PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit No.: 1490001

Source Name: Jeffrey Energy Center-Westar Energy, Inc.

Source Location: 25905 Jeffrey Road, St. Mary's, KS 66536

I. Area Designation:

K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. K.A.R. 28-19-350, Prevention of significant deterioration of air quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. Pottawatomie County, Kansas, where this modification is taking place, is currently in attainment or unclassifiable for all pollutants. As such, the PSD program, as administered by the State of Kansas under K.A.R. 28-19-350, will apply to the proposed project.

The St. Mary's area in Pottawatomie County, Kansas, where this modification is taking place, is in attainment for all the criteria pollutants.

II. Project description:

Westar Energy, Inc. (Westar) owns and operates the Jeffrey Energy Center (JEC), an existing coal-fired electric generating plant, located in St. Mary's, Pottawatomie County, Kansas. Westar is proposing to make certain modifications to the existing burner and combustion system on the Units 1 and 2 boilers at JEC. The burner and combustion system modifications include further tuning of existing equipment for Unit 1 and upgrades to the existing low NO_X burners (LNB) and separated overfire air (SOFA), adjustments to existing SOFA, additional SOFA for deeper staging, low NO_X system tuning and installation of associated equipment for Unit 2. This project will result in an overall decrease in NO_X emissions. As a result of lowering NO_X emissions there may be an increase in carbon monoxide (CO) emissions. With the increase in CO emissions a decrease in carbon dioxide (CO_2) emissions is anticipated.

III. Significant Applicable Air Emission Regulations

This source is subject to Kansas Administrative Regulations relating to air pollution control. The application for this permit was reviewed and will be evaluated for compliance with the following applicable regulations:

A. K.A.R. 28-19-300. Construction Permits and Approvals. Requires “Any person who proposes to construct or modify a stationary source or emissions unit shall obtain a construction permit before commencing such construction or modification.”

B. K.A.R. 28-19-350 Prevention of significant deterioration of air quality. "The provisions of K.A.R. 28-19-350 shall apply to the construction of major stationary sources and major modifications of major stationary sources in the areas of the state designated as an attainment area or an unclassified area for any pollutant under the procedures prescribed by section 107(d) of the federal clean air act (42 U.S.C. 7407 (d))."

IV. <u>Air Emissions from the Project:</u>

The potential-to-emit of one of the PSD regulated pollutants from the existing Jeffrey Energy Center exceeds 100 tons per year. Hence, JEC is considered to be a major stationary source under provisions of K.A.R. 28-19-350.

The potential-to-emit from the proposed modification, i.e. from the NOx Reduction Project, are listed in Table 1.1 of Section 1 and detailed out in Appendix B of the application. Proposed potential-to-emit of NOx, CO and CO_2 were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The increase in potential-to-emit is above the PSD significance level for CO and will be reviewed under the PSD regulations. NOx emissions were greatly reduced under this modification. CO_2 emissions will also be reduced under this project.

This project will be a major modification of an existing major stationary source resulting in a net significant increase of CO. This project will be subject to the various aspects of K.A.R. 28-19-350 such as the use of best available control technology, ambient air quality analysis, and additional impacts upon soils, vegetation and visibility. Good combustion practices were selected as BACT for CO with a limitation of 0.40 lb/mmBtu on a 30 day rolling average. Compliance with the CO limitation will be determined with a continuous emission monitor system (CEMS).

The proposed NOx Reduction Project is described in Section 2 of the application. The air emissions estimates are shown in the table below:

Table 1 Air Emission Estimate

Pollutant Type	Baseline Actual (tons per year)	Projected Actual (tons per year)	Change in Emissions (tons per year)
CO	8,504	23,483	14,979
NO_X	15,118	8,511	-6,607
CO_2	10,771,528	10,747,993	-23,535

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) issued the final Greenhouse Gas (GHG) Tailoring Rule (75 FR 31514). This rule established the thresholds for GHG emissions under the PSD permit program for new and existing industrial facilities. GHGs are a single air pollutant defined as the aggregate group of the following six gases:

- carbon dioxide (CO_2)
- nitrous oxide (N_2O)

- methane (CH_4)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulfur hexafluoride (SF_6)

Starting in January 2011, sources currently subject to the PSD permitting program (i.e., those that are newly-constructed or modified in a way that significantly increase emissions of a pollutant other than GHGs) are subject to permitting requirements for their GHG emissions under PSD. For those affected facilities, only GHG emissions increases of 75,000 tpy or more of total GHG, on a carbon dioxide equivalent (CO_2e) basis, need to determine the Best Available Control Technology (BACT) for their GHG emissions.

PSD does not apply to the GHG emissions from this proposed project. Even though the proposed modification is considered a major modification under the PSD permit program and Westar is required to obtain a PSD permit (called an "anyway source"), there is no potential emissions increase of GHGs from the modification.

V. Best Available Control Technology (BACT)

BACT requirement applies to each new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. Westar Energy was required to prepare a BACT analysis for KDHE’s review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed NOx Reduction Project’s analysis is presented in Attachment B of this document and Appendix C of the application.

