Section 5 – CAM Test Plan

Test Procedure Summary

Both of the previously discussed monitoring approaches (i.e., CAM models or Test and Cap) utilize opacity either as a primary or secondary indicator of compliance. As a result, the main objective of the testing was to determine the opacity/mass relationship specifically for Unit 1. Although neither approach relies on a direct correlation between these two properties, the relationship will assist in determining appropriate trigger levels under each approach. If it is determined that an ESP model approach should be considered for Unit 1, the data will be used to setup and calibrate the model. The following describes the general approach that was used for CAM testing at Southwest.

In order to determine the opacity/mass relationships, particulate testing was conducted on the unit at the stack outlet under multiple test conditions. Under each test condition, the boiler was operated at normal, full load. An initial, baseline test was conducted to determine the particulate mass loading during normal boiler and ESP operation. Additional tests were conducted on each unit at varying degrees of particulate mass emissions by removing power from the ESP ("de-tuning"). Four (4) "de-tuned" test conditions were conducted on Unit 1 during the scheduled CAM testing. One of the conditions was a "high-level" test where the opacity was near or exceeded the permit limit.[5] The other test conditions were "mid-level" test, with the opacity between the high-level test and the normal operating opacity. Stack opacity, ESP operating data, and various boiler operating data was collected simultaneously with each test and for each "de-tuned" condition.

Request CAM Test Exemption

Since each unit was tested at elevated opacity levels, excess opacity emissions occurred during testing. This was particularly true of the high-level tests where ESP plate rapping caused significant spikes in opacity. City Utilities requested and was granted an exemption from the Missouri Department of Natural Resources (MDNR) for any excess opacity emissions that resulted from the CAM test program. An e-mail communication granting City Utilities request was given by the MDNR.[6]

[5] This statement assumes that the particulate mass emissions will be at or below the limit while at the opacity limit.

[6] See e-mail correspondence from Peter Yronwode enclosed with the CAM documentation.

TEST SCHEDULE

CAM testing was conducted during the week of February 21, 2005. It was anticipated that three (3) to four (4) test conditions would be required for Unit 1 and testing would take up to four (4) days to complete. At each condition, sampling data will be collected for three (3) – one (1) hour test runs. Table 13 summarizes the test schedule as performed:

Table 13: CAM Test Schedule

Date	Description of Schedule or Events
Tuesday, February 22, 2005	Equipment Setup & Preliminary Testing
Wednesday, February 23, 2005	Pre-test Meeting/ESP Baseline and "De-tuned" Condition 1
Thursday, February 24, 2005	"De-tuned" Conditions 2 and 3
Friday, February 25, 2005	"De-tuned" Condition 4A and 4A (SO_3 injection system on)

Two (2) test conditions were performed each day. Testing was performed by Catalyst Air Management from Knoxville, Tennessee. The testing schedule beyond the first two (2) days depended on the number of tests that would be performed. A total of three (3) days of testing were required for the development of this CAM Plan.

Catalyst setup its equipment on Unit 1 stack on Tuesday preceding the start of the first day of testing. The stack test crew would have all their equipment setup and have completed any preliminary testing (i.e. stratification testing) so that they were ready to begin testing Tuesday morning. A brief, pre-test meeting was conducted Tuesday morning. The meeting included the stack test crew project manager, City Utilities plant personnel and City Utilities personnel from Government Relations/Environmental Affairs. The purpose of the meeting was to answer any questions that may arise and make sure all affected parties are aware of the test format and their specific roles during the testing. Discussion of appropriate plant operational and ESP parametric data collection was included.

Testing would start on Tuesday immediately following the pre-test meeting. For the remainder of the week, testing would begin each day at 8:00 A.M., barring any operational difficulties. Testing lasted 10-12 hours each day, although additional runs may be required to address operational upsets or questionable test results. For the de-tuned test conditions, preliminary ESP setup was not needed after the prior day's testing is completed. Because of the inertial effect of large changes in power, ESP power levels the following morning can sometimes be significantly different than the preliminary setup. As a result, delays to the start of testing for the de-tuned test conditions to make additional adjustments to achieve the desired test condition were needed.

