STATE OF MISSOURI
Matt Blunt, Governor • Doyle Childers, Director
DEPARTMENT OF NATURAL RESOURCES
www.dnr.mo.gov

MEMORANDUM

DATE: February 12, 2007

TO: John Rustige, P.E., Environmental Engineer
Operations Section, Air Pollution Control Program

FROM: Jeffry D. Bennett, P.E., Air Quality Modeling Unit Chief
Air Quality Analysis Section, Air Pollution Control Program

SUBJECT: Doe Run - Herculaneum State Implementation Plan (SIP) Dispersion Modeling Review

I. Introduction

In support of the attainment demonstration for the Herculaneum lead nonattainment area, a collaborative effort was undertaken to simulate lead concentrations from the Doe Run Company near the facility. This effort was primarily accomplished by staff from Shell Engineering (Doe Run's contractor) and the Air Pollution Control Program (APCP). 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.

II. Modeling Methodology

The selected model for this application is the Industrial Source Complex - Short Term with Prime Building Downwash (ISCST3-Prime or ISC3P) model (version 04269). The ISC3P is currently an alternative U.S. Environmental Protection Agency (EPA) approved model that can be used to assess concentrations from several types of sources associated with industrial source complexes. Additionally, it can account for building downwash, urban or rural dispersion coefficients, flat or elevated terrain, and averaging periods from one hour to one year. The last modeling analysis for this site utilized the ISCST3 model and Shell Engineering along with Air Pollution Control Program staff recommended the use of this modeling system due to the short deadline for completion of this project. This recommendation was, also, based on the history of acceptable modeling performance at the site with the ISCST3 modeling system.

However, in September/October 2006, EPA Region VII indicated that the AERMOD modeling system would need to be utilized for this project because it was now the EPA approved model for this type of analysis. Due to the nature of the meteorological information collected by Doe Run during the period of time that recent violations occurred and the amount of time remaining to complete the analyses, Air Program staff replied to EPA that this was not possible using the current meteorological dataset. Therefore, EPA approved the modeling protocol submitted in early November 2006 by Shell Engineering and APCP including the use of the ISC3P. The ISC3P is a valid modeling system for this project that includes enhanced building downwash algorithms when compared to the previous ISCST3 system used in the previous State Implementation Plan. In addition, the "new" ISC3P system went through a complete model performance evaluation exercise similar to the previous work on the Herculaneum area. This was done to establish confidence in the modeling system for the development of the attainment demonstration. NOTE: All the APCP modeling analyses were conducted exclusively on Linux-based systems with the Portland Group Fortran 90 compiler due to the extensive amount of computer time and resource needed for completion of the modeling exercise. Shell Engineering modeling results were compiled on PC systems and are included in the "Design Value Modeling Analysis in Support of the Revision to the Herculaneum, Missouri Lead SIP" and "Control Strategy in Support of the Revision to the Herculaneum, Missouri Lead SIP".

The meteorological data set used in the actual value modeling was developed from data collected by Doe Run in 2005. As outlined in the Shell Engineering design value report, there are four model-ready blocks of data. The longest and first block January 1 – May 30, 2005 has three components. The January 1-9 and May 6-30 portions utilize the solar radiation/delta temperature (SRDT) method for calculation of stability class. The remaining portion (January 10-May 5) utilized the Sigma-A method for stability class and there was a linear interpolation used on March 23 to fill two missing hours in the afternoon for wind speed and direction. The other blocks (June 23-August 21, August 27-September 5, and October 6-November 11) utilized the SRDT method. There were a total of 247 days that were utilized in the model performance evaluation, including the entire 1st quarter of 2005.

The design value and control strategy, or attainment demonstration, modeling used nine (9) quarters of data April 1997 - March 1999 and January - March 2005. The surface station used to collect for both the late 1990s and 2005 meteorological data was located at the Doe Run - Herculaneum facility. The upper air data for both sets was collected at the Lincoln, Illinois station (ID#4833). The inclusion of the previous meteorological data was requested by EPA Region VII and provided confidence that the results of the attainment demonstration were evaluated over additional time periods where high lead concentrations occurred in the Herculaneum area. After processing of the 1999 data, it was discovered that one of the days in the 1st quarter of 1999 appears to have erroneous sounding data (March 2, 1999). The data presented a flat mixing height (<10 m) for eleven hours between 7 AM and 6 PM and other modeling datasets using the same upper air station did not exhibit this problem. Shell Engineering downloaded the twice-daily soundings from a different source and re-ran MPRM to obtain results for use in the dispersion modeling analyses. After this correction, these data have been deemed representative and appropriate for this modeling exercise. All modeling for this exercise utilized rural dispersion characteristics based on the land use of the surrounding area. Rural dispersion is the correct choice for this exercise. The elevated terrain option was used for this exercise and was found to be appropriate. The BPIP-Prime software was executed to allow ISC3P to account for building downwash for each of the point sources.