In short, KDHE has concurred with the Westar Energy for the following:

BACT for Carbon Monoxide is 0.40 lb/mmBtu, thirty day rolling average; BACT for CO is good combustion practices.

KDHE has included the following to the BACT requirement:

The emission limitation established in the permit applies to JEC Units 1 and 2 at all times, including startup, shutdown and malfunction, except as provided in section “VI. Monitoring, Recordkeeping and Reporting, D. Malfunction” of the permit.

VI. Ambient Air Impact Analysis

A. Air Quality Impact Analysis (AQIA) Applicability

i. The proposed facility is a major source as defined by K.A.R. 28-19-350, Prevention of Significant Deterioration (PSD). Major sources with pollutant emissions exceeding significant emission rates must undergo PSD review. The owner or operator must demonstrate that allowable emission increases from the proposed facility would not cause or contribute to air pollution in violation of:

1. any National Ambient Air Quality Standard (NAAQS) in any air quality control region; or

2. any applicable maximum allowable increase over the baseline concentration in any area.

ii. Emissions from the proposed project and significant emission rate (SER) thresholds are listed in Table 2 below.

Table 2. Summary of emissions changes and PSD significant emission rates (SER)					
Criteria Pollutants[a]	**Baseline Actual Emissions (tons per year, tpy)**	**Projected Actual Emissions (tpy)**	**Emission Change (tpy)**	**PSD SER (tpy)**	**Exceeds SER?**
CO	8,504	23,483	14,979	100	**Yes**
NOx	15,118	8,511	-6,607	40	No
CO_2	10,771,528	10,747,993	-23,535	100,000	No

[a] CO = Carbon monoxide; NOx = Nitrogen oxides; and CO_2 = Carbon dioxide.

B. Model Selection

i. A dispersion model is a computer simulation that uses mathematical equations to predict air pollution concentrations based on weather, topography, and emissions data. AERMOD is the current model preferred by EPA for use in near-field regulatory applications, per 40 CFR Part 51 Appendix W, Section 3.1.2, and Appendix A to Appendix W:

"AERMOD is a steady-state plume dispersion model for assessment of pollutant concentrations from a variety of sources. AERMOD simulates transport and dispersion from multiple sources based on an up-to-date characterization of the atmospheric boundary layer. AERMOD is appropriate for: point, volume, and area sources; surface, near-surface, and elevated releases; rural or urban areas; simple and complex terrain; transport distances over which steady-state assumptions are appropriate, up to 50 km; 1-hour to annual averaging times; and continuous toxic air emissions."

ii. AERMOD modeling system Version 12345 was used to evaluate the impacts of the following pollutant and averaging times from the proposed project:

1. 1-hour CO; and
2. 8-hour CO.

iii. AERMINUTE Version 11325 was used to process 1-minute ASOS wind data to generate hourly average winds for input to AERMET. AERMET Version 12345 was used to prepare meteorological data for the years 2007-2011.

C. Model Inputs

i. Source Inputs

The source inputs such as emission rates, source types, source locations, stack parameters and other inputs used in the model were based on the data supplied in the permit application received by KDHE on April 4, 2013.

ii. Center of the Facility

The following is the center of the proposed project used in the modeling:

Zone: 14
Easting: 746,669 meters
Northing: 4,350,709 meters

iii. Modeling scenarios

Details of the modeling scenarios used in the model were described in permit application Appendix D.

iv. Urban or Rural

A review of the United States Geological Survey (USGS) National Land Cover Data (NLCD) for 1992 for the site and a surrounding three (3) kilometer radius was conducted to determine if rural or urban classification should be used for modeling. The area was deemed rural for air dispersion modeling purposes.

v. Terrain

The proposed project was modeled using the elevated terrain option. AERMAP processor Version 11103 was used to process the National Elevation Data (NED) files from the USGS to interpolate elevations at each receptor.

vi. Meteorological Data

KDHE supplied to the facility five (5) consecutive years (2007 through 2011) of meteorological data. The surface data was obtained from the Manhattan Regional Airport (MHK) meteorological station in Kansas. The upper air data was obtained from the Topeka Philip Billard Airport (TOP) meteorological station in Kansas. Table 3 shows additional information about the representative meteorological stations.

Figure 1 shows the wind rose (localized winds patterns) for the cumulative 5-year meteorological data where the prevailing wind originates from the south-southwest. Figure 2 shows a map that includes the Westar Jeffrey Energy Center (JEC) facility, the MHK and the TOP airport meteorological stations.

