1/7/16

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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-3266
Plant ID No.:	019-00077
Applicant:	Plateau Medical Center
Facility Name:	Not Applicable/Same
Location:	Oak Hill, WV
NAICS Code:	622100
Application Type:	Construction
Received Date:	August 14, 2015
Engineer Assigned:	John Legg
Fee Amount:	$2,000.00
Date Received:	August 18, 2015
Complete Date:	August 28, 2015 (the date the legal advertisement's original affidavit of publication was received at the DAQ)
Due Date:	November 28, 2015
Applicant Ad Date:	August 20, 2015
Newspaper:	The Fayette-Tribune (Beckley Newspapers)
UTM's:	Easting: 486.867 Northing: 4202.736 Zone: 17
Lat/Long Coordinates:	Latitude 37.972°N Longitude -81.150°E
Description:	Construction permit for three (3), diesel-fired emergency generators:

- EG-1, Perkins Engine (172 kW; 230 HP)/Caterpillar Generator (150 kW; 201 HP) installed **2011**
- EG-2, Caterpillar Engine (260 kW; 349 HP)/Caterpillar Generator (230 kw; 308 HP) installed **2005**
- EG-3, John Deere Engine (142 kw; 190 HP)/Kohler Generator (105 kW; 141 HP) installed **2002**

DESCRIPTION OF PROCESS

This Process Description came from permit application R13-3266, Attachment G:

Plateau Medical Center installed three (3) diesel-fired, emergency generators at its Oak Hill, West Virginia location. All three emergency generators are used to produce electricity in the event of a electrical power loss:

- A 150 kW (201 HP) Caterpillar standby generator (EG-1) was installed in **2011**. The Caterpillar generator is driven by a 172 kW (230 HP) Perkins 4-cycle, turbo-charged and after-cooled engine as provided in manufacturers' specifications (Attachment L). This generator has a 285-gallon aboveground diesel storage tank associated with it.

- A 230 kW (308 HP) Caterpillar standby generator (EG-2) was installed in **2005**. The Caterpillar Emergency generator is driven by a 260 kW (349 HP) Caterpillar 4-cycle, turbo-charged and after-cooled engine as provided in manufacturers' specifications (Attachment L). This generator has a 600-gallon underground diesel storage tank and a 25-gallon diesel day tank associated with it.

- A 105 kW (141 HP) Kohler standby generator (EG-3) was installed in **2002**. The Kohler generator is driven by a 142 kW (190 HP) John Deere 4-cycle, turbo-charged engine as provided in the manufacturers' specifications (Attachment L). This generator has a 275-gallon aboveground diesel storage tank associated with it.

The above three (3) emergency generators are summarizied in Tables 1 through 4 attached to the end of this evaluation.

SITE INSPECTION

The Plateau Medical Center's Oak Hill, Fayette County WV facility is know to the DAQ's Enforcement Group. The last inspection was a full onsite inspection conducted by Jamie Jarrett on July 8, 2013. The facility was found to be in-compliance, receiving an inspection code of 30.

It was noted in the Compliance Monitoring Report resulting from the above inspection that the hospital in 2011had added a Caterpillar NSPS IIII Certified 150 kW emergency generator engine (EG-1).

Directions as given in the permit application:

> From Interstate 64/77, take Exit 60 and take Rte. 612 East for 7.7 miles. Take a left on Scarbro Road (County Rte 1). Follow Scarbro Road 1.4 miles until it turns into Maple Avenue. Follow Maple Avenue 0.2 miles and turn left on Main Street. Hospital will be immediately on the left.

From Interstate 19 South, take the Main Street (Rt. 16) exit towards Rte 61N. Turn right on Main Street (Rte. 16) and the Hospital will be on your right in 0.6 miles. From Interstate 19 North, take the Main Street (Rt 16) exit towards Rte 61 N. Turn left on Main Street (Rte. 16) and the Hospital will be on your left in 0.3 miles.

Directions as given in Compliance Monitoring Report (Inspection: 7/8/2013; Completion: 7/15/2013):

From US-19 South take the Oak Hill exit ramp. Turn left onto WV-16N. Travel across US-19 overpass and make a right on Route 61. The hospital is located on the left in 0.3 miles. UTM coordinates: 486875.03 m E & 4202735.48 m N.

