04	1.83E-07		
Pyrene	129-00-0	5.00E-06	1.23E-08	1.07E-04	5.37E-08		
Toluene	108-88-3	3.40E-03	8.33E-06	7.30E-02	3.65E-05	2.50E+01	Below
o-Xylene	1330-20-7		0.00E+00	0.00E+00	0.00E+00	2.90E+01	Below
PAH [5]			2.79E-08	2.32E-04	1.16E-07	2.00E-06	Below

			NG Uncontrolled Potential to Emit				
Toxic -Metals	CAS Number	NG Emission Factor [10] (lb/10^6 scf)[6]	Emission Rate (lb/hr)	Emission Rate (lb/yr)	Emission Rate (ton/yr)	IDAPA 58.01.01.585/586 - EL (lb/hr)	PTE Emission Rate vs. EL
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Barium	7440-39-3	4.40E-03	1.08E-05	9.45E-02	4.72E-05	3.30E-02	Below
Beryllium	7440-41-7	1.20E-05	2.94E-08	2.58E-04	1.29E-07	2.80E-05	Below
Cadmium	7440-43-9	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.70E-06	Below
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Cobalt	7440-48-4	8.40E-05	2.06E-07	1.80E-03	9.02E-07	3.30E-03	Below
Copper	7440-50-8	8.50E-04	2.08E-06	1.83E-02	9.13E-06	6.70E-02	Below
Manganese	7439-96-5	3.80E-04	9.31E-07	8.16E-03	4.08E-06	6.70E-02	Below
Mercury	7439-97-6	2.60E-04	6.37E-07	5.58E-03	2.79E-06	1.00E-03	Below
Molybdenum	7439-98-7	1.10E-03	2.70E-06	2.36E-02	1.18E-05	3.33E-01	Below
Nickel	7440-02-0	2.10E-03	5.15E-06	4.51E-02	2.25E-05	2.75E-05	Below
Selenium	7782-49-2	2.40E-05	5.88E-08	5.15E-04	2.58E-07	1.30E-02	Below
Zinc	7440-66-6	2.90E-02	7.11E-05	6.23E-01	3.11E-04	6.67E-01	Below

Notes:

[1] Uncontrolled potential emissions are equal to actual emissions.

[2] Criteria Pollutants, small uncontrolled boilers (EPA AP-42, Section 1.4 Natural Gas Combustion, Tables 1.4-1 and 1.4-2).

[3] Provided by manufacturer

[4] Toxic Air Pollutants (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-3).

[5] Polynuclear aromatic hydrocarbons is the sum of benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, and benzo(a)pyrene

[6] Metals from Natural Gas Combustion (EPA AP-42, Section 1.4 Natural Gas Combustion, Table 1.4-4).

GHG Emissions Compound [7]	NG Emissions (metric tons)	GWP	NG CO2e
CO_2	1171.35	1	1171.35
CH_4	0.02	25	0.55
N_2O	0.002	298	0.66
Total	1171.37		1172.56

For CO2, Use Equation C-1 from 40 CFR 98 Subpart C:

CO2 = 1x10-3 x Fuel x HHV x EF

		NG
CO2 = Annual CO2 mass emissions in Metric Tons	=	1171.35
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	0.001028
EFCO2 = Emission factor (kg/mmBTU)	=	53.07

For CH4 and N2O, Use Equation C-8 from 40 CFR 98 Subpart C:

CH4, N2O = 1x10-3 x Fuel x HHV x EF

CH4 = Annual CH4 mass emissions in Metric Tons	=	0.0221
N2O = Annual N2O mass emissions in Metric Tons	=	0.00221
Fuel = Volume of fuel used (standard cubic feet)	=	21,470,588
Fuel = Volume of fuel used (gallons)	=	
HHV = High Heat Value from Table C-1 (mmBTU/short ton)	=	1.03E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-03
EFCH4 = Emission factor (kg/mmBTU)	=	1.00E-04

Notes

[7] 40 CFR 98.32 - For stationary fuel combustion sources only, report CO2, CH4, and N2O

GWP = Global Warming Potential - 40 CFR 98 Subpart A, Table A-1

APPENDIX B – AMBIENT AIR QUALITY IMPACT ANALYSES

MEMORANDUM

DATE: May 5, 2015

TO: Harbi Elshafei, Permit Writer, Air Program

FROM: Darrin Mehr, Air Quality Analyst, Air Program

PROJECT: P-2012.0057 PROJ 61323 PTC Application for the St Luke's Health Services, Permit to Construct for modification to the St. Luke's Meridian Medical Center

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

1.0 Summary

St. Luke's Health Services (SLHS) submitted a Permit to Construct (PTC) application for modifications to their St. Luke's Meridian Medical Center (SLMMC), located in Meridian, Idaho. Project-specific air quality impact analyses involving atmospheric dispersion modeling of estimated emissions associated with the proposed modification were submitted to DEQ and performed by DEQ to demonstrate that the proposed modification 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]). CH2M HILL, Inc. (CH2M), SLHS's permitting consultant, submitted the analyses and applicable information and data enabling DEQ to evaluate potential impacts to ambient air.

CH2M performed project-specific air quality impact analyses to demonstrate compliance of the proposed project with air quality standards. The project consisted of a PTC modification for the following:

- Hurst Boiler 1 and Hurst Boiler 2 will maintain the existing stack height of 20 feet in place of the previous PTC requirement to increase stack release of 35 feet above grade;
- Emergency electrical generator engines 1 and 2 will have increased hourly distillate fuel oil throughput limits for testing and maintenance operation;
- A new surgery center on the Meridian campus with 5 boilers was included in the modeling analysis and PTC modification. The building and boilers have been constructed and are operational.
- The modeling appropriately reflects Boiler 3, Boiler 4, Boiler 5, and Boiler 6 venting to a common stack. All boiler stacks (Boilers 1-11) are equipped with rain caps.

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 proposed facility or modification will not cause or significantly contribute to a violation of any applicable air quality standard. This review did not evaluate compliance with other rules or analyses that do not pertain to the air impact analyses. This review also did not evaluate the accuracy of emissions estimates. Evaluation of emissions estimates is the responsibility of the permit writer.

The submitted modeling information and air quality impact analyses: 1) utilized appropriate methods and models; 2) was conducted using reasonably accurate or conservative model parameters and input data (review of emissions estimates was not within the scope of this DEQ modeling review); 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 modification as modeled were below Significant Impact Levels (SILs) or other applicable regulatory thresholds; or b) that predicted pollutant concentrations from emissions associated with the modification 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 modification has a significant impact; 5) showed that Toxic Air Pollutant (TAP) emissions increases associated with the modification 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**
Boiler 1 and Boiler 2 • Boiler 1 and Boiler 2 were modeled assuming firing at rated capacity on ultra-low sulfur diesel (ULSD) distillate fuel oil for 4 consecutive hours every other month between the hours of 7 am and 6 pm. During other times the boilers will operate exclusively on natural gas. • Boilers 1 and 2 may not operate concurrently except where one boiler is operating on natural gas and the other boiler is being operated on ULSD fuel oil for testing purposes. • Boiler 1 or Boiler 2 may not be tested on ULSD fuel oil concurrently with testing of either Generator 1 or Generator 2.	Assumptions used in the modeling demonstration that limit operations of emissions units were key components in establishing compliance with the 1-hour NO_2 NAAQS.
Stack Heights for Boilers 1 and 2 An increased stack height was needed to enable compliance to be demonstrated for the 1-hour NO_2 NAAQS in the facility's April 2013 PTC modification. This project requested that the permit condition requiring Boiler 1 and 2 stack release heights from 20 feet to 35 feet be removed from the PTC.	Compliance with TAPs and NAAQS was demonstrated using release heights of 20 feet above grade.
Generators 1 and 2 Testing • Emergency generators are tested once each month for 1 hour between 7 am and 6 pm. • Annual hours of operation for testing and maintenance operation were established as 100 hours per year. • Generator 1 and Generator 2 were not modeled reflecting concurrent operation. • Emission rates for Generator 1 were modeled at 75% of rated load. Allowable fuel usage increased from 30.3 gallons per hour (gph) to 36.3 gph. • Emission rates for Generator 2 were modeled at 80% of rated load for testing and maintenance operation. Allowable fuel usage increased from 49 gph to 100.6 gph.	Assumptions used in the modeling demonstration that limit operations of emissions units were key components in establishing compliance with the 1-hour NO_2 NAAQS. NAAQS compliance has not been demonstrated for more frequent testing or testing outside of the specified time or for concurrent testing or maintenance operations. Modeled emission rates were below rates reflecting maximum rated capacities. These limitations and requirements apply during testing and maintenance operation and do not apply to periods of emergency operation.
Generator 2 Exclusion Zone A special ambient air boundary that increased the region exempt from ambient air surrounding the central physical plant building (model ID CENTPLAN) that houses Boiler 1, Boiler 2, and Generator 2.	A temporary physical barrier was used as a temporary ambient air boundary around the central physical plant building, and the public sidewalks adjacent to the building. This area was referred to by St. Luke's as the "Exclusion Zone" during testing of Generator 2. The Exclusion Zone was a critical component for the facility to demonstrate compliance with the 1-hour NO_2 NAAQS.
Fuel Oil Sulfur Content Ultra low sulfur distillate (USLD) fuel will be used in both generators.	USLD fuel limits the quantity of SO_2 that the project will emit and is the basis for not requiring a determination of compliance with the 1-hour SO_2 significant contribution levels and NAAQS.
Surgery Center Boilers Boilers 7 through 11were modeled with emission rates for natural gas combustion only.	Boilers 7-11 were not modeled with dual-fuel capability.