The receptor network for the model performance evaluation consisted of six monitoring stations operating in 2005. These stations included Broad St., City Hall/Main St. – DNR, City Hall/Main St. – Doe Run, Dunklin High School, Bluff, and Sherman. NOTE: the sampling data available for comparison to the dispersion modeling at the Broad St. and City Hall monitors is considerably more robust than the previous model performance evaluation due to the every day sampling at these sites.

The receptor network for the design value and control strategy runs was designed by conducting some initial runs with a coarse receptor network (250m and 500m spacing). These runs were considered due to previous modeling activities demonstrating the highest impacts were near the Doe Run facility. The results of these runs again illustrated that the highest impacts were near the facility and that some elevated impact receptors were located on the roads outside the plant. Based on these results and standard modeling procedures, the network was designed to include 50m spacing at the existing property boundary and 100m spacing to largely encompass areas with 1 $\mu g/m^3$ predicted concentrations for the design value portion of the analyses (except receptors on external roads). The extent of the network completely identifies potential areas where the lead NAAQS could be exceeded. Therefore, this network was adequate to evaluate the attainment status of Herculaneum.

For the actual value modeling, the use of actual stack height and an hour-by-hour inventory are acceptable. In addition, the use of flagpole heights at the receptor locations was necessary to simulate the height of the probe inlet for comparison with the modeled concentrations.

The design value and control strategy modeling utilized the Good Engineering Practice (GEP) stack height for the main stack. All other stacks are below the GEP stack height identified by BPIP-Prime and were modeled at actual height. Flagpole heights were not used in the simulation for any receptors.

The emission rates for the actual value modeling were derived from an "hour-by-hour" inventory developed by Shell Engineering and correspond to daily production records at the plant's major operating locations (sinter plant, blast furnace, dross, refinery, concentrate unloading, etc.). This inventory was largely based on the previous attainment demonstration calculations and emission inventory documentation utilized in the 2000 State Implementation Plan. The report entitled "2005 Hourly Lead Emission Inventory for the Doe Run Company's Herculaneum, Missouri smelter" by Shell Engineering provides a comprehensive discussion of the methodology used for the inventory and provides calculations along with references to emission factor development. The modeled emissions for this inventory followed an "average" temporal profile developed by Doe Run/Shell. These profiles are included in the Shell inventory report for each source. Changes were made to the emission inventory development from the last SIP based on revised emission testing/factors, operational changes, and model performance results. These changes are noted here:

1) Main stack (30001) emissions were based on a 2004 stack test,
2) Baghouse #7 (40007) emissions were based on a 2002 stack test,
3) Baghouse #8 (50007) emissions were based on a 2002 stack test,
4) Baghouse #9 (50008) emissions were based on a 2002 stack test,
5) Street sampling (both inside and outside the plant during 2005) was used in calculating the actual value emissions from roadways,
6) Baghouse 7/9 and 8 stacks were modeled at the actual built height of 100 feet,

7) Railcar concentrate unloading was eliminated and truck concentrate unloading/ revised handling procedures were included,
8) Sinter plant building fugitives were increased to 4 times the modeled total from the previous SIP due to significant model unprediction of the sinter plant source group when compared to the limited CMB analysis conducted by Doe Run for this exercise,
9) Fume unloading into the unloader (tipper) was eliminated and replaced by fume unloading into south-end storage, loading into "concentrate" railcars by front-end loader, and unloading into the tipper, and
10) The fume moisture content (dry previously) was updated to reflect a wet auger conveyance into the railcar prior to dumping to the south-end storage.