ESTIMATE OF EMISSIONS BY REVIEWING ENGINEER

The writer reviewed the Plateau Medical Center's emission calculations (found in Attachment N of the permit application) and found the calculations to be logical and correct.

Annual emissions for the three (3) emergency generator engines are summarized in Table 5 below.

Table 5: Annual Emission Summary for the Plateau Medical Center's Three (3) Emergency Generator Engines Permitted Under R13-3266.

Pollutant	Annual Engine Emissions (ton/yr)			
	EG-1	EG-2	EG-3	Total
NOx	0.36	0.87	0.72	1.95
CO	0.33	0.50	0.89	1.72
VOC	0.02	0.05	0.10	0.17
PM	0.02	0.03	0.04	0.09
SO2	0.23	0.35	0.19	0.77
HAPs	0.001	0.001	0.0004	0.0024

* Based on operating each generator 500 hr/yr.

Tables 6 through 8 given below detail how hourly and annual emission standards for the three (3) emergency generator engines were calculated.

Table 6: EG-1 Emergency Generator Engine (172 kw; 230 BHP).

Hourly and Annual Emission Calculations based on CFR 89.112, Table 1 - Emission Standards (g/kW-hr) for Tier 3 NonRoad Engines for Model Year 2011 and a Rated Power of 172 kW.

Pollutant	Emission Standard		lb/hr	Restricted ton/yr (3)	Unrestricted ton/yr (4)
	(g/kW-hr)	(lb/hp-hr)			
CO	3.5	0.006	1.33	0.33	5.81
(1) NOx	3.80	0.006	1.44	0.36	6.31
PM_{10}	0.20	0.0003	0.08	0.02	0.33
(1) VOC	0.20	0.0003	0.08	0.02	0.33
(2) SO_2	2.46	0.004	0.93	0.23	4.09
(5) Total HAPs	0.001492 (lb/MMBtu)	-----	0.002	0.001	0.01

(1) The NMHC + NOx Tier 3 emission standard has been divided into 95% NOX and 5% VOC.
(2) Sulfur emission factor from AP-42, Section 3.4 Tables 3.4-1 and 3.4-2. Sulfur content of fuel is < 0.5 wt%
(3) Restricted - 500 hr/yr of operation.
(4) Unrestricted - 8,760 hr/yr of operation.
(5) HAP constituent emission factors (for Acetaldehyde, Acroiein, Benzene, Formaldehyde, Naphthalene, Toluene and Xylenes) obtained from AP-42, Section 3.4, Table 3.4-3. Heat input to engine EG-1 from fuel estimated to be 1.5 MM Btu/hr.

Table 7: EG-2 Emergency Generator Engine (260 kW; 349 BHP).

Hourly and Annual Emission Calculations based on CFR89.112, Table 1 - Emission Standards (g/kW-hr) for Tier 3 NonRoad Engines for Model Year 2005 and a Rated Power of 260 kW.

Pollutant	Emission Standard		lb/hr	Restricted ton/yr (3)	Unrestricted ton/yr (4)
	(g/kW-hr)	(lb/hp-hr)			
CO	3.5	0.006	2.01	0.50	8.79
(1) NOx	6.08	0.010	3.49	0.87	15.26
PM_{10}	0.20	0.0003	0.11	0.03	0.50
(1) VOC	0.32	0.001	0.18	0.05	0.80
(2) SO_2	2.46	0.004	1.41	0.35	6.18
(5) Total HAPs	0.001492 (lb/MMBtu)	-----	0.004	0.001	0.02

(1) The NMHC + NOx Tier 3 emission standard has been divided into 95% NOX and 5% VOC.
(2) Sulfur emission factor from AP-42, Section 3.4 Tables 3.4-1 and 3.4-2. Sulfur content of fuel is < 0.5 wt%
(3) Restricted - 500 hr/yr of operation.
(4) Unrestricted - 8,760 hr/yr of operation.
(5) HAP constituent emission factors (for Acetaldehyde, Acrolein, Benzene, Formaldehyde, Naphthalene, Toluene and Xylenes) obtained from AP-42, Section 3.4, Table 3.4-3. Heat input to engine EG-2 from fuel estimated to be 2.5 MM Btu/hr.