The proposed modification involves the following: 1) increasing load capacity for Generators 1 and 2; 2) permitting of five natural gas boilers at the new Surgery Center on the SLMMC campus that were previously unpermitted; 3) correctly reflect the capped stack releases for all boilers; 4) maintain all testing capabilities for Generators 1 and 2 and Boilers1 and 2; 5) remove the PTC requirement to increase stack release heights for Boilers 1 and 2 from 20 feet above grade to 35 feet above grade; and, 6) increase load testing capacity for Generators 1 and 2.

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. The submitted information and analyses demonstrated to the satisfaction of the Department that operation of the proposed facility or modification will not cause or significantly contribute to a violation of any ambient air quality standard, provided the key conditions in Table 1 are representative of facility design capacity or operations as limited by a federally enforceable permit condition.

The following is the project history for modeling:

- December 5, 2013: DEQ received a modeling protocol for this project via email.
- January 21, 2014: DEQ issued a modeling protocol approval letter to CH2M and SLMMC via email.
- January 24, 2014: DEQ provided CH2M with $PM_{2.5}$ and PM_{10} ambient background values.
- January 30, 2014: PTC modification application was received by DEQ.
- June 14, 2014: The application was declared incomplete. Exhaust parameter assumptions concerning raincaps, locations of stacks, and a new nearby building on the SLMMC campus were critical issues for the modeling demonstration.
- July 15, 2014: DEQ received a response to the incompleteness letter. The submittal was referred to as an addendum and contained revised modeling files.
- August 14, 2014: The application was determined complete by DEQ.
- September 9, 2014: DEQ performed a conservative sensitivity analysis to verify annual TAPs compliance for operation of either Boiler 1 or Boiler 2 because only Boiler 1 impacts were presented in the July 15, 2014 modeling demonstration.
- October 7, 2014: DEQ requested that CH2M evaluate whether additional restrictions to emission rates were inadvertently applied to the PM_{10} and $PM_{2.5}$ modeled emission rates for the two emergency generator engines, which underestimated emissions for the impact analyses.
- October 15, 2014 SLMMC submitted revised PM_{10} and $PM_{2.5}$ modeling analyses and a revised modeling memo addressing PM_{10} and $PM_{2.5}$compliance and an updated operating restrictions request for the emergency generators.
- April 8, 2015: DEQ received an email submittal from CH2M, on behalf of SLMMC, revising the October, 2014 submittal's emergency generator operating conditions.

2.0 Background Information

2.1 Applicable Air Quality Impact Limits and Modeling Requirements

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

2.1.1 Area Classification

The proposed SLMMC project is a proposed modification to the existing SLMMC stationary facility. The facility is located in Meridian, Idaho, in northern Ada County. The area is designated as attainment or unclassifiable for all pollutants. Northern Ada County operates under limited PM_{10} and CO maintenance plans.

2.1.2 Modeling Applicability for Criteria Pollutants

Idaho Air Rules Section 203.02 state that a PTC cannot be issued unless the application demonstrates to the satisfaction of DEQ that the new source or modification will not cause or significantly contribute to a NAAQS violation. Atmospheric dispersion modeling is used to evaluate the potential impact of a proposed project to ambient air and demonstrate NAAQS compliance. However, if the emissions associated with a project are very small, project-specific modeling analyses may not be necessary.

If the emissions increase associated with a project are below modeling applicability thresholds established in the *Idaho Air Quality Modeling Guideline* (State of Idaho Guideline for Performing Air Quality Impact Analyses. Doc. ID AQ-011 {rev. 2, July 2011} http://www.deq.idaho.gov/media/1029/modeling-guideline.pdf), then a project-specific analysis is not required. Modeling applicability emissions thresholds were developed by DEQ based on modeling of a hypothetical source designed to reasonably assure that impacts are below the applicable Significant Impact Level (SIL). DEQ has established two threshold levels: Level 1 thresholds are unconditional thresholds, requiring no approval for use by DEQ; Level 2 thresholds are conditional upon DEQ approval, which depends on evaluation of the project and the site, including emissions quantities, stack parameters, number of sources emissions are distributed amongst, distance between the sources and the ambient air boundary, and the presence of sensitive receptors near the ambient air boundary.

2.1.3 Significant and Cumulative NAAQS Impact Analyses

If maximum modeled pollutant impacts to ambient air from emissions sources associated with a new facility or the emissions increase associated with a modification exceed the SILs of 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, then a cumulative NAAQS impact analysis is necessary to demonstrate compliance with NAAQS and Idaho Air Rules Section 203.02. A cumulative NAAQS impact analysis may also be required for permit revisions driven by compliance/enforcement actions, any correction of emissions limits or other operational parameters that may affect pollutant impacts to ambient air, or other cases where DEQ believes NAAQS may be threatened by the emissions associated with the facility or proposed project.

A cumulative NAAQS impact analysis for attainment area pollutants involves assessing ambient impacts, according to established DEQ/EPA guidance, policies, and procedures, from applicable facility-wide emissions and emissions from any nearby co-contributing sources. A DEQ-approved background concentration value is then added to the modeled result that is appropriate for the criteria pollutant/averaging-time at the facility location and the area of significant impact. The resulting pollutant concentrations in ambient air are then compared to the NAAQS listed in Table 2. Table 2 also lists SILs and specifies the modeled design value that must be used for comparison to the NAAQS. NAAQS compliance is evaluated on a receptor-by-receptor basis.

If the cumulative NAAQS impact analysis indicates a violation of the standard, the permit may not be issued if the permitted facility or modification 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, there may not be a significant contribution to a violation if impacts are below the SIL at the specific receptor showing the violation during time periods when there is a modeled violation.

Compliance with Idaho Air Rules Section 203.02 is 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 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.

Facility-wide modeling demonstrations were also requested in the modeling protocol approval based on the margin of compliance with the NAAQS. This position is supported further by the alterations to the exhaust parameters of all boiler stacks to account for rain-capped emission points.

Table 2. APPLICABLE REGULATORY LIMITS				
Pollutant	**Averaging Period**	**Significant Impact Levels[a] (μg/m³)[b]**	**Regulatory Limit[c] (μg/m³)**	**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 μg/m³)	75 ppb[p] (196 μg/m³)	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 μg/m³)	100 ppb[s] (188 μg/m³)	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. Rolling 3-month 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.

2.1.4 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.