The stack and release parameters for the point, volume, and area sources in the actual value modeling are included in Appendix A - Table 1, 2, and 3 respectively. The design value inventory is included in Appendix A - Tables 4 – 6 (area source parameters remained the same for both sets). Also, two figures denoting source locations inside and outside the Doe Run facility are included in Appendix A. NOTE: the design value source parameters and emission rates are included for information and completeness only. Those rates were not used in the attainment demonstration and do not represent a compliance requirement for Doe Run. The release parameters for the attainment demonstration mirror the Base I actual value modeling except for the stack heights on the Baghouse #7/9 and #8 stacks. The attainment demonstration modeling was conducted at 150 feet (45.72 meters) while the actual value modeling was conducted at the current height of 100 feet (30.48 meters). In the same fashion as the actual value inventory development, the Shell Engineering inventory report can be relied on to provide documentation regarding the calculation of emissions for the attainment demonstration inventory. It should be noted that the rationale for some of the control efficiencies is not identical and this memorandum should be relied upon for that discussion.

The goal of the actual value modeling was to determine if the model was performing well enough to pursue attainment demonstration modeling. Since this exercise relies on much of the inventory development from the previous SIP, the modeling analyses had an initial degree of quality assurance that previous analyses did not. Nonetheless, the model performance evaluation exercise utilized similar tools as the previous analyses. Initial model performance was evaluated using Doe Run provided inventories that directed analyses to sources that were not previously identified as contributing to high ambient lead concentrations in the last SIP. These sources included: Baghouse 7/9 stack, Baghouse 8 stack, the section of unpaved road between the north end of the blast furnace building and the refinery dock (Section H-L), and the concentrate delivery area (truck unloading, handling of concentrate, transfer of concentrate to the unloader).

During the modeling performance evaluation, comparisons with the quarterly averages for the study period, daily and special CMB days were evaluated. This comparison led to conclusions about the impact of different sources on the overall lead concentration at each monitor. Several discoveries led to some of the changes itemized above. The sinter plant fingerprint was identified in the CMB analyses as a significant contributor to ambient lead concentrations. Based on the control efficiency placed on the sinter plant in the previous SIP, this source was not identified in the initial dispersion analyses as a large contributor. After this initial evaluation, the sinter plant was examined and it was determined that the sinter building fugitives were likely underpredicted in the actual value dispersion modeling and these emissions were adjusted to more closely reflect the contribution identified in the CMB analyses. It was also discovered that the impacts from the dross plant and refinery plant building baghouses (#7, #8, and #9) were contributing a large fraction of the total ambient lead impact at the monitoring sites. This was due to a change in design of the baghouse stacks that were previously modeled at a lower stack height in the attainment demonstration analyses. The corrected stack height of 100 feet was modeled and the impacts were diminished and more closely reflected the output from the dross and refinery areas in the CMB analyses.

The release parameter and emission changes described above are detailed below in chronological order reflecting the on-going model performance improvement effort used during this project:

<u>Base B</u> – Shell Engineering submittal re-run by Missouri Department of Natural Resources (MDNR)
<u>Base C</u> – Changed hourly emissions files from Base B to incorporate rain events effects on unpaved road sources (70600s and 70700s)
<u>Base D</u> – EPA Region VII discovery that ISC-Prime must include point source parameters in the hourly emission file for use (parameters included)
<u>Base E</u> – Sinter plant fugitive sensitivities (used for scaling of sinter plant building fugitives)
<u>Base F</u> – Baghouse 7/9 and 8 stack parameters were corrected to actual built height, diameter, exit velocity and locations were adjusted to represent the single 7/9 stack; sinter plant building fugitives were scaled by 4 times due to Base E results
<u>Base G</u> – Haul road length correction in spreadsheet used to calculate hourly emissions file for 70500s, 70600s, 70650s, and 70700s
<u>Base H</u> – BPIP output incorrect for Baghouse 7/9 and 8 stacks due to original incorrect location (no emission changes from Base G)
<u>Base I</u> – Final basecase; included fume handling source change (no dumping of fume into unloader directly, dump at south-end storage, then railcar back to unloader along with concentrate) and unpaved slag road lead loading adjustment (road is actually the north end of the slag pile)

