2007 REVISION

of the

STATE IMPLEMENTATION PLAN

for the

HERCULANEUM LEAD NONATTAINMENT AREA

Adoption — April 26, 2007

Department of Natural Resources
Division of Environmental Quality

Air Pollution Control Program
P.O. Box 176
Jefferson City, Missouri 65102
Telephone: (573) 751-4817

Table of Contents

TABLES

Page

FIGURES

Page

ABBREVIATIONS

APCP	Air Pollution Control Program
CAAA	Clean Air Act Amendments of 1990
CMB	Chemical Mass Balance
EPA	Environmental Protection Agency
ISCST	Industrial Source Complex Short Term (Dispersion Model)
MACT	Maximum Achievable Control Technology
NAAQS	National Ambient Air Quality Standards
RACM	Reasonably Available Control Measures
RACT	Reasonably Available Control Technology
RFP	Reasonable Further Progress
SCE	Source Contribution Estimate
SIP	State Implementation Plan
$\mu g/m^3$	micrograms per cubic meter (concentration measure units)

ACKNOWLEDGMENTS

A number of people deserve recognition for the development of this plan revision. Instead of a typical three-year time frame the U.S. Environmental Protection Agency (EPA), with support of the state, established a deadline of only one year to revise the State Implementation Plan (SIP) in an effort to be responsive to a community that has been dealing with lead nonattainment issues for many years. It is only through the personal commitment of the professionals working on this project that it has been developed with a strong technical foundation and completed in a timely manner.

Doe Run contractor, Joseph Stolle (Shell Engineering) assembled an hourly lead emission inventory and prepared various modeling inputs such as the local meteorology data sets and modeling receptor networks. Rusty Keller and Aaron Miller (Doe Run) provided information about plant operations and proposed numerous emission control strategies for evaluation, as well as insights the implementation of different control options. Jeff Bennett, P.E. (Missouri Department of Natural Resources' Air Pollution Control Program) conducted the modeling project and along with Mr. Stolle made a number of improvements to the model based on their evaluation of model performance. Gwen Yoshimura (EPA) and Shelly Rios (EPA) provided comments and suggestions on many of the documents prepared as part of this revision including the emission inventory, the consent judgment, and the Work Practices Manual. Stacy Stotts (Stinson, Morrison, Hecker, LLP, representing Doe Run), Robert Patrick (EPA), and Todd Iveson (Missouri Attorney General's Office) worked to develop a Consent Judgment making the SIP control strategies enforceable conditions. John Rustige P.E., (Missouri Department of Natural Resources' Air Pollution Control Program) served as project manager for this SIP revision.

A number of other individuals provided assistance with this project, and their contributions are also recognized. The ultimate goal of the project is to meet the National Ambient Air Quality Standards (NAAQS) requirements for Lead in Herculaneum, and the individuals involved have all strove to develop a strong plan and make this happen as quickly as possible.

1.0 Introduction

This document is intended to serve as Missouri's formal State Implementation Plan (SIP) submittal to revise the previous lead attainment plan for the Herculaneum, Missouri, nonattainment area. It includes the following elements required by the Clean Air Act Amendments of 1990 (CAAA):

- enforceable components of a control strategy (consent judgement, and work practices manual),
- an analysis of Reasonably Available Control Technology (RACT) and Reasonably Available Control Measures (RACM),
- a discussion of Reasonable Further Progress (RFP) including control strategy construction deadlines,
- a contingency plan and set of contingency measures,
- a description of nonattainment boundaries,
- a summary of air quality data and trends and ambient monitoring sufficiency,
- a summary of the baseline and controlled emission inventory,
- an explanation of emission reductions expected from the installations of controls, and
- a discussion showing the ambient lead levels expected as a result of the control strategy demonstrating attainment of the national ambient air quality standard for lead.

1.1 Plant Description

Doe Run Resources Corporation operates the Herculaneum smelter. The plant is located in the town of Herculaneum, Missouri, approximately 30 miles south of St. Louis on the Mississippi River. The smelter is the largest lead smelting facility in the nation and has the ability to produce approximately 250,000 tons of 99.999% pure lead each year. Over 80% of the lead is used in the production of lead-acid batteries. The rest of the lead is used in a multitude of products ranging from computers to eyeglasses.

1.2 Regulatory History

Pursuant to the requirements of the CAAA, the U.S. Environmental Protection Agency (EPA) promulgated a national ambient air quality standard for lead on October 5, 1978, of 1.5 micrograms per cubic meter ($\mu g/m^3$) averaged over a calendar quarter. In response to this standard, the state of Missouri prepared lead SIPs for various geographic areas, including the area near the Herculaneum smelter.

As a result of ambient air monitoring, pursuant to the CAAA, the area within the city limits of Herculaneum, Missouri, was designated as nonattainment for lead. In 1993 Missouri revised the SIP to address continuing violations of the NAAQS in Herculaneum. This 1993 plan revision was approved by EPA with a goal of achieving the lead standard by June 30, 1995. This revised plan required the company to build air-filtering systems, enclose buildings, and improve material handling. It also required implementation of additional controls if the national ambient air quality standard for lead was not met. Since air monitoring showed continued violations of the lead standard, Doe Run was asked to implement all of the additional contingency controls identified in the 1993 SIP.

On August 27, 1996, EPA notified Missouri that a “ failure to attain ” determination was made at the Doe Run/Herculaneum smelter. A proposed “ failure to attain ” notice was published in the *Federal Register* on March 5, 1997, and explained the requirements of section 179 (d) of the Clean Air Act. When the technical work was begun to address this SIP call a decision was made to use a receptor modeling approach to enhance the dispersion modeling effort and to advance the understanding of the problem. All parties recognized the significant effort and time commitment resulting from this decision. Because of the complicated nature of this project, particularly with respect to the development of the receptor model, the SIP revision was not submitted to EPA within the regulatory timeframe. On July 28, 1999, EPA published in the Federal Register a notice of failure to submit. This failure to submit finding was expected because of the extended time required developing the receptor model. The department’s Air Pollution Control Program worked very closely with Doe Run and EPA to finalize the proposed plan. The revision was approved and adopted by the Missouri Air Conservation Commission on December 7, 2000. The Consent Judgement set emission control construction deadlines, established process throughput limitations, outlined a set of contingency measures, and established stipulated penalties with potential production cuts. The Judgement was filed in Iron County Court and signed on January 5, 2001, and the plan was formally submitted to EPA on January 9, 2001. EPA issued a completeness finding on January 18, 2001. This finding stopped the mandatory sanctions clock. The plan was formally approved in the April 16, 2002 publication of the federal register.

The emission control strategy of this 2001 revision involved enclosure of the main processes at the plant, and the installation of building ventilation systems. The ventilation gases are filtered by state-of-the-art, high-efficiency baghouse filtration systems prior to release to the atmosphere. Capital costs were approximately $12,000,000. The Refinery Building was enclosed and ventilated. The refinery kettle ventilation project was completed. All remaining plan controls were completed by the plan deadline of July 31, 2002. In addition to the plan controls, Doe Run completed all of the contingency measures listed in the plan. These controls further reduce emissions and provide an additional margin of safety.

For ten consecutive calendar quarters after all of the projects were completed, no violations of the NAAQS were recorded in Herculaneum. In the eleventh quarter (first quarter of 2005), however, the Broad Street monitor recorded 1.88 micrograms per cubic meter ($\mu g/m^3$) exceeding the 1.5 $\mu g/m^3$ standard. The Broad Street monitor is the monitor that is located closest to the plant and typically records the highest concentrations. Although this was the first violation recorded since the installation of the emission controls required in the 2000 State Implementation Plan, several previous quarters had been very close to the standard.

As a result of this ambient violation and subsequent violations, EPA filed a notice in the December 19, 2005 *Federal Register* that found the State Implementation Plan substantially inadequate. EPA responded to comments on the notice and finalized the SIP call on April 14, 2006. This federal rulemaking required the state to revise the SIP to provide for attainment no later than April 7, 2008, and submit the revised SIP by April 7, 2007. This document is intended to serve as this revision.

2.0 Description of Nonattainment Area

2.1 EPA Description

EPA designated the geographic area inside the city limits of Herculaneum, Missouri, as nonattainment for lead in 56 Federal Register 6694, November 6, 1991, effective January 6, 1992. This designation was based on ambient monitoring data that indicated violations of the lead national ambient air quality standard. Air monitoring has shown that lead concentrations have decreased over time as a result of each of the plan revisions. Figure 2 shows the locations of the ambient monitors.

2.2 Location and Topography

Herculaneum is located on the west bank of the Mississippi River about thirty miles south of St. Louis. Figure 1 is a map showing the location of Herculaneum, Missouri. Joachim Creek empties into the Mississippi at the south end of the plant. The plant is located east and south of the town; however, residential homes are located within about four hundred yards of the plant. According to the 1990 census Herculaneum had a population of 2,263, growing to an estimated population of 2,805 in 2000 and 3,172 in 2005, respectively. These growth estimates likely do not account for the people that have left the town as a result of the voluntary property purchase program that was negotiated between the Doe Run Company and the Missouri Department of Natural Resources. As part of the program Doe Run purchased approximately 170 residential properties located near the plant.

The terrain generally rises to the west away from the river, and a river bluff is located on the north side of the plant. Figure 2 is a composite topographic map showing the local topography. This figure also shows the location of the plant, local buildings, and the locations of the ambient air monitoring stations. Figure 3 is a composite aerial photo showing the same information.

2.3 Meteorology

2.3.1 Wind

During daylight hours, wind speeds can vary considerably up to 4.0 meters per second and greater. Nighttime winds are generally light and variable, up to 2.5 meters per second or greater. During Northwestern weather front events, winds can achieve significant speeds, up to 8.0 meters per second from the northwest.

Topographical influences to wind speed and direction are likely. The tall bluffs just north of the plant likely affect winds from the south and east. The rising terrain to the west of the plant likely affects winds from the east.

