E. SIKESTON POWER STATION

The Sikeston Power Station is a coal-fired electric generating facility located in Scott County, Missouri. Based on the air program's technical review of this facility, current conditions support a recommendation of attainment for all of Scott County. Sikeston was also evaluated under the 2015 federal consent decree and designated unclassifiable/attainment in June 2016. EPA has indicated that sources evaluated under the consent decree, but not designated nonattainment, should also be evaluated in the rounds governed by the Data Requirements Rule (DRR). Therefore, Sikeston is included in this recommendation.

E.1 Monitoring and Modeling Data

There are no ambient SO_2 monitors near Sikeston that can be relied upon to characterize the air quality around the source. Instead, the air program performed extensive air dispersion modeling to characterize air quality for the area. The air program modeled Sikeston using the most recent three years of actual emissions data and concurrent representative meteorological data to approximate a monitored design value for the area. The following paragraphs summarize the modeling analysis performed specific to Sikeston, and the modeling protocol in Appendix H contains more detail on general modeling procedures.

Emissions Data for Model Input

The most recent three years (2013-2015) of hourly emissions (CEMS) data was obtained through EPA's Clean Air Markets Division program database (CAMD) and the downloaded SO_2 hourly mass emissions data was formatted for direct input into AERMOD. Sikeston provided hourly recorded varying stack release parameters including exit temperature and exit flow rate that were evaluated and paired with the CAMD retrieved CEMS emissions. Further emissions information including interactive source evaluation is included in Section E.2.

Meteorological Data for Model Input

An air program staff meteorologist performed a technical evaluation to determine which surface and upper air stations are most representative of Sikeston. The Sikeston Power Station has no on-site or nearby collected surface or upper air meteorological data. Offsite NWS data is evaluated for representativeness in the following discussion. In general, meteorological stations within 200 km of the facility of interest are preferred as their prevailing weather conditions would be most similar to the facility. However, locations more than 200 km from the facility of interest can be considered when surface conditions of nearby meteorological stations are not deemed representative.

For upper air data, the Springfield, MO upper air station is closest to Sikeston at 338 km and best represents the vertical atmospheric characteristics of the region surrounding Sikeston.

For surface data, the Cape Girardeau (39 km), Poplar Bluff (64 km), and Farmington (122 km) airports are the closest to the Sikeston facility. Explicit criteria for each of the respective stations are compared below.

> Cape Girardeau: The surface roughness values compare favorably between Sikeston and this airport. Because the land cover characteristics are very similar, with 90% row crop/10% pasture at Cape Girardeau, and 66% row crop and 8% pasture at Sikeston, the surface roughness values within 1 km of each site are very similar (4-56% different by season). The 1992 Land Cover Data identifies 11% of the land cover near Sikeston as water. Changes at the facility shown in more recent satellite images indicate that the amount of water cover near the facility has dropped significantly since 1992, especially in the southeast quadrant. Current land cover in this quadrant

is low grasses, which compares favorably with Cape Girardeau. The albedos agree within 5%. The Bowen ratios differ by 3-30% across all seasons.

Poplar Bluff: The surface roughness values compare favorably between Poplar Bluff and Sikeston. Land cover is 51% row crops, 9% pasture, and 16% low intensity residential for Poplar Bluff; compared to 66% row crop and 8% pasture for Sikeston. Surface roughness values differ by 40-98% between these locations by season. The albedos agree within 1%. The Bowen ratios differ by 6-22% across the seasons.

Farmington: The surface roughness values differ by 12-72% across all seasons between Farmington and Sikeston. The land cover categories are similar, with planted or grass cover at 75% for Farmington and 77% for Sikeston (includes pasture, row crop and recreational grasses). By individual land type, Farmington only has 14% row crop compared to 66% for Sikeston, accounting for most of the difference in winter and spring surface roughness. Albedo values agree within 7%. Bowen ratios are within 29% for all seasons and precipitation schemes.