Table 3. Meteorological Data Sites					
Station Type	**Station Name**	**WBAN #**	**Latitude/ Longitude**	**Elevation (m)**	**Years of Data**
Surface Air Station	Manhattan Regional Airport (MHK), KS	03936	39.1346/ -96.6788	322.2	2007-2011
Upper Air Station	Topeka Philip Billard Airport (TOP), KS	13996	39.0725/ -95.6261	267.0	2007-2011

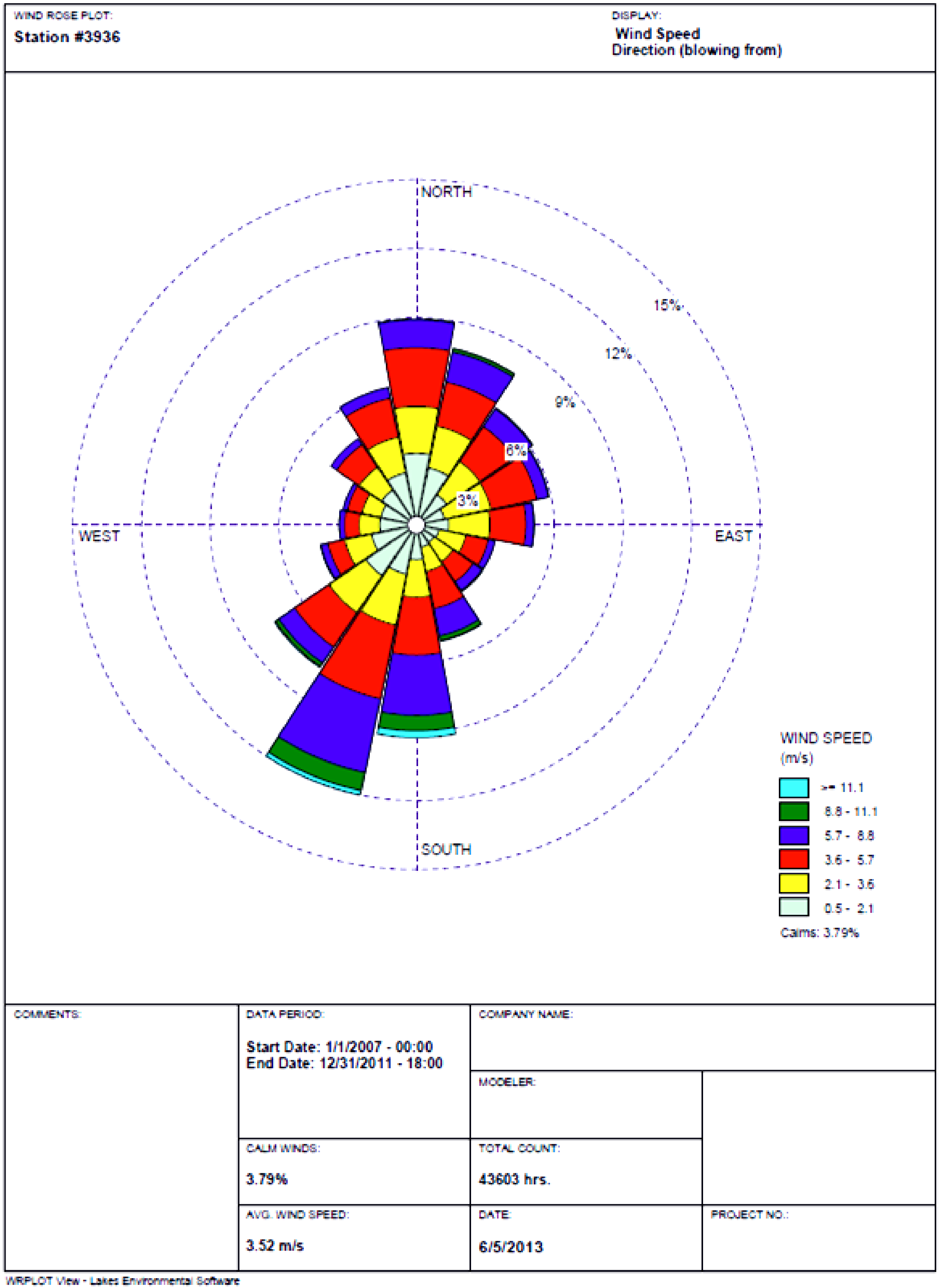

Figure 1. Wind Rose for Years 2007 to 2011

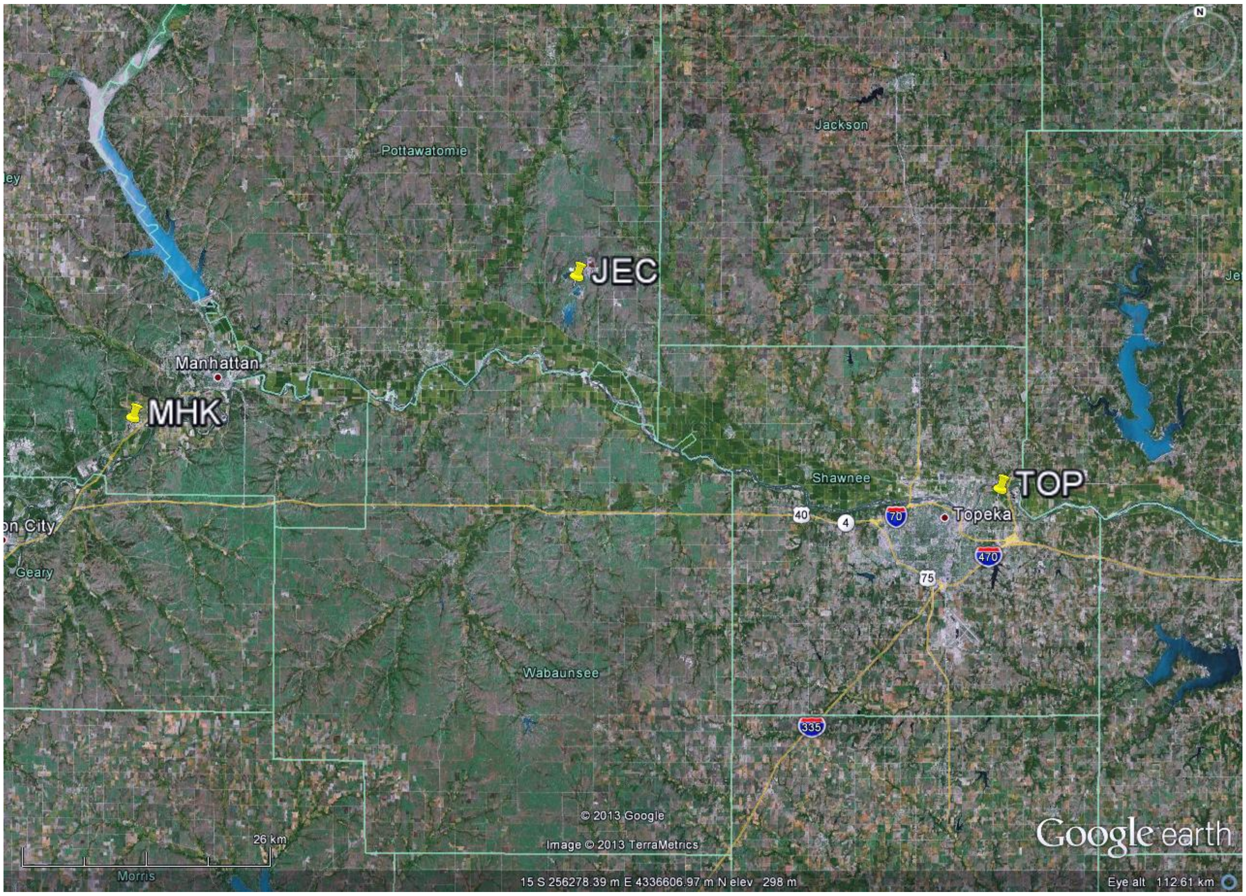

Figure 2. Map showing the Westar Jeffrey Energy Center (JEC) in Pottawotamie County in Kansas, the Manhattan Regional Airport (MHK) and the Topeka Philip Billard Airport (TOP) meteorological stations in Kansas.

D. Building Downwash

i. Good Engineering Practice (GEP) stack height for stacks constructed after January 12, 1979 is defined as the greater of

a. 65 meters, measured from the ground-level elevation at the base of the stack, and

b. Stack height calculated from the following EPA's refined formula:

$H_g = H + 1.5L$

where,

H_g = GEP stack height, measured from the ground-level elevation at the base of the stack

H = height of nearby structure(s) measured from the ground-level elevation at the base of the stack

L = lesser of the Building Height (BH) or Projected Building Width (PBW); PBW is the greatest crosswind distance of a building also known as maximum projected width.

ii. Emissions released at stack heights greater than GEP are modeled at GEP stack height. Emissions released at or below GEP are modeled at their true release height.

iii. Building downwash was calculated using the Building Profile Input Program (BPIP) with plume rise model enhancements (PRIME).

E. Receptors

i. AERMOD estimates ambient concentrations using a network of points, called receptors throughout the region of interest. Model receptors are typically placed at locations that reflect the public's exposure to the pollutant.

ii. The minimum receptor spacing used in the dispersion modeling for the proposed project consisted of a multi-tiered grid shown in Table 4.

Table 4. Receptor spacing used in dispersion modeling of the proposed facility

Distance From Facility Boundary (meters)	Receptor Spacing (meters)
Facility Center to 1000	50
1,000 to 2,000	100
2,000 to 10,000	250
10,000 to 50,000	1000

iii. Receptors along the facility's fence line were placed at 50 meter spacing.

iv. Figure 3 shows an image of the receptor grids used for 1-hr CO and 8-hr CO incorporating Jeffrey Road in the modeling impact analysis.