FIGURE 1: Location of Herculaneum, Missouri

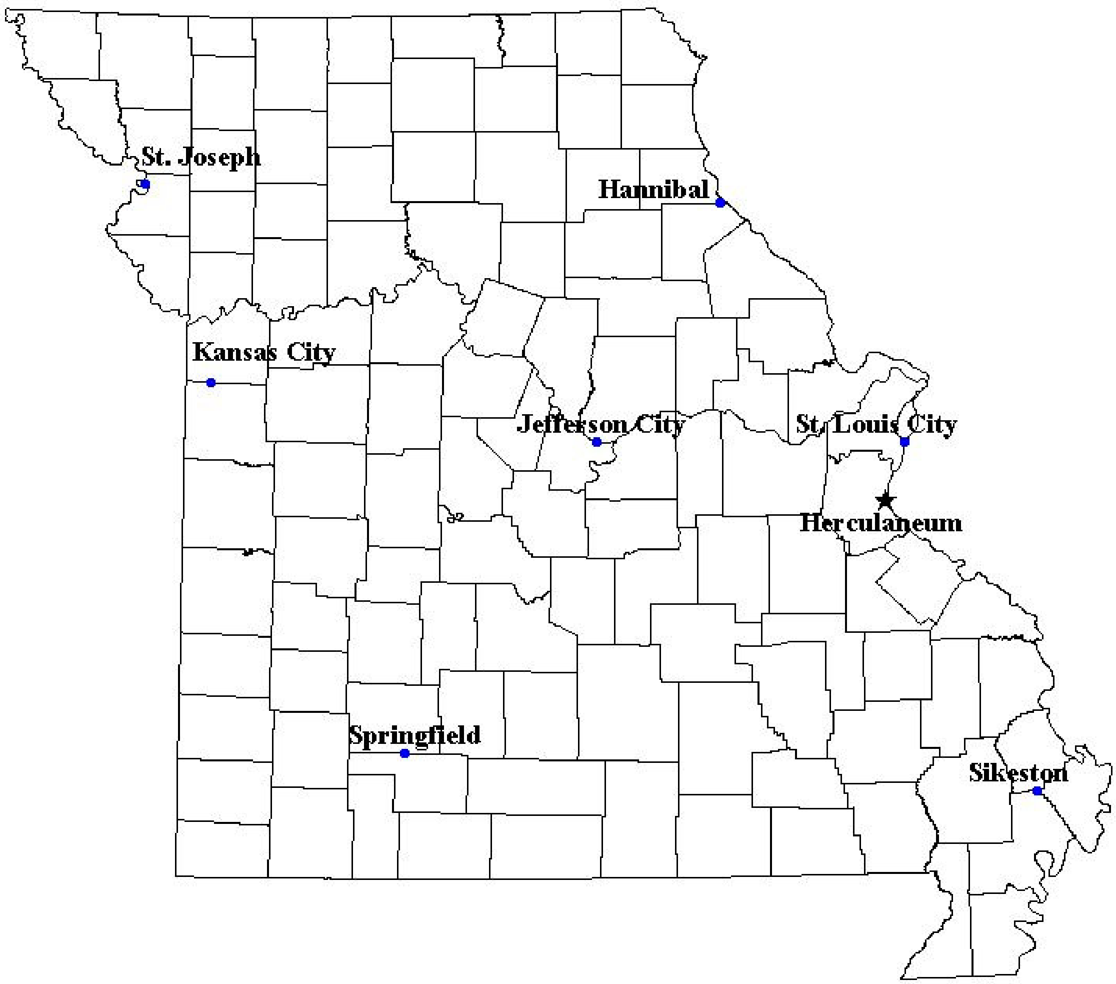
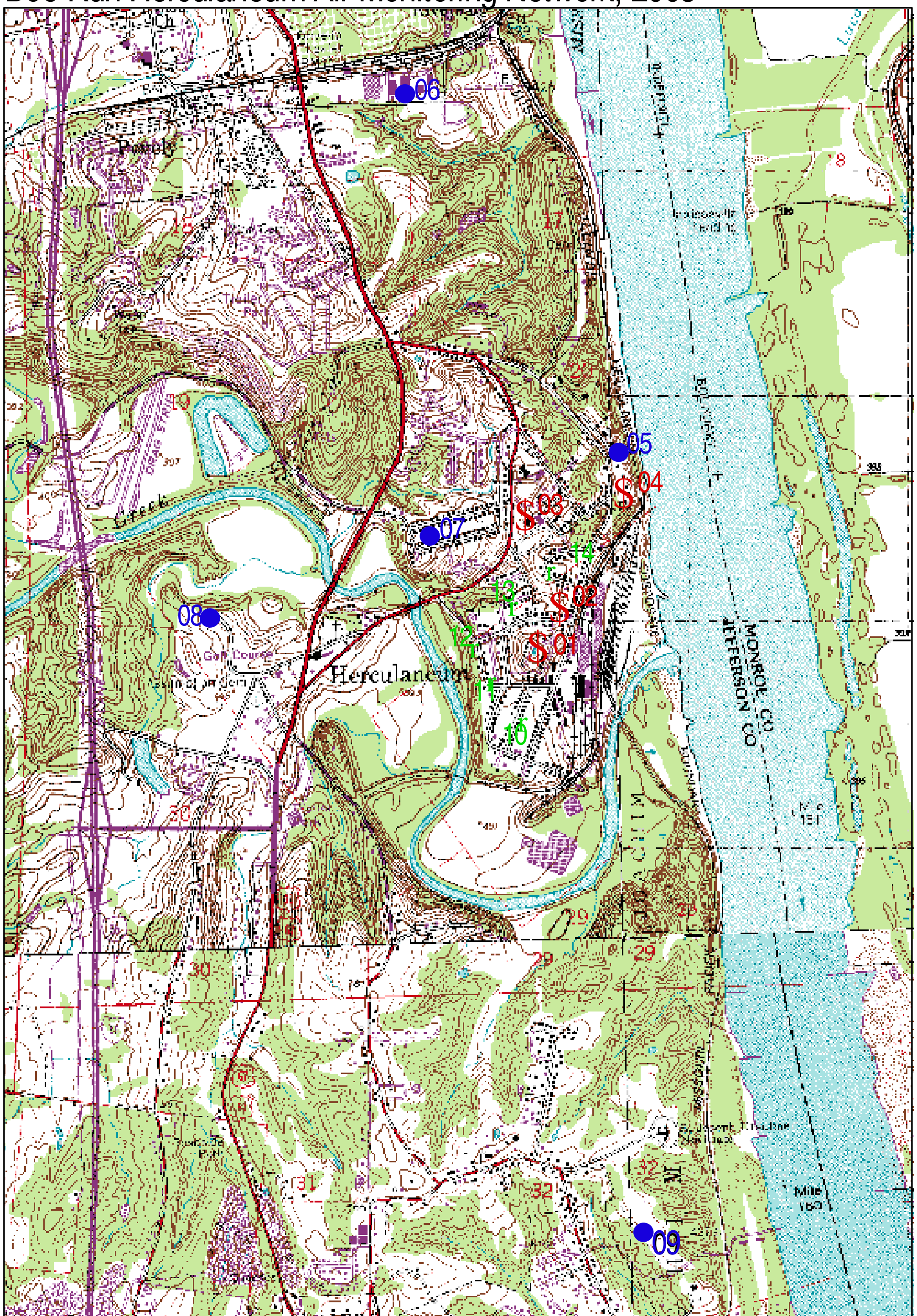


FIGURE 2: Composite Topographic Map

Doe Run Herculaneum Air Monitoring Network, 2005



Missouri Department of Natural Resources

Legend	Site#	Site Name	Site#	Site Name
● Individual Monitoring Sites	01	Broad Street	08	Golf Course
	02	Main Street	09	Ursuline
$ Collocated Monitoring Sites	03	Dunklin H. Sch.	10	South Main
	04	Bluff	11	South Cross
	05	Sherman	12	North Cross
r Proposed Monitoring Sites	06	North Site	13	Mott
	07	Thurwell	14	Circle

N
W E
S

Figure 3: Composite Aerial Photo

2.3.2 Precipitation and Temperature

Herculaneum, Missouri, averages about 37.5 inches of precipitation per year, mostly as rain. Snow falls occasionally during the winter months. Temperatures in Herculaneum range from average lows of 20 degrees Fahrenheit in January to average highs of 89 degrees Fahrenheit in August.

2.4 Summary of Air Quality Data

Doe Run and the Missouri Department of Natural Resources operate a network of ambient air monitors in the nonattainment area. At several locations both organizations operate co-located monitors. Monitor locations are shown in Figure 2.

The monitors take 24-hour samples on a schedule of at least every six days. Monitoring at several locations is conducted on a more frequent basis. The daily lead values collected in each calendar quarter are then averaged to generate the reported quarterly averages. A summary of the quarterly averages recorded since the third quarter of 1982 is presented in Table 1.

The data shows that the ambient lead concentrations at the more distant monitors consistently show attainment of the lead national ambient air quality standard since July of 2002. The results at the Broad Street monitor show violations of the NAAQS in the first, second, and third quarters of 2005 and the first and third quarters of 2006.

Daily monitoring data was used for dispersion model validation.

TABLE 1

LEAD AMBIENT AIR QUALITY DATA – VICINITY OF HERCULANEUM SMELTER
CALENDAR QUARTERLY VALUES
in micrograms of lead per cubic meter of air ($\mu g/m^3$)

DATE	Dunklin (S)	Dunklin (H)	Golf	North	Ursuline	Bluff	Sherman	Broad St.	Main St.
1982									
1st									
2nd									
3rd	0.8	**1.8**		0.3	0.3	0.7	0.6		
4th		**3.8**		0.7	0.1	**2.6**	1.3		
1983									
1st		1.1	0.4	0.5	0.3	1.4	0.7		
2nd		**1.9**	0.3	0.4	0.6	**1.9**	1.0		
3rd		**1.6**	0.5	0.7	0.6	**1.6**	1.3		
4th		**4.3**	0.4	1.3	0.3	**6.7**	**2.6**		
1984									
1st		1.0	0.5	0.7	0.4	0.7	0.7		
2nd		0.1	0.2	0.1	0.1	0.2	0.1		

3rd		0.6	0.2	0.2	0.2	0.2	0.1		
4th		1.3	0.3	1.1	0.4	**2.4**	**1.6**		
1985									
1st	0.1	0.5	0.3	0.3	0.6	0.8	0.5		
2nd		**1.9**	0.4	0.6	0.3	2.5	1.3		
3rd	**2.4**	**4.3**	0.4	**1.6**	0.2	**4.1**	**4.6**		
4th	**1.6**	**1.8**	0.4	0.5	0.7	0.9	0.8		
1986									
1st	**1.9**	2.4	0.5	0.7	0.3	**5.7**	**2.2**		
2nd	**1.6**	1.5	0.4	0.5	0.6	1.1	1.3		
3rd	1.0	1.7		0.6	0.6	**2.9**	0.9		
4th	**3.3**	3.5	0.4	**1.8**	0.4	1.2	1.1		
1987									
1st	1.0	1.1	**1.5**	0.9	0.9	**2.4**	0.9		
2nd	**2.0**	**2.7**	0.4	0.7	0.6	**2.9**	0.9		
3rd	**1.5**	**1.9**	0.5	0.6	0.4	**2.0**	1.6		
4th	0.8	**1.9**	0.7	0.6	0.4	**3.5**	1.7		
1988									
1st	**2.5**	**3.7**	0.5	0.5	1.4	**7.4**	**8.6**		
2nd	**1.8**	1.4	0.2	0.6	0.4	**3.5**	0.3		
3rd	1.4	**1.5**	0.3	0.4	0.3	0.9	0.8		
4th	1.2	**1.5**	0.4	0.3	0.7	**2.2**	0.9		
1989									
1st	**1.5**	1.2	0.6	0.7	0.8	**2.1**	**1.6**		
2nd	1.4	**1.6**	0.5	0.7	0.7	**2.3**	**1.8**		
3rd	0.6	1.1	0.4	0.4	0.4	**1.5**	0.9		
4th	**1.6**	1.3	0.8	0.9	0.4	**1.9**	1.2		
1990									
1st	0.9	0.9	0.4	0.4	0.3	**2.2**	0.7		
2nd	**2.0**	**1.6**	0.2	0.4	0.3	0.8	0.8		
3rd	**1.6**	1.2	0.2	0.5	0.3	1.1	0.9		
4th	**2.2**	**1.9**	0.3	0.5	0.3	**2.3**	1.4		
1991									
1st	**1.9**	1.4	0.4	0.5	0.4	1.3	0.8		
2nd	0.8	0.7	0.2	0.3	0.1	0.4	0.5		
3rd	**1.8**	1.4	0.1	0.4	0.1	1.2	1.1		
4th	**2.3**	**1.7**	0.2	0.5	0.1	0.8	1.4		
1992									
1st	0.7	0.7	0.2	0.2	0.2	**1.9**	1.4		
2nd	1.0	1.3	0.2	0.3	0.2	1.0	0.3		
3rd	1.3	**2.0**	0.1	0.6	0.2	1.0	0.6		
4th	**2.2**	**2.5**	0.2	0.3	0.2	1.3	0.9	**5.5**	
1993									
1st	0.3	0.3	0.3	0.1	0.3	0.6	0.3	**3.7**	
2nd	**1.8**	**1.7**	0.2	0.3	0.2	1.3	0.6	**5.5**	
3rd	0.7	0.6	0.1	0.2	0.1	0.8	0.4	**2.1**	