BOILER OPERATION

Each test was conducted with the boiler operated at normal, full load conditions (or as possible based on daily ambient conditions, and coal delivery variations). Full operating load will generate the highest level of particulate mass emissions and produce conservative indicator ranges under any of the CAM monitoring approaches. Furthermore, full load is the normal operating condition for Unit 1's boiler at Southwest.

To the extent practicable, unit load was operating at normal, full load for at least two hours prior to the start of testing each morning. This allowed the boiler and ESP to achieve steady-state conditions prior to testing. Typically, testing commenced at 8 a.m. each morning. Although actual testing was expected to last 6-8 hours, normal load was required during the preliminary setup of the ESPs for the de-tuned test conditions and for longer than expected test runs. As a result, unit load was maintained until approximately 9 p.m. each test day or until testing and ESP setup was completed.

Unit load, air flow, fuel flow, excess air, steam temperatures, etc. were maintained as steady as possible during the entire test period. Since testing was conducted for Unit 1 on multiple days, it was important that boiler operation and load be as similar as possible between each test. This helped to ensure the development of an accurate opacity/mass relationship, which is the ultimate goal of the testing. Air heater blowing was not conducted during the test period. If necessary, air heater blowing was conducted between test runs. All other soot blowing continued as normal. Any boiler-related problems that developed during the testing were noted as part of each test condition.

ESP OPERATION

The CAM testing at Southwest should reflect normal operation of both the boiler and the ESPs. As a result, testing was conducted using the existing ESP voltage controller settings, rapper configuration and cycle times, and ash handling operation, except as noted below for the de-tuned test conditions. Gas temperature and flow should also be representative of normal ESP operation and remain stable throughout the testing. Slight changes in inlet gas temperature or flow distribution can have significant effects on ESP operation.

Unit 1 SO_3 Injection

No adjustments to the flue gas conditioning system on the Unit 1 ESP for this test program were made. The gas conditioning system does not play a significant role under any of the proposed CAM approaches, since the current system is used marginally to maintain baseline opacity averages at or below 15%. The SO_3 injection system was not used during the bulk of the testing. De-tuned condition 4B mirrored the ESP conditions for 4A, however, the SO_3 injection system was operated and monitored during testing to verify steady-state operation of the system. In order to aid the effectiveness of particle capture in the ESP, the resistivity of the coal fly ash can be lowered using the SO_3 conditioning system. The results indicated that opacity, and therefore, particulate mass emissions are controlled with the application of the injection system. Results with the injection system operating indicated a decrease in opacity from 25.77 to 24.83 with a corresponding decrease in the PM emission rate from 0.088 to 0.074 lb/mmBtu. No other parameters were adjusted during this test condition. The overall efficiency of the ESP to collect particulate matter seemed to improve with the injections system operating, which is to be expected.

DE-TUNED TEST CONDITIONS

The unit was tested at multiple conditions of reduced ESP performance. The purpose of the tests was to develop the opacity/mass relationship by simulating a partial ESP "failure," in order to demonstrate the level of reduced performance where the permit limits can still reasonably be expected to be met. The most common types of ESP failure (or causes of reduced performance) are either grounded fields or close clearances. In order to simulate these conditions, the ESP was "de-tuned" by reducing and/or eliminating power to various portions of the precipitator. This effectively increased the particulate mass loading and opacity at the exit of the precipitator.

The test program included four (4) to five (5) de-tuned test conditions. One condition included a "high-level" test where the opacity level was near the opacity limit and several mid-level tests where the opacity is roughly between the high-level test condition and the baseline operating opacity. The ESP de-tuned test points were conducted at opacity levels of 19, 25, 26 29, and 35 percent.