2.2 Background Concentrations

Background concentrations are used in the cumulative NAAQS impact analyses to account for impacts from sources not explicitly modeled. Background concentrations were needed for 24-hour PM_{10}, 24-hour $PM_{2.5}$, and 1-hour NO_2 standards based on emission rates presented at the time of modeling protocol review. DEQ also provided the annual $PM_{2.5}$ background value. Project-specific modeling analyses were not needed for other criteria pollutants because emissions increases associated with the proposed project were below established DEQ modeling applicability thresholds. Revised emission estimates were presented in the final emission inventory spreadsheet submitted by CH2M, on behalf of SLMMC on July 10, 2014. These emission rates demonstrate annual $PM_{2.5}$, 1-hour, 3-hour, 24-hour, annual SO_2 were below Level I modeling thresholds.

As discussed in greater detail in Section 3.2 of this memorandum, the emission inventory indicated that the project's annual $PM_{2.5}$ emission increase was 0.06 T/yr, which is well below the Level I modeling threshold of 0.35 T/yr. Modeling to demonstrate compliance with the annual $PM_{2.5}$ NAAQS was not required for this project. The emission inventory presented a 0.2 T/yr reduction in annual NOx emissions. Modeling was not required for the annual NO_2 NAAQS.

Table 3 provides $PM_{2.5}$ background concentrations. These levels were based on air monitoring data collected at the SLMMC site by DEQ during 2010 through 2013. DEQ relied on the NW AIRQUEST lookup tool for the 24-hour PM_{10} background value. No co-contributing sources were identified by DEQ or CH2M for this project.

Table 3. AMBIENT BACKGROUND CONCENTRATIONS		
Pollutant	**Averaging Period**	**Background Concentration ($\mu g/m^3$)[a]**
PM_{10}	24-hour	88[b]
$PM_{2.5}$	24-hour	27.3[c]
	Annual	6.74[d]

a. Micrograms per cubic meter.
b. Northwest AirQuest (NW AIRQUEST) ambient background lookup tool, January 2014 lookup date, extreme values removed. See http://lar.wsu.edu/nw-airquest/lookup.html.
c. 3-year mean of 98th percentile values of 2010, 2011, and 2012 monitoring data from the Meridian site.
d. 3-year mean of 2010, 2011, 2013 Meridian data.

Background concentrations for 1-hour NO_2 were based on monitoring data collected at the SLMMC site by DEQ during January 2009 through January 2011. A separate NO_2 background value was used for each hour of the day, using the 98th percentile value of monitoring data for each hour of the day. Hourly 1-hour NO_2 background concentrations are given in Table 4.

Table 4. BACKGROUND 1-HOUR NO_2 CONCENTRATIONS					
Hour Ending	**Concentration ($\mu g/m^3$)[a]**	**Hour Ending**	**Concentration ($\mu g/m^3$)[a]**	**Hour Ending**	**Concentration ($\mu g/m^3$)[a]**
1	56.38	9	60.16	17	41.36
2	48.88	10	52.50	18	58.81
3	48.88	11	46.30	19	65.50
4	47.41	12	37.60	20	69.56
5	50.42	13	33.84	21	80.80
6	54.52	14	33.84	22	82.23
7	58.28	15	33.84	23	75.20
8	58.28	16	35.64	24	64.48

a. micrograms per cubic meter.

3.0 Modeling Impact Assessment

3.1 Modeling Methodology

This section describes the modeling methods used by the applicant's consultant, CH2M, to demonstrate preconstruction compliance with applicable air quality standards.

3.1.1 Overview of Analyses

CH2M and DEQ performed project-specific air impact analyses that were determined by DEQ to be reasonably representative of the proposed modification of the SLMMC. Results of the submitted analyses combined with DEQ's verification analyses demonstrated 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 5 provides a brief description of parameters used in the modeling analyses.

Table 5. MODELING PARAMETERS		
Parameter	**Description/Values**	**Documentation/Addition Description**
General Facility Location	Meridian	The area is an attainment or unclassified area for all criteria pollutants.
Model	AERMOD	AERMOD with the PRIME downwash algorithm, version 14134. Beta algorithms for modeling horizontal and capped release points were used for this project.
Meteorological Data	Boise	2008-2012. See Section 3.1.6 of this memorandum.
Terrain	Considered	Receptor, building, and emissions source elevations were determined using a USGS 1 arc second National Elevation Dataset (NED) file.
Building Downwash	Considered	Plume downwash was considered for the structures associated with the facility.
Receptor Grid	Grid 1	8.5-meter spacing on building walls. Ambient air exists immediately exterior to the buildings.
	Grid 2	10-meter spacing in a 370 meter (x) by 430 meter (y) grid centered on the facility.
	Grid 3	100-meter spacing in a 2,300 meter (x) by 2,300 meter (y) grid centered on Grid 2.
	Grid 4	500-meter spacing in a 10,500 meter (x) by 10,500 meter (y) grid centered on Grid 3.

3.1.2 Modeling Protocol and Methodology

A modeling protocol was submitted to DEQ on December 5, 2013, prior to submittal of the application. The protocol was submitted by CH2M on and DEQ provided an electronic protocol approval letter on January 21, 2014. On January 22, 2014, CH2M submitted an additional email concerning the use of a special temporary ambient air boundary that will only be in place during periods of testing and maintenance operation of Generator 2. DEQ accepted the proposal in a January 23, 2014 email. DEQ provided $PM_{2.5}$ and PM_{10} ambient background concentrations in an email to CH2M dated January 24, 2014.

At CH2M's request, DEQ provided CH2M with two AERMOD-ready hourly NOx emission rate files for two independent operating scenarios of Boilers 1 and 2 with random intermittent operations of other sources on ultra-low sulfur distillate (ULSD). The emission rate files supersede the emission rates listed in the model setup. In the first file, Boiler 1 operated continuously as a primary natural gas-fired boiler, Boiler 2 was shut down except for 4 hours testing on ULSD fuel oil once every other month for four consecutive hours between the hours of 7 am and 6 pm. Generators 1 and 2 were each set up as operating independently for one hour during the 7 am to 6 pm period once per month. Boilers 3 through 11 were not affected by the DEQ-generated emission rate file. This file also included an 8-consecutive-hour test period once per year between the hours of 7 am to 6 pm for Generators 1 and 2 (this once-annual test was later dropped by CH2M and SLMMC but the 1-hour NO_2 NAAQS modeling was not revised). The second NOx emission rate file was set up in the same manner as the first except with Boiler 2 operating continuously on natural gas and Boiler 1 shut down except for the random 4-hour test once every other month. All other assumptions were applied to the second emission rate file.

Modeling of the testing emissions from the emergency generators was recommended by DEQ for the cumulative impact analysis. DEQ generated an operational schedule consistent with the actual testing schedule proposed by the applicant and CH2M. Specific hours during which testing occurs were randomly selected from the stated potential schedule of once per month and an annual 8-hour test. A 5-year emissions input file for AERMOD was then constructed using the results from randomly generated operational hours, with an emissions value of 0.0 pounds/hour for non-testing hours. The request for the annual 8-hour load test was dropped at CH2M's request received by DEQ on October 14, 2014. Compliance with the 1-hour NO_2 NAAQS was also complicated by the emissions from Boiler 1 and

Boiler 2, especially when combusting diesel fuel. SLHS only intermittently operates the boilers on diesel to test the system for backup capabilities. They requested the ability to use diesel for 4.0 consecutive hours of testing of each boiler every two months, alternating monthly between Boiler 1 and Boiler 2. Concurrent testing is not performed. This testing schedule was included in the DEQ-generated NOx emission rate files.

A project-specific air impact analysis was performed for 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10}. The total increase in emissions associated with the project (summing only emissions changes from sources showing increased emissions and not considering any emissions reductions at sources) for other criteria pollutants were below DEQ-established Level 1 Modeling Thresholds provided in the *Idaho Air Quality Modeling Guideline,* or were above Level I modeling thresholds but less than Level II modeling thresholds, and were not required by DEQ to be modeled for this project.

NO_2 impacts were modeled using a Tier 3 analysis that considered NO/NO_2 atmospheric chemistry. Section 3.1.5 describes the Tier 3 analysis and the model parameters used.

The modeling protocol approval letter required a cumulative impact analysis for all pollutants modeled. SLMMC performed facility-wide NAAQS analyses for pollutants and averaging periods exceeding modeling thresholds.