4th	0.8	0.6	0.1	0.2	0.1	**1.8**	0.9	**2.3**	
1994									
1st	0.5	0.4	0.3	0.2	0.2	0.8	0.6	**3.5**	
2nd	0.6	0.7	0.3	0.2	0.1	**2.1**	0.5	**3.7**	
3rd	**1.8**	1.3	0.1	0.3	0.1	0.9	0.6	**3.9**	
4th	**2.1**	1.4	0.2	0.3	0.1	1.1	0.9	**3.1**	
1995									
1st	0.7	0.6	0.5	0.2	0.2	**1.5**	0.8	**6.5**	
2nd	1.0	0.7	0.1	0.2	0.1	1.0	0.4	**2.5**	
3rd	1.4	1.2	0.3	0.3	0.2	1.0	1.2	**4.1**	
4th	**1.9**	**1.7**	0.4	0.8	0.1	**1.6**	1.3	**6.3**	
1996									
1st	**2.3**	**1.9**	0.3	0.4	0.1	1.4	0.8	**2.3**	
2nd	**1.6**	1.2	0.5	0.1	0.2	**2.4**	0.8	**5.7**	
3rd	0.8	0.6	0.1	0.2	0.3	0.7	0.5	**4.0**	
4th	**1.7**	**1.8**	0.1	0.5	0.3	1.4	0.9	**1.6**	
1997									
1st	0.8	0.7	0.1	0.1	0.3	1.4	0.5	**4.0**	
2nd	1.4	1.3	0.3	0.2	0.2	0.5	0.4	**6.8**	
3rd	1.3	1.1	0.1	0.1	0.2	0.8	0.5	**1.6**	
4th	**1.5**	1.3	0.5	0.6	0.1	1.3	0.8	**8.5**	
1998									
1st	1.3	1.1	0.2	0.2	0.2	1.2	0.4	**11.6**	
2nd	**1.5**	1.4	0.2	0.3	0.1	0.6	0.5	**4.1**	
3rd	0.9	0.8	0.1	0.3	0.1	1.1	0.6	**3.9**	
4th	1.3	1.4	0.4	0.3	0.2	1.1	0.6	**5.4**	
1999									
1st	1.2	1.3	0.3	0.2	0.2	0.5	0.9	**6.8**	
2nd	0.7	1.4	0.1	0.1	0.1	0.5	0.3	**4.1**	
3rd	0.7	0.4	0.2	0.2	0.1	0.5	0.3	**2.9**	
4th	1.2	1.0	0.2	0.2	0.1	1.2	0.9	**4.2**	
2000									
1st	1.43	1.19	0.34	0.22	0.07	0.93	0.66	**4.31**	
2nd	**1.99**	1.35	0.28	0.15	0.16	1.24	0.66	**4.93**	
3rd	1.35	1.23	0.19	0.24	0.16	0.36	0.43	**6.86**	
4th	0.77	0.90	0.22	0.20	0.16	0.84	0.88	**2.76**	
2001									
1st	**4.50**	**3.78**	0.17	0.49	0.26	0.69	**1.19**	**2.95**	
2nd	**1.87**	**1.80**	0.33	0.31	0.18	**3.72**	**1.51**	**6.78**	
3rd	**2.18**	**1.89**	0.48	0.38	0.12	0.61	0.54	**9.13**	
4th	1.25	1.28	0.10	0.16	0.05	1.21	0.80	**1.80**	
2002									
1st	0.37	0.39	0.03	0.06	0.05	0.96	0.31	1.11	
2nd	0.73	0.61	0.08	0.07	0.04	0.48	0.27	**1.85**	
3rd	0.38	0.37	0.05	0.07	0.06	0.41	0.26	0.92	
4th	0.14	0.15	0.11	0.07	0.05	0.31	0.14	1.02	

2003									
1st	0.28	0.37	0.16	0.17	0.03	0.53	0.27	1.49	
2nd	0.24	0.25	0.09	0.05	0.07	0.48	0.24	1.35	
3rd	0.19	0.25	0.15	0.07	0.01	0.31	0.16	1.36	
4th	0.39	0.54	0.03	0.06	0.02	0.50	0.20	1.02	
2004									
1st	0.38	0.51	0.04	0.07	0.03	0.63	0.31	1.39	0.97
2nd	0.46	0.68	0.07	0.11	0.04	1.30	0.87	1.48	1.24
3rd	0.47	0.47	0.12	0.14	0.07	0.35	0.24	1.46	1.42
4th	0.25	0.32	0.14	0.09	0.04	0.34	0.18	1.36	1.48
2005									
1st	0.19	0.21	0.19	0.03	0.03	0.18	0.15	**1.93**	0.88
2nd	0.34	0.30	0.13	0.11	0.08	0.34	0.34	**1.61**	1.09
3rd	0.26	0.29	0.04	0.06	0.03	0.42	0.10	**1.73**	0.89
4th	0.37	0.27	0.01	0.08	0.07	0.35	0.11	1.22	1.09
2006									
1st	0.24	0.27				0.54	0.21	**1.82**	1.45
2nd	0.34	0.35				0.29	0.19	1.50	0.98
3rd	0.31	0.31				0.22	0.10	**1.62**	1.40
4th									

This data beginning in 2000 is also presented in graphical form in Figures 4, 5, and 6 below.

FIGURE 4:

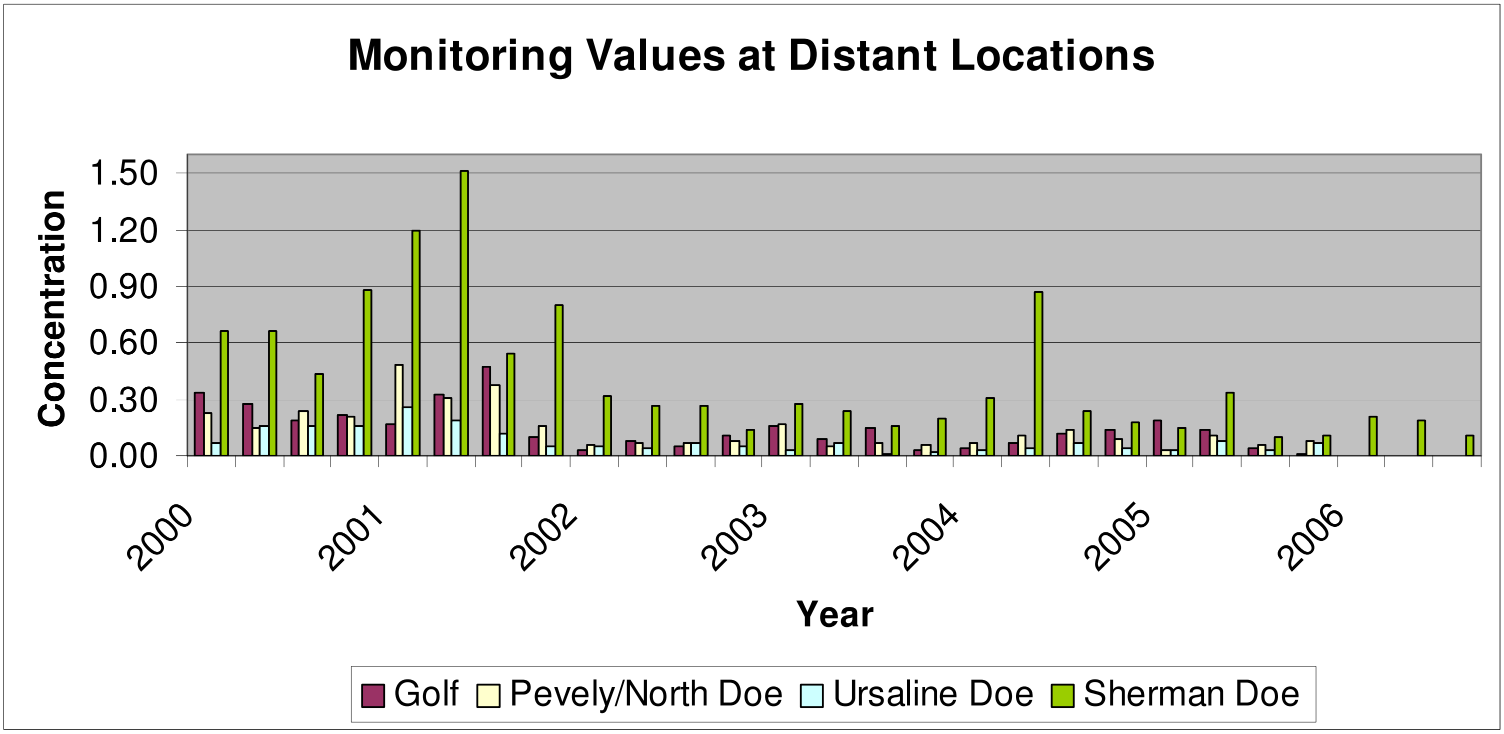


FIGURE 5:

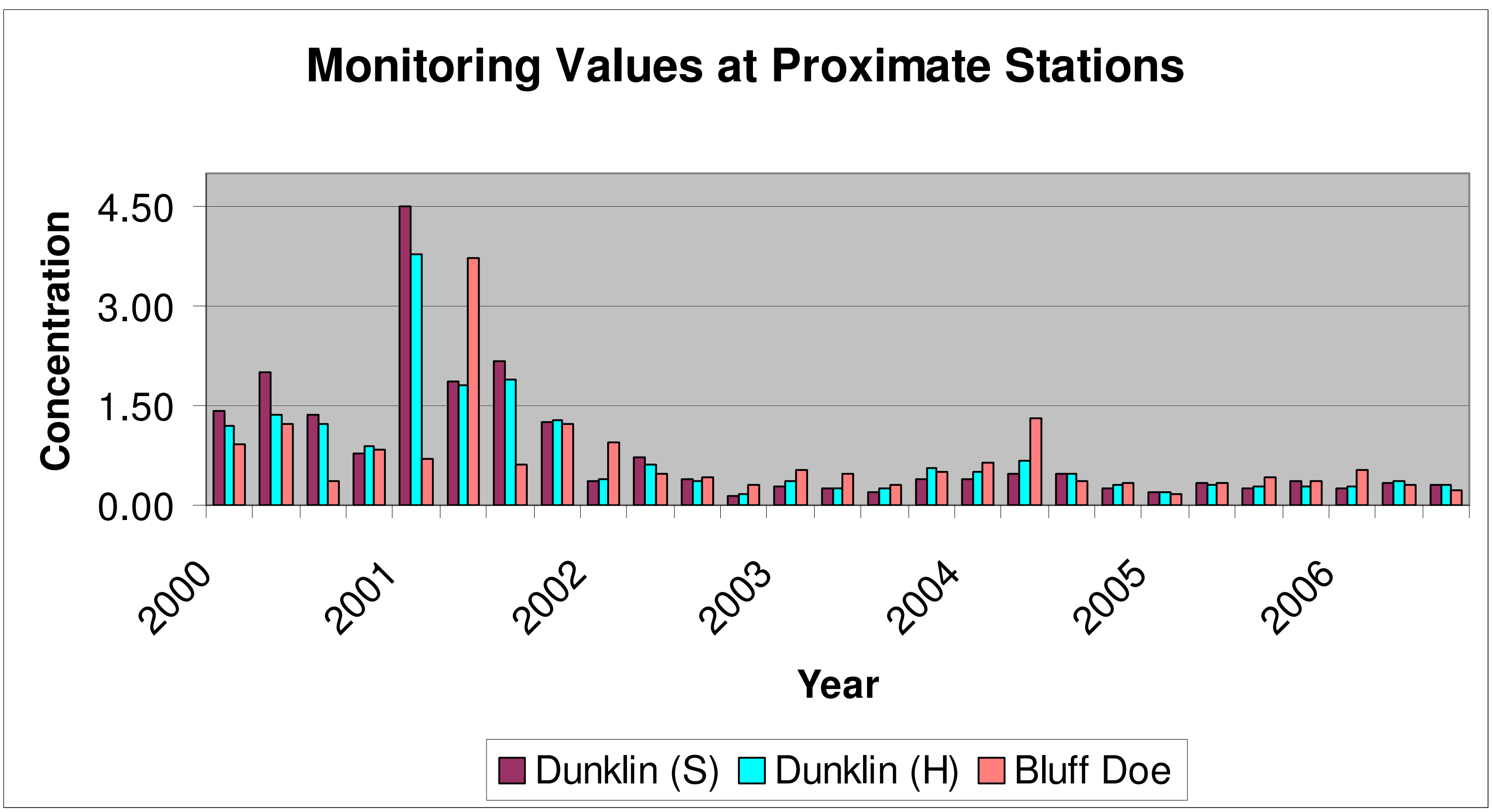
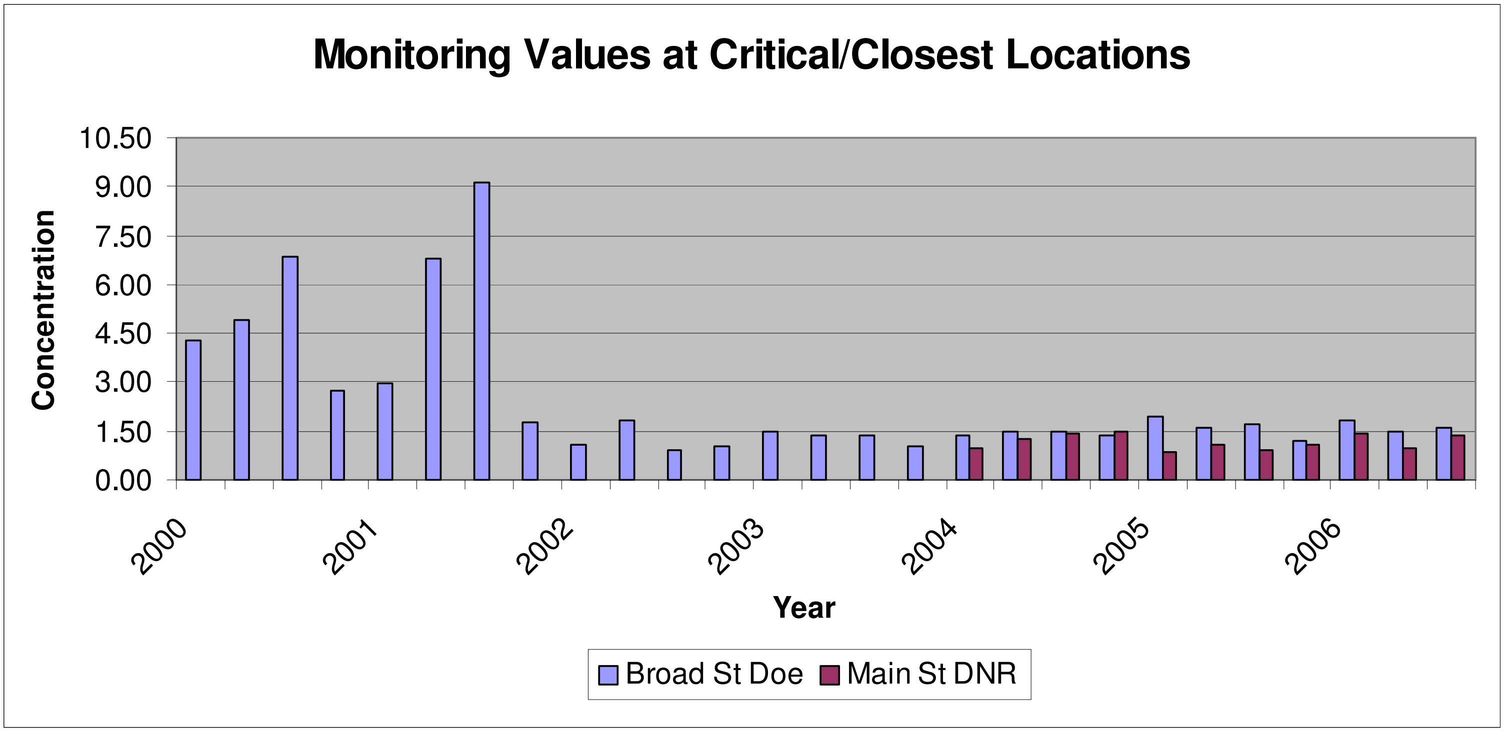


FIGURE 6:



Monitoring Values at Critical/Closest Locations
Concentration
10.50
9.00
7.50
6.00
4.50
3.00
1.50
0.00
2000
2001
2002
2003
2004
2005
2006
Year
Broad St Doe
Main St DNR

3.0 Attainment Demonstration Development

3.1 Dispersion Modeling Summary

The technical attainment demonstrations of previous plan revisions relied on analytical tools available at the time they were developed. The early revisions relied on predictive dispersion models, and the previous study introduced the use of receptor modeling tools. Each of the previous plan revisions produced control strategies that significantly reduced ambient concentrations. These previous studies also provided insights that proved useful for this study in improving model performance.

The technical details of the emission inventory and modeling study are provided in the "2005 Hourly Lead Emission Inventory for the Doe Run Company's Herculaneum, Missouri Smelter" and the "Design Value Modeling Analysis in Support of the Revision to the Herculaneum, Missouri Lead SIP," prepared by Shell Engineering and a summary of the modeling review prepared by the Department of Natural Resources titled "Doe Run - Herculaneum State Implementation Plan (SIP) Dispersion Modeling Review."

The dispersion model estimates the combined ambient impact of sources by simulating Gaussian dispersion of emission plumes. Emission rates, wind speed and direction, atmospheric mixing heights, terrain, plume rise from stack emission, initial dispersion characteristics of fugitive sources, and particle size and density are all factors that the model considers when estimating ambient impacts.

The attainment demonstration study can be divided into three phases. As explained in the memo "Doe Run - Herculaneum State Implementation Plan (SIP) Dispersion Modeling Review:"

> First, actual value modeling was conducted to establish confidence in the modeling tools and the underlying emission inventory selected for this analysis. This modeling evaluated the lead concentrations at ambient monitoring locations in Herculaneum to accomplish a direct comparison with monitored lead data on a day-to-day and quarterly basis. In addition to this direct comparison, Doe Run has evaluated several days in 2005 using the previous Chemical Mass Balance (CMB) fingerprints to identify culpable sources. The results of these analyses were also compared to the dispersion modeling results to further establish the effectiveness of the modeling tools.
>
> After completion of the actual value modeling, a design value modeling analysis was conducted to gain information regarding potential maximum impacts from Doe Run's operation on the Herculaneum area. This design value modeling is conducted without additional controls on the facility to understand the magnitude of the impact given worst-case operating conditions. Based on the results of the design value modeling, decisions

were made by Doe Run regarding which sources to control or limit to allow for compliance of the lead National Ambient Air Quality Standard (NAAQS). These decisions led to modeling of the control strategies to be utilized in the attainment demonstration. All these analyses were developed through extensive cooperation between Doe Run Company, Shell Engineering, and the Air Pollution Control Program.

The Industrial Source Complex - Short Term with Prime Building Downwash (ISCST3-Prime or ISC3P) model (version 04269) was utilized for the dispersion study. The ISC3P model has the capability to account for building downwash, urban or rural dispersion coefficients, flat or elevated terrain, and averaging periods from one hour to one year. The modeling analysis of the previous plan revision utilized the ISCST3 model and Shell Engineering along with the department Air Pollution Control Program staff recommended the use of this modeling system because of its acceptable performance in the previous study and because a different modeling system would have required technical and time resources that were not available.

3.2 Meteorological Inputs

A meteorological database, suitable for use in the ISCST3 Dispersion Model, was compiled by collecting surface wind, stability, and temperature data at a local meteorological station. The databases were assembled from meteorological data collected by Doe Run at their local stations. Contemporaneous mixing heights were calculated from upper air data collected at the Lincoln, Illinois station.