Table 8: EG-3 Emergency Generator Engine (142 kW; 190 BHP).

Hourly and Annual Emission Calculations based on CFR89.112, Table 1 - Emission Standards (g/kW-hr) for Tier 1 NonRoad Engines for Model Year 2002 and a Rated Power of 142 kW.

Pollutant	Emission Standard		lb/hr	Restricted ton/yr (2)	Unrestricted ton/yr (3)
	(g/kW-hr)	(lb/hp-hr)			
CO	11.4	0.019	3.56	0.89	15.60
NOx	9.2	0.015	2.87	0.72	12.59
PM_{10}	0.54	0.0009	0.17	0.04	0.74
VOC	1.3	0.0021	0.41	0.10	1.78
(1) SO_2	2.46	0.0040	0.77	0.19	3.37
(4) Total HAPs	0.001492 (lb/MMBtu)	----	0.002	0.0004	0.01

(1) Sulfur emission factor from AP-42, Section 3.4 Tables 3.4-1 and 3.4-2. Sulfur content of fuel is < 0.5 wt%.
(2) Restricted - 500 hr/yr of operation.
(3) Unrestricted - 8,760 hr/yr of operation.
(4) HAP constituent emission factors (for Acetaldehyde, Acroiein, Benzene, Formaldehyde, Naphthalene, Toluene and Xylenes) obtained from AP-42, Section 3.4, Table 3.4-3. Heat input to engine EG-3 from fuel estimated to be 1.2 MM Btu/hr.

REGULATORY APPLICABILITY

Plateau Medical Center's Oak Hill, WV facility is an non-major source of criteria pollutants. The facility is an area source of HAPs.

The following State and Federal Rules were examined for applicability:

45CSR13 - "Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Temporary Permits, General Permits, and Procedures for Evaluation."

Plateau Medical Center submitted a complete application, ran a legal advertisement, and paid an application fee to obtain a construction permit for the three (3) emergency generators currently operated at their facility.

45CSR16 "Standards of Performance for New Stationary Sources"

Adopts by reference the standards of performance for new stationary sources promulgated by the United States Environmental Protection Agency pursuant to section 111(b) of the federal Clean Air Act, as amended (CAA). This rule codifies general procedures and criteria to implement the standards of performance for new stationary sources set forth in 40 CFR Part 60. The rule also adopts associated reference methods, performance specifications and other test methods which are appended to these standards.

40 CFR 60, Subpart IIII applies to the 172 kW/230 HP emergency diesel-fired engine installed in 2011. See below.

40CSR30 - "Requirements for Operating Permits."

The facility is not Title V source.

40 CFR 60 Subpart IIII, "Standards of Performance for Stationary Compression Ignition Internal Combustion Engines."

On July 11, 2006 the USEPA issued the NSPS for Stationary Compression Ignition (CI) Internal Combustion Engines (ICE). This rule outlines standards of performance for stationary compression ignition (CI) internal combustion engines (ICE). The rule segments applicability primarily by whether the applicant is an engine manufacturer, or an owner/operator.

Plateau Medical Center is subject to Subpart IIII because the new emergency diesel-fired engine installed in 2011 (EG-1) is a stationary CI ICE that commenced construction after July 11, 2005, and was manufactured after April 1, 2006.

The other two (2) emergency diesel-fired engines (EG-2 and EG-3) were manufactured before April 1, 2006 and are not subject to this subpart.

40 CFR 63, Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combust Engines"

Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary RICE located at major and area sources of HAP emissions. The subpart also establishes

requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

Plateau Medical Center is classified as an area source of HAP emissions (individual HAP with potential emissions less than or equal to 10 ton/yr; aggregated HAP with potential emissions less than or equal to 25 ton/yr) and will remain so after this modification.

The 260 kW (EG-2) and 142 kW (EG-3) diesel-fired emergency generators are subject to 40 CFR 63, Subpart ZZZZ. However, in accordance with 40 CFR 64.6585(f), the RICE NESHAP does not apply to the engines because they are existing institutional stationary engines located at an area source of HAPs.