The next closest airport within 200 km (St. Louis Downtown, 193km) offers no improvement to the comparison of combined surface roughness, albedo, or Bowen ratios than the three closest surface weather stations. The strong similarity in land cover between Cape Girardeau and Sikeston, along with similar albedo and Bowen ratios, make the closest NWS meteorological station at Cape Girardeau the most representative surface weather station.

The recommended representative meteorological stations used in this modeling analysis are shown in Table 1.

Table 1 – Sikeston Power Station Meteorological Datasets

Facility of Interest	Surface Data Location	Upper Air Location
Sikeston Power Station	Cape Girardeau, MO	Springfield, MO

For purposes of evaluating the entire county, the receptor grid was expanded to cover all of Scott County. The same tiered grid spacing as detailed in the modeling protocol was used for Sikeston, except the last tier was extended to the North and East to encompass all of Scott County.

The regional background concentration was established at 9 ppb for rural areas. This was based on an analysis of the East St. Louis monitor in Illinois. The modeling protocol in Appendix H further details this analysis. The background was added to model predicted concentrations to account for natural sources and sources not included in the modeling inventory. The maximum modeled concentration for the area was 93.7 $\mu g/m^3$ or 35.7 ppb. This demonstrates the area is currently in compliance with the 1-hour SO_2 standard of 75 ppb. A map including plotted output concentrations is shown in Figure 1.