All eleven boilers vent to stacks that are equipped with rain caps instead of having releases with vertical and uninterrupted flow for these point sources as presented in past modeling demonstrations, this project's modeling protocol, and DEQ's modeling protocol approval. DEQ approved the use of Beta algorithms for capped and horizontal sources in the AERMOD runs in DEQ's June 13, 2014 incompleteness determination letter. The use of the Beta algorithms is appropriate considering the overwhelming majority of sources are capped. Only the generators have releases with vertical and uninterrupted flow from the stacks during operation.

Project-specific modeling was generally conducted using data and methods described in the protocol and in the *Idaho Air Quality Modeling Guideline*.

3.1.3 Evaluation of Ozone Impacts

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. Emissions of VOCs and NOx from the proposed modification were evaluated for their potential to cause a violation of the 8-hour O_3 NAAQS.

DEQ conservatively reviewed facility-wide short-term VOCs and NOx emissions, expressed as ton/year by assuming continuous operation. This resulted in calculated emissions rates of 6 ton/year VOC and 26 ton/year NOx. Short-term emissions from the testing of emergency generators were not considered because this modification resulted in a decrease in allowable/potential emissions from the engines and these sources are only intermittently operated.

The following is a simplified summary of the atmospheric chemistry in a VOC-rich atmosphere:

$$NO_2 + h\upsilon \rightarrow NO + O$$
$$O + O_2 \rightarrow O_3$$
$$O_3 + NO \rightarrow NO_2 + O_2$$
$$HO_2 + NO \rightarrow NO_2 + OH$$

Atmospheric dispersion models used in stationary source air permitting analyses (see Section 3.1.4) cannot be used to accurately 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. DEQ has used CMAQ to estimate O_3 concentrations for the Treasure Valley and evaluate potential O_3 control strategies. Use of the CMAQ model is very resource intensive and DEQ asserts that routinely performing a CMAQ analysis for a particular permit application is not a reasonable requirement for air quality permitting, especially for minor source permitting.

DEQ has not typically required minor sources to evaluate potential O_3 impacts as a part of the stationary source air permitting process. This is consistent with 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."*

The VOC and NOx emissions from the SLMMC modification are well below the suggested 100 ton/year threshold to trigger a more extensive O_3 analysis.

3.1.4 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 for the modeling analyses to evaluate impacts of the facility. The permittee demonstrated compliance with applicable NAAQS using the non-regulatory Beta algorithms in AERMOD for rain-capped sources.

NO_2 1-hour impacts are assessed using a tiered approach to account for $NO/NO_2/O_3$ chemistry. Tier 1 assumes full conversion of NO to NO_2. Tier 2 assumes a 0.80 default ambient ratio of NO_2/NOx. Tier 3 accounts for more refined assessment of the NO to NO_2 conversion, and a supplemental modeling program can be used with AERMOD to better account for $NO/NO_2/O_3$ atmospheric chemistry. Either the Plume Volume Molar Ratio Method (PVMRM) or the Ozone Limiting Method (OLM) can be specified within the AERMOD input file. As stated in EPA guidance (Memorandum: from Tyler Fox, Leader, Air Quality Modeling Group, C439-01, Office of Air Quality Planning and Standards, USEPA; to Regional Air Division Directors. *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard.* March 01, 2011), EPA has not indicated a preference of one option over the other (PVMRM vs OLM). Therefore, CH2M was allowed to use the option of their choice and elected to use PVMRM. Section 3.1.5 provides a description of parameters and data used for PVMRM.

3.1.5 Data and Parameters used for Modeling 1-Hour NO_2 with PVMRM

PVMRM was used with AERMOD to provide a more refined estimate of 1-hour NO_2 concentrations at specific receptors. Table 6 lists the data and parameters used for PVMRM. Hourly O_3 data were used in PVMRM to estimate the conversion of NO to NO_2. O_3 hourly monitoring data were collected from the SLMMC site. The O_3 data were collected during periods when O_3 is expected to be at its highest levels during the year - generally starting in April or May and extending through September. The data analyzed included: July 27, 2007 – September 30, 2007; May 1 2008 – September 30, 2008; and May 1, 2009 – September 30, 2011.

Monitoring data were analyzed to generate single hourly values for each of the 24 hourly periods within a day. Data were sorted by hour and then the upper 99^{th} percentile was calculated for each hour of the day across all days. For each hour modeled, a background O_3 value equal to the 99^{th} percentile was used as input to PVMRM. This method is reasonably conservative because it does not account for seasonal variation in O_3 concentrations and the data were collected during the time of year when maximum ozone concentrations are expected.

Table 6 lists hourly O_3 concentrations used in PVMRM for the 1-hour NO_2 impact analyses.

Table 6. BACKGROUND OZONE CONCENTRATIONS

Hour	Concentration (ppb)[a]	Hour	Concentration (ppb)[a]	Hour	Concentration (ppb)[a]
1	46.25	9	42.09	17	68.78
2	45.40	10	47.90	18	66.04
3	44.40	11	54.60	19	61.28
4	42.96	12	60.00	20	56.20
5	40.16	13	63.26	21	50.86
6	39.49	14	70.89	22	47.00
7	36.20	15	70.95	23	48.71
8	38.26	16	69.50	24	47.60

a. parts per billion by volume.

An NO_2/NOx ratio for NOx emissions is also used in PVMRM. The values used in this project's analyses are listed in Table 7. The NO_2/NOx ratio for the generator engines and Boilers 1 and 2 for this project were determined by CH2M based on data obtained from the In-Stack NO_2/NOx Ratio (ISR) Alpha Database posted on EPA's Support Center for Regulatory Atmospheric Modeling (SCRAM) webpage (http://www.epa.gov/ttn/scram/no2_alpha_isr_database.htm). An in-stack ratio of 0.15 was used by CH2M for both generator engines. CH2M used the alpha database for certain emissions units. The alpha database is a separate database from the rather than the final database and contains entries that have not been incorporated in the final database.

A NO_2/NOx ratio of 0.10 was used as the in-stack NO_2/NOx ratio for Boilers 1 and 2. This value was generated by CH2M based on a select number of entries in the EPA SCRAM webpage database on In-stack NO_2/NOx ratios. Refer to CH2M's modeling protocol for their discussion of these values. Boilers 3-6 at the main St. Luke's building and Boilers 7-11 at the new Surgery Center building used the EPA guidance default ratio of 0.5.

Table 7. PARAMETERS AND DATA FOR PVMRM		
Parameter	**Value**	**Source/Comments**
NO_2/NOx ratio for In-Stack Emissions	• 0.15 for GEN1 (the 1750 kW emergency generator) and GEN2 (the 800 kW emergency generator), • 0.10 for the BOILER1 and BOILER2; • 0.50 for BOILER3-BOILER6 (Main building boilers) and BOILER7-BOILER11(New Surgery Center building boilers)	0.5 is an EPA suggested default when source-specific data are not available.
Ambient Equilibrium for NO_2/NOx	0.90	Default value.
O_3 Concentrations	Value specified for each hour modeled	Based on values from the SLMMC site in Meridian, Idaho.

3.1.6 Meteorological Data

DEQ provided CH2M with model-ready meteorological data processed from Boise surface and Boise upper air meteorological data. The dataset covered the years 2008-2012 and was processed with Automated Surface Observing System (ASOS) data for missing surface data. These data were collected by the National Weather Service at the Boise airport. They were process into AERMOD-ready files using the EPA preprocessing program AERMINUTE. DEQ determined these data were reasonably representative for the SLMMC site. More representative data of sufficient quality for use in dispersion models were not available for the area.

3.1.7 Terrain Effects

CH2M used 1 arc second National Elevation Dataset (NED) files, in the NAD83 horizontal datum, to calculate elevations of receptors. The terrain preprocessor AERMAP 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. The model 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. Terrain effects are anticipated to be minimal for SLMMC because maximum impacts are on site or just offsite, and the area is effectively flat for dispersion modeling purposes.

