

Appendix C

Calculation Equations and Report Nomenclature

Calculation Equations

EPA Method 2 Calculations

Flue Gas Linear Velocity

$$V_s = 85.49 \times C_p \times \sqrt{\Delta P} \times \sqrt{\frac{\overline{T_s}}{P_s \times M_s}}$$

Volumetric Flow Rates - ACFM, SCFM & DSCFM

$$Q = 60 \times v_s \times A$$

$$Q_s = Q \times \left(\frac{528}{T_s} \right) \times \left(\frac{P_s}{29.92} \right) = Q \times 17.647 \times \left(\frac{P_s}{T_s} \right)$$

$$Q_{sd} = Q_s \times (1 - B_{ws})$$

Mass Flow Rate of Wet Flue Gas

$$m_g = \frac{4.995 \times Q_{sd} \times G_d}{1 - B_{ws}}$$

Actual Gas Density

$$\rho = \frac{0.04585 \times P_s \times M_s}{\overline{T_s}}$$

Where:

A	=	Cross-sectional area of duct at sample point (sq. ft.).
B _{ws}	=	Water vapor in gas stream (proportion by volume).
C _p	=	Pitot tube calibration coefficient.
G _d	=	Flue gas specific gravity relative to air, dimensionless.
m _g	=	Mass flow rate of wet flue gas (LB/HR).
M _s	=	Molecular weight of wet flue gas (LB/LB-mole).
P _s	=	Absolute gas pressure of duct (Inches Hg).
ΔP	=	Velocity pressure measured by pitot tube (Inches WC).
Q	=	Actual flue gas volumetric flow rate (ACFM).
Q _s	=	Volumetric gas flow at standard conditions (SCFM).
Q _{sd}	=	Dry standard volumetric gas flow rate (DSCFM).
T _s	=	Flue gas temperature (°R).
V _s	=	Flue gas linear velocity (feet per second).
ρ	=	Actual flue gas density (LB/CF).

EPA Method 3 Calculations

Dry Molecular Weight of Flue Gas

$$M_d = (0.44 \times \%CO_2) + (0.32 \times \%O_2) + (0.28 \times (\%N_2 + \%CO))$$

Wet Molecular Weight of Flue Gas

$$M_s = M_d \times (1 - B_{ws}) + (18 \times B_{ws})$$

Percent Excess Air

$$\%EA = 100 \times \left(\frac{\%O_2 - (0.05 \times \%CO)}{(0.264 \times \%N_2) - \%O_2 + (0.5 \times \%CO)} \right)$$

Fuel F-factor (for comparison)

$$F_o = \frac{20.9 - \%O_2}{\%CO_2}$$

Where:

B_{ws}	=	Water vapor in gas stream (proportion by volume).
$\%CO$	=	Carbon monoxide in gas stream (percent).
$\%CO_2$	=	Carbon dioxide in gas stream (percent).
$\%EA$	=	Excess air for combustion (percent).
F_o	=	Fuel F-factor for results comparison.
M_d	=	Molecular weight of dry flue gas (LB/LB-mole).
M_s	=	Molecular weight of wet flue gas (LB/LB-mole).
$\%N_2$	=	Nitrogen in gas stream (percent).
$\%O_2$	=	Oxygen in gas stream (percent).

EPA Method 4 Calculations

Sample Volume, Standard Conditions

$$V_{std} = 17.647 \times V_m \times Y \times \left(\frac{P_b + \frac{\Delta H}{13.6}}{T_m} \right)$$

Volume of Water Vapor Sampled

$$V_w = 0.047070 \times V_{lc}$$

Proportion of Water Vapor in Sampled Gas

$$B_{ws} = \frac{V_w}{V_w + V_{std}}$$

Moisture Content of Sampled Gas

$$MC = B_{ws} \times 100$$

Where:

B_{ws}	=	Water vapor in gas stream (proportion by volume).
ΔH	=	Orifice meter differential pressure (Inches WC).
MC	=	Moisture Content, % v/v
P_b	=	Barometric pressure (Inches Hg).
T_m	=	Sampling train meter temperature (°R).
V_{lc}	=	Total volume of liquid collected in sampling train (mls).
V_m	=	Volume of gas sample measured by gas meter (CF).
V_{std}	=	Gas volume corrected to standard conditions (DSCF).
V_w	=	Volume of water vapor in gas sample (SCF).
Y	=	Dry gas meter calibration coefficient.