A similar meteorological data set was used for the design value and attainment demonstration modeling, and included a broader time period. This modeling utilized the first quarter of 2005 and the approved meteorological data used in the previous plan modeling study (April 1997-March 1999). This data set provided confidence that the controls selected for the attainment demonstration will be effective over a large variety of meteorological conditions. In addition, the use of the more recent data provided additional confidence that these controls would have been effective during one of the most recent violating quarters. This composite represented the best available data for the project and meets the EPA guidelines for meteorological data use.

3.3. Emission Inventory

The emission inventory for this study was largely based on the inventory developed for the previous study, with a number of updates and additions. The “2005 Hourly Lead Emission Inventory for the Doe Run Company’s Herculaneum, Missouri Smelter” details the calculations and development of the inventory, and includes a table that identifies the updates and additions from the previous SIP inventory.

The inventory utilizes the appropriate emission factors and relates and relates emission factors to activities in the plant. Through these emission factor relationships, it was possible to quantify lead emission rates from each source in the facility for each hour of operation. In some cases, where field measurements were not feasible or where emissions were thought to be less significant, the emission inventory relied on published emission factors.

There were essentially five basic steps used to develop this inventory. First all sources were identified through review of previous lead studies and a thorough on-site examination of the facility. For each source identified, an activity was identified that was thought to relate directly with emissions. During the study period of the previous study, Doe Run collected and organized a set of detailed process logs that were used to document particular activities in the plant. In most cases this information was recorded on shift logs. An on-site measurement campaign was performed during the six-month study period. During these campaigns, point source and fugitive sampling was conducted for the selected sources and the critical source parameters were measured. Laboratory analyses of all source samples were performed by an independent laboratory. The final step was the computation of emissions on an hourly, daily, and monthly basis. This information was compiled in spreadsheet form and put in tables for use in the modeling effort.

This hour-by-hour inventory of lead emission rates for all of the lead sources at the Herculaneum facility was used to provide input to the ISCST3 model. These rates were estimated using predictive equations developed from the actual measurement of sources at the Herculaneum facility.

For the design value modeling, an emission inventory was developed that reflected initial assumptions about future production rates. The attainment demonstration modeling inventory was developed after the design value modeling. The development evolved through a series of iterative steps designed to reflect operational limits, control levels, and release point characteristics. These inventories do not consider specific upset events or conditions that can occur, but instead reflect "worse case typical" operations. This information, again, is detailed in both the "2005 Hourly Lead Emission Inventory for the Doe Run Company's Herculaneum, Missouri Smelter."

3.4 Attainment Demonstration Results

The emission rate equations developed in the Emission Inventory were used to develop a "Design Value" emission inventory. This inventory represented maximum emission rates that reflect the highest production rates of each activity. The attainment demonstration modeling were developed by applying operational limits, control levels, and specific release point characteristics to the inventory. This modeling used nine quarters of meteorological data (April 1997 through March 1999 & January 2005 through March 2005).

The receptor network was quite extensive with receptors placed at 50 meter spacing at the property boundary, 100 meter spacing to approximately 1000 meters, and 200 meter spacing from 2 kilometers out to 5 kilometers. The 100-meter spacing portion of the network contains all the highest concentrations in the control strategy analysis. The control strategy modeling utilized "Good Engineering Practice" stack height for the main stack.

To evaluate naturally occurring lead in the atmosphere, distant sources of lead, and sources of lead not directly accounted for in the emission inventory, a background concentration was developed for the attainment demonstration. This evaluation was conducted in a manner identical to that used in the previous plan study examining measured concentrations at three monitors (Ursuline, Bluff, and Broad Street) when wind directions from the on-site meteorological station were determined to have no plant impact. The measured results on these types of days (72 days total) were averaged yielding a background estimate of 0.063 $\mu g/m^3$.

The attainment demonstration shows that the national ambient air quality standard for lead will be attained. The maximum predicted concentration, including background, is 1.492 $\mu g/m^3$. In general, there are two areas of concentrations over 1.0 $\mu g/m^3$, one along the eastern edge of the plant and the other at the municipal water treatment plant.

4.0 Control Strategy

Appropriate capture and control efficiencies were applied to each emission source in the attainment demonstration modeling. This section is intended to provide a summary of the selected controls projects and their construction deadlines. Table 2 shows the individual source controls outlining the production throughput, the associated capture/control efficiency, the time-of-day restrictions, and the emission rates of the various sources in the model.

Table 2 - Attainment Demonstration Limitations

Source / #	Throughput (TPD or VMT/day)	Capture/ Control Efficiency	Time Restriction	Emission Rate (g/s)
Concentrate Truck Unloading / 10001A1	1800	90%	6 AM - 10 PM	2.31E-03
Transfer Concentrate to Storage/Railcar / 10001A2	1800	80%	6 AM - 10 PM	4.62E-03
Loading Concentrate from Storage into Railcar / 10001B1	1187	50%	6 AM - 10 PM	7.62E-03
Unloading at Tipper / 10001B2	1800	90%	6 AM - 10 PM	2.31E-03
Load Sinter to Railcar / 20001A	500**	N/A	N/A	3.02E-05
Railcar Sinter Dump to Unloader / 20001B	500**	N/A	N/A	3.02E-05
Load Sinter to Truck / 20002	500**	N/A	N/A	3.02E-05
Unload Sinter Truck at Storage / 20003	500**	N/A	N/A	3.02E-05
Baghouse #5 Fume Loading to Railcar / 20004	13*	95%	N/A	2.41E-04
Fume Unloading at South Storage / 20004B	13*	90%	12 PM – 6 PM	1.93E-03
Loading of Fume to Railcar at South Storage / 20004C	13*	90%	6 AM – 10 PM	7.23E-04
Sinter Mix Room Conc. & Sinter / 20005	1800	90%	N/A	1.54E-03
Sinter Mix Room Fume/ 20005	13*	90%	N/A	4.82E-04
Sinter Plant Building Fugitives / 20006	2160	94%	N/A	2.31E-03
Baghouse #3 Fugitives / 20007	2160	N/A	N/A	3.72E-04
Main Stack / 30001	4944	+	N/A	4.17E+00
Blast Furnace Fug / 30002	2160	97%	N/A	2.31E-03
#5 Baghouse Vents / 30011-13	2160	N/A	N/A	7.45E-04
Dross Heat Stacks / 40004-5	1260	50%	N/A	1.72E-03
Dross Fugitives / 40006	1260	90%	N/A	4.33E-03
Refinery Fugitives / 50006	888	90%	N/A	3.17E-03
#8 Baghouse / 50007	888	++	N/A	4.31E-02

#7/#9 Baghouse Stack / 50008	1260/888	+++	N/A	2.97E-01
Refinery Kettle Heat Stack / 50011-18	888	50%	N/A	1.32E-02
Strip Mill Heat Stacks / 60001-2	100.8	N/A	N/A	2.25E-04
Strip Mill Baghouse / 60003	100.8	N/A	N/A	5.93E-06
Low Alpha Baghouse / 60004	0.96	N/A	N/A	1.80E-03
Strip Mill Vents / 60005-8	100.8	N/A	N/A	4.68E-03
Road AB / 70100-122	155.30	95%	Traffic Scalars	1.40E-04
Road BC / 70150-213	425.13	95%	Traffic Scalars	1.38E-03
Road CD / 70250-252	15.43	95%	Traffic Scalars	9.16E-05
Road DE / 70300	1.37	95%	Traffic Scalars	1.43E-05
Road EF / 70350-358	9.63	95%	Traffic Scalars	3.79E-05
Road DF / 70400-406	13.09	95%	Traffic Scalars	5.86E-05
Road FG / 70450-454	7.13	95%	Traffic Scalars	4.62E-05
Road GH / 70500-513	20.88	95%	Traffic Scalars	1.65E-04
Road GK / 70550-553	0.60	95%	Traffic Scalars	6.06E-06
Road HL / 70600-612	2.68	90%	Traffic Scalars	1.59E-03
Road IJ / 70650-669	10.73	95%	Traffic Scalars	1.08E-04
Road KM / 70700-703	1.01	N/A	Traffic Scalars	1.69E-03

*Fume loading and unloading was based on a 1170 Tons per quarter throughput scaled back to the daily throughput shown above.
**Sinter to storage transfers are limited to 45,000 Tons per quarter throughput scaled back to the daily throughput shown above.
+Main stack emissions were limited to 794 lb/day
++ Baghouse 8 emissions were limited to 8.2 lb/day
+++Combined emissions from Baghouse 7 and 9 were limited to 56.6 lb/day

The attainment deadline in which all controls must be fully implemented is April 7, 2008, which is a very aggressive schedule considering the nature of some of the projects. Some of the projects have already been installed. The schedule for implementation of the control strategies provides for implementation as expeditiously as practicable and requires full implementation prior to the attainment deadline. Given the very short time frame for implementation of all controls, the schedule meets the state's reasonable further progress obligation.

4.1 Individual Strategies

A general description of the control strategies is presented below. Control projects from previous plan efforts will continue to be in effect, and only the new projects have been outlined. The deadline for implementation of the strategies is indicated in parentheses. Deadlines listed as 2007 will be implemented no later than April 7, 2007, and those listed as 2008 will be implemented no later than the attainment deadline of April 7, 2008.

4.1.1 Concentrate Delivery

Emissions from this source occur as trucks deliver concentrated ore to the plant, and as that material is subsequently handled. Trucks will be required to enter the plant and back to the unloading station (2007). The station will be partially enclosed to minimize wind-caused particle drift (2008). The concentrate must be maintained at a minimum of 6 percent moisture content to minimize dust emissions during dumping and handling (2007). The load will be dumped into a bin, where it will be screw conveyed directly into a railcar (2007). The tailgate area of the truck will be hosed down, if necessary, to remove material that may fall from the truck when it is moved again. Doe Run is obligated to directly load a minimum of 11 railcars of concentrate to railcar each day (2008). When a railcar is not available concentrate shall be delivered from the conveyor to the ground, and moved by front end loader into a new set of bins (2007). Direct loading to railcar eliminates material handling steps and reduces emissions. The conveyor will be fitted with a drop sleeve to further reduce emissions (2008). The bins will be constructed of interlocking concrete blocks and the walls of the bins will be three blocks high, or approximately eight feet high. The bins or walls are expected to reduce emissions by minimizing reintrainment of particles. The walls will also prevent the migration of concentrate or other materials onto road surfaces where it can be further abraded and reintrained (2007).

Concentrate trucks must also proceed through a truck wash to remove any stray concentrate that may be tracked out of the plant (2007). Trucks exiting the truck wash have their tailgates inspected and power washed to minimize the track out of materials outside the plant for potential reintrainment (2007). All concentrate trucks must be outfitted with and utilize tarps and maintained in working condition (2007).

<u>Application of Control Efficiency</u>:

In the attainment demonstration modeling, concentrate unloading was limited to 1,800 tons per day to occur between the hours of 6 A.M. and 10 P.M. The concentrate must have a minimum moisture content of 6 percent. In the analysis, a control efficiency of 50 percent was applied based on this moisture requirement. Since the unloading event will occur inside a partial enclosure, an additional 80 percent control efficiency was applied. The total emission control efficiency applied at the concentrate unloader is therefore 90 percent.