3.1.8 Building Downwash

Potential downwash effects on the emissions plume were accounted for in the model by using building parameters as described by CH2M. The Building Profile Input Program for the PRIME downwash algorithm (BPIP-PRIME) was used to calculate direction-specific dimensions and Good Engineering Practice (GEP) stack height information from building dimensions/configurations and release parameters for input to AERMOD.

3.1.9 Ambient Air Boundary

The general public has access to areas external to buildings. Therefore, all such areas are considered to be ambient air, and receptors were placed within such areas accordingly. Figure 1 shows the structures at the SLMMC site.

Figure 2 below show the enhanced ambient air boundary used to demonstrate NAAQS compliance during testing and maintenance of emergency electrical Generator #2 (Model ID GEN2). Figure 2 was presented by SLMMC in the PTC application and represents the building labeled "CENTPLAN" in Figure 1. The highlighted boundary region will be in place only during testing of Generator 2, which will occur monthly for a one-hour period. During all other times ambient air is everywhere external to the SLMMC buildings.

Figure 1. CURRENT BUILDING LAYOUT

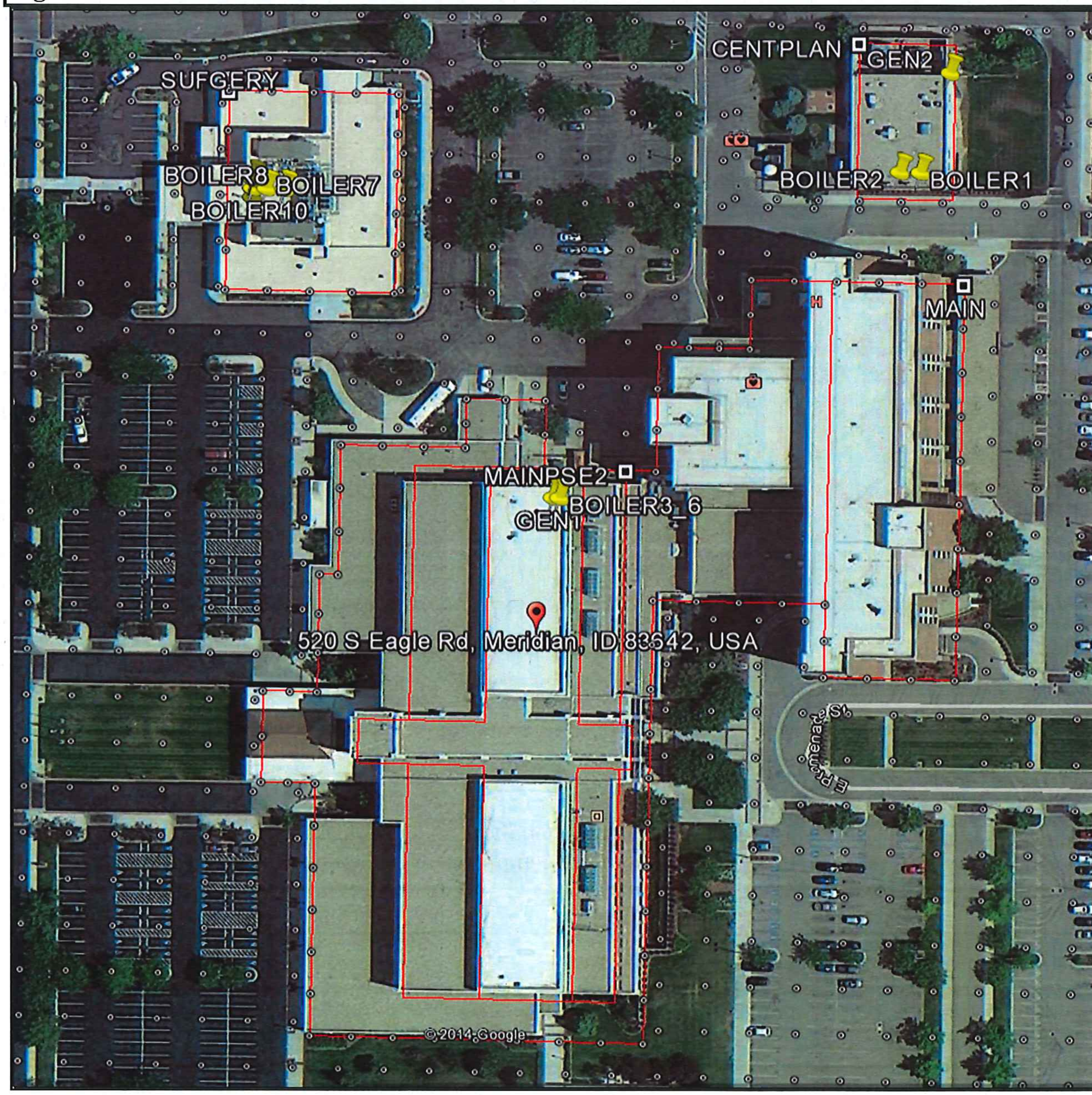

Figure 2. SLMMC SPECIAL EXCLUSION ZONE AMBIENT AIR BOUNDARY

3.1.10 Receptor Network

Table 5 describes the receptor network used in the submitted modeling analyses. DEQ contends that the receptor network was adequate to reasonably assure compliance with applicable air quality standards at all ambient air locations.

3.2 Emission Rates

Emissions rates of criteria pollutants and TAPs for the proposed modification and facility-wide sources were provided by the applicant for various applicable averaging periods. DEQ modeling review, described in this memorandum, did not include review of emissions rates for accuracy. Review and approval of estimated emissions was the responsibility of the DEQ permit writer. DEQ modeling review included verification that the application's potential emissions rates were properly used in the model.

Modeling applicability was based on the emission inventory presented with the modeling protocol and updated in July 15, 2015 incompleteness response submittal. SLMMC's net emission increases were used to establish modeling requirement, and are listed below in Figure 3. Figure 3 is an excerpt of the permit application's Excel spreadsheet for the project's emissions rates. Modeling to demonstrate compliance with annual average $PM_{2.5}$ and annual NO_2 was not required based on the submitted emissions inventories. Values listed in Figure 3 that are contained within parentheses represent negative values.

Figure 3. MODIFICATION EMISSION RATES FOR MODELING APPLICABILITY

Net Change in Emissions PTE

Criteria Pollutants	PM10		PM2.5		CO		NOx		SOx[2]		Lead		VOC	
Emissions Unit Name	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**	**(lb/hr)**	**(ton/yr)**
Plant Gen (Gen 2, Cat) - 2346 HP	0.43	0.02	0.40	0.02	6.14	0.31	13.72	0.69	0.011	0.0006	-	-	0.65	0.03
Office Gen (Gen 1, Detroit) - 1231 HP	(0.14)	(0.005)	(0.14)	(0.005)	(2.73)	(0.14)	(2.25)	(0.11)	0.0017	0.0001	-	-	(0.15)	(0.01)
Boiler #1 Hurst (ULSD & NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.74E-06	2.51E-05	0.00	0.00
Boiler #2 Hurst (ULSD & NG)	(0.09)	(0.38)	(0.09)	(0.38)	(0.96)	(4.22)	(1.67)	(5.02)	(0.02)	(0.03)	-	-	(0.06)	(0.28)
Boiler #3 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #4 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #5 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #6 Kewanee (NG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boiler #7 Hurst (NG)	0.02	0.09	0.02	0.09	0.16	0.68	0.37	1.62	0.01	0.03	2.06E-06	9.02E-06	0.11	0.46
Bioler #8 Hurst (NG)	0.02	0.09	0.02	0.09	0.16	0.68	0.37	1.62	0.01	0.03	2.06E-06	9.02E-06	0.11	0.46
Boiler #9 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Boiler #10 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Boile4 #11 Lochinvar (NG)	0.02	0.08	0.02	0.08	0.03	0.11	0.08	0.34	0.00	0.01	1.23E-06	5.37E-06	0.01	0.06
Total Increase/Decrease	0.30	0.06	0.27	0.06	2.83	(2.36)	10.77	(0.19)	0.014	0.05	2.59E-05	1.13E-04	0.44	(0.25)
Level I Threshold	0.22		0.05	0.35	15.00		0.20	1.20	0.21	1.20	0.019			
Exceed Level I Threshold	Yes		Yes	No	No		Yes		No	No	No			

Livel I Threshold comes from State of Idaho Guideline for Performing Air Quality Impact Analyses, Table 2, July 2011

Level I Threshold for lead is 14 lb/month. 14 lb/month x 12 month / 8,760 hours = 0.019 lb/hr

Emissions increases associated with the project, without considering any sources where there was an emissions decrease, were below Level 1 modeling applicability thresholds for all averaging periods for SO_2, all averaging periods for CO, and Pb.