EPA Method 5 Calculations

Sample Volume, Standard Conditions

$$V_{std} = 17.647 \times V_m \times Y \times \left(\frac{P_b + \frac{\Delta H}{13.6}}{\overline{T}_m} \right)$$

Isokinetic Variation

$$I = 0.09450 \times \left(\frac{\overline{T}_s \times V_{std}}{P_s \times V_s \times A_n \times \theta \times (1 - B_{ws})} \right)$$

Particulate Concentration

$$C_s = 15.432 \times \left(\frac{m_n}{V_{std}} \right)$$

Particulate Mass Rate

$$m_p = 0.008571 \times C_s \times Q_{sd}$$

Where:

A_n	=	Cross-sectional area of nozzle opening (square feet).
B_{ws}	=	Water vapor in gas stream (proportion by volume).
C_s	=	Particulate concentration of gas stream (GR/DSCF).
ΔH	=	Orifice meter differential pressure (Inches WC).
I	=	Isokinetic variation of sampling rate (percent).
m_n	=	Total particulate collected in sampling train (grams).
m_p	=	Particulate mass flow rate (LB/HR).
P_b	=	Barometric pressure (Inches Hg).
P_s	=	Absolute gas pressure of duct (Inches Hg).
Q_{sd}	=	Dry standard volumetric gas flow rate (DSCFM).
T_m	=	Sampling train meter temperature (°R).
T_s	=	Flue gas temperature (°R).
V_m	=	Volume of gas sample measured by gas meter (CF).
V_{std}	=	Gas volume corrected to standard conditions (DSCF).
V_s	=	Flue gas linear velocity (feet per second).
Y	=	Dry gas meter calibration coefficient.
θ	=	Total sampling time of run (minutes).

Psychrometric Moisture Content

Saturated Water Vapor Pressure

VP_s = Value indexed from Vapor Pressure of Water Table (29.92" Hg)

Source Gas Water Vapor Pressure

VP_a = $VP_s - (0.000367 \times P_s \times (T_{db} - T_{wb}) \times (1 + ((T_{wb} - 32) \div 1571)))$

Moisture Content

$MC\%$ = $100 \times VP_a \div P_s$

Where:

$MC\%$ = Moisture content of stack gas, percent by volume.
 P_s = Absolute pressure of stack gas, inches Hg.
 T_{db} = Dry bulb temperature measurement, °F.
 T_{wb} = Wet bulb temperature measurement, °F.
 VP_a = Vapor pressure of stack gas, inches Hg.
 VP_s = Saturated vapor pressure at wet bulb temperature and 29.92 inches Hg.