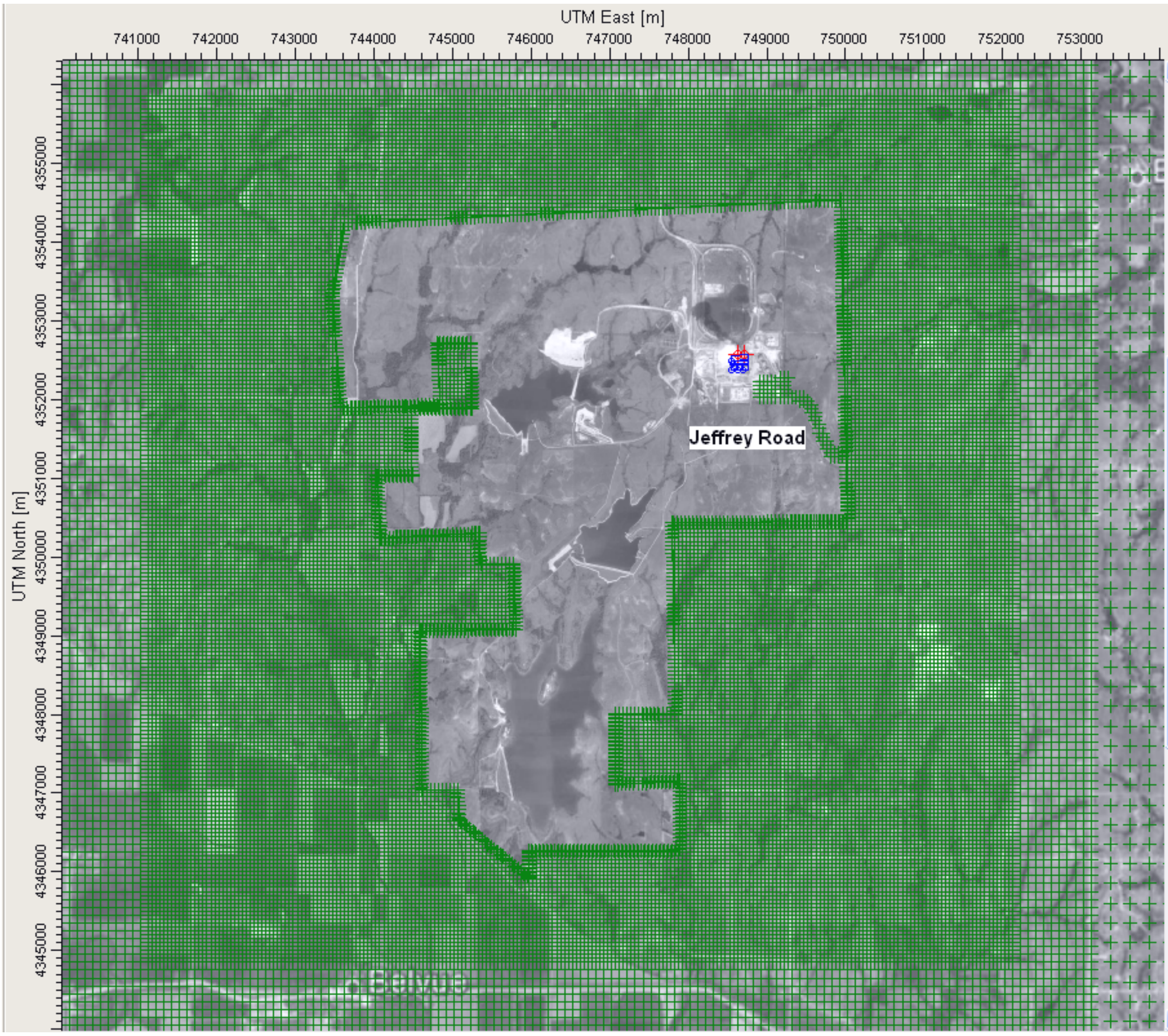

Figure 3. Receptor grids used for 1-hr CO and 8-hr CO showing the incorporation of Jeffrey Road in the modeling impact analysis.

F. Modeling domain

i. Preliminary modeling analysis establishes the distance (from the center of the facility) to the farthest receptor with modeled concentration greater than the significant impact level (SIL) thresholds; this is often referred to as the significant impact area (SIA).

ii. Full impact (also called refined or cumulative) modeling analyses usually use nearby sources from a radius of the SIA plus 50 kilometers (km) for long-term standards. For short-term standards, full impact modeling analyses usually use nearby sources from within a 20 km radius. This modeling domain use in full impact analyses is often called as the radius of impact (ROI).

G. Preliminary Modeling Analysis

i. In order to determine if a full impact modeling analysis and/or ambient air monitoring is necessary, a preliminary modeling analysis is first conducted.

ii. The preliminary analysis only included the proposed project's emission sources to determine if a modeled high first high (HIH) impact (or concentration) will exceed the SIL thresholds. The preliminary modeling results of the worse-case scenario (both boiler units 1 and 2 are operating at 100% load) of the proposed project are shown in Table 5. The permit application Table D.3 (CO modeling results) of Attachment D shows the maximum modeled CO concentrations of all modeling scenarios used in the analysis.

Table 5. Preliminary modeling results of the worse-case scenario.