For the concentrate that gets loaded in the railcar and to the ground, the 50 percent control efficiency was again applied, with the drop sleeve given an additional control efficiency of 60 percent. Applying both controls, the overall control efficiency for this source is 80 percent.

The activity of transferring concentrate from the ground to the railcar is limited to 1187 tons per day. Again, this activity was limited to occurring between 6 A.M. and 10 P.M., and a control efficiency of 50 percent was applied based on the moisture requirement.

The attainment demonstration modeling applied no specific control efficiency regarding the construction of the concentrate storage walls or truck washing.

4.1.2 Sinter Loading Area

Sinter currently stored in the northeast corner of the Sinter Plant will be enclosed in the building (2008). This will require the construction of building walls. The total enclosure of this area will reduce emissions by preventing them from escaping the confines of the Sinter Plant building.

Application of Control Efficiency:

This enclosure is a supplement to the general building enclosure projects. Please refer to those sections for a discussion of control efficiencies related to building enclosures.

4.1.3 Railcar Tipper

Concentrate that is delivered ends up loaded in a railcar. These railcars are then dumped at the Tipper. The Tipper currently is partially enclosed by doors on the north end. This new control will require the installation of a south door to totally enclose the railcar tipper (2008). The doors will enclose this process and minimize emissions.

Application of Control Efficiency:

In the attainment demonstration analysis, the unloading throughput was set at 1,800 tons per day, and this activity was limited to between the hours of 6 A.M. and 10 P.M. The material being unloaded at the Tipper is wet, however, moisture testing is not accomplished at this point. The overall enclosure will result in a 90 percent reduction, with confidence added due to the moisture content of material.

4.1.4 Wheel Tunnel

Dusty gases can currently escape the sides of the Sinter Machine. This source is responsible for a large percentage of the dust within the Sinter Plant building. The edges of the Sinter Machine will be enclosed and ventilated with a design rate of 15,000 actual cubic feet per minute (2007). These gases will then be routed to Number 3 Baghouse, to be filtered prior to reporting to the main stack (2007).

Application of Control Efficiency:

In the attainment demonstration analysis, this control was assumed to reduce dust loading inside the sinter plant building. Please refer to those sections for a discussion of control efficiencies related to building enclosures.

4.1.5 Number 3 Baghouse Upgrade

The Number 3 Baghouse will be upgraded to use reverse flow technology for bag cleaning, which is intended to reduce bag failure frequency and improve baghouse efficiency (2007).

Application of Control Efficiency:

Gases from Number 3 Baghouse are routed to the main stack. In the attainment demonstration, the main stack was limited to 794 pounds of lead per day. No control efficiency was directly applied as a result of Number 3 Baghouse upgrades.

4.1.6 Carrier Cooler Baghouse Enclosure

The fume handling section of this baghouse will be enclosed (2008). The enclosure will minimize emissions if the need arises to open the fume handling area of this baghouse for maintenance.

Application of Control Efficiency:

The attainment demonstration did not apply a control efficiency to this source because the purpose of this control is to eliminate emission events during periods of upsets.

4.1.7 Number 5 Baghouse Fume Pugger, and South End Fume Handling

Fume from the Number 5 Baghouse currently is fed directly to the Sinter Plant when the Sinter Plant is operational. When the Sinter Plant is not operational, fume is wet and screw conveyed to a railcar. This process is referred to as the pugger. This control strategy requires the operator to maintain an 8 percent moisture in the augered fume (2008). The conveyor will be equipped with a drop sleeve to minimize the effective height of the drop into the railcar (2008).

The fume is transferred by railcar to the south end of the plant and placed on the ground in the fume storage pile. After storage, this material is added back into the Sinter Machine feed circuit. While on the ground, operators will assure that the moisture content of the fume is 8 percent or higher to minimize dust as this material is handled (2007). In addition, the fume storage area will be treated with a chemical/physical compound that minimizes emissions by forming a “crust” on the pile that precludes most wind erosion events (2007).

Application of Control Efficiency:

In the attainment demonstration a control efficiency of 90 percent was applied to the pugger process because the fume is wet very thoroughly in the screw conveyor. The particulate characteristics of the fume require additional moisture as compared to concentrate to achieve the same level of control (6 percent versus 8 percent). An additional 50 percent control was applied because the drop point will be controlled by the installation of a drop sleeve. The sleeve used here was determined to be slightly less effective than the concentrate drop sleeve dut to the different particulate characteristics. The combined control efficiency is, therefore, 95 percent.

4.1.8 Number 5 Baghouse Fans and Blast Furnace Blowers Interlock

An interlock will be installed so that the air being fed to the bottom of the furnace is restricted when the baghouse fans are not operational (2007). This would prevent a condition where air is being forced up through the furnace carrying lead-bearing dust into the area above the furnace when the control device, the Number 5 Baghouse, is not operating properly.

Application of Control Efficiency:

The attainment demonstration did not apply a control efficiency to this source because the purpose of this control is to minimize emission events during periods of upset conditions.

4.1.9 Number 5 Baghouse Fan Malfunction Alarms at Blast Furnace

A process alarm system will be installed to alert blast furnace operators when there is a malfunction of the Number 5 Baghouse which controls emissions from this process (2007). An alarm will enable blast furnace operators to take immediate action to reduce flows in the furnace to minimize emissions.

Application of Control Efficiency:

The attainment demonstration did not apply a control efficiency to this source because the purpose of this control is to minimize emission events during periods of upset conditions.

4.1.10 Tuyere Controller Upgrade

Tuyeres are the tubes that are used to inject air into the bottom of the furnace. Sensors and a process control system will be installed to monitor, control, and distribute air flow through the furnace (2007). The purpose of the control system is to identify the operating situation that sometimes occurs where voids or channels are formed in the furnace. If this happens, the flow has a tendency to take the path of least resistance leading to high flows in certain areas that can carry more dust out of the top of the furnace. The control system compares flows at each tuyere and automatically restricts flow if there is an indication that this condition is being experienced.

Application of Control Efficiency:

The purpose of this control is to reduce blow hole events, which can emit particulates into the blast furnace building. The expected reductions in emissions to the interior of the building is one of the actions that will reduce building fugitives. Please refer to the building enclosure sections for a discussion of control efficiencies related to building enclosures. The attainment demonstration did not apply a direct control efficiency to this source.

4.1.11 Blast Furnace Relocation

Number 1 Blast Furnace is being relocated to the former location of Number 3 Blast Furnace (2008). This move will serve to reduce ventilation length and potentially increase ventilation flowrates and shorten some conveyor circuits, thereby reducing emissions.

Application of Control Efficiency:

The purpose of this control is to move the furnace closer to the ventilation source, thereby improving capture of these emissions that are released to the interior of the blast furnace building. Shortening the conveyor circuits also reduce emissions into the building. Please refer to the building enclosure sections for a discussion of control efficiencies related to building enclosures. The attainment demonstration did not apply a direct control efficiency to this source.

4.1.12 Blast Furnace Doghouse Ventilation and Redesign of Hoods Servicing the Front of the Furnace

The Doghouse area inside and near the top of the Blast Furnace Building has been observed to be a location within the building that has the highest dust concentrations. This project will dedicate ventilation to this area, with the gases reporting to Number 6 Baghouse for filtering (2007). The ventilation rate will be designed at 50,000 actual cubic feet per minute. There will also be improvements made in the design of the ventilation hoods at the front of the furnace to improve the efficiency of this control (2008)

Application of Control Efficiency:

The attainment demonstration modeling applied control efficiencies to building fugitives. This source serves to reduce concentrations inside the Blast Furnace Building. Please refer to the building enclosure sections for a discussion of control efficiencies related to building enclosures. The attainment demonstration did not apply a direct control efficiency to this source.

4.1.13 Kettle Heat Stack Cameras

Cameras will be mounted that continuously view the exits of the kettle heat stacks in the dross and refinery areas (2008). The purpose of the camera will be to aid in the quick discovery of kettle failures, where lead bearing products leak into the kettle settings and can then be vaporized and emitted from the heat stacks. The camera will broadcast in real time to the sinter plant control room, environmental department, blast furnace control room, general foreman's office and the security office so that multiple people can observe for an event. In the event that a plume of smoke is noticed from one or more of the kettle heat stacks, operators will be contacted so that they can immediately shut off the burners to the kettle(s) showing the problem(s) to stop the smoke. Also, before a kettle can be put back into service, the setting must be inspected and cleaned of any visible products remaining in the setting (2008).

Application of Control Efficiency:

The attainment demonstration applied a 50 percent control efficiency to this source because it relies on a visual means of identification to limit the time that emission swill occur. The events that cause emissions are kettle failures (weeping), and are noticeable. Therefore, control of the length of time of these events is the critical component to this measure.

4.1.14 Improvements to Number 8 and Number 7&9 Baghouses that Service Hygiene Air

Pleated Filters will be installed in the Number 7&9 Baghouse to increase the air to cloth ratio and to improve baghouse efficiency (2008). The height of both the Number 8 and the Number 7&9 stacks will be modified, raising them to a minimum of 150 feet (2008). These stacks are currently 100 feet tall, and the additional height will serve to dilute ambient concentrations from this source.

Application of Control Efficiency:

Gases from Number 7& 9 Baghouses are routed to the the 7&9 stack. In the attainment demonstration, the emissions from this stack was limited to 56.6 pounds of lead per day. The attainment demonstration modeling reflected the 50 foot extension on this stack. No control efficiency was directly applied as a result of Number 3 Baghouse upgrades.

4.1.15 Specific Control of "North End of Blast Furnace to Refinery Dock" Haul Road

Dust on this road will be controlled by the application of water during periods when slag hauling is occurring (2007). Slag hauling is generally done about once per calendar quarter for a period of about two weeks. Once the hauling is complete, the road will be treated with a road surfactant, which will also reduce emissions from incidental road traffic (2007).

Application of Control Efficiency:

The attainment demonstration applied a 90 percent control to this source because of the requirement to conduct documented haul road watering during slag hauling campaigns, and chemical surfactant for incidental traffic. This is identical with control efficiencies typically applied to haul road for documented watering during contruction permit reviews.

4.1.16 Street Sweeping

The streets of Herculaneum, outside the plant, will be swept with a regenerative air sweeper (2008). The area to be swept includes the route the concentrate delivery trucks take once they've exited Missouri Highway 61/67. This technology is improved over previous sweepers, and will reduce emissions to the air from road traffic. Within the plant, the paved traffic routes will be swept with a wet sweeper (2008).

Application of Control Efficiency:

In the attainment demonstration modeling, a control efficiency of 95 percent was applied to emissions from paved haul road surfaces, both inside and outside the plant boundary. The identical control efficiency was applied to haul roads beyond highway 61/67 because at that distance the emissions are believed to be very low. Also, the use of near plant lead loading overestimates emissions at this distance. The materials handling order issued by EPA provides additional assurance that the more distant haul roads are appropriately controlled.