VAPOR PRESSURE OF WATER ("Hg)										
	0	1	2	3	4	5	6	7	8	9
0	0.0376	0.0398	0.0417	0.0441	0.0463	0.0489	0.0517	0.0541	0.0571	0.0598
10	0.0631	0.0660	0.0696	0.0728	0.0768	0.0810	0.0846	0.0892	0.0932	0.0982
20	0.1025	0.1080	0.1127	0.1186	0.1248	0.1302	0.1370	0.1429	0.1502	0.1567
30	0.1647	0.1716	0.1803	0.1878	0.1955	0.2035	0.2118	0.2203	0.2292	0.2383
40	0.2478	0.2576	0.2677	0.2782	0.2891	0.3004	0.3120	0.3240	0.3364	0.3493
50	0.3626	0.3764	0.3906	0.4052	0.4203	0.4359	0.4520	0.4686	0.4858	0.5035
60	0.5218	0.5407	0.5601	0.5802	0.6009	0.6222	0.6442	0.6669	0.6903	0.7144
70	0.7392	0.7648	0.7912	0.8183	0.8462	0.8750	0.9046	0.9352	0.9666	0.9989
80	1.032	1.066	1.102	1.138	1.175	1.213	1.253	1.293	1.335	1.378
90	1.422	1.467	1.513	1.561	1.610	1.660	1.712	1.765	1.819	1.875
100	1.932	1.992	2.052	2.114	2.178	2.243	2.310	2.379	2.449	2.521
110	2.596	2.672	2.749	2.829	2.911	2.995	3.081	3.169	3.259	3.351
120	3.446	3.543	3.642	3.744	3.848	3.954	4.063	4.174	4.289	4.406
130	4.525	4.647	4.772	4.900	5.031	5.165	5.302	5.442	5.585	5.732
140	5.881	6.034	6.190	6.350	6.513	6.680	6.850	7.024	7.202	7.384
150	7.569	7.759	7.952	8.150	8.351	8.557	8.767	8.981	9.200	9.424
160	9.652	9.885	10.12	10.36	10.61	10.86	11.12	11.38	11.65	11.92
170	12.20	12.48	12.77	13.07	13.37	13.67	13.98	14.30	14.62	14.96
180	15.29	15.63	15.98	16.34	16.70	17.07	17.44	17.82	18.20	18.61
190	19.01	19.42	19.84	20.27	20.70	21.14	21.59	22.05	22.52	22.99
200	23.47	23.96	24.46	24.97	25.48	26.00	26.53	27.07	27.62	28.18
210	28.75	29.33	29.92	30.52	31.13	31.75	32.38	33.02	33.67	34.33
220	35.00	35.68	36.37	37.07	37.78	38.50	39.24	39.99	40.75	41.52
230	42.31	43.11	43.92	44.74	45.57	46.41	47.27	48.14	49.03	49.93
240	50.84	51.76	52.70	53.65	54.62	55.60	56.60	57.61	58.63	59.67
250	60.72	61.79	62.88	63.98	65.10	66.23	67.38	68.54	69.72	70.92
260	72.13	74.36	74.61	75.88	77.16	78.46	79.78	81.11	82.46	83.83
270	85.22	86.63	88.06	89.51	90.97	92.45	93.96	95.49	97.03	98.61
280	100.2	101.8	103.4	105.0	106.7	108.4	110.1	111.8	113.6	115.4
290	117.2	119.0	120.8	122.7	124.6	126.5	128.4	130.4	132.4	134.4
300	136.4	138.5	140.6	142.7	144.8	147.0	149.2	151.4	153.6	155.9
310	158.2	160.5	162.8	165.2	167.6	170.0	172.5	175.0	177.5	180.0
320	182.6	185.2	187.8	190.4	193.1	195.8	198.5	201.3	204.1	206.9
330	209.8	212.7	215.6	218.6	221.3	224.6	227.7	230.8	233.9	237.1
340	240.3	243.5	246.8	250.1	253.4	256.7	260.1	263.6	267.1	270.6
350	274.1	277.7	281.3	284.9	288.6	292.3	296.1	299.9	303.8	307.7
360	311.6	315.5	319.5	323.5	327.6	331.7	335.9	340.1	344.4	348.7
370	353.0	357.4	361.8	366.2	370.7	375.2	379.8	384.4	389.1	393.8
380	398.6	403.4	408.2	413.1	418.1	423.1	428.1	433.1	438.2	443.4
390	446.6	453.9	459.2	464.6	470.0	475.5	481.0	486.6	492.2	497.9
400	503.6	509.3	515.1	521.0	526.9	532.9	538.9	545.0	551.1	557.3

Volatile Organic Compound Calculations

Weight/Volume Concentration

$$C_{VOC} = \frac{m_{VOC}}{V_{std}}$$

Volume/Volume Concentration

$$C_{PPM} = \frac{C_{voc} \times 24.04}{MW_{VOC}}$$

VOC Emission Rate

$$E_{VOC} = (6.242 \times 10^{-8}) \times 60 \times C_{VOC} \times DSCFM$$

Where:

C_{VOC}	=	Volatile organic compound (VOC) concentration, mg/dscm
C_{PPM}	=	Volatile organic compound (VOC) concentration, PPM v/v
DSCFM	=	Volumetric airflow, Dry Standard Cubic Feet per Minute
E_{VOC}	=	Volatile organic compound (VOC) emission rate, LB/HR
M_{VOC}	=	Mass of volatile organic compound collected, μ g
MW_{VOC}	=	Molecular weight of volatile organic compound
V_{std}	=	Standard volume of air sample, liters
(6.242×10^{-8})	=	Conversion from mg/dscm to LB/DSCF
60	=	Conversion from minutes to hours

Instrumental Analyzer Calculations EPA Methods 3A, 6C, 7E and 10

Analyzer Calibration Error

$$A_E = \frac{C_{AR} - C_{Cyl}}{S_{FS}} \times 100$$

System Calibration Bias

$$B_{Sys} = \frac{C_{SR} - C_{AR}}{S_{FS}} \times 100$$

System Drift

$$D_{Sys} = \frac{C_{SR_F} - C_{SR_I}}{S_{FS}} \times 100$$

Gas Concentration Corrected for System Bias

$$C_{PPM} = (\bar{C} - C_{0SR}) \left(\frac{C_{Cyl}}{\left(\frac{C_{SR_I} + C_{SR_F}}{2} \right) - C_{0SR}} \right)$$

