Prevention of Significant Deterioration Air Permit Application Technical Support Document

Nearman Creek Power Station

Unit 1 Low NO_X Combustion System

KANSAS CITY BOARD OF PUBLIC UTILITIES

September 2010

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1.0 Introduction

The Kansas City Board of Public Utilities (BPU) supports regional initiatives to reduce emissions of nitrogen oxides (NO_X) from stationary sources in the Kansas City Maintenance Area (KCMA) for ozone and will install emission control technologies at its existing Nearman Creek Power Station (Nearman) electric generating facility located in Wyandotte County, Kansas City, Kansas. BPU will reduce NO_X emissions on Unit 1 through the use of a new Low NO_X Combustion system (LNC) comprised of low NO_X burners (LNB), overfire air (OFA), underfire air (UA), boundary air (BA), and wing port air (WPA) combustion control methods (hereinafter referred to as the Project). In addition to the LNC system, the Project includes certain requisite activities planned concurrently for Unit 1.

The proposed LNC system is expected to result in a reduction of NO_X emissions of approximately 40 percent from average baseline for Nearman Unit 1. Installation of the new LNC system is scheduled to occur during an outage planned for the Spring of 2012. Although the total Project cost will be about 29.5 million dollars, reduced NO_X emissions will result in reduced summer ozone levels and cleaner air for the region.

The Project will not result in any increase in fuel consumption, heat input, or steam generation. However, due to the inverse relationship between NO_X and CO emissions, the new LNC equipment will result in an increase in CO emissions, and thus subject the Project to New Source Review/Prevention of Significant Deterioration (NSR/PSD) review for this pollutant. As required by NSR/PSD review, a Best Available Control Technology (BACT) analysis, Ambient Air Quality Impact Analysis (AAQIA), and a PSD Additional Impact Analysis were conducted for the increase in CO emissions resulting from the proposed Project. The results of these analyses indicate that the use of good combustion controls is BACT for CO, and that the emissions from the LNC system result in a less than significant air quality impact based on air dispersion modeling. A Project description, emission calculations, regulatory review, as well as the details of the aforementioned BACT and AAQIA analyses, are included herein as part of this NSR/PSD technical support document.

2.0 Project Characterization

The following sections briefly characterize the Project including a general description of the facility, proposed Project description, a summary of the estimated emissions, as well as a discussion of applicable federal and state air quality regulations.

2.1 Project Location

The Nearman facility is located in Kansas City, Kansas, within Wyandotte County, in northeastern Kansas. The specific location of the Project is illustrated in Figure 2-1. The Nearman facility is situated along the southern side of an east-west reach of the Missouri River near Little Platte Bend. The terrain encompassing the proposed site consists mostly of lightly forested flat land within the flood plain with some gently rolling hills located to the south and north. Areas surrounding the site are used for farming and residential purposes.

2.2 Project Description

This section includes a general description of the BPU's existing Nearman facility, and a detailed discussion of the LNC system proposed for the facility.

2.2.1 Nearman Creek Power Station Description

The Nearman facility was originally designed for one 235 MW and four (up to) 600 MW PC fired units. However, only Unit 1, a Riley Power Inc. turbo-fired, dry–bottom, pulverized coal-fired boiler, was built which became operational in 1981. Current air quality control equipment on Unit 1 consists of first-generation LNB, combustion optimizer program to reduce NO_X, an electrostatic precipitator (ESP), and flue gas conditioning with SO_3 to control particulate matter. A second generating unit, CT4, a simple cycle combustion turbine that can fire both natural gas and No. 2 distillate fuel oil, was added in 2006. The balance of the existing equipment present at the facility supporting the two generating units includes an 8-cell mechanical draft cooling tower, auxiliary boiler, black start generator, dust collectors, coal/ash handling equipment, and a fuel oil storage tank.

Coal fuel is delivered to the site via rail in unit trains which are unloaded with a bottom dumper. The coal is then processed through a series of material handling systems designed to stack out, reclaim, crush, and convey the fuel to the Unit 1 boiler.