4.1.17 In-Plant Sprinklers

Permanent water sprinklers will be installed to continuously wet paved surfaces in the plant to reduce dust from traffic (2008). The sprinklers will be operated except when ambient temperatures fall below a point where ice formation could create safety issues.

Application of Control Efficiency:

The attainment demonstration did not rely on the in-plant sprinkler system to provide a specific control efficiency. Instead, the modeling relied on sweeping to and the application of a 95 percent control efficiency on paved haul routes. This sprinkler system was treated as an activity that provided additional conservatism in the analysis. No control efficiency was directly applied as this source in the attainment demonstration analysis.

4.1.18 Door Closure Compliance Improvements

Building enclosures will be improved. All man doors in the Sinter Building, Blast Furnace Building and Refinery Building will be equipped with cords, pullies, and weights so that the doors close automatically (2008). Automatic doors will reduce the amount of dust that can leave the building when doors are left ajar. A lockout system will be instituted on the larger equipment doors (2007). When an equipment door needs to be opened, a key will need to be logged out and returned. This procedure is intended to prevent doors being left open by contractors or others within the plant, and place responsibility on the operators within their respective buildings to make sure that the doors stay closed. Of course, the point of this is to reduce the amount of dust that can leave buildings when the large equipment doors are left open.

Application of Control Efficiency:

Please refer to the discussion in the ventilation study section.

4.1.19 Siding Inspections

The siding of the Sinter Building, Blast Furnace Building, Carrier Cooler Baghouse, and Refinery Building will be inspected for integrity every two weeks, and timely repairs will be made when problems are found (2007). Again, the goal is to prevent particles from exiting these buildings.

Application of Control Efficiency:

Please refer to the discussion in the ventilation study section.

4.1.20 Ventilation Study

To make sure that the ventilation to the Sinter Building, Blast Furnace Building, and Refinery Building is sufficient, a study will be conducted under the supervision of the Missouri Department of Natural Resources. The goal of the study will be to develop a mathematical relationship between building inflow rates and ventilation fan amperages, and to establish minimum fan amperages to assure that particles emitted within these buildings are being appropriately captured by the ventilation systems. A work plan for the study is required by July 1, 2007, and within 90 days of approval the field study must be conducted. Within 60 days of the field study, the findings will be summarized in a report. The minimum fan amperage identified by the study must then be maintained.

Application of Control Efficiency:

In the attainment demonstration modeling different control efficiencies were applied to the fugitive emissions from the various buildings. All of the buildings will capture more fugitive emissions because of the periodic building integrity inspections, door enclosure assurances, and a study of building inflow for the purpose of setting minimum ventilation fan amperages. In the Sinter Plant, the wheel tunnel ventilation will reduce interior dust and an overall control efficiency of 94 percent was applied to fugitive emissions from the

Sinter Plant Building. A 90 percent control efficiency was applied to Dross Plant and Refinery Building fugitives. A higher control efficiency was applied to the Blast Furnace Building because of the additional projects that will reduce particulate emissions into the building. These include a redesign of the hood on the front of the furnace, a redirection of ventilation flows to areas in the building that tend to be more dusty, the reduced emissions associated with the installation of the automatic tuyere flow controllers, and the relocation of the furnace. A 97 percent control efficiency was applied as a result of the combined reductions from all of these projects.

A calculation or derivation for these control efficiencies is not provided because these estimates rely on the application of best engineering judgment. The department is not aware of methods for deriving control efficiencies for projects of this type. The engineering judgment relies on previous applications of similar controls as they have been applied at the Glover smelter as part of previous technical attainment demonstration of previous plan revision projects.

4.1.21 Stack Emission Limits & Testing

Emissions from the primary stacks in the plant will be limited to the amounts listed in the table below:

Stack Name	Emission Limitiation (lbs per 24-hours)
Main stack	794
7 & 9 baghouse Stack	56.6
8 baghouse Stack	8.2

The main stack will be tested twice by June 30, 2009, and if found to be in compliance with the limit, the frequency will drop to every twenty-four months.

The other stack sources will be tested every three months for a total of four times beginning in the second quarter of 2008. If the average of these tests does not exceed 80 percent of the respective limit then the testing frequency will be reduced to annual. If the average is above 80 percent of the respective limit, the frequency will only be reduced to twice yearly.

If any test exceeds the limit, a continuous or near-continuous lead emission monitor will be installed, provided the testing method is approved by EPA. If no approved method is available, the testing frequency will be quarterly.

Application of Control Efficiency:

Control efficiencies were not applied to stack emissions in the attainment demonstration modeling. Instead, the stacks were modeled as point sources at the given emission rate.

4.1.22 Process Throughput Limitations of Individual Operations in the Plant

Daily and quarterly production throughputs of individual operations in the plant will be limited to the amounts shown in the tables below (2007):

Activity	Process Throughput Limitiation (tons per 24-hour period as per the Work Practices Manual)
Concentrate Delivery	1,800
Concentrate Loaded into Railcars from Ground	1,187
Sinter Produced	2,160
Blast Furnace Charge (of Sinter)	2,160
Rough Lead Produced	1,260
Refined Lead Produced	888
Sinter to South End Storage	45,000
Fume handling to storage on South End	1,170

<u>Application of Control Efficiency</u>:

Please refer to the discussion in the Limitation of Hours of Operation section below.

4.1.23 Overall Plant Production Limits

Sinter Plant production is limited to 169,190 tons of finished sinter per calendar quarter. Blast Furnace Sinter throughput is limited to 169,190 tons of sinter charged per calendar quarter. The current production limit at the refinery (50,000 tons of lead metal cast per quarter) will be the starting production limit. After April 7, 2008 this limit will be increased by up to 5,000 additional tons per calendar quarter to a maximum of 62,500 tons of lead metal cast per calendar quarter, provided the air quality data does not indicate an exceedence of the NAAQS. If a NAAQS violation occurs, the production limits as part of the contingency measures will apply.

<u>Application of Control Efficiency</u>:

Please refer to the discussion in the Limitation of Hours of Operation section below.

4.1.24 Limitation of Hours of Operation

Certain times of day are more conducive to high ambient concentrations than others because of typical wind speeds and atmospheric stability. These conditions occur more frequently in the evening, night, and early morning hours. Limiting activities to avoid these times helps to reduce the impact on the community.

Concentrate unloading, concentrate loading to railcar, and concentrate tipping will be conducted only between 6 A.M. and 10 P.M. Fume unloading will be conducted only 13 days per calendar quarter and only between the hours of noon and 6 P.M. (2007)

Application of Control Efficiency:

The plant throughput limitations and time of day requirements were included in the attainment demonstration modeling analysis, but no direct control efficiency was applied as a result of these limits.

4.1.25 Fence

The existing fence must be maintained to preclude public access. If a new fence is constructed it must also preclude public access. The consent judgement prohibits the relocation of existing processes or the construction of new sources in the area between the existing fence and a new fence.

Application of Control Efficiency:

The attainment demonstration shows that the proposed controls will provide for attainment of the standard at the current existing fenceline. No control efficiency was applied for the installation of a new fence.

5.0 Continual Improvement

There are several new mechanisms that are being included with this plan revision that haven't been included in previous lead plans. This revision will require a number of elements that fit into the category of "continual improvement." These obligations are enforceable and permanent obligations, and are included in the consent judgment. The goal of this approach was to look for opportunities to improve existing emission controls and to identify ongoing projects that would improve air quality in Herculaneum. Because this concept contemplates a range of different potential outcomes, it was difficult to be focused or specific about these ongoing obligations.

This section is intended to provide a summary of the "continual improvement" obligations, and outline the way that these concepts are intended to function.

5.1 Technology Study for Fugitive Dust Control

Although considerable research and thought went in to designing the control strategy, it is believed that there may be other strategies that may be available that weren't identified or considered. The consent judgment requires a work plan for a study of best practices for control of fugitive dust, and requires the evaluation of fugitive dust controls at a minimum of three other smelting facilities or facilities with fugitive dust challenges. It is hoped that this review will identify other common sense fugitive control strategies that simply haven't been thought of for implementation in the plant.

5.2 Continuous Monitoring

It has sometimes been suspected that certain atypical events occur at the plant that can occur in a relatively short time frame that cannot be evaluated against ambient data because the highest time resolution for ambient data is daily. The daily concentrations are quite variable and it is suspected that shorter time resolution may help to shed light on whether certain hours or certain events are dominating the problem.

The consent judgment will require Doe Run to operate continuous particulate monitors at the Broad Street and Main Street sites. These monitors will collect data in a much more time resolved manner which may be of assistance in diagnosing what caused a particular day to record very high lead concentrations.

The consent judgment also requires an analysis for all days that exceed a 5 microgram per cubic meter concentration. The analysis shall include a review of the continuous particulate monitoring, the daily ambient concentrations, wind speed and direction data, precipitation data, a summary of process throughputs, an identification of malfunctions, process upsets, or other conditions that may be expected to contribute to ambient impact, and a summary of the elemental chemical analysis from the ambient filter. The same analysis will be done every sixth day when the ambient concentration exceeds 1.5 micrograms per cubic meter. This information will be useful for comparison purposes.

As a result of reviews of this data it is hoped that patterns will become evident that will point to potential emission control improvements. For instance, it may be possible to identify frequent events that are contributing to short term ambient excursions that have the potential to be addressed through either new control strategies or modifications to operating procedures within the plant.

5.3 Extension of Receptor Modeling

As part of the previous plan revision a chemical mass balance receptor modeling study for apportioning ambient lead concentrations was conducted to resolve and quantify source contributions. This method is based on direct measurement of the chemical composition of ambient total suspended particulate mass in an area of interest. The relative apportionment of these chemical species between potential sources is based on a statistical comparison of a chemical profile or "fingerprint" of each source with the chemical profile of an ambient particulate sample.

With this "fingerprinting" approach, impacts are based on retrospective measurements of samples selected from a specific period of potential impact. Results represented the most probable quantitative source impacts for each specific sample selected. Source profiles were developed for all the major emission sources.

With the installation of the extensive emission control projects it is likely that the source fingerprints will change. The consent judgment requires the development of new source profiles after the attainment deadline.

This information can then be used to help resolve questions of culpability on individual days as required in the "continual improvement" concept or simply to provide confidence that future control decisions will target the correct sources.

5.4 Responsible Official

The consent judgment requires that the plant appoint an individual who reports to the General Manager to be responsible for overseeing compliance with the obligations of the consent judgment and to make sure that other housekeeping and fugitive dust control measures are being properly tended to.

5.5 Ongoing Meteorological Monitoring

The consent judgement requires the ongoing collection of a suite of meteorological data that will assist in culpability analysis as well as provide appropriate inputs for any potential future dispersion modeling efforts. The consent judgment also requires that the meteorological instruments be maintained so that blocks of data are not lost if a malfunction occurs.