Pollutant	Averaging Period	Modeled Concentration (High First High, H1H) (µg/m^3)	Modeling Significant Impact Level (SIL) (µg/m^3)	Exceeds SIL?	Pre-application Monitoring Threshold Concentration (µg/m^3)	Exceeds Monitoring Threshold?
CO	1-hour	**378***	**2000**	**No**	N/A	N/A
	8-hour	**114****	**500**	**No**	**575**	**No**

* 2009 modeling run conducted by the facility
** 2010 modeling run conducted by the facility

iii. For each pollutant and averaging time that the modeled HIH concentration is below the SIL threshold, no further analysis is necessary for that particular pollutant and averaging time. KDHE considers this to be a sufficient demonstration that the project does not cause or contribute to a violation of the NAAQS or PSD increment. Refer to Figures 4 and 5 for SIL modeling isopleths.

iv. The modeled H1H impacts of 1-hour and 8-hour CO fall below SIL thresholds. Therefore, full impact (refined or cumulative) modeling analyses are not required for this pollutant and averaging times. EPA has not established a Class II maximum allowable increment for CO. Therefore, no calculation of the potential consumption of such increment is possible.

v. The PSD significant monitoring concentration (SMC) threshold was not exceeded for 8-hour CO. No SMC currently exists for 1-hour CO.