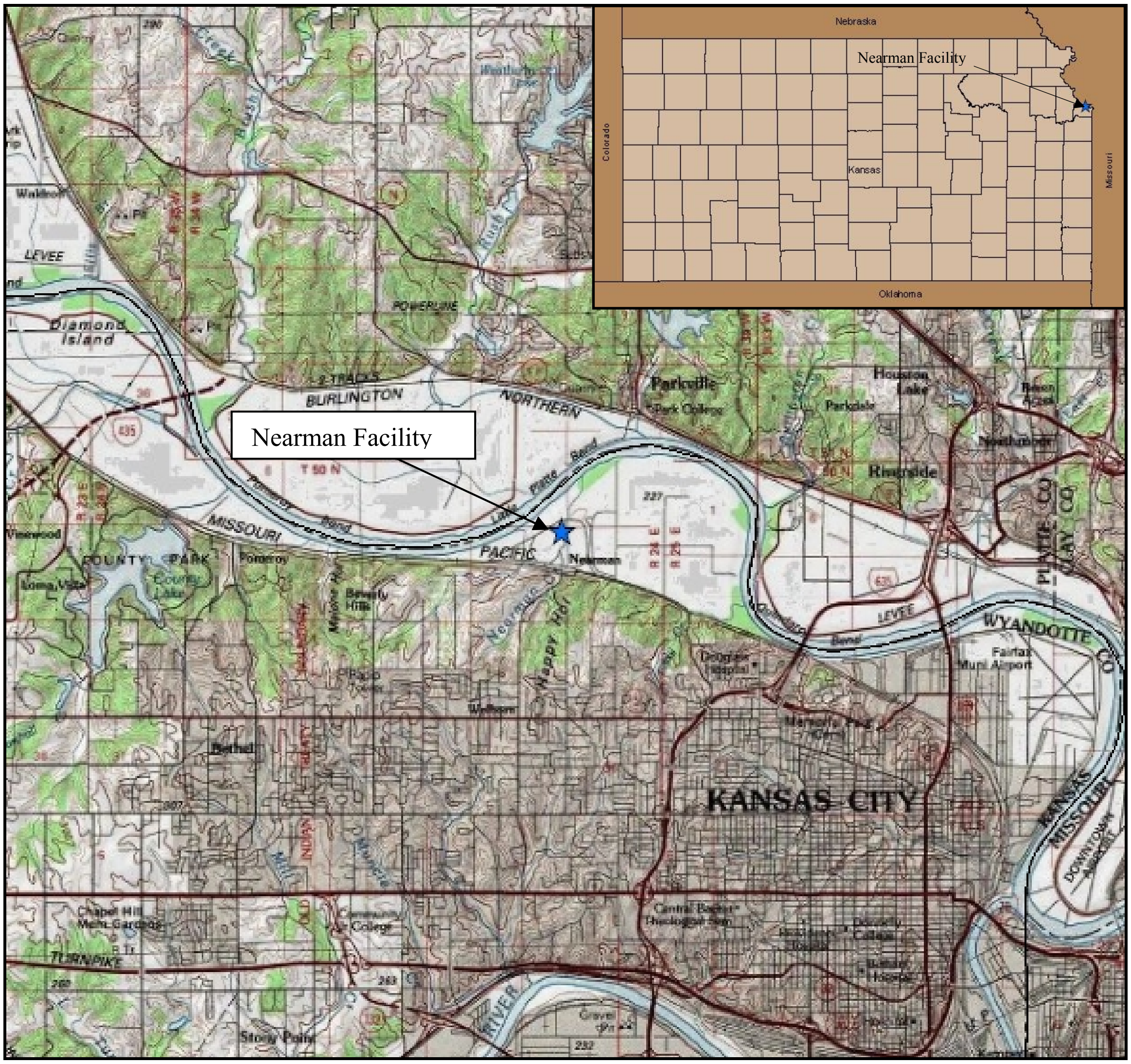

Figure 2-1 Facility Location

2.2.2 Unit 1 LNC System Description

BPU is proposing to install LNB/OFA/UF/BA/WPA technology on Unit 1 to reduce NO_X emissions from the Nearman facility. LNB and OFA/UF/BA/WPA are two forms of combustion control that have been combined in a single technology to reduce NO_X emissions from pulverized coal fired units. NO_X, primarily in the form of NO and NO_2, is formed during combustion by two primary mechanisms: thermal NO_X and fuel NO_X. Thermal NO_X results from the dissociation and oxidation of nitrogen in the combustion air. The rate and degree of thermal NO_X formation is dependent upon oxygen availability during the combustion process and is exponentially dependent upon the combustion temperature. Fuel NO_X, on the other hand, results from the oxidation of nitrogen organically bound in the fuel. This is the dominant NO_X producing mechanism in the combustion of pulverized coal and typically accounts for 75 to 80 percent of total NO_X.