5.6 Environmental Management System

The consent judgment requires the facility to develop and adhere to a comprehensive environmental management system. The system is a mechanism to identify and track environmental obligations, and it requires corrective actions for when problems are identified. It includes an obligation for continuing improvement to review the effectiveness of control strategies, and to report problems to the Missouri Department of Natural Resources.

6.0 RACT Analysis

The CAAA requires that implementation plans for non-attainment areas provided for all RACM including emissions reductions obtained through the adoption of RACT. Section 172(c)(1) of the Clean Air Act further specifies that measures need not be implemented if they would not expedite attainment or reasonable further progress. EPA defines RACT as the lowest emission limitation that a particular source can meet by the application of control technology that is reasonably available considering technological and economic feasibility.

EPA did not find the SIP substantially inadequate with respect to the RACM/RACT requirements, as such, a more extensive analysis was not necessary. EPA's SIP call established an attainment deadline of April 7, 2008. Additional RACT measures were not identified that would expedite attainment or reasonable further progress.

The technology feasibility of applying an emission reduction method to a particular source considers the source's process and operating procedures, raw materials, and physical plant layout. The process, operating procedures, and raw materials used by the source can affect the feasibility of carrying out process changes that reduce emissions and the selection of add-on emission control equipment. The operation of and longevity of control equipment can be significantly influenced by the raw materials used and the process to which it is applied. The feasibility of modifying processes or applying control equipment is also influenced by the physical layout of a particular plant. The space available in which to carry out such changes may limit the choices of control. Furthermore, control measures that are not proven effective or reliable in a commercial application would not be considered reasonably available.

Determinations of technological feasibility also consider adverse impacts on other resources. If a control technology increases pollution of bodies of water, creates additional solid waste disposal, or exacerbates worker exposure problems; the technology may not be considered reasonably available.

In general, economic feasibility considers the cost of reducing emissions and the difference in costs between the particular source for which RACT/RACM is being determined and other similar sources that have implemented emissions reductions. In practice however, economic feasibility is closely tied to technological feasibility, in that, a control measure would not be considered technologically (nor economically) feasible if the control measure was not proven reliable in a commercial application, bearing commercial economic considerations. In addition, if a control measure did not achieve a sufficient amount of emission reduction, technological (and economic) feasibility questions are not useful to pursue. The use of a Cost Effectiveness comparison, where Cost Effectiveness simply divides annualized cost by emissions reduced, can be a useful tool in comparing control measures for a *single given source*. Economic comparisons between sources and between commercial installations involve so many variables that any conclusions drawn from them are of informational quality at best.

Determinations of RACT/RACM must also consider the attainment needs of the area. RACT/RACM does not require that all available measures be implemented, only that attainment of the NAAQS be demonstrated.

In the previous plan Doe Run prepared a RACT/RACM evaluation, and the plant has not changed significantly. All RACT/RACM measures were implemented as part of the previous plan. In addition, 40 CFR Part 63 Subpart TTT, the Federal Maximum Achievable Control Technology (MACT) standard for Primary Lead Smelters, applies to this facility. MACT standards typically require measures beyond that required for RACT.

Table 3 summarizes the results of a current analysis of RACT/RACM:

TABLE 3
Doe Run Herculaneum
RACT/RACM Analysis

Description of Measure	**Explanation**	Used in Control Strategy
Pave, vegetate or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads	All primary traffic routes inside the plant have been paved. Unpaved areas are used only for material storage.	Yes
Require dust control plans for construction or land clearing projects	Such sources have not been identified in the emission inventory or modeling study. Nearly all of the land near the active areas of the plant has been cleared and much of it is paved. These types of sources are not addressed in the control strategy. Doe Run will address these types of issues on a case-by-case basis after the plan controls are implemented	No
Require haul trucks to be covered	This measure is currently standard practice and will be incorporated in the work practice manual.	Yes
Provide for traffic rerouting around or rapid cleanup of temporary sources of dust on paved roads	Currently Doe Run operates a vacuum sweeper that operates on an aggressive schedule. This facilitates quick cleanups of spills of any lead-bearing dust on the paved areas in the plant. The work practice manual will address the issue of driving through spills.	Yes
Develop traffic reduction plans for unpaved roads	All primary traffic routes inside the plant have been paved. Unpaved areas are used only for material storage.	Yes

Develop traffic reduction plans for unpaved roads	Areas in the plant that are currently not paved remain unpaved because they are not routinely used, and serve only as material storage areas.	No
Limit use of recreational vehicles on open land	Recreational vehicles are not permitted in the Doe Run, Herculaneum plant	Yes
Require improved material specifications for and reduction of usage of skid control sand or salt	Use of these materials is very limited in the Doe Run, Herculaneum plant. These materials do not contain appreciable amounts of lead and, therefore, its control is not applicable to the control strategy	No
Require curbing and pave or stabilize shoulders of paved roads	All primary traffic routes inside the plant have been paved. Shoulders of roads in the plant have not been identified as sources of lead-bearing dust.	No
Pave or chemically stabilize unpaved roads	All primary traffic routes inside the plant have been paved. Unpaved areas are used only for material storage.	Yes
Pave or chemically stabilize unpaved parking areas	All primary traffic routes inside the plant have been paved. Parking areas are paved.	Yes
Require dust control measures for material storage piles	Most of the lead-bearing storage piles are located inside buildings. Covering outdoor storage piles is not feasible. Certain materials in storage piles located at the South End of the plant will be wet and treated with a chemical/physical application of proprietary compounds to limit dust emissions.	Yes
Provide stormwater drainage to prevent water erosion onto paved roads	Much of the paved areas feed a stormwater collection system to minimize erosion and treat the runoff. Erosion of lead-bearing material onto paved roads, and subsequent re-entrainment of the dust has not been identified as a significant contributor of lead emissions in the plant.	Yes
Require revegetation, chemical stabilization, or other abatement of wind erodible soil	Storage piles (concentrate, sinter) are being controlled by the application of proprietary stabilization compounds. The concentrate storage area is being enclosed by block walls to abate wind erosion from these piles. The emission inventory and dispersion modeling do	Yes

	not show wind erosion events as significant contributors of lead emissions at the Doe Run, Herculaneum facility.	
Rely upon the soil conservation requirements to reduce emissions from agricultural operations	No agricultural operations involving soil disturbance occur at the Doe Run, Herculaneum plant.	No

7.0 Contingency Measures

7.1 List of Contingency Measures & Schedule

Pursuant to Section 172 of the CAAA, a set of contingency measures has been prepared that could be implemented if required by a finding of the EPA Regional Administrator that a) the nonattainment area has failed to make RFP, b) there is a failure to implement a control strategy to attain the NAAQS by the statutory deadline, or c) monitoring shows that the nonattainment area has failed to attain the NAAQS by the statutory deadline.

The modeling was revisited and reviewed to determine what contingency controls could be both effective and permanent. Several contingency measures have been identified:

a. Enclose pugger

b. Pave North End of Blast Furnace to Refinery Dock

c. Route Kettle heat stacks to main stack

d. Implement contingency measures identified as a result of the Technology Study for Fugitive Dust Control

e. Install dedicated ventilation to the Sinter Plant provided that the plant will be in operation longer than 36 months.

For the calendar quarter following the attainment date, or in any quarter thereafter, an exceedance of the NAAQS is monitored, the contingency controls will be implemented. Projects a and b will be implemented within 6 months. If in any quarter after implementing a & b, a violation is recorded project c will be implemented within 12 months. If in any quarter after project c has been implemented a violation is recorded, project e will be implemented within 24 months. The schedule to implement project d will not be set until the project(s) is/are defined.

In addition to the engineering projects, production at the plant will be reduced by 5 percent of the actual production during the exceedance quarter. For each subsequent violation, production will be limited by an additional 5 percent, until a minimum production limitation of 35,000 tons of refined lead per calendar quarter is reached.

These production limits may also be increased provided that ambient violations are no longer occurring and Doe Run implements additional control measures that can be shown to reduce the impacts by an equivalent amount.

7.2 Quantification of Expected Contingency Measures Emission Reductions

The expected emission reductions associated with the individual contingency measures is provided below. It was necessary to establish a basis from which the emission reduction were calculated. The department choose to use actual production / emissions from 2005 as a basis for the calculations. Because the production at the plant can vary, the assumptions under which these calculations were based will vary as well. This means that the actual emission reductions associated with the installation of any of these contingency measures may result in emission reductions that are somewhat higher or lower than those provided. This is particular true with regard to the 5 percent reduction from actual emissions. The magnitude of the 5 percent is, of course, dependent on the actual production during which the triggering exceedence was experienced.

7.2.1 Enclosure of Pugger

In the attainment demonstration modeling this source (20004) was modeled at a lead emission rate of 0.006 pounds per year. Total enclosure of this process would be expected to result in elimination of this emission source.

7.2.2 Paving "North End of Blast Furnace to Refinery Dock" Haul Road

The attainment demonstration analysis applied a 90 percent control efficiency for documented watering of this haul route during slag hauling campaigns and the application of a chemical surfactant during periods when this haul road is subject only to incidental traffic.

Paving of this section of haul road would be expected to improve the control efficiency to 95 percent. This would result in a 1.226 pound per hour reduction.

7.2.3 Routing of Kettle Heat Stacks to Main Stack

The re-routing of this emission point from relatively short stacks to the main stack would not reduce emissions. Instead, this change would reduce impacts because these emissions would be much more dispersed.

7.2.4 5 Percent Reduction in Production

A 5 percent reduction in production would be expected to reduce emissions from the plant, but it would not result in a 5 percent reduction in emissions. Certain sources are assumed to emit at nearly the same rate regardless or minor changes in production. For example, wind erosion from storage piles will occur at about the same rate.

2005 production rates were used as a basis for this estimate. The estimate also assumed that all of the emission controls associated with the plan revision are fully implemented.

If it is assumed that emissions from the main stack will be reduced by 5 percent upon the application of a 5 percent production limitation, the estimated reduction is 2,687 pounds of lead per year. If it is assumed that the emissions from the main stack will be unaffected by the application of the 5 percent production limit the emission reductions are estimated at 179.4 pounds per year.

Of course, these reductions would be quite different if different assumptions are made.

8.0 Enforcement Documents

The primary document that makes the SIP controls permanent and enforceable will be the consent judgment. The Consent Judgement is a comprehensive document that will be entered into Jefferson County Court. This document establishes the responsibilities of the parties, and addresses the following major topics: 1.) Emission control project schedules and associated performance criteria, 2.) Stack testing, 3.) Process throughput and hours-of-operation limitations, 4.) Recordkeeping requirements, 5.) Contingency measures, 6.) Stipulated penalties, and 7.) Dispute resolution.

The Work Practice Manual is meant to function as a guide to plant operators, and is an element of the consent judgment, making these practices enforceable and permanent. The manual explains how to minimize emissions by specifying the way certain plant functions are conducted.