TOXICITY OF NON-CRITERIA REGULATED POLLUTANTS

The combustion of #2 diesel fuel in the three (3) emergency generator engines results in the formation of very small amounts of Hazardous Air Pollutants (HAPs).

AIR QUALITY IMPACT ANALYSIS

Individual criteria pollutant (CO, NOx, PM, SO_2, VOC) emission rates based on operating each of the three (3) emergency generators 500 hr/yr do not exceed 2.0 ton/yr/criteria pollutant. Because emission rates are small, not air quality impact analysis/study was conduct for this application.

MONITORING OF OPERATIONS

4.2.1. For the purpose of demonstrating compliance with maximum hours of operation limits set forth in section 4.1.1, the permittee shall:

a. Install, calibrate, maintain and operate equipment to monitor the hours of operation of each diesel engine (EG-1, EG-2 and EG-3).
b. Monitor and record the monthly and rolling twelve-month total hours of operation for each diesel engine (EG-1, EG-2 and EG-3).

4.2.2. The permittee is not required to submit an initial notification for emergency generator EG-1. The permittee is required to keep records of the operation of engine EG-1 in emergency and non-emergency service that are recorded through the non-resettable hour meter. The permittee must record the time of operation of engine EG-1 and the reason the engine was in operating during that time.

4.4.4. The permittee shall maintain the following records in accordance with section 4.1.3.b of this permit:

a. The name of the diesel supplier;
b. A statement from the diesel supplier that the fuel complies with the specifications under the definition of distillate oil in 40 CFR§60.4.1c; and
c. Sulfur content or maximum sulfur content of the diesel supplied.

RECOMMENDATION TO DIRECTOR

Plateau Medical Center's request to construct and operate three (3) diesel-fueled emergency generators at their Oak Hill, Fayette County, WV facility meets the requirements of 45CSR13 (Rule 13) and all other applicable rules, and therefore should be granted a Rule 13 construction permit (R13-3266).

John Legg
Permit Writer

1/7/16
January 7, 2016

Table 1: Emission Unit Table for the Three (3) Diesel-fired Emergency Generator Engines Installed at the Plateau Medical Center Located in Oak Hill, Fayette County, WV.

Emission Unit ID	Emission Point ID	Emission Unit Description	Year Installed	Design Capacity	Control Device
S1	EG-1	Caterpillar Emergency Generator (Perkins Engine)	2011	172 kW (engine) 150 kW (generator)	None
S2	EG-2	Caterpillar Emergency Generator (Caterpillar Engine)	2005	260 kW (engine) 230 kW (generator)	None
S3	EG-3	Kohler Emergency Generator (John Deere Engine)	2002	142 kW (engine) 105 kW (generator)	None

Table 2: Information on Emergency Generator EG-1 Located at the Plateau Medical Center, Oak Hill, Fayette County, WV.

Perkins (engine) /Caterpillar (generator)	
Emission Unit ID No.	S1
Emission Point ID No.	EG-1
Year Installed:	2011
Engine Model No.	1106D-E66TA (4-cycle, 6 cylinder, turbo-charged and charge air-cooled)
Engine Model No. (DAQ Compliance Monitoring Report; 7/8/13; 7/15/13)	20011 Caterpillar Model D150-8 diesel fired emergency generator rated at 150 kW (480 VAC)
Power Rating (BHP/kW)	230 HP/172 kW engine 201 HP/150 kW generator
Certified Speed (RPM)	1800
Fuel	Diesel
Fuel Consumption (Permit Application - Attachment F)	10.7 gal/hr

Table 2: Information on Emergency Generator EG-1 Located at the Plateau Medical Center, Oak Hill, Fayette County, WV.