Accounting for net emissions rates incorporating reductions due to emission rate decreases and the increases attributed to five new boilers indicated annual $PM_{2.5}$ and annual NOx exceeded Level I modeling thresholds. This project scope and details were altered based on CH2M and SLMMC's response to the incompleteness determination. Considering the modeling protocol and DEQ's protocol approval, did not address the addition of five new boilers in the surgery center building that were included in the July 15, 2014, incompleteness response submittal's revised modeling demonstration. No revisions to the modeling protocol were submitted, and DEQ re-evaluated modeling applicability in greater detail.

Annual NOx emissions attributed to Boilers 7 through 11, at 4.3 ton/year, were above the 1.2 ton/year Level 1 threshold but below the 14 ton/year Level 2 threshold.

Level 2 thresholds are questionably appropriate for the SLMMC because of the height of the applicable stacks in relation to the surrounding buildings and the short distance to ambient air. However, the total NOx emissions from the facility are relatively small (22 ton/year) and the annual NO_2 NAAQS is not likely to be violated. To assess the need to model annual NO_2 on the basis of facility-wide NAAQS compliance, the Level 1 threshold was adjusted to assure impacts are below a value equal to the 100 $\mu g/m^3$ NAAQS with an annual NO_2 background of 12 $\mu g/m^3$ subtracted. This involved multiplying the 1.2 ton/year threshold by a ratio of the 88 $\mu g/m^3$ allowable increment of impact by the 1.0 $\mu g/m^3$ SIL, giving a threshold of 105 ton/year. Facility-wide NOx emissions are 22 ton/year and well below the 105 ton/year threshold, thereby assuring compliance with the annual NO_2 NAAQS.

Modeling applicability for annual $PM_{2.5}$, was evaluated in the same fashion as annual NO_2. Annual potential $PM_{2.5}$ emissions from new Boilers 7-11 were 0.42 ton/year. This is slightly above the Level I modeling threshold of 0.35 ton/year, but well below the Level II threshold of 4.1 ton/year.

The Level 1 threshold was adjusted to assure impacts are below an allowable increment value equal to the 12 $\mu g/m^3$ NAAQS with an annual $PM_{2.5}$ background of 6.74 $\mu g/m^3$ subtracted. This involved multiplying the 0.35 ton/year Level I threshold by a ratio of the 5.26 $\mu g/m^3$ allowable increment of impact by the 0.3

$\mu g/m^3$ SIL, giving a threshold of 6.1 ton/year. Facility-wide annual $PM_{2.5}$ emissions are 1.67 ton/year, which are well below the 6.1 ton/year threshold, thereby assuring compliance with the annual $PM_{2.5}$ NAAQS.

The facility is required to demonstrate compliance with the 1-hour NO_2 and 24-hour $PM_{2.5}$ and 24-hour PM_{10} NAAQS based on facility-wide allowable emissions.

3.2.1 Criteria Pollutant Emissions Rate

Table 8 lists criteria pollutant emissions rates used in the project-specific modeling analyses for all applicable averaging periods. The rates listed represent the maximum allowable rate as averaged over the specified period.

Table 8. SLMMC FACILITY CRITERIA POLLUTANT EMISSIONS USED IN ANALYSES

Emissions Point in Model	Pollutant and Averaging Period		
	PM_{10}[a] 24-hour (lb/hr)[b]	$PM_{2.5}$[c] 24-hour (lb/hr)	NOx[d] 1-hour (lb/hr)
GEN1 – 1,231 hp office generator	0.0043[e]	0.0043[e]	11.32[f]
GEN2 – 2,346 hp plant generator	0.034[e]	0.033[e]	26.75[f]
BOILER1	0.087	0.087	1.67 (distillate fuel oil testing[g, h]) or 1.15 (natural gas)
BOILER2	0.087	0.087	1.67 (distillate fuel oil testing[g, h]) or 1.15 (natural gas)
BOILER3, BOILER4, BOILER5, BOILER6 (exhausting through a common stack)	0.19	0.19	2.48
BOILER7	0.020	0.020	0.37
BOILER8	0.020	0.020	0.37
BOILER9	0.019	0.019	0.080
BOILER10	0.019	0.019	0.080
BOILER11	0.019	0.019	0.080

a. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers.
b. Pounds per hour emissions rate used in modeling analyses for specified averaging periods.
c. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers.
d. Nitrogen oxides.
e. PM emissions were modeled by averaging the requested maximum hourly emission rate by a factor of 1hour per 24 hour day.
f. Emissions modeled for testing only. Generators are tested 1 hour each month between the hours of 7 am and 6 pm. Specific hours modeled were randomly selected according to the defined testing schedule.
g. 1.147 lb/hr is the emissions rate for natural gas combustion in the boiler and 1.671 lb/hr is the rate for diesel combustion. The boilers are fired on diesel once every other month for a maximum of 4 hours, alternating between Boiler 1 and Boiler 2, between the hours of 7 am and 6 pm. Specific days and hours modeled for diesel combustion were randomly selected according to the defined testing schedule.
h. Either Boiler 1 or Boiler 2 may operate at any time for normal operation, but not concurrently except while one boiler is fired on diesel for testing and the other is fired on natural gas.

3.2.2 TAP Emissions Rates

CH2M modeled those TAPs where the increase in TAP emissions associated with the proposed modification exceeded the emissions screening levels (ELs) of Idaho Air Rules Section 585 and 586. The TAPs emissions for this project have been modeled in prior projects, including the permit modification issued April 12, 2013—PTC No. P-2012.0057 Project 61106. TAPs compliance applicability was established due to the important changes in the modeled exhaust parameters for most sources and sources that were recently placed under St. Luke's ownership and control. These changes include: all existing boiler stacks are actually equipped with rain caps; Boilers 1 and 2 will reduce the required stack height from 35 feet above grade to 20 feet above grade; Boilers 7 through 11 are new emissions units.

CH2M submitted modeling for chromium, comparing emissions to both the chromium VI (Cr+6) EL in Idaho Air Rules Section 586 for carcinogenic TAPs and the non-carcinogenic chromium (Cr+2) or chromium III (Cr+3) compounds. The project's emissions rate from all sources was 7.26E-05 lb/hr based on the July 15, 2015 emissions spreadsheet. All of these emissions are attributed to natural gas combustion sources. The DEQ permit writer clarified the valence states of these emissions are entirely chromium II or III, and the emissions should be compared to the 0.033 lb/hr chromium II and III EL. Since chromium emissions are below the chromium II and III EL, project-specific modeling is not required for the non-carcinogenic increment. Boiler 1 and Boiler 2 are each allowed to combust 4,011 gallons per year of ULSD fuel oil for testing. Note that both boilers are allowed to operate within the same year. This results in 3.84 E-07 lb/hr of chromium from both boilers. Even if all of these emissions are considered to be chromium VI, this emission rate is below 5.6E-07 lb/hr EL specified in Section 586 of the Idaho Air Rules for chromium VI. Because non-carcinogenic and carcinogenic chromium emissions are below the applicable ELs modeling is not required, and results are not shown below in Table 9 or Table 12.

Boiler 1 and Boiler 2 are not allowed to operate concurrently for normal operations at any time. Only one boiler was modeled and CH2M selected Boiler 1 for the TAPs modeling demonstration.

Generator 1 and Generator 2 hourly emissions were averaged over 8,760 hours per year based on 100 hours per year total operation for each engine at 75% of rated capacity for Generator 1 and 80% of rated capacity for Generator 2.