All LNBs offered commercially for application to coal fired boilers control the formation of NO_X through some form of staged combustion. A diagram illustrating the staged combustion of LNBs and OFA/UF/BA/WPA is presented in Figure 2-2. The basic NO_X reduction principles for LNBs are to control and balance the fuel and airflow to each burner, and to control the amount and position of secondary air in the burner zone so that fuel devolatilization and high temperature zones are not oxygen rich. In this process, the mixing of the fuel and the air by the burner is controlled in such a way that ignition and initial combustion of the coal takes place under oxygen-deficient conditions, while the mixing of a portion of the combustion air is delayed along the length of the flame. The objective of this process is to drive the fuel-bound nitrogen out of the coal as quickly as possible, under conditions where no oxygen is present, and where it will be forced to form molecular nitrogen rather than be oxidized to NO_X.

OFA works by reducing the excess air in the burner zone, thereby enhancing the combustion staging effect of the LNBs and further reducing NO_X emissions. Residual unburned material, such as CO and unburned carbon that inevitably escapes the main burner zone, is subsequently oxidized as the OFA is added. BA is introduced above the burner elevation while UF is introduced below the burners close to the furnace hopper. The BA/UF systems both work to reduce the amount of CO emissions resulting from operation under the staged firing conditions developed with the directional flame nozzles and OFA. WPA is a protective system designed to provide a curtain of air on the waterwalls directly above the burners. This area is generally under a reducing atmosphere, the WPA provides adequate air at the furnace sidewalls to prevent oxidation of the tubes.

The net result of the staged combustion associated with a LNB is usually lower peak combustion temperatures and longer and/or wider flames, due to the delayed mixing process. The lower combustion temperatures and potential for encroachment on cooled boiler surfaces are the main reasons why low NO_X combustion techniques may be associated with the potential for increased carbon in ash and higher CO emissions. The resulting efficiency loss due to increased carbon in ash and increased CO emissions can be somewhat offset, however, by the lower total excess air demand that is part of the low NO_X firing strategy. Additionally, improved stoichiometric control (air and coal flow monitoring) at the burners will improve combustion by ensuring a better coal/air balance across all of the coal burners, and maintaining coal fineness will allow for good coal burnout.

The proposed NO_X and CO emissions resulting from the installation of LNC equipment are presented in Table 2-1. The NO_X and CO emission rates identified in Table 2-1 reflect emission guarantees BPU received from Riley Power Inc. for the Project. A detailed explanation of the CO emission rate is provided in the BACT analysis included in Appendix C.