Perkins (engine) /Caterpillar (generator)	
Heat Input (based on 140,000 Btu/gal of Diesel Oil)	1.498 MM Btu/hr
PM Control Device. 60.4209(b) (DAQ Compliance Monitoring Report; 7/8/13; 7/15/13)	The Caterpillar D150-8 is not equipped with a diesel particulate filter (page 9 of DAQ Compliance Monitoring Report).
USEPA Certificate of Conformity - 2011 Model Year [From Compliance Monitoring Report (Inspected 7/8/2013; Completion 7/15/2013)]	
Engine Family	BPKXL06.6PJ1
Certificate Number	PKX-NRCI-11-10
FELs: g/kW-hr	NMHC + NOx: N/A NOx: N/A PM: N/A
Data from Caterpillar (DAQ Compliance Monitoring Report, page 7)	Rated Power: 150 kW Model Year: 2011 NMHC+NOx (g/kW-hr): 3.7 CO (g/kW-hr): 1.5 PM (g/kW-hr): 0.17

Table 3: Information on Emergency Generator EG-2 Located at the Plateau Medical Center, Oak Hill, Fayette County, WV.

Caterpillar (engine) /Caterpillar (generator)	
Year Installed	2005
Emission Unit ID No.	S2
Emission Point ID No.	EG-2
Engine Model No.	3306BDITA (4-cycle, 6 cylinder, turbocharged)
Power Rating (BHP/kW)	349 HP/260 kW engine 308 HP/230 kW generator
Certified Speed (RPM)	1800
Fuel	Diesel
Fuel Consumption (Permit Application - Attachment F)	17.8 gal/hr
Heat Input (based on 140,000 Btu/gal of Diesel Oil)	2.492 MM Btu/hr

Table 4: Information on Emergency Generator EG-3 Located at the Plateau Medical Center, Oak Hill, Fayette County, WV.

John Deere (engine) /Kohler (generator)	
Emission Unit ID No.	S3
Emission Point ID No.	EG-3
Year Installed:	2002
Engine Model No.	6068TF250 (4-cycle, 6 cylinder, turbo-charged and radiator-cooled)
Power Rating (BHP/kW)	190 HP/142 kW engine 141 HP/105 kW generator
Certified Speed (RPM)	1800
Fuel	Diesel
Fuel Consumption (Permit Application - Attachment F)	8.5 gal/hr
Heat Input (based on 140,000 Btu/gal of Diesel Oil)	1.19 MM Btu/hr

(a) Exhaust emission from nonroad engines to which this subpart is applic
exhaust emission standards contained in Table 1, as follows:

Table 1.—Emission Standards (g/kW-hr)

Rated Power (kW)	Tier	Model Year[1]	NOx	HC	NMHC + NOx	CO	PM
kW<8	Tier 1	2000	—	—	10.5	8.0	1.0
	Tier 2	2005	—	—	7.5	8.0	0.80
8≤kW<19	Tier 1	2000	—	—	9.5	6.6	0.80
	Tier 2	2005	—	—	7.5	6.6	0.80
19≤kW<37	Tier 1	1999	—	—	9.5	5.5	0.80
	Tier 2	2004	—	—	7.5	5.5	0.60
37≤kW<75	Tier 1	1998	9.2	—	—	—	—
	Tier 2	2004	—	—	7.5	5.0	0.40
	Tier 3	2008	—	—	4.7	5.0	
75≤kW<130	Tier 1	1997	9.2	—	—	—	—
	Tier 2	2003	—	—	6.6	5.0	0.30
	Tier 3	2007	—	—	4.0	5.0	
130≤kW<225	Tier 1	1996	9.2	1.3	—	11.4	0.54
	Tier 2	2003	—	—	6.6	3.5	0.20
	Tier 3	2006	—	—	4.0	3.5	
225≤kW<450	Tier 1	1996	9.2	1.3	—	11.4	0.54
	Tier 2	2001	—	—	6.4	3.5	0.20
	Tier 3	2006	—	—	4.0	3.5	
450≤kW≤560	Tier 1	1996	9.2	1.3	—	11.4	0.54
	Tier 2	2002	—	—	6.4	3.5	0.20
	Tier 3	2005	—	—	4.0	3.5	
kW>560	Tier 1	2000	9.2	1.3	—	11.4	0.54
	Tier 2	2006	—	—	6.4	3.5	0.20

[1] The model years listed indicate the model years for which the specified tier of standards take effect.

CFR 89.112
Table 1

EG-3 2002
EG-1 2011
EG-2 2005

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(b) Exhaust emissions of oxides of nitrogen, carbon monoxide, hydrocarbo
neasured using the procedures set forth in subpart E of this part.