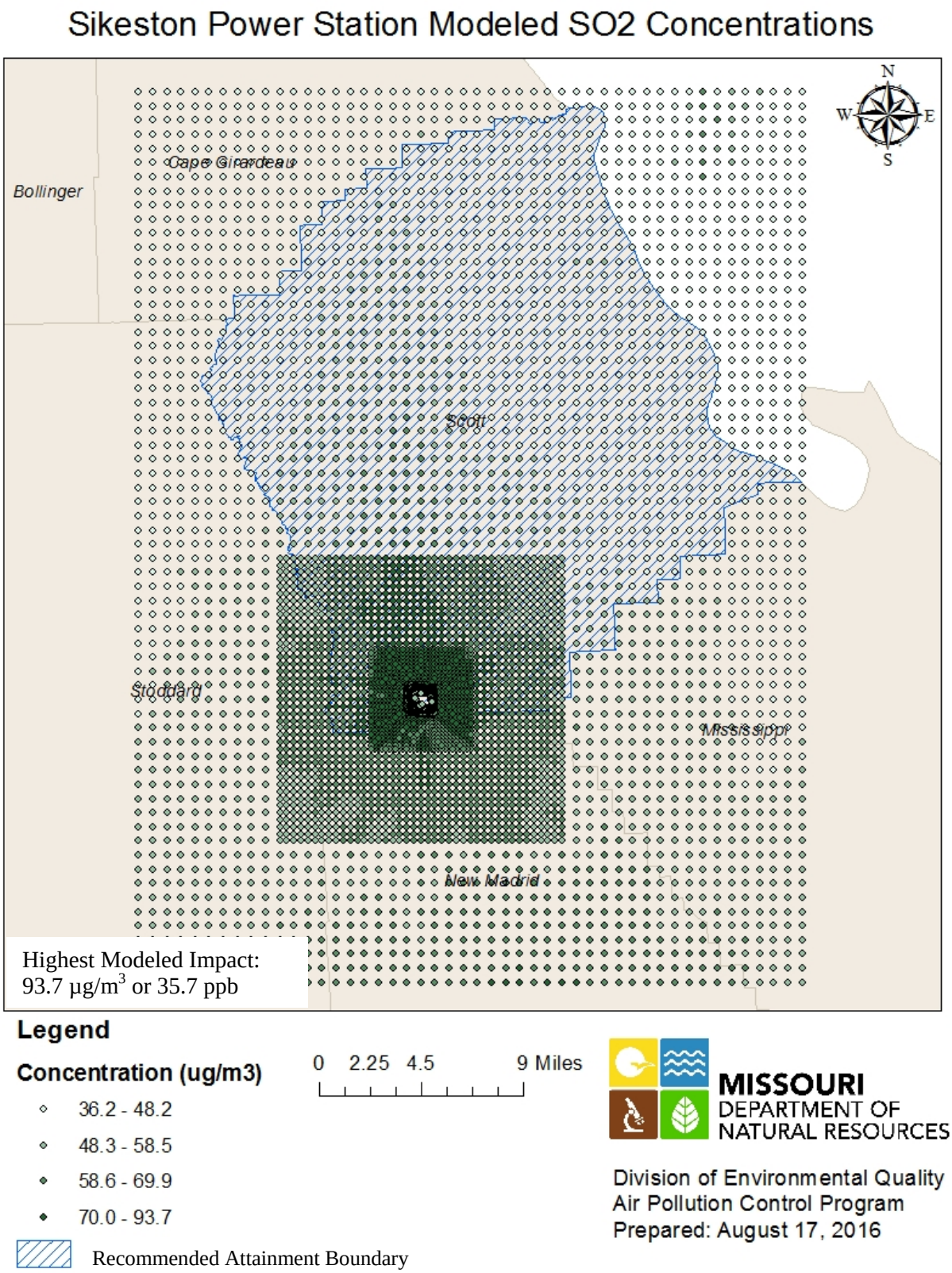

Figure 1 – Sikeston Power Station Modeled SO_2 Concentrations

E.2 Emissions Data

The emissions sources surrounding Sikeston were evaluated to determine an interactive source inventory for the dispersion modeling analysis. Figure 2 displays a map of Scott, New Madrid, Stoddard, Mississippi, and Cape Girardeau Counties along with all permitted SO_2 sources within 20 km of Sikeston that were evaluated for inclusion in the modeling inventory. Sources outside 20 km but within 50 km of Sikeston were also evaluated to ensure all potential impacts are being addressed. Noranda Aluminum and AECI New Madrid power station were identified as large sources within this area and were included in the interactive source inventory. Three other sources, Havco Wood Products, Q.C. Corporation, and Buzzi Unicem Cape Girardeau, are located between 20 km and 50 km from Sikeston and were included as interactive sources. Apart from these sources, there were no other sources outside 20 km but within 50 km of Sikeston with SO_2 emissions greater than 10 tons per year. Table 2 lists all sources included on the map along with their 2013-2015 actual emissions.