As a general approach in setting up the ESPs for the high-level test, power was removed, as necessary, to achieve an operating opacity that is close the desired test condition. ESP power was then removed, as necessary, to "fine-tune" the emissions to the desired test condition. The reverse procedure was used for the mid-level test, where certain fields were placed back into service and power levels increased. The procedure was conducted incrementally, as took some time for the fields downstream of the de-powered section to adjust to the increased dust loading. Although City Utilities understands that the DNR granted City Utilities a variance for excess emissions during the CAM testing, care was taken to keep emissions within "reasonable" levels during testing. As a result, City Utilities personnel were cognizant of especially weak fields and rapping cycles in establishing ESP "de-tuned" conditions.

ESP operating conditions were established (i.e. adjust power levels) prior to conducting testing at each test condition. ESP setup was performed each morning/afternoon after the successful completion of the previous test condition. Infrequently, additional adjustments were required prior to testing, depending on where the ESP "settled out" prior to the scheduled morning testing or load variations.

STACK TESTING ISSUES

Filterable-only particulate mass emissions were measured at the existing stack sampling location using EPA Reference Method 17. Unit 1's test location met the requirements for the use of the method. Alternatively, Reference Method 5 could have been used instead of Method 17. However, it was believed that in-stack filter measurements are more accurate and less likely for stack tester error, so Method 17 was used during the testing. Prior approval was given by the MDNR to use the alternate test method, since only a reasonable assurance of compliance was required.

Each test condition consisted of at least three (3) – one (1) -hour runs. The results of each test were then averaged over the three (3) runs at each condition. It should be emphasized that measurement accuracy was very important in developing the opacity/mass relationship.

Catalyst had the capability of performing preliminary, on-site analysis of the particulate sample after each run. This preliminary data was analyzed by City Utilities personnel to determine subsequent testing (de-tuned) conditions on Unit 1.

DATA REQUIREMENTS

Various coal, ash, boiler and ESP operating data was collected during each test. This data will be used to evaluate operations stability, if required. ESP data collected can be used to develop the ESP model protocol, if this approach is desired.

Boiler and ESP operating data were collected continuously during each test. However, selected data was manually recorded by City Utilities plant personnel. For boiler data, an existing unit log was created in an Excel (*.xls) spreadsheet for collection. ESP data included primary and secondary voltages and currents, and spark rate. Snapshots of the ESP performance parameters were printed on occasion during the testing by City Utilities personnel. CEMS data included a standard emissions report including stack temperature, gross load, and opacity. At a minimum, all data was collected at least every hour. The following is a list of the specific boiler and ESP data collected:

Table 14: Unit, Stack, and ESP Data Collected

Unit Data	Stack (CEMS) Data	ESP Data (each TR Set)
Gross Unit Load	Opacity	Primary Voltage
Total Air Flow	Stack Flow	Primary Current
Total Fuel Flow	Stack NO_x	Secondary Voltage (if available)
Total Steam Flow	Stack SO_2	Secondary Current
Excess O_2	Stack CO_2	Spark Rate
SH Temperature	Stack Temperature	SO_3 Converter ΔT (Unit 1)
RH Temperature		
SH Spray		
RH Spray		
AH Gas Out Temperature		

Coal and fly ash samples were taken each test day. A representative fly ash sample was taken during the course of the testing by plant personnel at a consistent/representative location. The samples were collected by the plant and placed in labeled, sealed containers, which will be retained until it is determined whether analysis is required.