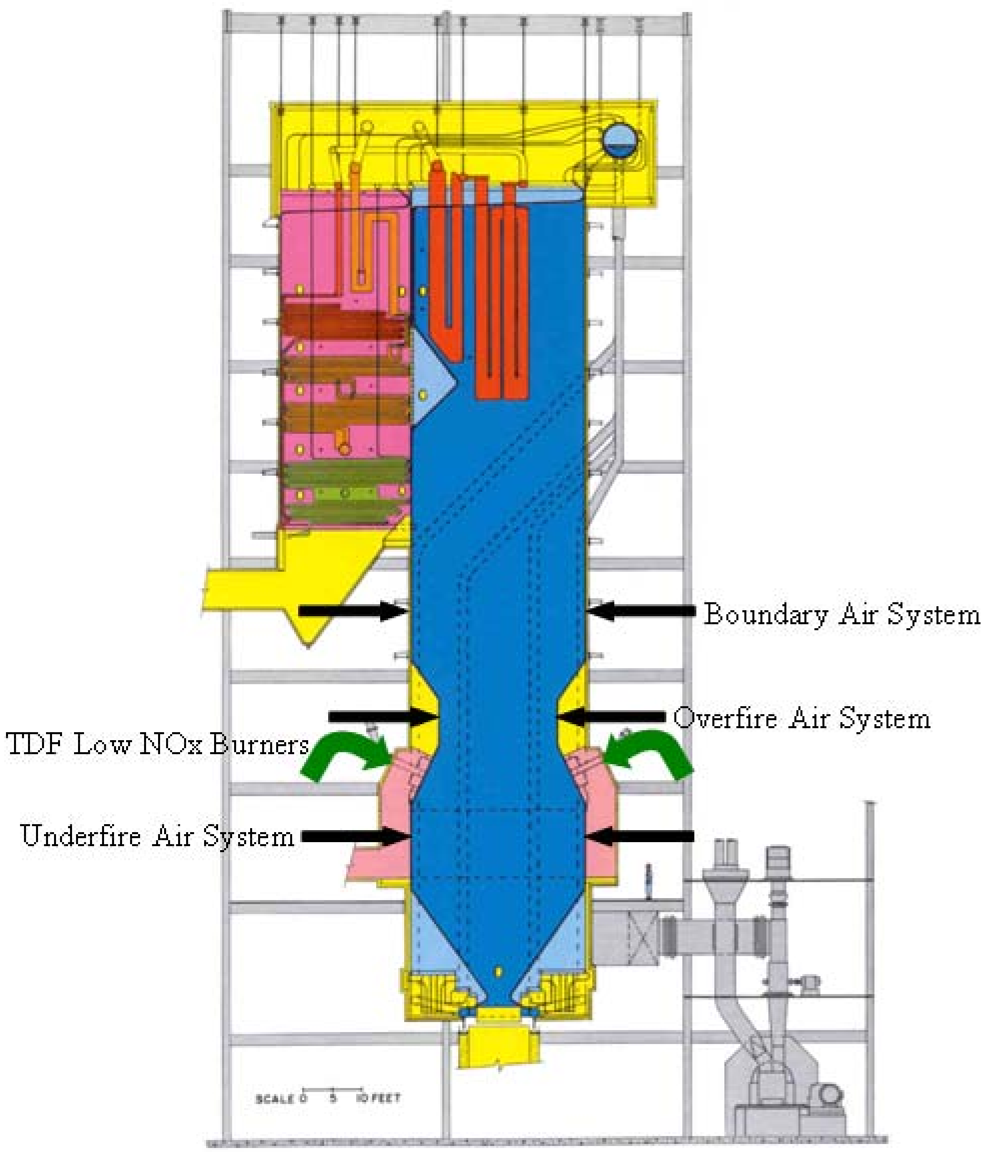

Figure 2-2 Staged Combustion of LNB/OFA/UF/BA/WPA System at Nearman

Table 2-1
LNC NO_X and CO Emission Levels

	NO_X (lb/MBtu)	CO (lb/MBtu)
Unit 1	0.26	0.17

2.2.3 Concurrent Project Descriptions

The concurrent projects listed below, designed to improve the performance and consistency of the coal milling system with respect to coal fineness and outlet temperature to allow proper operation of the LNC system and the guaranteed NO_X and CO emissions, are not intended nor designed to increase fuel consumption, heat input, or generation output above currently permitted levels:

Igniters, Scanners, and Cooling Skids

New scanners, igniters and cooling air systems will be installed to ensure the new LNB system can be operated safely and reliably by providing new equipment alignment of all components with the new burners. The new igniters will be the sized to provide the same heat input as the existing equipment.

Coal Inlet Divider Heads

New coal inlet divider heads will be installed to ensure alignment of the coal supply pipe with the new burners.

Added Combustion Optimization Equipment

An electronic combustion optimization system had previously been installed on Nearman Creek. Additional instrumentation will be installed to improve the performance of this system. The new instrumentation is expected to provide more information for the Combustion Optimzation system allowing for improved control resulting in reduced NO_X and CO emissions.

2.2.4 Project Schedule

As previously discussed, BPU is proposing to implement the LNC emissions control upgrade to align with a planned major outage of Nearman Unit 1 scheduled for the Spring of 2012. Specifically, Unit 1 has a planned 8 week outage scheduled to begin in March 2012; during which, the LNC system will be installed in a 6 week time period.

2.3 Project Emissions

A modification project at an existing major source is considered to be a major modification, and thus subject to NSR/PSD review, if the projected emission increase (PEI) for a regulated pollutant is significant. On December 31, 2002, the USEPA substantially reformed the NSR/PSD program, including the manner in which it is determined whether a project (such as the Project proposed herein) results in a significant emissions increase. The USEPA's revised rules, as incorporated by the KDHE, are used in this application as the basis for determining whether the NSR/PSD major modification thresholds are triggered.

A project's PEI is calculated as the difference between the projected actual emissions (PAE) and the baseline actual emissions (BAE), excluding those emission increases resulting from future business activity that the facility could otherwise accommodate. This NSR/PSD applicability test method is often referred to as the Actual-to-Projected Actual Applicability Test. Commensurate with the 2002 Reform Rules, the following five steps were utilized to determine this Project's PEI, and thus its NSR/PSD applicability. A detailed emission calculation spreadsheet is included as Appendix B.