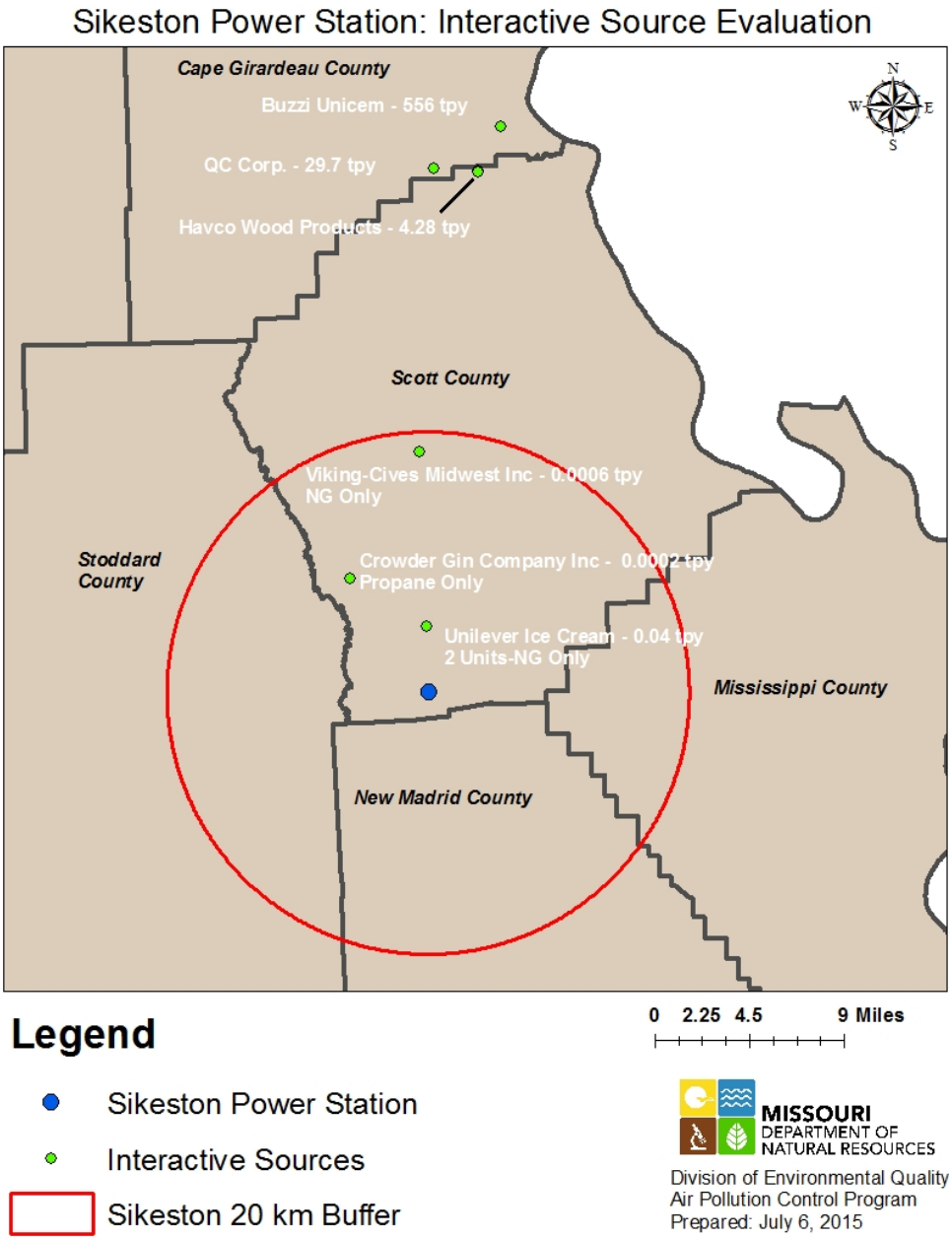

Figure 2 – Sikeston Power Station with Nearby Interactive Sources (2014 Emissions)

Table 2 – Sikeston Power Station and Interactive Source 2013-2015 SO_x Emissions

Source Name	2013 SO_x Emissions (TPY)	2014 SO_x Emissions (TPY)	2015 SO_x Emissions (TPY)
Sikeston Power Station	5,967	6,651	4,789
Unilever Ice Cream	0.04	0.04	0.04
Viking-Cives – Midwest Inc.	0.0006	0.0006	0.0006
Crowder Gin Company Inc.	0.0002	0.0002	0.0002
Havco Wood Products Inc.	3.54	4.28	4.43
Q.C. Corporation	29.71	29.71	29.71
Buzzi Unicem Cape Girardeau	654.59	556.81	596.78
Noranda Aluminum	5,062	5,323	5,153
AECI New Madrid Plant	16,822	16,672	12,375

E.2.1 Evaluation of Sources to Model

All sources included on the map in Figure 2 were evaluated for possible inclusion in the modeling inventory. The following bullets describe each of the sources listed in Table 2 along with a discussion about how each source will be characterized in the modeling analysis:

- Sikeston Power Station (201-0017) – This source was included in the March 2015 federal consent decree and designated unclassifiable/attainment by EPA in June 2016. This source is also affected by the Data Requirements Rule (DRR). Sikeston includes one coal-fired boiler that generates electricity that is supplied to the grid. The plant is owned by Sikeston Board of Municipal Utilities. The air program used actual SO_2 emissions data from the continuous emission monitoring system (CEMS) located at this facility. The modeled years include the most recent three years (2013 – 2015). The use of CEMS data in the model for this facility allows the model to act as a surrogate for monitoring data, which EPA guidance deems appropriate when developing boundary designation recommendations. EPA has indicated the use of hourly variable stack release parameters are preferable for use in actual conditions modeling when available. Therefore the air program utilized hourly variable release information in the model as provided by the facility.