Table 9 provides modeled emissions rates for TAPs. Hourly emissions rates were modeled for 8,760 hours per year.

Table 9. TOXIC AIR POLLUTANT EMISSIONS USED IN ANALYSES

Emissions Point in Model	Carcinogenic TAP - Annual Average			
	Arsenic (lb/hr)[a]	Cadmium (lb/hr)	Nickel (lb/hr)	Formaldehyde (lb/hr)
GEN1 –office generator	0.0	0.0	0.0	4.57E-06
GEN2 – central plant generator	0.0	0.0	0.0	1.27E-05
BOILER1	2.28E-06	1.26E-05	2.42E-05	8.61E-04
BOILER3, BOILER4, BOILER5, BOILER6 (exhausting through a common stack)	4.95E-06	2.72E-05	5.25E-05	1.83E-03
BOILER7	8.24E-07	4.52E-06	8.65E-06	3.08E-04
BOILER8	8.24E-07	4.52E-06	8.65E-06	3.08E-04
BOILER9	4.91E-07	2.69E-06	5.14E-06	1.84E-04
BOILER10	4.91E-07	2.69E-06	5.14E-06	1.84E-04
BOILER11	4.91E-07	2.69E-06	5.14E-06	1.84E-04

a. Pounds per hour.

3.3 Emission Release Parameters and Plant Criteria

Table 10 lists emissions release parameters for sources modeled. Parameters appeared to be within normally expected ranges for the source types modeled.

DEQ modeling staff did not perform an in depth review of the documentation submitted with the modeling protocol and permit application that was intended to support the derivation of the release parameters for this project. In general, the release parameters for the two emergency generator engines were slightly more conservative for this project than were used for the previous project's modeling demonstration supporting PTC number P-2012.0057 PROJ 61106, issued April 12, 2013.

Exit velocity values for all boilers are not a concern for this project considering the momentum flux of each stack's plume is minimized due to the existence of rain-capped stacks.

The five new Surgery Center boilers (BOILER7 through BOILER11) and the main building's BOILER3_6 stack each used a 200 degree Fahrenheit exit temperature. This value is considered accurate, or more probably, conservative.

BOILER1 and BOILER2 each used a 450 degree Fahrenheit exit temperature. This value has been used in past modeling demonstrations, but it may be a relatively high exit temperature considering the high efficiencies of modern natural gas and dual fuel-fired boilers. The temperature is not an extremely high value and DEQ approves its use for this project.

Table 10. EMISSIONS RELEASE PARAMETERS

Release Point / Location	Source Type	Release Characteristics	Stack Height (m)[a]	Modeled Diameter (m)	Stack Gas Temperature (K)[b]	Stack Gas Flow Velocity (m/sec)[c]
BOILER1 /Physical Plant	Point	Raincap	10.7	0.52	505.4	11.4
BOILER2 /Physical Plant	Point	Raincap	10.7	0.52	505.4	11.4
BOILER3_6 Main Building[e]	Point	Raincap	21.2	0.61	366.5	12.0
BOILER7 / Surgery Center Bldg	Point	Raincap	16.5	0.61	366.5	2.0
BOILER8 / Surgery Center Bldg	Point	Raincap	16.5	0.61	366.5	2.0
BOILER9 /Surgery Center Bldg	Point	Raincap	16.5	0.61	366.5	1.2
BOILER10 / Surgery Center Bldg	Point	Raincap	16.5	0.61	366.5	1.2
BOILER11 / Surgery Center Bldg	Point	Raincap	16.5	0.61	366.5	1.2
GEN1 / Main Building	Point	Vertical and uninterrupted[d]	18.0	0.30	676.4	49.8
GEN2 / Physical Plant	Point	Vertical and uninterrupted[d]	6.1	0.30	762.1	82.2

a. Meters.
b. Kelvin.
c. Meters per second.
d. Generator engines are equipped with a hinged rainflap that opens during operation of the engine.
e. Boilers 3 through 6 vent to a common stack.

3.4 Results for Significant Impact Level Analyses

CH2M did not perform any Significant Impact Level (SIL) analyses for this project. DEQ's modeling protocol approval requested that a cumulative modeling demonstration be conducted for all modeled criteria air pollutants where modeling was required.

3.5 Results for Cumulative Impact Analyses

Table 11 provides results for the cumulative impact analyses performed for criteria pollutants for 1-hour NO_2, 24-hour $PM_{2.5}$, and annual $PM_{2.5}$.

The modeled 1-hour NO_2 design value at each receptor is the five-year average of 8^{th} highest maximum of daily 1-hour impacts over each year. Cumulative design-value impacts of 1-hour NO_2 for the two operational scenarios (using randomized emissions schedules for the testing of emergency generators and testing operations of Boiler 1 and 2 on diesel fuel) were below NAAQS. The two individual scenarios reflect continuous operation of either Boiler 1 or Boiler 2 on natural gas, while the other is idle for natural gas combustion. The idle boiler was represented in the scenario for testing purposes only while operating at capacity on ultra-low sulfur distillate fuel oil for four consecutive hours once every other month during daylight hours. Cumulative 1-hour NO_2 impacts complied with NAAQS only if a temporary "exclusion zone" is employed, which increases the region around the physical plant building that houses Boilers 1 and 2 and Generator 2. The exclusion zone increases the area around the physical plant building that is exempt for ambient air during testing of emergency Generator 2. Considering the testing for Generator 2 occurs once per month, for one hour between 7 am and 6 pm, this temporary ambient air boundary expansion is a reasonable compliance method for DEQ to approve.

Modeled cumulative 24-hour $PM_{2.5}$ 24-hour impacts were below NAAQS without using randomized emissions scenarios for either generator testing or testing every other month of Boilers 1 and 2 on diesel fuel. One hour of emissions per day was accounted for both Generator 1 and Generator 2. SLMMC's requested operating scenarios demonstrated compliance with the applicable NAAQS.

Table 11. RESULTS FOR CUMULATIVE IMPACT ANALYSES

Pollutant	Averaging Period	Design Case	Modeled Design Concentration[a] (µg/m³)[b]	Background Concentration (µg/m³)	Total Ambient Impact (µg/m³)	NAAQS[c] (µg/m³)	Percent of NAAQS
NO_2[d]	1-hour	Standard AAB[g] - Boiler 1 Operating	209.7	Included	209.7	188	112%
		Standard AAB[g] – Boiler 2 Operating	231.6		231.6		123%
		Exclusion Zone - Boiler 1 Operating	152.1		152.1		81%
		Exclusion Zone - Boiler 2 Operating	169.1		169.1		90%
$PM_{2.5}$[e]	24-hour	Boiler 1 Operating[h]	4.17	27.3	31.5	35	90%
		Boiler 2 Operating[h]	4.17		31.5		90%
PM_{10}[f]	24-hour	Boiler 1 Operating[h]	4.73	88	93	150	62%
		Boiler 2 Operating[h]	4.73		93		62%

a. Design values are the calculated vale to compare to the applicable NAAQS after adding an appropriate background value. For 1-hour NO_2, the design value is the 5-year averaged of the 8th highest value of daily maximum 1-hour concentrations for each year modeled. For 24-hour $PM_{2.5}$, the design value is the 5-year average of the maximum 24-hour average concentration for each year modeled. For PM_{10}, the design value is the maximum highest 6th high concentration at any receptor over the 5-year period, if a 5-year dataset is used.

b. Micrograms per cubic meter.

c. National ambient air quality standards.

d. Nitrogen oxides.

e. Particulate matter with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers, including condensibles.

f. Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers, including condensibles.

g. The standard ambient air boundary (AAB) contains discrete receptors at all locations external the SLMMC buildings that the where the general public is allowed access.

h. CH2M only presented results for the Exclusion Zone ambient air boundary case. The 1-hour NO_2 NAAQS demonstrations showed that the exclusion zone ambient air boundary would be necessary to accommodate the requested testing schedules for Generators 1 and 2 and Boilers 1 and 2.

3.6 Results for Toxic Air Pollutant Analyses

Table 12 presents results for TAPs modeling. TAPs impacts were below the applicable increments.