In order to evaluate naturally occurring lead in the atmosphere, distant sources of lead, and sources of lead not in the emission inventory, a background concentration was developed for the attainment demonstration modeling exercise. This evaluation examined concentrations at three monitors (Ursaline, Bluff, and High School) when wind directions from the on-site meteorological tower were determined to have "no plant" impact during 2005. The wind fans were developed by adding or subtracting 45° from the edge of plant emissions sources. Generally, concentrations from the Bluff monitor were included when the wind was from the west, north, or east. The following are the background wind fans for the different monitors: Ursaline 40°-280°, Bluff 256°-142°, and High School 241°-88°. After these determinations were made, all the meteorological data was examined for the study period. This evaluation eliminated monitoring days with wind directions outside the appropriate wind fan. The concentrations from the remaining 72 site-monitoring days were then averaged over the whole sampling period. The resultant of this calculation is the background concentration of 0.063 $\mu g/m^3$. This methodology is identical to the background calculation from the previous analyses in Herculaneum.

III. Modeling Results

Actual Value/Model Performance Modeling

The results of the actual value modeling were compared to five monitoring sites that are a portion of the monitoring network for the Herculaneum area. Three separate comparisons were made and the summary tables and figures are included in Appendix B. The first comparison is a day-to-day evaluation of the modeling output for the final base-case (Base I). This comparison was undertaken for all sites with at least an every three day sampling schedule (Broad St., City Hall/Main St. DNR, City Hall/Main St. DR, Bluff, and Dunklin High School). All sites demonstrate a pattern of overall accuracy for directional prediction (high monitored days being high modeled days and low monitored days being low modeled days). This type of performance demonstrates the model is predicting well when the winds are either toward or away from the monitoring sites with respect to the plant location. Further confidence in the meteorological data used in the analysis was gained due to this finding. In general, the model provides poor performance when lead concentrations are exceptionally high (see Broad St. 3/21 and 3/22/05). The model is not designed to handle uncharacterized "emission events" (e.g. Baghouse #5 failure on 3/21). In general, the model performs well at predicting daily values at all monitors in this exercise. However, the uncertainties in the emission inventory, the meteorological measurements, and the model algorithms cause the daily predicted concentrations to vary from the measured values.

The second comparison is the overall contribution analyses on days with CMB filter analyses. In the 247 day study period during 2005, there were 21 days with CMB filter analysis completed at the Broad St. monitoring site (all days) and the City Hall/Main St. site (11 days). This evaluation was conducted with the fingerprint data from the previous SIP and future analyses of this type will need to use updated fingerprints to reflect the future controlled source configuration. However, this data still provided a good snapshot of the overall contribution from several source locations at the facility. The summary of performance is included in Appendix B. In general, the CMB illustrates four major contributors to lead concentrations on these days (using both monitors): (1) in-plant roads and yard dust, (2) sinter/trestle operations, (3) blast furnace, and (4) refinery. For the same days, the ISC-Prime predicts: (1) in-plant roads, (2) sinter/trestle operations, (3) blast furnace, (4) refinery, and the (5) dross plant as contributing in a significant fashion. In general, the models show relatively good agreement for all source types except the dross area is a relatively large contributor in the dispersion analysis. The overall signal is indicative of generally good model performance for these sites/days and establishes more confidence in the results.

The final comparison and, for the purposes of using this modeling to predict future control impacts, the most important evaluation was the overall average performance of the model and the monitored data at each of the five monitoring sites used in the first evaluation. In addition to the original five sites, one more distant monitor was included to understand the model's prediction capability at a larger distance from the plant. Table 1 illustrates the model comparison for the Entire Study Period (247 days in 2005). Sites with two values represent collocated samplers with Doe Run's monitor being reported first and the DNR sampler second. Prediction bias is represented as positive when the model overpredicts the concentration at the monitor and negative when the model underpredicts the concentration at the monitor.

Table 1 - Model Comparison for 2005

Monitor	Monitored (μg/m^3)	ISC-Prime Predicted (μg/m^3)	Overall Percentage Bias
Broad St.**	**1.361/1.215**	**1.230**	**-9.6%/1.2%**
City Hall DR	**0.811**	**0.859**	**6.0%**
City Hall DNR	**0.917**	**0.982**	**7.0%**
High School	0.265/0.247	0.467	76.6%/88.9%
Bluff	0.362/0.241	0.484	33.6%/101.2%
Sherman	0.178	0.295	65.4%

** The Broad St. average does not include the 3/21 and 3/22 event days because the emissions were not adjusted in the model for these days to reflect these events.
BOLD denotes monitors with an every day sampling schedule.