- Unilever Ice Cream (201-0118) – This source is located within 20 km of Sikeston. This source is an ice cream and frozen desserts manufacturing plant with total SO_2 emissions less than 0.1 ton per year. This source primarily burns natural gas or propane. This source was not included in the modeling inventory and is accounted for with the regional background concentration.

- Viking Cives – Midwest Inc.(201-0095) – This source is located within 20 km of Sikeston. This source is a truck and bus body manufacturing plant with total SO_2 emissions less than 0.1 ton per year. This source primarily burns natural gas or propane. This source was not included in the modeling inventory and is accounted for with the regional background concentration.

- Crowder Gin Company Inc.(201-0073) – This source is located within 20 km of Sikeston. This source is a cotton ginning plant with total SO_2 emissions less than 0.1 ton per year. This source primarily burns natural gas or propane. This source was not included in the modeling inventory and is accounted for with the regional background concentration.

- Havco Wood Products (201-0021) – This source is not located within 20 km of Sikeston but is the only other permitted SO_2 emitting source in Scott County, therefore was included in the evaluation. This source is a wood product manufacturing plant with total SO_2 emissions less than five tons per year. This source is located 40 km away from Sikeston. There are two SO_2 emitting units at this facility; both are sawdust-fired boilers with stack releases. These two units were modeled at 2014 reported actual emissions with parameters as reported to MoEIS.

- Q.C. Corporation (031-0060) – This source is located within 50 km of Sikeston with emissions greater than 10 tons per year; therefore it was included in the evaluation. This source is a chemicals manufacturing plant with total SO_2 emissions less than 30 tons per year. This source is located 40 km away from Sikeston. There are two SO_2 emitting units at this facility; both are monohydrate exhaust stacks. These two units were modeled at 2014 reported actual emissions with parameters as reported to MoEIS.

- Buzzi Unicem Cape Girardeau (031-0021) – This source is located within 50 km of Sikeston with emissions greater than 10 tons per year; therefore it was included in the evaluation. This source is a lime kiln operation with total SO_2 emissions greater than 500 tons per year. This source is located 44 km away from Sikeston. There is one major SO_2 emitting unit at this facility; a preheater/precalciner kiln with stack release. This unit was modeled at 2014 reported actual emissions with parameters as reported to MoEIS.

- Noranda Aluminum Inc. (143-0008) – This source is located within 50 km of Sikeston with emissions greater than 10 tons per year; therefore it was included in the evaluation. This source is an aluminum production facility with total SO_2 emissions greater than 500 tons per year. This source is located 40 km away from Sikeston. This source was included at emission rates and using parameters contained in a recent Prevention of Significant Deterioration (PSD) permit application.

- AECI New Madrid Plant (143-0004) – This source is located within 50 km of Sikeston with emissions greater than 10 tons per year; therefore it was included in the evaluation. This source is an electric generating facility with total SO_2 emissions greater than 500 tons per year. This source is located 40 km away from Sikeston. There are two coal-fired boilers located at this facility with stack releases. These units were included in the interactive inventory and modeled at actual SO_2 emissions for 2013-2015 from the CEMS located at this facility and using release parameters as reported to MoEIS.

Table 3 details the emission release parameters used for the single boiler at Sikeston, and Table 4 shows an excerpt from the hourly emissions file. The hourly combined emissions file contains hourly emissions for the main Sikeston boiler and the two boilers at the AECI New Madrid power plant.