Table 12. RESULTS FOR TOXIC AIR POLLUTANT ANALYSES				
Pollutant	**Averaging Period**	**Maximum Modeled Concentration ($\mu g/m^3$)[a]**	**AACC Increment[b] ($\mu g/m^3$)**	**Percent of Increment**
Arsenic	Annual	7.0E-05	2.3E-04	30.4%
Cadmium	Annual	4.10E-04	5.6E-04	73.2%
Formaldehyde	Annual	2.77E-02	7.7E-02	36.0%
Nickel	Annual	7.80E-04	4.2E-03	18.6%

a. Micrograms per cubic meter.
b. Acceptable ambient concentration for carcinogens as listed in Idaho Air Rules Section 586.

3.6.1 DEQ Sensitivity Analyses

DEQ ran sensitivity analyses to verify that compliance with ambient standards would be assured where questions on the modeling assumptions remained a concern that the modeling demonstration adequately demonstrated compliance to the agency's satisfaction.

3.6.1.1 TAPs

SLMMC's TAPs demonstration provided ambient impacts only for Boiler 1 TAPs. Boiler 2 is treated as an idle boiler under the scenario, with Boiler 1 modeled with continuous operation for 8,760 hours per year at rated capacity on natural gas. The same scenario representing Boiler 2 operational and Boiler 1 idle was not presented by CH2M. Additional discussion of Boiler's 2 absence from the modeling demonstration was not noted in the submittal. The 1-hour NO_2 NAAQS demonstration showed that the scenario with Boiler 2 as the operational boiler provided higher predicted ambient impacts than the scenario with Boiler 1 operational. Thus, DEQ modeling staff performed a sensitivity run using Boiler 2 exhaust parameters from the criteria pollutant modeling inputs and an emission rate identical to the Boiler 1 emission rate. Boiler 1 and 2 are identical in design. Cadmium impacts were closest to the allowable increment and this was selected as a test case. The maximum annual impact at any receptor averaged over 5 years was 4.4 E-04 $\mu g/m^3$. This impact was 7% greater than the impact presented in SLMMC's July 15, 2015 modeling submittal with Boiler 1 operating and Boiler 2 idle. Impacts for the DEQ sensitivity run were below the allowable TAP increment. DEQ concludes that compliance is adequately demonstrated for cadmium, arsenic, formaldehyde, and nickel emissions for either Boiler 1 or Boiler 2 operating scenarios.

Table 13. RESULTS FOR DEQ TAP SENSITIVITY ANALYSIS				
Pollutant	**Averaging Period**	**Maximum Modeled Concentration ($\mu g/m^3$)[a]**	**AACC Increment[b] ($\mu g/m^3$)**	**Percent of Increment**
Cadmium	Annual	4.4E-04	5.6E-04	79%

a. Micrograms per cubic meter.
b. Acceptable ambient concentration for carcinogens, as listed in Idaho Air Rules Section 586.

3.6.1.2 1-Hour NO_2 - In-Stack NO_2/NOx Ratios for Generators 1 and 2

The modeling demonstration uses the Tier III Plume Volume Molar Ratio Method (PVMRM) for the 1-hour NO_2 NAAQS demonstration. Each NOx-emitting source is assigned an in-stack ratio of the default value of 0.5 or less, depending on supporting technical documentation for each source. CH2M stated in the December 5, 2013 modeling protocol that an in-stack NO_2/NO_x ratio of 0.20 would be used for Generators 1 and 2, and a value of 0.10 would be used for Boilers 1 and 2 in the 1-hour NO_2 modeling. DEQ's January 21, 2014 modeling protocol approval letter did not address the in-stack NO_2/NOx ratios. CH2M's modeling demonstration used a 0.15 ratio value for Generators 1 and 2 instead of the 0.20 values described in the modeling protocol.

The modeling demonstration supporting the PTC issued April 12, 2013 used ratios of 0.20 for GEN2, 0.25 for GEN1, and 0.112 for BOILER1 and BOILER2, where the generator's ratio values were based on procedures and data from the Texas Natural Resources Conservation Commission (TNRCC) Rules for Permits by Rule for Turbines and Engines (Chapter 106, Subchapter W, Section 106.512).

CH2M obtained the reference documentation from the "alpha" database for the EPA's Technology Transfer Network (TTN) site at http://www.epa.gov/ttn/scram/no2_isr_alpha_database.xlsx. The EPA site notes, "While this database contains a large number of entries, none fully satisfy the requirements for the formal collection effort." The "NO2_ISR_DATABASE.XLSX" database contains the data EPA Office of Air Quality Planning and Standards (OAQPS) has collected and incorporated into the final database. NO_2/NO_x ratios for diesel-fired generator engines is affected by a number of parameters, including, but definitely not limited to, displacement, actual operational power output level versus rated capacity, ignition timing, etc. Size of the engine is an important factor for the NOx and in-stack NO_2 emission rates. DEQ did not comment on this issue in the modeling protocol or the list of items in DEQ's June 13, 2014 incompleteness determination letter. However, it is an issue that is important enough in the 1-hour average NO_2 compliance that an additional evaluation was needed to support this project in light of the changes in assumptions from those used in the modeling for PTC issued in April 2013. DEQ selected the default diesel-fired internal combustion engine in-stack NO_2/NO_x ratio value of 0.20 from the tables in Appendix C of the California Air Pollution Control Officers Association (CAPCOA) *Modeling Compliance of the Federal 1-Hour NO_2 NAAQS*, October 27, 2011. This value corresponds well with the 0.25 value used for Generator 1 and matches the 0.20 value for Generator 2 in the previous NAAQS analyses, and matches the value CH2M's modeling protocol stated would be used.

The Boiler 2 as primary boiler operating scenario with the exclusion zone ambient air boundary was selected for the sensitivity run because this is the scenario with the higher predicted impact while still demonstrating compliance with the 1-hour NO_2 NAAQS. None of the in-stack ratios for any of the boilers were altered.

CH2M's submitted NAAQS demonstration presented a design impact of 169.08 micrograms per cubic meter, 1-hour average at the receptor located at Universal Transverse Mercator (UTM) coordinate 552,357.10 meters Easting and 4,827,731.8 meters Northing, zone 11. The effect of increasing the in-stack NO_2/NO_x ratio for the generators was a minimal increase in the design impact. The design impact is dominated by Boilers 1 and 2. Boiler 2 was operated as a primary boiler on natural gas and Boiler 2 was operated on distillate fuel for testing for 24 hours per year. Under the limited one hour per month and one annual 8-hour test schedule during daylight hours, the effects of increasing the in-stack ratios for the generators to default values for diesel engines was insignificant.

Table 14. RESULTS FOR DEQ 1-HOUR NO_2 SENSITIVITY ANALYSIS

Pollutant	Averaging Period	Maximum Modeled Concentration ($\mu g/m^3$)[a]	Background	NAAQS	Percent of NAAQS
NO_2	1-hr	169.44[c,d]	Included in impact value	188	90%

a. Micrograms per cubic meter.

[b] Nitrogen dioxide.
[c] Design impact is the maximum 8th highest 1-hr daily impact averaged over 5 years.
[d] Impact was at the same receptor location as the applicant's NAAQS demonstration design impact location.

4.0 Conclusions

The ambient air impact analyses, in combination with DEQ's sensitivity analyses, demonstrated to DEQ's satisfaction that emissions from the proposed SLMMC project will not cause or significantly contribute to a violation of any ambient air quality standard.

APPENDIX C – PROCESSING FEE

PTC Fee Calculation

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:	**St. Luke's Meridian Medical Center**
Address:	**520 South Eagle Road**
City:	**Meridian**
State:	**ID**
Zip Code:	**83642**
Facility Contact:	**Mr. Russ Harbaugh**
Title:	**Director of Operations**
AIRS No.:	**001-00182**

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	22.0	22.21	-0.2
SO_2	0.2	0.13	0.1
CO	15.7	18.02	-2.4
PM10	1.7	1.63	0.0
VOC	2.0	1.21	0.8
TAPS/HAPS	0.0	0	0.0
Total:	0.0	43.2	**-1.6**
Fee Due	**$ 1,000.00**		

Comments: