

National Ambient Air Quality Standards-Lead

Lead (Pb) is a naturally occurring metal that can be found in various manufactured products produced at industrial sites across the United States and abroad. The removal of lead from gasoline in the 1980's resulted in a drastic decline in ambient concentrations. Today, lead emissions primarily result from industrial processes that occur at lead smelters, recycling facilities and mining operations.

On November 12, 2008, the Environmental Protection Agency substantially strengthened the lead National Ambient Air Quality Standards (NAAQS) by reducing the primary standard from 1.5 micrograms per cubic meter, $\mu\text{g}/\text{m}^3$, to $0.15 \mu\text{g}/\text{m}^3$ (measured as total suspended particles). The Environmental Protection Agency also revised the secondary (welfare-based) standard to be identical to the primary standard, refer to Table 1.

Table 1 Lead NAAQS			
Pollutant	Averaging Time	NAAQS	Comment
		<i>($\mu\text{g}/\text{m}^3$)</i>	
Pb	Rolling 3-month Average	0.15	Not to be exceeded

The form of the standard is based upon the highest rolling three-month average over a period of three years. The standard is met when the three-month average is less than or equal to $0.15 \mu\text{g}/\text{m}^3$. If a facility is required to conduct a full impact analysis for lead, the analysis must include the emissions from the proposed source, existing "interactive" sources and monitored background concentrations. The modeled emission rates must reflect the maximum allowable operating conditions for each source based upon federally enforceable emission limits and operating level(s).

If the predicted impact due to the proposed source, interactive sources and the monitored background value is below the NAAQS for each applicable averaging period, compliance has been demonstrated and no further analysis for lead is necessary.

Unlike the remaining criteria pollutants, lead does not have a significant impact threshold. As such, if a violation of the lead NAAQS is predicted to occur at one or more receptors, the applicant will not be able to demonstrate compliance and permit issuance can't move forward until the violations are resolved through the establishment of emission limits, the installation of controls or other measures that reduce the ambient lead impact at the violating receptors.

The following paragraphs provide a hypothetical example of a NAAQS evaluation for lead. The data describes a basic situation and is not meant to address all modeling scenarios and/or issues that might arise during the review process.

Example NAAQS Demonstration

Facility A is proposing to install a battery manufacturing plant at a greenfield site in rural Missouri. The significant emission rate for lead is exceeded and triggers the need for an air



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quality impact analysis. Because lead does not have a significant impact threshold, the applicant is automatically required to submit a NAAQS compliance demonstration.

As noted in the introduction, NAAQS compliance is based upon the impact due to the combination of the emissions from the proposed source, existing “interactive” sources and monitored background concentrations. Because a significant impact threshold does not exist, a radius of impact is not determined. As such, the inclusion of interactive sources is based upon emission totals and the location of the off-site facilities in relation to Facility A. No lead sources were noted in the vicinity; as such, Facility A was the only source included in the led NAAQS compliance assessment.

In order to determine the impact due to the proposed source, the emissions from Facility A were explicitly modeled. The monitored background value was obtained from a representative monitoring site.

Emission rates and release parameters for each source within the inventory were input into the air quality model. In order to determine the ambient impact due to lead, the user must calculate the maximum three-month rolling average that is predicted to occur. Because the current version of AERMOD will not generate a three-month rolling average; the Environmental Protection Agency developed a post processing tool called LEADPOST. LEADPOST will read monthly concentration outputs from a model generated POSTFILE in order to calculate the rolling three-month averages that are ultimately needed to determine compliance.

For Facility A, two keywords within the AERMOD input file were necessary in order to produce monthly averages for use in the LEADPOST processor as follows:

- Control Pathway:
 - CO AVERTIME MONTH
- Output Pathway:
 - OU POSTFILE Lead1 FacA PLOT FacilityA_Monthly_Lead_2003.pst

The POSTFILE will contain the combined ambient impact due to the modeled sources on a receptor by receptor basis for each month within the year.



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Pb_Test_NAQ_2003.PsT - Notepad

File Edit Format View Help

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* AERMOD ( 12060): Lead NAAQS Example
* MODELING OPTIONS USED:
* RegDFault CONC
* POST/PLOT FILE OF CONCURRENT MONTH VALUES FOR SOURCE GROUP: ALL
* FOR A TOTAL OF 18 RECEPTORS.
* FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,I8.8,2X,A8)
*
* X Y AVERAGE CONC ZELEV ZHILL ZFLAG AVE GRP DATE NET ID
*
466366.36000 4119874.07000 0.00532 390.10 390.10 0.00 MONTH ALL 03013124
466383.60000 4119856.55000 0.00645 390.28 390.28 0.00 MONTH ALL 03013124
466433.58000 4119854.97000 0.00800 390.90 390.90 0.00 MONTH ALL 03013124
466483.55000 4119853.40000 0.00826 391.77 391.77 0.00 MONTH ALL 03013124
466533.53000 4119851.82000 0.00468 392.70 392.70 0.00 MONTH ALL 03013124
466583.50000 4119850.24000 0.00409 393.40 393.40 0.00 MONTH ALL 03013124
466623.48000 4119848.97000 0.00390 393.92 393.92 0.00 MONTH ALL 03013124
466666.05000 4119847.63000 0.00373 394.46 394.46 0.00 MONTH ALL 03013124
466663.99000 4119797.67000 0.00420 394.03 394.03 0.00 MONTH ALL 03013124
466661.93000 4119747.71000 0.00399 393.53 393.53 0.00 MONTH ALL 03013124
466659.87000 4119697.76000 0.00310 393.24 393.24 0.00 MONTH ALL 03013124
466657.80000 4119647.80000 0.00220 392.87 392.87 0.00 MONTH ALL 03013124
466656.27000 4119597.82000 0.00126 392.67 392.67 0.00 MONTH ALL 03013124
466655.03000 4119567.85000 0.00090 392.66 392.66 0.00 MONTH ALL 03013124
466653.11000 4119534.08000 0.00092 392.91 392.91 0.00 MONTH ALL 03013124
466619.95000 4119496.67000 0.00261 394.14 394.14 0.00 MONTH ALL 03013124
466593.41000 4119466.73000 0.00247 395.18 395.18 0.00 MONTH ALL 03013124
466573.07000 4119443.78000 0.00213 395.92 395.92 0.00 MONTH ALL 03013124
466366.36000 4119874.07000 0.00595 390.10 390.10 0.00 MONTH ALL 03022824
466383.60000 4119856.55000 0.00739 390.28 390.28 0.00 MONTH ALL 03022824
466433.58000 4119854.97000 0.00996 390.90 390.90 0.00 MONTH ALL 03022824
466483.55000 4119853.40000 0.00935 391.77 391.77 0.00 MONTH ALL 03022824
466533.53000 4119851.82000 0.00547 392.70 392.70 0.00 MONTH ALL 03022824
466583.50000 4119850.24000 0.00508 393.40 393.40 0.00 MONTH ALL 03022824
466623.48000 4119848.97000 0.00425 393.92 393.92 0.00 MONTH ALL 03022824
466666.05000 4119847.63000 0.00290 394.46 394.46 0.00 MONTH ALL 03022824
466663.99000 4119797.67000 0.00227 394.03 394.03 0.00 MONTH ALL 03022824
466661.93000 4119747.71000 0.00147 393.53 393.53 0.00 MONTH ALL 03022824
466659.87000 4119697.76000 0.00081 393.24 393.24 0.00 MONTH ALL 03022824
466657.80000 4119647.80000 0.00100 392.87 392.87 0.00 MONTH ALL 03022824
466656.27000 4119597.82000 0.00141 392.67 392.67 0.00 MONTH ALL 03022824
466655.03000 4119567.85000 0.00134 392.66 392.66 0.00 MONTH ALL 03022824
466653.11000 4119534.08000 0.00116 392.91 392.91 0.00 MONTH ALL 03022824
466619.95000 4119496.67000 0.00162 394.14 394.14 0.00 MONTH ALL 03022824
466593.41000 4119466.73000 0.00158 395.18 395.18 0.00 MONTH ALL 03022824
466573.07000 4119443.78000 0.00149 395.92 395.92 0.00 MONTH ALL 03022824
466366.36000 4119874.07000 0.00839 390.10 390.10 0.00 MONTH ALL 03033124
466383.60000 4119856.55000 0.00980 390.28 390.28 0.00 MONTH ALL 03033124
466433.58000 4119854.97000 0.01149 390.90 390.90 0.00 MONTH ALL 03033124
466483.55000 4119853.40000 0.01046 391.77 391.77 0.00 MONTH ALL 03033124
466533.53000 4119851.82000 0.00532 392.70 392.70 0.00 MONTH ALL 03033124
466583.50000 4119850.24000 0.00402 393.40 393.40 0.00 MONTH ALL 03033124
466623.48000 4119848.97000 0.00295 393.92 393.92 0.00 MONTH ALL 03033124
466666.05000 4119847.63000 0.00196 394.46 394.46 0.00 MONTH ALL 03033124
466663.99000 4119797.67000 0.00169 394.03 394.03 0.00 MONTH ALL 03033124
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In order for LEADPOST to execute correctly, the POSTFILE must be in this format and based upon the monthly (MONTH) averaging period. Upon execution LEADPOST will provide two differing output files, the three-month rolling averages and the maximum monthly concentrations for each receptor and source group requested. The following output is an example of the three-month rolling average output file that was obtained from LEADPOST for Facility A.



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01_2003_12_2003_3_month_concs.txt - Notepad

466386.37500	4119874.00000	390.10	390.10	0.00	0.655333E-02	ALL	March	2003	0.532000E-02	January	2003	0.595000E-02	February	2003	0.839000E-02	March
466383.59375	4119856.50000	390.28	390.28	0.00	0.1788000E-02	ALL	March	2003	0.645000E-02	January	2003	0.739000E-02	February	2003	0.980000E-02	March
466433.59375	4119855.00000	390.90	390.90	0.00	0.981667E-02	ALL	March	2003	0.800000E-02	January	2003	0.996000E-02	February	2003	0.114900E-01	March
466483.56250	4119853.50000	391.77	391.77	0.00	0.935667E-02	ALL	March	2003	0.826000E-02	January	2003	0.935000E-02	February	2003	0.104600E-01	March
466533.53125	4119851.75000	392.70	392.70	0.00	0.515667E-02	ALL	March	2003	0.468000E-02	January	2003	0.547000E-02	February	2003	0.532000E-02	March
466583.50000	4119850.25000	393.40	393.40	0.00	0.439667E-02	ALL	March	2003	0.409000E-02	January	2003	0.508000E-02	February	2003	0.402000E-02	March
466623.46875	4119849.00000	393.92	393.92	0.00	0.370000E-02	ALL	March	2003	0.390000E-02	January	2003	0.425000E-02	February	2003	0.295000E-02	March
466666.06250	4119847.75000	394.46	394.46	0.00	0.286333E-02	ALL	March	2003	0.373000E-02	January	2003	0.290000E-02	February	2003	0.196000E-02	March
466664.00000	4119797.75000	394.03	394.03	0.00	0.272000E-02	ALL	March	2003	0.420000E-02	January	2003	0.227000E-02	February	2003	0.169000E-02	March
466661.93750	4119747.75000	393.53	393.53	0.00	0.228667E-02	ALL	March	2003	0.399000E-02	January	2003	0.147000E-02	February	2003	0.140000E-02	March
466659.87500	4119697.75000	393.24	393.24	0.00	0.1465667E-02	ALL	March	2003	0.310000E-02	January	2003	0.810000E-03	February	2003	0.106000E-02	March
466657.81250	4119647.75000	392.87	392.87	0.00	0.129333E-02	ALL	March	2003	0.220000E-02	January	2003	0.100000E-02	February	2003	0.680000E-03	March
466656.28125	4119597.75000	392.67	392.67	0.00	0.106667E-02	ALL	March	2003	0.126000E-02	January	2003	0.141000E-02	February	2003	0.530000E-03	March
466655.03125	4119567.75000	392.66	392.66	0.00	0.330000E-03	ALL	March	2003	0.900000E-03	January	2003	0.134000E-02	February	2003	0.550000E-03	March
466653.12500	4119534.00000	392.91	392.91	0.00	0.916667E-03	ALL	March	2003	0.920000E-03	January	2003	0.116000E-02	February	2003	0.670000E-03	March
466619.93750	4119496.75000	394.14	394.14	0.00	0.189667E-02	ALL	March	2003	0.261000E-02	January	2003	0.162000E-02	February	2003	0.146000E-02	March
466593.40625	4119466.75000	395.18	395.18	0.00	0.198667E-02	ALL	March	2003	0.247000E-02	January	2003	0.158000E-02	February	2003	0.191000E-02	March
466573.06250	4119443.75000	395.92	395.92	0.00	0.178000E-02	ALL	March	2003	0.213000E-02	January	2003	0.149000E-02	February	2003	0.172000E-02	March
466386.37500	4119874.00000	390.10	390.10	0.00	0.709667E-02	ALL	April	2003	0.595000E-02	February	2003	0.839000E-02	March	2003	0.695000E-02	April
466383.59375	4119856.50000	390.28	390.28	0.00	0.944333E-02	ALL	April	2003	0.739000E-02	February	2003	0.980000E-02	March	2003	0.814000E-02	April
466433.59375	4119855.00000	390.90	390.90	0.00	0.102900E-01	ALL	April	2003	0.996000E-02	February	2003	0.114900E-01	March	2003	0.942000E-02	April
466483.56250	4119853.50000	391.77	391.77	0.00	0.942333E-02	ALL	April	2003	0.935000E-02	February	2003	0.104600E-01	March	2003	0.846000E-02	April
466533.53125	4119851.75000	392.70	392.70	0.00	0.508000E-02	ALL	April	2003	0.547000E-02	February	2003	0.532000E-02	March	2003	0.445000E-02	April
466583.50000	4119850.25000	393.40	393.40	0.00	0.417667E-02	ALL	April	2003	0.508000E-02	February	2003	0.402000E-02	March	2003	0.343000E-02	April
466623.46875	4119849.00000	393.92	393.92	0.00	0.330667E-02	ALL	April	2003	0.425000E-02	February	2003	0.295000E-02	March	2003	0.272000E-02	April
466666.06250	4119847.75000	394.46	394.46	0.00	0.233000E-02	ALL	April	2003	0.290000E-02	February	2003	0.196000E-02	March	2003	0.213000E-02	April
466664.00000	4119797.75000	394.03	394.03	0.00	0.201333E-02	ALL	April	2003	0.227000E-02	February	2003	0.169000E-02	March	2003	0.208000E-02	April
466661.93750	4119747.75000	393.53	393.53	0.00	0.150667E-02	ALL	April	2003	0.147000E-02	February	2003	0.140000E-02	March	2003	0.165000E-02	April
466659.87500	4119697.75000	393.24	393.24	0.00	0.966667E-03	ALL	April	2003	0.810000E-03	February	2003	0.106000E-02	March	2003	0.103000E-02	April
466657.81250	4119647.75000	392.87	392.87	0.00	0.900000E-03	ALL	April	2003	0.100000E-02	February	2003	0.680000E-03	March	2003	0.102000E-02	April
466656.28125	4119597.75000	392.67	392.67	0.00	0.123333E-02	ALL	April	2003	0.141000E-02	February	2003	0.530000E-03	March	2003	0.176000E-02	April
466655.03125	4119567.75000	392.66	392.66	0.00	0.286667E-02	ALL	April	2003	0.314000E-02	February	2003	0.550000E-03	March	2003	0.197000E-02	April
466653.12500	4119534.00000	392.91	392.91	0.00	0.132000E-02	ALL	April	2003	0.116000E-02	February	2003	0.670000E-03	March	2003	0.213000E-02	April
466619.93750	4119496.75000	394.14	394.14	0.00	0.199000E-02	ALL	April	2003	0.162000E-02	February	2003	0.146000E-02	March	2003	0.289000E-02	April
466593.40625	4119466.75000	395.18	395.18	0.00	0.195667E-02	ALL	April	2003	0.151000E-02	February	2003	0.191000E-02	March	2003	0.238000E-02	April
466573.06250	4119443.75000	395.92	395.92	0.00	0.190667E-02	ALL	April	2003	0.149000E-02	February	2003	0.172000E-02	March	2003	0.251000E-02	April
466386.37500	4119874.00000	390.10	390.10	0.00	0.678333E-02	ALL	May	2003	0.839000E-02	March	2003	0.695000E-02	April	2003	0.501000E-02	May
466383.59375	4119856.50000	390.28	390.28	0.00	0.979000E-02	ALL	May	2003	0.927000E-02	March	2003	0.814000E-02	April	2003	0.597000E-02	May
466433.59375	4119855.00000	390.90	390.90	0.00	0.943333E-02	ALL	May	2003	0.943333E-02	March	2003	0.114900E-01	April	2003	0.739000E-02	May
466483.56250	4119853.50000	391.77	391.77	0.00	0.865333E-02	ALL	May	2003	0.104600E-01	March	2003	0.846000E-02	April	2003	0.704000E-02	May
466533.53125	4119851.75000	392.70	392.70	0.00	0.421333E-02	ALL	May	2003	0.522000E-02	March	2003	0.445000E-02	April	2003	0.287000E-02	May
466583.50000	4119850.25000	393.40	393.40	0.00	0.301333E-02	ALL	May	2003	0.402000E-02	March	2003	0.343000E-02	April	2003	0.159000E-02	May
466623.46875	4119849.00000	393.92	393.92	0.00	0.223000E-02	ALL	May	2003	0.295000E-02	March	2003	0.272000E-02	April	2003	0.102000E-02	May
466666.06250	4119847.75000	394.46	394.46	0.00	0.157667E-02	ALL	May	2003	0.196000E-02	March	2003	0.213000E-02	April	2003	0.640000E-03	May
466664.00000	4119797.75000	394.03	394.03	0.00	0.147667E-02	ALL	May	2003	0.169000E-02	March	2003	0.208000E-02	April	2003	0.660000E-03	May
466661.93750	4119747.75000	393.53	393.53	0.00	0.131000E-02	ALL	May	2003	0.140000E-02	March	2003	0.165000E-02	April	2003	0.880000E-03	May
466659.87500	4119697.75000	393.24	393.24	0.00	0.107667E-02	ALL	May	2003	0.106000E-02	March	2003	0.103000E-02	April	2003	0.114000E-02	May
466657.81250	4119647.75000	392.87	392.87	0.00	0.923333E-03	ALL	May	2003	0.680000E-03	March	2003	0.102000E-02	April	2003	0.107000E-02	May
466656.28125	4119597.75000	392.67	392.67	0.00	0.119000E-02	ALL	May	2003	0.530000E-03	March	2003	0.176000E-02	April	2003	0.128000E-02	May
466655.03125	4119567.75000	392.66	392.66	0.00	0.129667E-02	ALL	May	2003	0.550000E-03	March	2003	0.197000E-02	April	2003	0.137000E-02	May
466653.12500	4119534.00000	392.91	392.91	0.00	0.139667E-02	ALL	May	2003	0.670000E-03	March	2003	0.213000E-02	April	2003	0.139000E-02	May
466619.93750	4119496.75000	394.14	394.14	0.00	0.222667E-02	ALL	May	2003	0.146000E-02	March	2003	0.289000E-02	April	2003	0.233000E-02	May
466593.40625	4119466.75000	395.18	395.18	0.00	0.228667E-02	ALL	May	2003	0.191000E-02	March	2003	0.238000E-02	April	2003	0.257000E-02	May