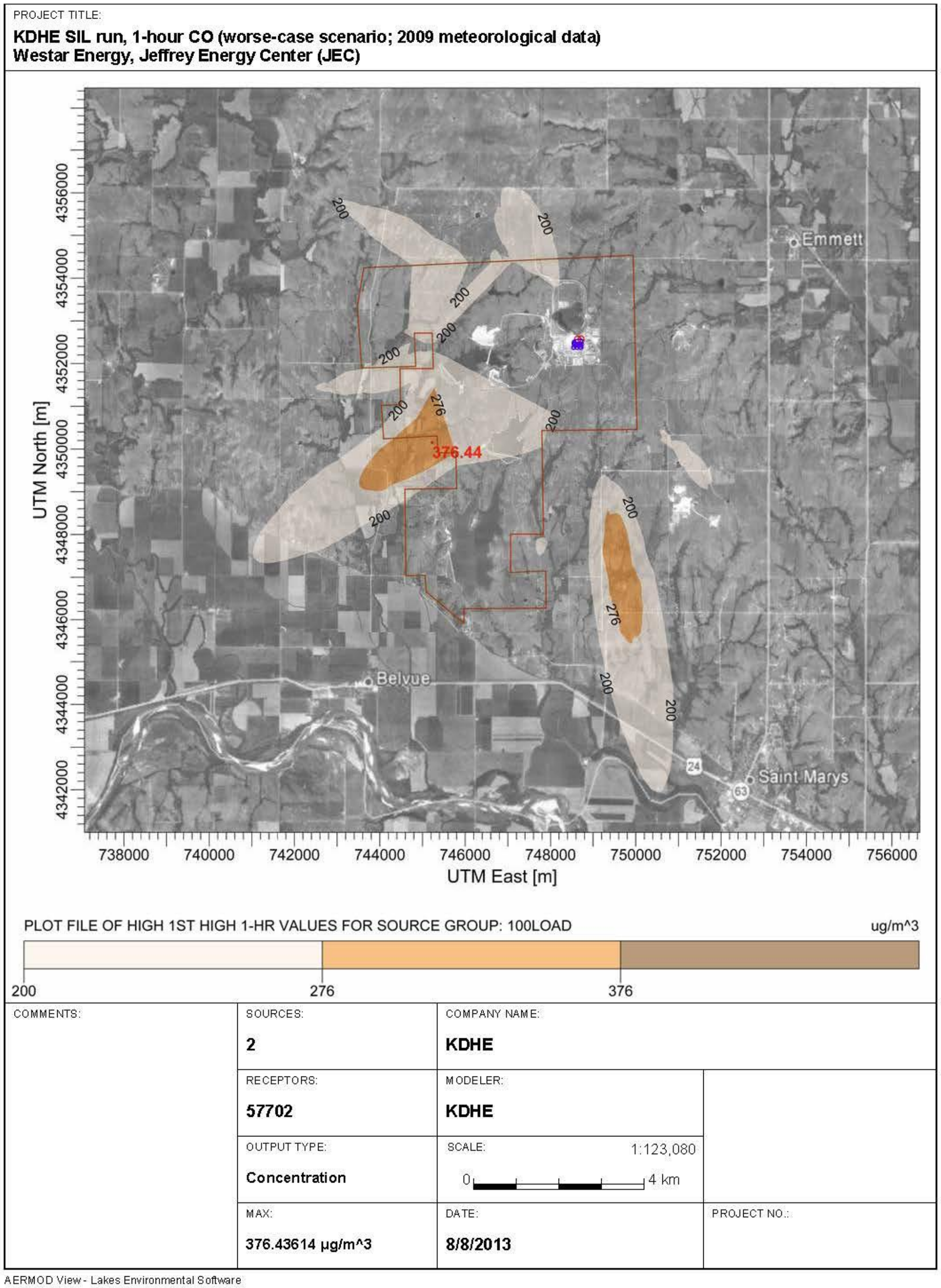

Figure 4. SIL Modeling Isopleths for 1-hour CO

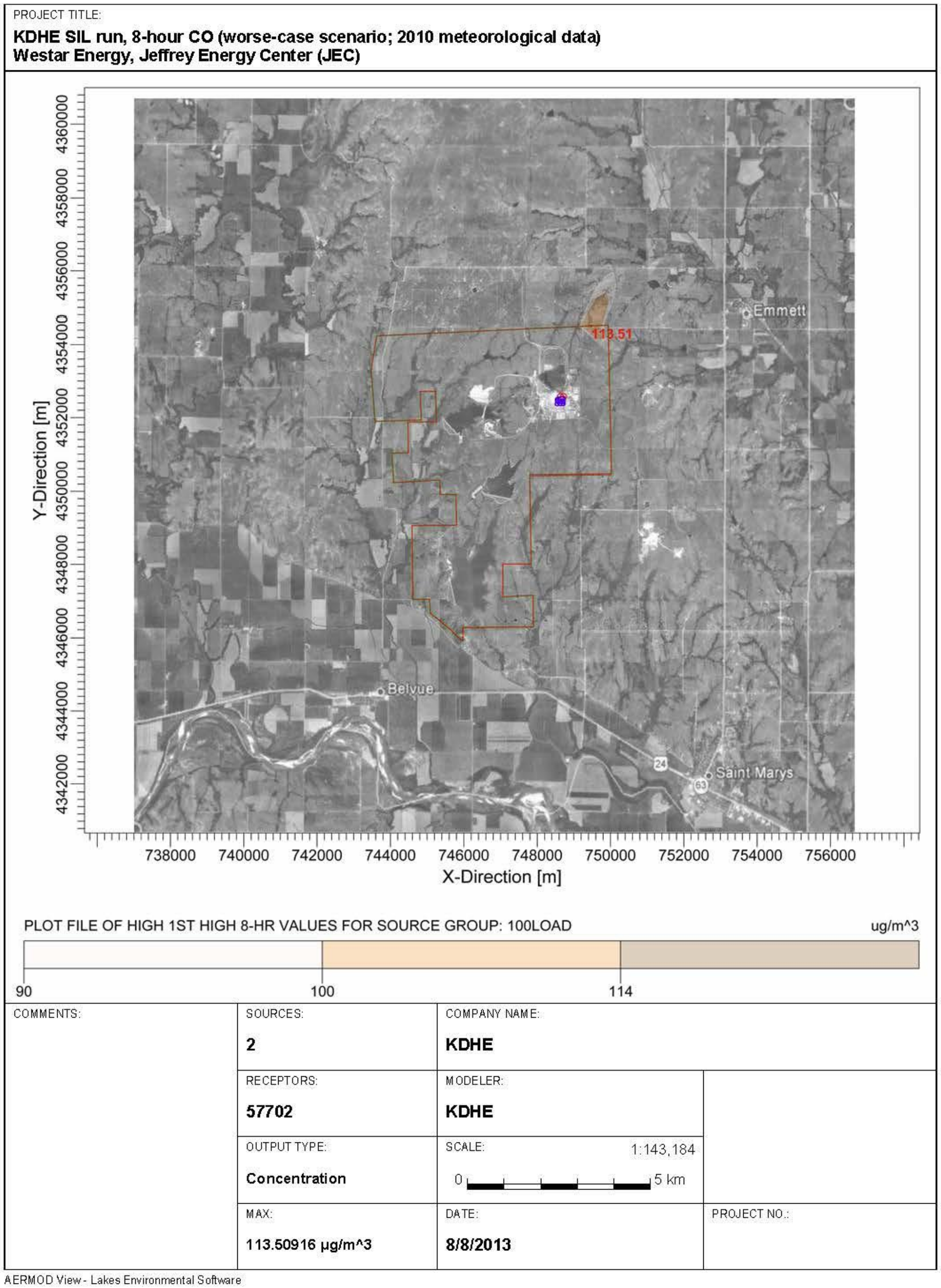

Figure 5. SIL Modeling Isopleths for 8-hour CO

H. Additional Impact Analysis

In accordance with 40 CFR 52.21(o)(1) and (o)(2), the owner or operator shall provide an analysis of impairment to visibility, soils and vegetation that would occur as a result of the proposed project and to what extent the emissions from the proposed project impacts the general commercial, residential, industrial and other growth.

For a more detailed discussion on the additional impact analysis, please see the permit application Section D.2 of Appendix D.

1. Visibility Impacts

Pollutants that are typically evaluated for their impact on visibility as part of PSD permitting include particulate matter (PM), NO_x, sulfur dioxide (SO_2) and volatile organic compounds (VOCs). Since CO is the only pollutant that will increase as a result of the project, a visibility analysis is deemed not necessary.

2. Soil and Vegetation Impacts

The primary NAAQS for criteria pollutants were developed to provide adequate protection of human health, while the secondary standards were designed to protect the general welfare, i.e., manmade and natural materials, including soils and vegetation. EPA guidance on new source review supports this by stating:

> For most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary NAAQS will not result in harmful effects.

CO is not known to harm soils, as there is no deposition of CO onto soil. The project will actually decrease NOx emissions, providing a benefit to the surrounding area.

The land cover of the area surrounding JEC was analyzed using the 2005 Kansas Land Cover Patterns. This tool shows that the primary land cover in the immediate area around JEC is warm-season grassland. This local area is surrounded by agricultural use, such as corn and soybean farming.