Table 3 – Sikeston Power Station Emission Release Parameters

Facility I.D.	Facility Name	Site Name	Emission Point I.D.	Model ID	Description	Release Type
201-0017	City of Sikeston	Sikeston Power Station	1	SIKE1	Boiler #1	POINT

Easting *Meters*	**Northing** *Meters*	**Base Elevation** *Meters*	**Actual Stack Height** *Meters*	**Stack Temperature** *Kelvin (From MoEIS)*	**Stack Exit Velocity** *Meters/Second (From MoEIS)*	**Stack Diameter** *Meters*
801211.2145	4086783.627	91.72	137.16	Used hourly temperatures in lieu of static values (see Table 4)	Used hourly velocity values in lieu of static values (see Table 4)	4.572

Table 4 – Excerpt from 2013-2015 Combined Hourly CEMS Emission File for Sikeston Power Station and AECI New Madrid Power Plant

	Year	Month	Day	Hour	Unit ID	SO_2 ER (g/s)	Temp (K)	Velocity (m/s)
SO HOUREMIS	13	1	1	1	B1	245.7954	579.2611	29.49448
SO HOUREMIS	13	1	1	1	B2	266.8243	581.4833	29.22524
SO HOUREMIS	13	1	1	1	SIKE1	263.813	405.4069	26.79314
SO HOUREMIS	13	1	1	2	B1	270.6168	579.2611	29.49448
SO HOUREMIS	13	1	1	2	B2	267.1393	581.4833	29.22524
SO HOUREMIS	13	1	1	2	SIKE1	270.0624	405.3019	26.81137
SO HOUREMIS	13	1	1	3	B1	277.1687	579.2611	29.49448
SO HOUREMIS	13	1	1	3	B2	265.5895	581.4833	29.22524
SO HOUREMIS	13	1	1	3	SIKE1	269.8735	403.783	26.7876
SO HOUREMIS	13	1	1	4	B1	272.217	579.2611	29.49448
SO HOUREMIS	13	1	1	4	B2	271.6374	581.4833	29.22524
SO HOUREMIS	13	1	1	4	SIKE1	267.1393	404.0559	26.80422

E.3 Meteorology and Topography

Meteorology and topography are interrelated as significant topographical features often cause localized meteorological effects. Due to this related nature, these two factors were evaluated together. Topography and surrounding land features can have a significant impact on the wind patterns and thus the dispersion of air pollutants from emission sources. There are no significant terrain features in the area around Sikeston that would greatly impact dispersion, such as mountain ranges. However, the Mississippi river valley does form the Eastern county boundary which could cause some localized meteorological effects in the eastern portion of the modeling domain. The surrounding terrain and meteorological effects were represented in Sikeston's modeling analysis to best simulate monitoring of the area's ambient air quality. Since no other significant terrain or meteorological features exist around Sikeston, except the river valley which is used to set the Eastern boundary, topography and meteorology were not used to set the remainder of the recommended area boundary.

E.4 Jurisdictional Boundaries

Attainment area boundaries are typically defined by easily identifiable features such as county, municipal, or township boundaries. Large, immovable features such as rivers or highways can also be used. In this case, since Sikeston's modeled impact attains the standard, the main considerations are that the boundary include the Sikeston Power Station and be easily identifiable.

All permitted SO_2 emitting sources located within Scott County were evaluated in this analysis, and the receptor grid for this modeling analysis was increased to include the entire county. As discussed previously, the modeling evaluation performed for Sikeston resulted in no modeled violations of the 2010 1-hour SO_2 NAAQS. Therefore, the county boundary is considered representative of the recommended attainment area. The recommended attainment boundary for Sikeston consists of the county lines for Scott County. Figure 3 displays a map with the recommended boundary.