It is important to note that the model outputs do not include the monitored background concentration; this value must be added to the model predictions prior to determining compliance with the NAAQS. Table 1 contains the model outputs for a sampling of the receptors obtained from the LEADPOST output for Facility A.

Table 1 Lead NAAQS Compliance Determination						
3-Month Rolling Average = 0.15 µg/m ³ (Not to Be Exceeded)						
Eastings	Northing	Elevation	Hill	LEADPOST	Background	NAAQS
(Meters)	(Meters)	(Meters)	(Meters)	(µg/m ³)	(µg/m ³)	(µg/m ³)
				3-Month Rolling Average	3-Month Rolling Average	
466433.59	4119855.00	390.90	390.90	1.87E-02	8.00E-02	9.87E-02
466483.56	4119853.50	391.77	391.77	1.77E-02	8.00E-02	9.77E-02
466433.59	4119855.00	390.90	390.90	1.70E-02	8.00E-02	9.70E-02
466483.56	4119853.50	391.77	391.77	1.61E-02	8.00E-02	9.61E-02
466433.59	4119855.00	390.90	390.90	1.53E-02	8.00E-02	9.53E-02
466483.56	4119853.50	391.77	391.77	1.49E-02	8.00E-02	9.49E-02
466433.59	4119855.00	390.90	390.90	1.37E-02	8.00E-02	9.37E-02
466383.59	4119856.50	390.28	390.28	1.35E-02	8.00E-02	9.35E-02
466483.56	4119853.50	391.77	391.77	1.25E-02	8.00E-02	9.25E-02
466383.59	4119856.50	390.28	390.28	1.23E-02	8.00E-02	9.23E-02

The first four columns contain information regarding the location of the receptor under review, followed by the predicted concentration from the dispersion model for each three-month rolling average obtained from LEADPOST. The maximum three-month rolling average concentration must be added to the monitored background number. The sum represents the total concentration that should be compared to the NAAQS in order to determine compliance. Based



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upon the results contained within Table 1, Facility A has demonstrated compliance and no further analysis is necessary for the lead NAAQS. If violations had been predicted, Facility A would be required to reduce its ambient impact to levels that comply with the air quality standard for lead.