Section 6 – Test Results Summary

Table 15: Unit 1 Average Test Data Results

Description of Parameter Measured	Units of Measure	Unit 1					
		Baseline	De-Energized Point 1	De-Energized Point 2	De-Energized Point 3	De-Energized Point 4A	De-Energized Point 4B[1]
Flue Temperature	°F	324.0	324.3	322.3	324.0	317.3	318.0
Volume of Flue Gas	acfm	850,820	851,463	845,804	696,657	704,494	707,750
Volume of Flue Gas	dscfm	489,828	487,803	484,943	420,625	431,202	435,577
O_2%, dry	%	5.30	4.90	4.93	5.03	4.60	4.73
CO_2%, dry	%	14.67	14.97	14.40	14.20	14.60	14.47
Dust Concentration	lb/dscf	2.94E-06	1.34E-05	4.38E-06	7.54E-06	7.01E-06	5.87E-06
Dust Concentration	lb/hr	86.50	392.44	127.30	220.19	204.48	172.72
Dust Concentration	grs/acf	0.021	0.094	0.031	0.052	0.048	0.039
Dust Concentration	grs/dscf	0.021	0.094	0.031	0.053	0.049	0.041
Particulate Emissions	lbs/mBtu	0.039	0.172	0.056	0.097	0.088	0.074
Opacity%	%	11.10	34.80	19.40	29.00	25.77	24.83

[1]Test Condition with the SO_3 Injection system operational.

Table 16: Previous Unit 1 Baseline Test Points

Date(s) of Testing	Average Opacity Data	PM Emission Rate	Gross Load
	(Percent)	(lb/mmBtu)	(MW)
9/6/95	16.44	0.037	152
9/7/95	18.74	0.053	192

Figure 3: Unit 1 Average Data Results (Test and Cap)