Conversion to Weight/Volume Units

$$C_{mg/dscm} = C_{PPM} \times \frac{M_{Gas}}{24.04}$$

Emission Rate Calculation

$$E_R = 6.243 \times 10^{-8} \times C_{mg/dscm} \times DSCFM \times 60$$

Where:

A_E	=	Analyzer calibration error, percent of span.
B_{Sys}	=	System calibration bias, percent of span.
D_{Sys}	=	System calibration drift, percent of span.
\bar{C}	=	Average gas concentration response from analyzer, PPM (or %).
C_{0SR}	=	Average of initial and final system calibration bias check responses for the zero gas, PPM (or %).
C_{AR}	=	Analyzer direct calibration response, PPM (or %).
C_{Cyl}	=	Actual concentration of calibration gas, PPM (or %).
C_{SR}	=	System calibration response, PPM (or %).
C_{SRF}	=	Final system calibration response, PPM (or %).
C_{SRI}	=	Initial system calibration response, PPM (or %).
C_{PPM}	=	Concentration adjusted for system bias, PPM (or %).
$C_{mg/dscm}$	=	Constituent concentration converted to mg/dscm.
M_{Gas}	=	Molecular weight of target constituent, lb/lb-mole.
E_R	=	Emission rate of constituent, LB/HR.
S_{FS}	=	System measurement span, full scale.
$DSCFM$	=	Dry standard cubic feet per minute.
6.243×10^{-8}	=	Conversion factor, mg/cm to LB/CF.
60	=	Conversion factor, minutes to hours.

Gas Concentration Calculations

Weight/Volume Concentration

$$C_{mg/cm} = \frac{m}{V_{std}}$$

Volume/Volume Concentration

$$C_{ppm} = \frac{C_{mg/cm} \times 24.04}{MW}$$

Emission Rate

$$E_{Gas} = (6.242 \times 10^{-8}) \times 60 \times C_{mg/cm} \times DSCFM$$

Where:

- $C_{mg/cm}$ = Compound Concentration, mg/cubic meter.
- C_{ppm} = Compound Concentration, PPM v/v.
- DSCFM = Volumetric Airflow, dry standard cubic feet per minute.
- E_{Gas} = Compound Emission Rate, LB/HR.
- m = Mass of Compound Collected, μg .
- MW = Molecular Weight of Compound.
- V_{std} = Standard Volume of Air Sample, liters.
- (6.242×10^{-8}) = Conversion From mg/dscm To LB/CF.
- 60 = Conversion From Minutes to Hours.

Moisture Correction Calculations

Wet to Dry Concentration Correction

$$C_{dry} = \frac{C_{wet}}{\left(1 - \frac{MC_{source}}{100}\right)}$$

Dry to Wet Concentration Correction

$$C_{wet} = C_{dry} \times \left(1 - \frac{MC_{source}}{100}\right)$$

Wet Analytical Basis to Wet Stack Basis

$$C_{wet-s} = \frac{C_{wet-a}}{\left(1 - \frac{MC_{analysis}}{100}\right)} \times \left(1 - \frac{MC_{source}}{100}\right)$$

Note: Changes in temperature and pressure from the source to analysis affect the moisture capacity of the gas sample. 100% rH at laboratory conditions, or 2.5% v/v, is assumed for the analysis moisture content. If another value is used, it will be noted in the Results Summary. Care must be taken to ensure that analytes of interest are not soluble in the resulting condensate.

Where:

- C_{dry} = Compound Concentration, dry basis, not unit specific.
- C_{wet} = Compound Concentration, wet basis, not unit specific.
- C_{wet-a} = Compound Concentration, wet basis, at analysis.
- C_{wet-s} = Compound Concentration, wet basis, in source gas.
- $MC_{analysis}$ = Moisture content of gas at analytical conditions.
- MC_{source} = Moisture content of gas at source conditions.

Volatile Organic Compound Calculations EPA Method 25A

Convert Analyzer Response to Carbon Basis

$$C_{ppm-C1} = C_{propane} \times 3$$

Methane Corrected Concentration (as carbon)

$$C_{ppm-(C1-CH4)} = C_{ppm-C1} - C_{ppm-CH4}$$

Weight/Volume Concentration (as carbon)

$$C_{VOC-C1} = \frac{C_{ppm-C1} \times 12.01}{24.04} = C_{ppm-C1} \times 0.5 \quad \text{or} \quad C_{ppm-(C1-CH4)} \times 0.5$$

Emission Rate (as carbon)

$$E_{VOC-C1} = (6.242 \times 10^{-8}) \times 60 \times C_{VOC-C1} \times SCFM$$

Where:

C_{VOC-C1}	=	VOC Concentration as Carbon, mg/scm.
C_{ppm-C1}	=	VOC Concentration as Carbon, PPM v/v.
$C_{ppm-(C1-CH4)}$	=	Methane Corrected Concentration as Carbon, PPM v/v.
$C_{ppm-CH4}$	=	Methane Concentration, PPM v/v.
$C_{propane}$	=	Average THC Analyzer Concentration, PPM as propane.
SCFM	=	Volumetric Airflow, Standard Cubic Feet Per Minute.
E_{VOC-C1}	=	VOC Emission Rate as Carbon, LB/HR.
12.01	=	Molecular Weight of Carbon.
(6.242×10^{-8})	=	Conversion From mg/scm To LB/SCF.
60	=	Conversion from Minutes to Hours.

Report Nomenclature

Abbreviations, Symbols, and Nomenclature

"Hg	Inches of Mercury (pressure)	FTIR	Fourier Transform Infrared
"WC	Inches Water Column (pressure)	g	Gram
°C	Degrees Centigrade or Celsius	GC	Gas Chromatograph(y)
°F	Degrees Fahrenheit	GPD	Gallons Per Day
°K	Degrees Kelvin (absolute)	GPH	Gallons Per Hour
°R	Degrees Rankin (absolute)	GR	Grains
% v/v	Percent by volume	H ₂ O	Water
% w/w	Percent by weight	H ₂ S	Hydrogen Sulfide
ACFM	Actual Cubic Feet per Minute	HAP	Hazardous Air Pollutant
AP-42	Compilation of Air Pollutant Emission Factors, Volume I, Stationary Point and Area Sources.	HAPs	Hazardous Air Pollutants
BACT	Best Available Control Technology	Hg	Mercury
BH	Baghouse	HP	Horsepower
BHP	Brake Horsepower	HR	Hour
BTU	British Thermal Unit	In.	Inch or Inches
c	Centimeter	KLB	Thousand Pounds
c ³	Cubic Centimeter	kW	Kilowatt
cc	Cubic Centimeter	kWH	Kilowatt Hour
CAA	Clean Air Act	l	liter
CAAA	Clean Air Act Amendments	LB	Pound or Pounds
CE	Control Equipment (in Reg. ID Nos.)	LDAR	Leak Detection and Repair
CE	Control Efficiency	m	Meter
CEM	Continuous Emissions Monitor	m ³	Cubic Meter
CEMS	Continuous Emissions Monitoring System	MACT	Maximum Achievable Control Technology
CF	Cubic Feet	MC	Moisture Content
CFR	Code of Federal Regulations	µg	Microgram
C ₁	Carbon (as carbon)	µl	Microliter
CH ₄	Methane	µm	Micrometer (micron)
C ₃ H ₈	Propane	mg	Milligram
cm	Cubic Meter	MGAL	Thousand Gallons
CO	Carbon Monoxide	Min.	Minute or Minutes
CO ₂	Carbon Dioxide	ml	Milliliter
DGS	Distiller's Grains with Solubles	mm	Millimeter
DDGS	Dry Distiller's Grains with Solubles	MMBTU	Million British Thermal Units
DRE	Destruction/Reduction Efficiency	MMSCF	Million Standard Cubic Feet
DSCF	Dry Standard Cubic Feet	MS	Mass Spectrometry
DSCFM	Dry Standard Cubic Feet per Minute	MSDS	Material Safety Data Sheet
dscm	Dry Standard Cubic Meter	mW	Megawatt
dscmm	Dry Standard Cubic Meter per Minute	MW	Molecular Weight
dsl	Dry Standard Liter	N ₂	Nitrogen
EPA	Environmental Protection Agency	NA	Not Applicable
EP	Emission Point	NAAQS	National Ambient Air Quality Standards
ESP	Electrostatic Precipitator	NESHAP	National Emission Standards for Hazardous Air Pollutants
EU	Emission Unit	NO ₂	Nitrogen Dioxide
FID	Flame Ionization Detector	NO _x	Nitrogen Oxides (quantified as NO ₂)
FGR	Flue Gas Recirculation	NSPS	New Source Performance Standard
FPD	Flame Photometric Detector	O ₂	Oxygen
FPM	Feet Per Minute	PEMS	Parametric (or Predictive) Emissions Monitoring System
FPS	Feet Per Second	PID	Photo Ionization Detector
FR	Federal Register	PM	Particulate Matter
FT or ft	Foot or Feet		
FT ³	Cubic Feet		