The entire model performance table is included in Appendix B. The model performs extraordinarily well for the sites with the most sampling days and the highest concentrations (Broad St. and City Hall). For the sites with lower concentrations, the background concentration of 0.063 μg/m^3 has a more dramatic impact and likely causes a higher positive bias since many days at those monitors are reporting the detection limit as the concentration (nearly 0 μg/m^3). When you evaluate the monthly or period averages for the lower average monitoring sites (High School, Bluff, and Sherman), the model predicts better when the average is at its highest for these sites. Also, the model predicts the lowest average at the monitor with the lowest average concentrations. This demonstrates the logical progression to lower concentrations at larger distances from the facility. In general, the model has a slight overprediction bias for the most critical monitoring sites and this provides additional confidence that the model performed acceptably to develop control strategies for the attainment demonstration exercise.

Design Value Modeling

With the development of the numerous base-case scenarios, the on-going improvements to the emission factor calculations, and the ambitious schedule to meet our SIP submittal deadline of April 7, 2007, the final design value modeling was conducted using a version of the inventory that corresponded most closely with Base H of the actual value modeling. There were previous iterations of the design value analysis, but those are not discussed here. The outputs from this portion of the study were designed to learn which sources would significantly contribute to the lead non-attainment problem in Herculaneum based on near-maximum production at the Doe Run facility.

The result summary for the design value modeling is included in Appendix B. Some source areas of concern that were identified included: south-end storage, unloader area, building fugitive emissions (all process buildings), Baghouse 7/9 stack, Baghouse 8 stack, in-plant roads, and, to a lesser extent, external haul routes. The contribution from each one of these source areas was significant enough to warrant investigation of methods to reduce the impacts from these sources. Based on this investigation and without additional controls being implemented through this exercise, the maximum quarterly average lead concentration is 14.40 μg/m^3 near the Doe Run facility.

Attainment Demonstration Modeling

This modeling exercise was completed to demonstrate attainment of the quarterly lead NAAQS (1.5 μg/m^3). The results do indicate that the NAAQS will be attained. The maximum concentration (including background) for each quarter is presented in Table 2 along with the location of the receptor. In general, there are two areas of concentrations over 1 μg/m^3: one area is along the western edge of the main property area (Main St.) and the other is a single receptor at the Herculaneum wastewater treatment plant. The receptors over 1 μg/m^3 along with their predicted maximum concentration and quarter that it occurred are listed in Table 3. The attainment demonstration results are, also, illustrated in Appendix B.

Table 2 - Maximum Quarterly Concentrations

Quarter	Concentration ($\mu g/m^3$)	UTM-Easting (m)	UTM-Northing (m)
2nd 1997	1.123	729,375	4,237,698
3rd 1997	**1.492**	729,375	4,237,698
4th 1997	1.235	729,424	4,237,840
1st 1998	1.053	729,375	4,237,698
2nd 1998	1.052	729,483	4,238,082
3rd 1998	1.374	729,375	4,237,698
4th 1998	1.288	729,375	4,237,698
1st 1999	1.088	729,375	4,237,698
1st 2005	0.994	729,435	4,237,202

Table 3 - Receptors with Concentrations over 1 $\mu g/m^3$

Receptor #	UTM-Easting	UTM-Northing	Concentration	Quarter
1	729,375	4,237,698	1.492	3rd 1997
2	729,369	4,237,700	1.423	3rd 1997
3	729,392	4,237,745	1.419	3rd 1997
4	729,456	4,237,986	1.352	3rd 1997
5	729,424	4,237,840	1.338	3rd 1998
6	729,323	4,237,557	1.337	3rd 1998
7	729,469	4,238,034	1.324	3rd 1997
8	729,409	4,237,792	1.290	3rd 1997
9	729,358	4,237,651	1.263	3rd 1998
10	729,483	4,238,082	1.262	3rd 1997
11	729,435	4,237,888	1.262	3rd 1998
12	729,446	4,237,937	1.236	3rd 1998
13	729,341	4,237,604	1.220	3rd 1998
14	729,306	4,237,510	1.196	3rd 1998
15	729,332	4,237,614	1.155	3rd 1998
16	729,497	4,238,130	1.095	3rd 1997
17	729,469	4,238,100	1.062	3rd 1997
18	729,369	4,237,800	1.052	3rd 1998
19	729,435	4,237,202	1.013	2nd 1997

IV. Recommendations

Based on the results of this review, it is concluded that the lead NAAQS will be attained in Herculaneum, Missouri. This conclusion is based on the following levels of operation and capture/control efficiencies provided by Doe Run and Shell Engineering.