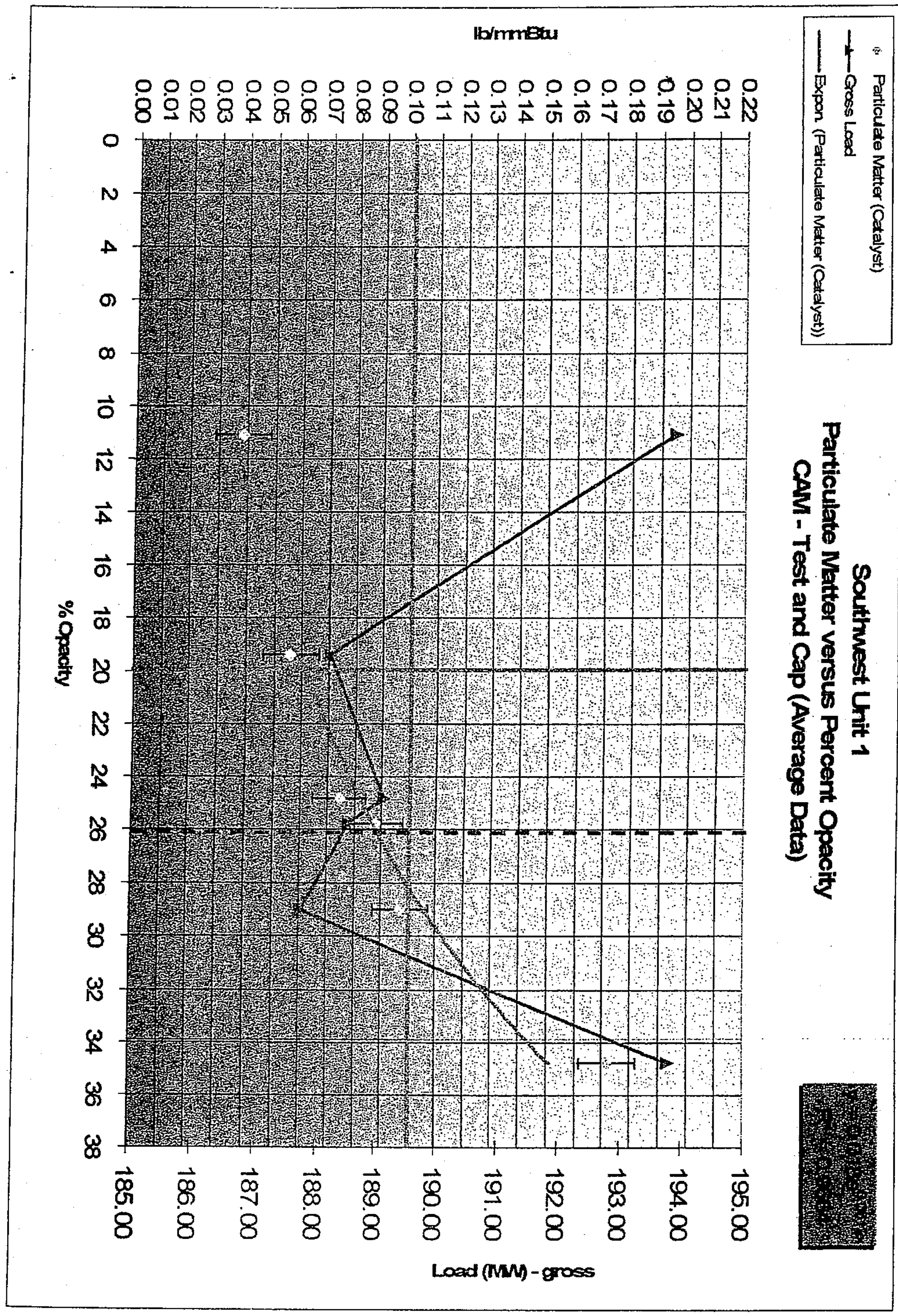
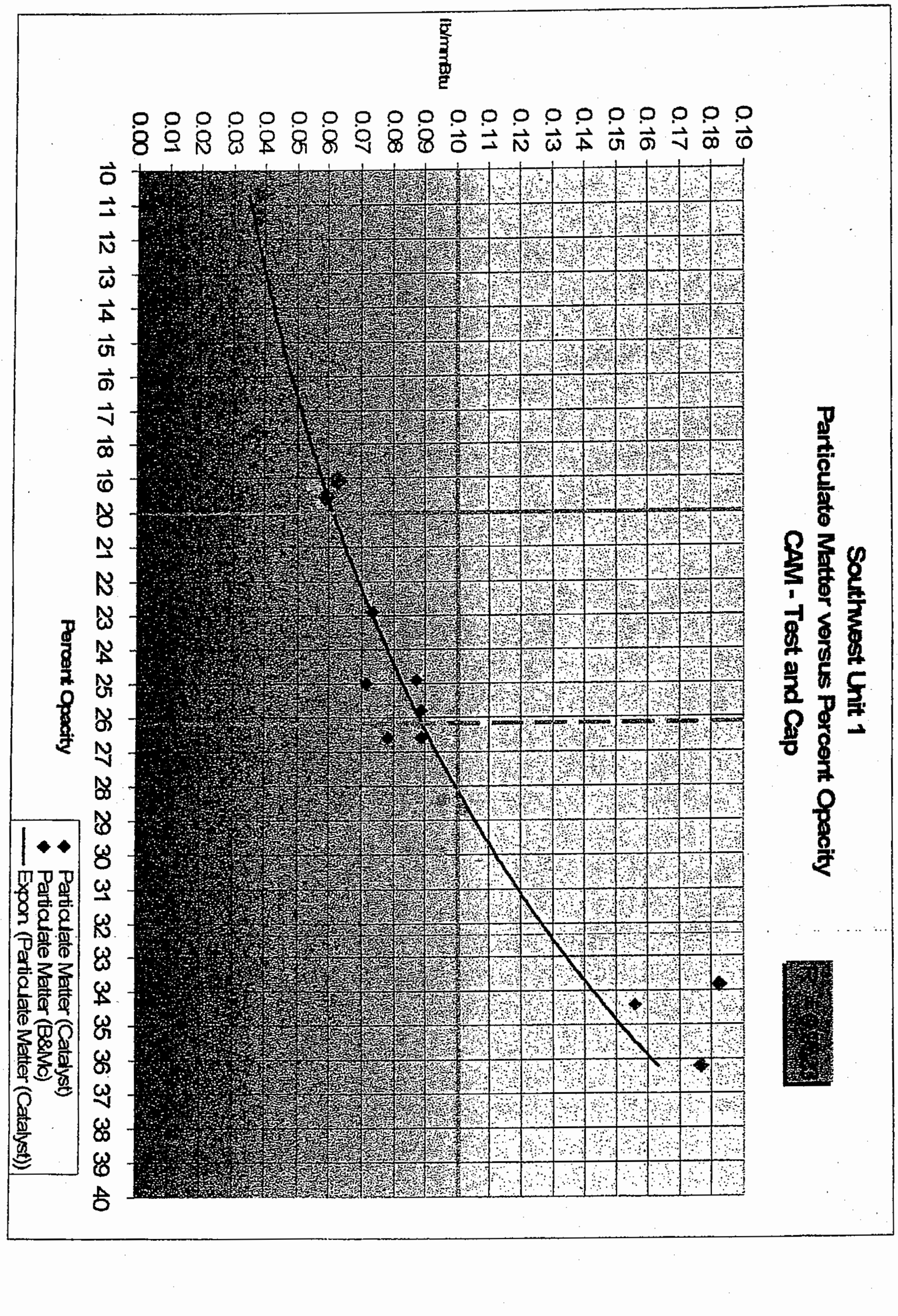


Table 17: CAM/PM PERFORMANCE TESTING (Southwest Unit 1)

Test Date	Run No.	Particulate Matter (PM) Emissions		Opacity	Stack Testing Company
		lb/hr	lb/mmBtu	%	
9/7/1995	4	141.56	0.063	19.07	Burns & McDonnell
9/7/1995	5	84.00	0.038	17.64	Burns & McDonnell
9/7/1995	6	132.11	0.059	19.53	Burns & McDonnell
2/23/2005	1	86.98	0.039	11.20	Catalyst Air Management
2/23/2005	2	86.81	0.039	10.70	Catalyst Air Management
2/23/2005	3	85.71	0.038	11.40	Catalyst Air Management
2/23/2005	4	414.50	0.182	33.80	Catalyst Air Management
2/23/2005	5	399.28	0.177	36.20	Catalyst Air Management
2/23/2005	6	363.54	0.156	34.40	Catalyst Air Management
2/24/2005	7	126.30	0.054	19.20	Catalyst Air Management
2/24/2005	8	123.98	0.056	19.30	Catalyst Air Management
2/24/2005	9	131.61	0.058	19.70	Catalyst Air Management
2/24/2005	10	215.46	0.096	28.40	Catalyst Air Management
2/24/2005	11	215.12	0.095	29.90	Catalyst Air Management
2/24/2005	12	229.98	0.101	28.70	Catalyst Air Management
2/25/2005	13	206.19	0.089	25.80	Catalyst Air Management
2/25/2005	14	205.72	0.089	26.60	Catalyst Air Management
2/25/2005	15	201.52	0.087	24.90	Catalyst Air Management
2/25/2005	16	170.27	0.073	22.90	Catalyst Air Management
2/25/2005	17	165.74	0.072	25.00	Catalyst Air Management
2/25/2005	18	182.14	0.078	26.60	Catalyst Air Management

***NOTE: Stack data bolded and color-coded was plotted on the graphs below but was not used to develop curve trend because of precision and accuracy of the data and inconsistencies between previously sampled data and the corresponding opacity averages over the test period. Opacity data based on 1-minute average data collected during the CAM test run. Previous test results show 6-minute opacity average data.**

Figure 4: PM EMISSIONS VERSUS OPACITY (Southwest Unit 1)



STATEMENT OF BASIS

Permit Reference Documents
These documents were relied upon in the preparation of the operating permit. Because they are not incorporated by reference, they are not an official part of the operating permit.

1) Part 70 Operating Permit Application, received June 20, 2005;
2) 2006 Emissions Inventory Questionnaire, received May 31, 2007;
3) U.S. EPA document AP-42, *Compilation of Air Pollutant Emission Factors*; Volume I, Stationary Point and Area Sources, Fifth Edition;
4) Construction Permit 0391-001, Issued March 4, 1991;
5) Acid Rain Permit, OP2007-068;
6) Compliance Assurance Monitoring (CAM) Plan.