CO has not been found to adversely affect plants at concentrations below 114,500 $\mu g/m^3$ for exposures from one to three weeks (USEPA 1976). There are no reports of measured CO levels producing any adverse effects on plants (EPA 600/P-99/00lF). In its most recent review of the CO NAAQS, EPA concluded that "the currently available scientific information with respect to non-climate welfare effects, including ecological effects and impacts to vegetation, does not support the need for a CO secondary standard" (76 FR 54294).

Since there are no secondary NAAQS standards for CO, the modeled concentrations are compared to the primary NAAQS standards.

The results of the air quality analysis presented in the permit application Table D.3 (CO modeling results) of Appendix D demonstrate that the maximum ambient air impacts due to the increase in CO emissions from the project will be under the applicable SILs, which are lower than the NAAQS. The 1-hour CO NAAQS is 40,000 μg/m^3, and the 8-hour CO NAAQS is 10,000 μg/m^3. The project is not expected to result in harmful effects to soils or vegetation.

3. Commercial, Residential, and Industrial Growth Impacts

There will be no associated industrial, commercial or residential growth in the area due to the project. Given the temporary nature of the construction and the lack of other source growth in the area, the project is not expected to cause any adverse construction or growth-related air quality impacts.

I. Summary and Conclusions for the Ambient Air Impact Analysis

i. The results of the modeling analysis conducted by the facility are summarized in Table D.3 of Appendix D of the permit application received by KDHE on April 4, 2013.

ii. The modeled H1H impacts of 1-hour and 8-hour CO fall below SIL thresholds. Therefore, full impact (refined) modeling analyses are not required for this pollutant and averaging times.

iii. The PSD significant monitoring concentration (SMC) threshold was not exceeded for 8-hour CO. No SMC currently exists for 1-hour CO.

iv. CO is not known to harm soils. CO are not expected to adversely affect vegetation.

v. The project is not expected to cause any adverse construction or growth-related air quality impacts.

vi. KDHE concludes that Westar Energy JEC has sufficiently demonstrated that the proposed project will not cause or contribute to a violation of any NAAQS or PSD increment; and that the proposed project has no adverse impact on visibility; vegetation, soils and animals; and in industrial, commercial and residential growth.

Attachment A
KEY STEPS IN THE "TOP-DOWN" BACT ANALYSIS

STEP 1: IDENTIFY ALL POTENTIAL AVAILABLE CONTROL TECHNOLOGIES.

The first step in a "Top-Down" analysis is to identify, for the emission unit in question, "all available" control options. Available control options are those air pollution control technologies or techniques with a PRACTICAL POTENTIAL FOR APPLICATION to the emissions unit and the regulated pollutant under review. This includes technologies employed outside of the United States. Air pollution control technologies and techniques include the application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant.

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

The technical feasibility of the control options identified in Step 1 is evaluated with respect to the source-specific (or emissions unit specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

All remaining control alternatives not eliminated in Step 2 are ranked and then listed in order of over-all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

1) control efficiencies;
2) expected emission rate;
3) expected emission reduction;
4) environmental impacts;
5) energy impacts; and
6) economic impacts.

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

The applicant presents the analysis of the associated impacts of the control option in the listing. For each option, the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative. The applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. In the event the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology cannot be eliminated.

STEP 5: SELECT BACT.

The most effective control option not eliminated in Step 4 is proposed as BACT for the emission unit to control the pollutant under review.

Attachment B
KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT'S EVALUATION OF WESTAR ENERGY, INC. JEFFREY ENERGY CENTER PROPOSED BACT OPTIONS

Westar Energy, Inc. evaluated the BACT analysis to control emissions from the NOx Reduction Project. The only significant emission increase from this project is carbon monoxide (CO).

CO BACT for the NOx Reduction Project

Carbon monoxide is formed as a result of incomplete oxidation of carbon in the fuel. The concern is that by minimizing CO formation, NOx emissions are inversely increased.

Carbon Monoxide (CO) controls consist of good combustion practices or an oxidation catalyst. Good combustion practices can insure limits of 0.40 lb/mmBtu, 30 day rolling average for combusting subituminous coal. Catalytic oxidation is capable of reducing CO emissions by 90 percent in a boiler.

The PSD regulations require BACT, which requires the source to evaluate the control options for technical feasibility. The use of CO oxidation catalyst on a coal-fired boiler is considered technically infeasible. Due to the high sulfur trioxide and sulfuric acid gas formation which would cause rapid and destructive corrosion of ducts and equipment downstream of the catalyst, vendors do not offer a CO oxidation catalyst for coal-fired applications. Another reason is because the higher particulate levels of the gas stream would quickly plug the catalyst material, rendering it ineffective. Therefore, catalytic oxidation is determined technically infeasible for this case.

Based on the technical constraints, the use of good combustion practices to meet an emission level of 0.40 lb/mmBtu is proposed by Westar Energy as BACT. KDHE agrees with the analysis.