Table 4 - 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

Table 4 - Attainment Demonstration Limitations (continued)

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 TPQ throughput scaled back to the daily throughput shown above.
**Sinter to storage transfers are limited to 45,000 TPQ 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

Doe Run should adhere to the emission rates specified in Tables 4 and to the daily throughput and capture/control efficiencies in Table 4 to achieve attainment of the lead NAAQS.

The control efficiencies assigned to the individual sources are as follows:

Concentrate Delivery [10001A1] – Installation of partial enclosure (3 sides) around the truck dump into the Grizzly and the moisture content testing (minimum of 6% daily average) = 90%

Transfer to Concentrate to Railcar/Storage [10001A2] – Installation of sleeve on conveyor drop and moisture content testing (minimum of 6% daily average) = 80%

Loading of Concentrate from Storage to Railcar [10001B1] – Moisture content testing (minimum of 6% daily average) = 50%

Unloading of Concentrate at Railcar Tipper [10001B2] – Installation of door on the south end of the unloader that will be closed when material is dumped along with the minimum moisture content testing (concentrate = 6% and fume = 8% moisture minimums) = 90%

Loading of Fume to Railcar [20004] – Installation of sleeve on conveyor drop to railcar and moisture content testing (minimum of 8%) = 95%

Fume Unloading at South Storage [20004B] – Moisture content testing (minimum of 8%) = 90%

Fume Loading to Railcar at South Storage [20004C] – Moisture content testing (minimum of 8%) and wetting of material before loading = 90%

Sinter Plant Mix Room [20005A-F] – Building enclosure improvements including inflow testing and continuous monitoring of inflow (or surrogate) = 90%

Sinter Plant Building Fugitives [20006] – Building enclosure improvements including inflow testing and continuous monitoring of inflow (or surrogate) along with wheel tunnel ventilation and monitoring = 94%

Blast Furnace Building Fugitives [30002] – Building enclosure improvements including inflow testing and continuous monitoring of inflow (or surrogate) along with automated tuyere controllers, interlock and alarm system between baghouse and tuyere controllers, improvement of fugitive emission capture due to relocation of furnace 140 feet closer to ventilation input, and blast furnace doghouse ventilation improvements = 97%

Dross Kettle Heat Stacks [40004-5] – Installation and monitoring of cameras to identify kettle failure or leak along with action plan to immediately turn off kettle firing upon identification of a problem = 50%

Dross Plant Building Fugitives [40006] – Building enclosure improvements including inflow testing and continuous monitoring of inflow (or surrogate) = 90%

Refinery Plant Building Fugitives [50006] – Building enclosure improvements including inflow testing and continuous monitoring of inflow (or surrogate) = 90%

Refinery Kettle Heat Stacks [50011-18] – Installation and monitoring of cameras to identify kettle failure or leak along with action plan to immediately turn off kettle firing upon identification of a problem = 50%

External Haul Routes [70100-122,70150-213] – New regenerative sweeper = 95%

In-plant Paved Roads [70250-252,70300,70350-358,70400-406,70450-454,70500-513,70550-553,70650-659] – New regenerative sweeper and fixed water sprinkler system (Glover-style) = 95%

In-plant Unpaved Road [70600-612] – Documented watering during times when slag is being hauled and surfactant application when slag is not being hauled = 90%

In addition to the daily and quarterly process limits, the stack emission limits, project controls, and the hour of day operation restrictions, Doe Run must increase stack heights from their #7/#9 baghouse (50008) and #8 baghouse (50007) stacks to a minimum of 150 feet to demonstrate attainment of the lead NAAQS. This increase to 45.72 meters is still considerably lower than the GEP stack height for these stacks of 65 meters.

JB:bw

Attachments

c: Richard Daye, U.S. Environmental Protection Agency, Region VII