Abbreviations, Symbols, and Nomenclature

PM ₁₀	Particulate Matter with an aerodynamic diameter equal to or less than 10 microns
PM-10	PM ₁₀
PM _{2.5}	Particulate Matter with and aerodynamic diameter equal to or less than 2.5 microns
PM-2.5	PM _{2.5}
PPB	Parts Per Billion (see variation below)
PPM	Parts Per Million
PPMv	Part Per Million by volume
PPMv-dry	Parts Per Million by volume, dry basis
PPMv-wet	Parts Per Million by volume, wet basis
PPMw	Parts Per Million by Weight (mg/l)
PSIA	Pounds per Square Inch, Absolute
PSIG	Pounds per Square Inch, Gauge
PTE	Permanent Total Enclosure
RA	Relative Accuracy
RATA	Relative Accuracy Test Audit
rH	Relative Humidity
RTO	Regenerative Thermal Oxidizer or Recuperative Thermal Oxidizer
SCF	Standard Cubic Feet
SCFM	Standard Cubic Feet per Minute
scm	Standard Cubic Meter
scmm	Standard Cubic Meter per Minute
Scr.	Scrubber
SIC	Standard Industrial Classification
SO ₂	Sulfur Dioxide
SO _x	Sulfur Oxides
Sq. Ft.	Square Feet
TCD	Thermal Conductivity Detector
TO	Thermal Oxidizer
TPD	Tons Per Day
TPH	Tons Per Hour
TPY	Tons per year
TRS	Total Reduced Sulfur
TSP	Total Suspended Particulate Matter
TTE	Temporary Total Enclosure
USEPA	United States Environmental Protection Agency
VHAP	Volatile Hazardous Air Pollutant
VOC	Volatile Organic Compound
VOCs	Volatile Organic Compounds
WC	Water Column
WDGS	Wet Distiller's Grains with Solubles

Abbreviations, Symbols, and Nomenclature

State Environmental Agency Acronyms

ADEM	Alabama Department of Environmental Management	NHDES	New Hampshire Department of Environmental Services
ADEC	Alaska Department of Environmental Conservation	NJDEP	New Jersey Department of Environmental Protection
ADEQ	Arizona Department of Environmental Quality	NMED	New Mexico Environment Department
ADEQ	Arkansas Department of Environmental Quality	NYSDEC	New York State Department of Environmental Conservation
CARB	California Air Resources Board	NCDENR	North Carolina Department of Environment & Natural Resources
CDPHE	Colorado Department of Public Health & Environment	NDDH	North Dakota Department of Health
CDEP	Connecticut Department of Environmental Protection	OEPA	Ohio Environmental Protection Agency
DNREC	Delaware Natural Resources & Environmental Control	ODEQ	Oklahoma Department of Environmental Quality
FDEP	Florida Department of Environmental Protection	ODEQ	Oregon Department of Environmental Quality
GEPD	Georgia Environmental Protection Division	PDEP	Pennsylvania Department of Environmental Protection
IDEQ	Idaho Department of Environmental Quality	RIDEM	Rhode Island Department of Environmental Management
IEPA	Illinois Environmental Protection Agency	SCDHEC	South Carolina Department of Health & Environmental Control
IDNR	Iowa Department of Natural Resources	SDDENR	South Dakota Department of Environment & Natural Resources
KDHE	Kansas Department of Health & Environment	TDEC	Tennessee Department of Environment & Conservation
KDEP	Kentucky Department for Environmental Protection	TCEQ	Texas Commission on Environmental Quality
LDEQ	Louisiana Department of Environmental Quality	UDEQ	Utah Department of Environmental Quality
MDEP	Maine Department of Environmental Protection	VANR	Vermont Agency of Natural Resources
MDE	Maryland Department of the Environment	VDEQ	Virginia Department of Environmental Quality
MDEP	Massachusetts Department of Environmental Protection	WSDNR	Washington State Department of Natural Resources
MDEQ	Michigan Department of Environmental Quality	WVDEP	West Virginia Division of Environmental Protection
MPCA	Minnesota Pollution Control Agency	WDNR	Wisconsin Department of Natural Resources
MDEQ	Mississippi Department of Environmental Quality		
MDNR	Missouri Department of Natural Resources		
MDEQ	Montana Department of Environmental Quality		
NDEQ	Nebraska Department of Environmental Quality		
NDEP	Nevada Division of Environmental Protection		