Applicable Requirements Included in the Operating Permit but Not in the Application or Previous Operating Permits
In the operating permit application, the installation indicated they were not subject to the following regulation(s). However, in the review of the application, the agency has determined that the installation is subject to the following regulation(s) for the reasons stated.

The following Emission Units no longer exist at this facility and were not included in this renewal permit: EU0030 – Coal Crushing (EP03), EU0050 – Pugmill (EP10), EU0100 – Limestone Unloading (E33), EU0110 – Limestone Conveying (E35) and EU0120 – Limestone Crushing (E36).

Other Air Regulations Determined Not to Apply to the Operating Permit
The Air Pollution Control Program (APCP) has determined the following requirements to not be applicable to this installation at this time for the reasons stated.

10 CSR 10-6.100, *Alternate Emission Limits*
This rule is not applicable because the installation is in an ozone attainment area.

10 CSR 10-4.030, *Restriction of Emission of Particulate Matter from Industrial Processes* does not apply to EU0010 and EU0020 because the emissions from these units are fugitive.

10 CSR 10-6.220, *Restriction of Emission of Visible Air Contaminants* does not apply to EU0010 and EU002 because the emissions from these units are fugitive.

10 CSR 10-4.040, *Maximum Allowable Emission of Particulate Matter From Fuel Burning Equipment Used for Indirect Heating* does not apply to EU0040 - Coal Fired Boiler because it is subject to the particulate matter limitations of 10 CSR 10-6.070, *New Source Performance Regulations.*

Construction Permit Revisions
The following revisions were made to construction permits for this installation:

Southwest Power Plant was issued Construction Permit 122004-007 on December 15, 2004, to install a 2,724 million, British thermal units per hour, pulverized, coal-fired boiler and associated material handling equipment. The facility is in the process of constructing the new equipment and will submit an application for major modification of this operating permit within one year of start-up of the new equipment. Construction is expected to be complete around January 2010.

Construction Permit 0391-010 record keeping requirements were changed from two years to five years in this Title V permit.

New Source Performance Standards (NSPS) Applicability

40 CFR Part 60 Subpart Ka, *Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After May 18, 1978, and Prior to July 23, 1984*
The 200,000 Gallon and 892,000 Gallon fuel oil storage tanks are not subject to Subpart Ka because they do not meet the definition of "petroleum liquid" storage. Also the tanks were installed prior to 1978.

40 CFR Part 60 Subpart Y, *Standards of Performance for Coal Preparation Plants*
This subpart is applicable to any of the following facilities in coal preparation plants which process more than 200 tons per day and were constructed or modified after October 24, 1974: Thermal dryers, pneumatic coal-cleaning equipment, coal processing and conveying equipment (including breakers and crushers), coal storage systems, and coal transfer and loading systems. This subpart does not apply to EU0020 Coal Conveying or EU0010 Coal Unloading because this facility does not meet the definition of "coal preparation plant". According to this subpart a coal preparation plant means any facility which prepares coal by one or more of the following processes: breaking, crushing, screening, wet or dry cleaning, or thermal drying. EU0030 Coal Crushing was removed as part of this permit review.

40 CFR Part 60 Subpart GG, *Standards of Performance for Stationary Gas Turbines*
This subpart applies to all stationary gas turbines with a heat input peak load equal to or greater than ten pound per million British thermal units per hour that commenced construction, modification, or reconstruction after October 3, 1977. The combustion turbines (EU0130 and EU0140) were originally built in 1972, and pre-date Subpart GG, therefore this subpart was not applied to these emission units.

Maximum Available Control Technology (MACT) Applicability

40 CFR Part 63, Subpart YYYY, *National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines*
This subpart applies to stationary combustion turbines located at a major source of HAP emissions. However, the combustion turbines located at this facility (EU0130 and EU0140) would be considered "existing" units (commenced construction or reconstruction on, or before January 14, 2003). There are no listed requirements or work practice standards to meet for existing combustion turbines, therefore this subpart was not included in the operating permit.