(c) Exhaust emission of particulate matter is measured using the California
leavy-Duty Off-Road Diesel Cycle Engines. This procedure is incorporated by

(d) In lieu of the NO_x standards, NMHC + NO_x standards, and PM stando

Table 3.4-1. GASEOUS EMISSION FACTORS FOR LARGE STATIONARY DIESEL AND ALL STATIONARY DUAL-FUEL ENGINES[a]

Pollutant	Diesel Fuel (SCC 2-02-004-01)			Dual Fuel[b] (SCC 2-02-004-02)		
	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING	Emission Factor (lb/hp-hr) (power output)	Emission Factor (lb/MMBtu) (fuel input)	EMISSION FACTOR RATING
NO_x						
Uncontrolled	0.024	3.2	B	0.018	2.7	D
Controlled	0.013[c]	1.9[c]	B	ND	ND	NA
CO	5.5 E-03	0.85	C	7.5 E-03	1.16	D
SO_x[d]	8.09 E-03S_1	1.01S_1	B	4.06 E-04S_1 + 9.57 E-03S_2	0.05S_1 + 0.895S_2	B
CO_2[e]	1.16	165	B	0.772	110	B
PM	0.0007[c]	0.1[c]	B	ND	ND	NA
TOC (as CH_4)	7.05 E-04	0.09	C	5.29 E-03	0.8	D
Methane	f	f	E	3.97 E-03	0.6	E
Nonmethane	f	f	E	1.32 E-03	0.2[g]	E

$S_1 = 0.5$

[a] Based on uncontrolled levels for each fuel, from References 2,6-7. When necessary, the average heating value of diesel was assumed to be 19,300 Btu/lb with a density of 7.1 lb/gallon. The power output and fuel input values were averaged independently from each other, because of the use of actual brake-specific fuel consumption (BSFC) values for each data point and of the use of data possibly sufficient to calculate only 1 of the 2 emission factors (e. g., enough information to calculate lb/MMBtu, but not lb/hp-hr). Factors are based on averages across all manufacturers and duty cycles. The actual emissions from a particular engine or manufacturer could vary considerably from these levels. To convert from lb/hp-hr to kg/kw-hr, multiply by 0.608. To convert from lb/MMBtu to ng/J, multiply by 430. SCC = Source Classification Code.

[b] Dual fuel assumes 95% natural gas and 5% diesel fuel.

[c] References 8-26. Controlled NO_x is by ignition timing retard.

[d] Assumes that all sulfur in the fuel is converted to SO_2. S_1 = % sulfur in fuel oil; S_2 = % sulfur in natural gas. For example, if sulfer content is 1.5%, then S = 1.5.

[e] Assumes 100% conversion of carbon in fuel to CO_2 with 87 weight % carbon in diesel, 70 weight % carbon in natural gas, dual-fuel mixture of 5% diesel with 95% natural gas, average BSFC of 7,000 Btu/hp-hr, diesel heating value of 19,300 Btu/lb, and natural gas heating value of 1050 Btu/scf.

[f] Based on data from 1 engine, TOC is by weight 9% methane and 91% nonmethane.

[g] Assumes that nonmethane organic compounds are 25% of TOC emissions from dual-fuel engines. Molecular weight of nonmethane gas stream is assumed to be that of methane.

Table 3.4-3. SPECIATED ORGANIC COMPOUND EMISSION FACTORS FOR LARGE UNCONTROLLED STATIONARY DIESEL ENGINES[a]

EMISSION FACTOR RATING: E

Pollutant	Emission Factor (lb/MMBtu) (fuel input)
Benzene[b]	7.76 E-04
Toluene[b]	2.81 E-04
Xylenes[b]	1.93 E-04
Propylene	2.79 E-03
Formaldehyde[b]	7.89 E-05
Acetaldehyde[b]	2.52 E-05
Acrolein[b]	7.88 E-06

[a]Based on 1 uncontrolled diesel engine from Reference 7. Source Classification Code 2-02-004-01. Not enough information to calculate the output-specific emission factors of lb/hp-hr. To convert from lb/MMBtu to ng/J, multiply by 430.
[b]Hazardous air pollutant listed in the *Clean Air Act.*

HAPs