Northern Boundary: County Line dividing Scott County from Cape Girardeau County
Eastern Boundary: Missouri State Line/Mississippi River and County Line dividing Scott County from Mississippi County
Southern Boundary: County Line dividing Scott County from New Madrid County
Western Boundary: County Line dividing Scott County from Stoddard County

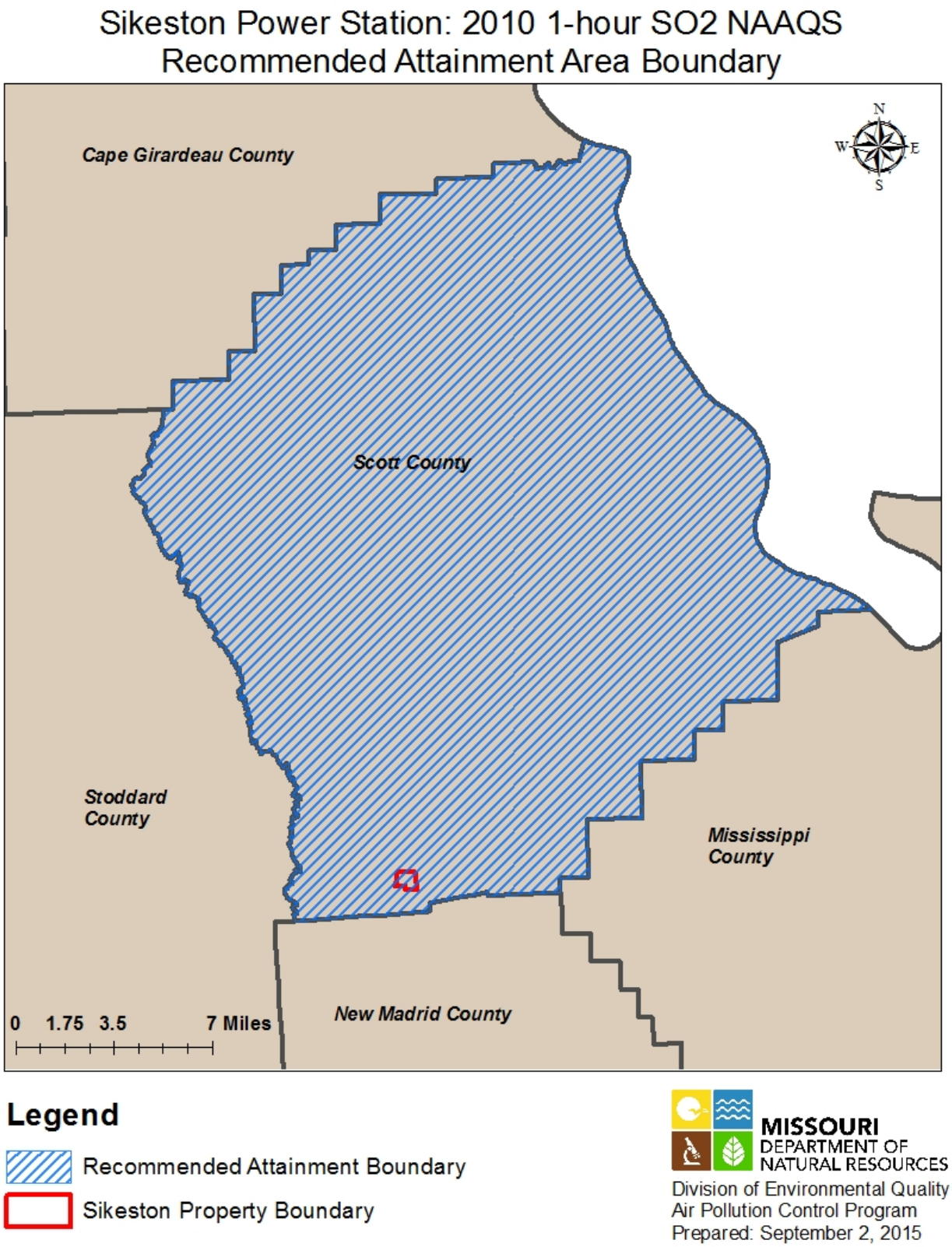

Figure 3 – Sikeston Power Station Recommended 2010 1-hour SO_2 NAAQS Attainment Area