40 CFR Part 63, Subpart DDDDD, *National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial and Institutional Boilers and Process Heaters*
On July 30, 2007, the United States Court of Appeals, District of Columbia Circuit officially ordered a full vacatur of the Boiler MACT rule. The vacatur has the same effect as if a federal Boiler MACT rule was never promulgated. This means there is no longer a September 13, 2007 compliance date for sources affected by this HAP source category. We are awaiting written guidance from EPA on how to handle sources formerly subject to the Boiler MACT. The Small Building Heat Boiler (EU0090) would have been subject to this MACT, however, there would have been no requirements other than initial notification because this unit is an existing gas/oil-fired unit according to § 63.7506 (b)(1) and (2). If there is a new MACT promulgated and this unit is subject with requirements a major modification will be required to update this operating permit.

National Emission Standards for Hazardous Air Pollutants (NESHAP) Applicability

In the permit application and according to Air Pollution Control Program records, there was no indication that any Missouri Air Conservation Law, Asbestos Abatement, 643.225 through 643.250; 10 CSR 10-6.080, Emission Standards for Hazardous Air Pollutants, Subpart M, National Standards for Asbestos; and 10 CSR 10-6.250, Asbestos Abatement Projects - Certification, Accreditation, and Business Exemption Requirements apply to this installation. The installation is subject to these regulations if they undertake any projects that deal with or involve any asbestos containing materials. None of the installation's operating projects underway at the time of this review deal with or involve asbestos containing material. Therefore, the above regulations were not cited in the operating permit. If the installation should undertake any construction or demolition projects in the future that deal with or involve any asbestos containing materials, the installation must follow all of the applicable requirements of the above rules related to that specific project.

Compliance Assurance Monitoring (CAM) Applicability
40 CFR Part 64, *Compliance Assurance Monitoring (CAM)*
The CAM rule applies to each pollutant specific emission unit that:
- Is subject to an emission limitation or standard, and
- Uses a control device to achieve compliance, and
- Has pre-control emissions that exceed or are equivalent to the major source threshold.

40 CFR Part 64, *Compliance Assurance Monitoring (CAM)*
Boiler 1 (EU0040) meets the applicability criteria for 40 CFR Part 64, *Compliance Assurance Monitoring (CAM)*, because this unit has the uncontrolled potential to emit particulate matter above the major source threshold levels (as defined by Part 70) and utilizes control devices (as defined by 40 CFR §64.1) to comply with 40 CFR Part 60 Subpart D.

The permittee submitted a Compliance Assurance Monitoring plan with the renewal permit application, on June 20, 2005. The approved conditions of the Compliance Assurance Monitoring plan have been incorporated into Permit Condition EU0040-001.

Other Regulatory Determinations

City of Springfield Code
Although opacity limitations from the Missouri Code of State Regulations are very similar to the City of Springfield Code, the permittee has requested that all City of Springfield Ordinances be given separate Permit Conditions within the operating permit. This results in some redundancy, but more clearly outlines the responsibilities of the permitee.

Other Regulations Not Cited in the Operating Permit or the Above Statement of Basis
Any regulation which is not specifically listed in either the operating permit or in the above Statement of Basis does not appear, based on this review, to be an applicable requirement for this installation for one or more of the following reasons:

1. The specific pollutant regulated by that rule is not emitted by the installation;
2. The installation is not in the source category regulated by that rule;
3. The installation is not in the county or specific area that is regulated under the authority of that rule;
4. The installation does not contain the type of emission unit which is regulated by that rule;
5. The rule is only for administrative purposes.

Should a later determination conclude that the installation is subject to one or more of the regulations cited in this Statement of Basis or other regulations which were not cited, the installation shall determine and demonstrate, to the Air Pollution Control Program's satisfaction, the installation's compliance with that regulation(s). If the installation is not in compliance with a regulation which was not previously cited, the installation shall submit to the Air Pollution Control Program a schedule for achieving compliance for that regulation(s).

Prepared by:

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