Step 1 - Baseline Actual Emissions (BAE)

Baseline actual emissions (BAE), as they relate to an Electric Utility Steam Generating Unit (EUSGU), are defined, per 40 CFR §52.21 as adopted by reference in K.A.R. 28-19-350, as the average rate, in ton per year (tpy), at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 5-year period immediately preceding the date that a complete permit application is received by KDHE.

For this analysis, the BAE was determined for Unit 1 using monthly CEMS data and KDHE-reported annual emissions reporting documentation for the most recent 5-year period.

The BAE for each pollutant for the Project are presented in Table 2-2. While the regulations allow each pollutant to use a different 24-month period to determine the BAE, each unit for a given pollutant must use the same 24-month period. Since the Project only pertains to Unit 1, the project total BAE was determined as the highest 24-month rolling annual average of the monthly sum of historical emissions for each pollutant from Unit 1 over the most recent 5 years.

Table 2-2
Baseline Actual Emissions Summary

Pollutant	BAE (tpy) [a, b]
CO	284
NO_X	4,512
PM	267
PM_{10}	90.8
$PM_{2.5}$	52.1
SO_2	7,181
VOCs	33.9
Lead	0.33
H_2SO_4	111
Fluorides	33.0
H_2S	Negligible
Total Reduced Sulfur	Negligible

[a] Detailed emission calculations are contained in Appendix B.
[b] Includes emissions from the combustion of coal and fuel oil.

Step 2 - Projection Period

In order to determine the Project's PAE (Step 3), it is necessary to first determine the duration of the projection period. The projection period begins on the date the affected facility resumes regular operation and typically encompasses the subsequent first 5 years of operation. Under certain circumstances (such as a design capacity or PTE increase), the projection period must be extended an additional 5 years, for a total of 10 years following the date the affected unit resumes normal operation. Since the proposed Project will increase the unit's CO PTE, a 10 year projection period is utilized.

Step 3 - Projected Actual Emissions (PAE)

PAE are defined in 40 CFR §51.166(b)(40)(i) as, "the maximum annual rate, in TPY, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 years (12-month period) following the date the unit resumes regular operation after the project, or in any one of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit that regulated NSR pollutant, and full utilization of the unit would result in a significant emissions increase, or a significant net emissions increase at the major stationary source".

To calculate the PAE, it is necessary to account for the emissions associated with 1) the future business activity level (i.e., electrical demand growth in the case of EUSGU) over the course of the projection period (in this case 10 years); and 2) any projected emissions change associated with the proposed Project itself.

First, to determine the projected increase associated with future business activity, BPU commissioned a dispatch and forecast load study. BPU and Black & Veatch performed a 10-year load projection study for Unit 1 at the Nearman facility based on the most recent dispatch and financial forecast analysis. In the study, it was assumed that Nearman Unit 1 will be dispatched to serve load, meet spinning reserve requirements, and make spot sales, if available. Additionally, both planned and unplanned unit outages were factored into the load projection forecast.

Table 2-3 presents the 5-year historical and 10-year annual generation projection for Nearman Unit 1. Compared with the historical maximum annual generation over the baseline period (2005-2009) of 1,632,510,000 kW-h, the load projection forecast indicates that future demand will not exceed historical demand over the projection period. As such, there is no predicted emission increases associated with future business activity (demand growth).

The second factor in calculating the PAE is to determine the projected emissions change associated with the proposed Project itself. As previously discussed in Section 2.2.2, the Project itself will result in a decrease in NO_X emissions and an increase in CO emissions. Therefore, since there are no emissions increases associated with demand growth, the PAE for the projection period is calculated solely using the new KCMA NO_X emission limit of 0.26 lb/MBtu and the CO emission level (see Table 2-1) from the LNC system.

The PAE is simply an estimate of the post-project, actual annual emissions that Nearman Unit 1 is expected to have as the result of the LNC system installation and the natural capacity factor response of Nearman Unit 1 to anticipated load growth. The PAE for each pollutant for the Project is presented in Table 2-4.

Table 2-3
Nearman 10-year Annual Generation Projection

Year	Annual Generation (Net) [a] (kW-h)
2005	1,478,198,000
2006	1,260,433,000
2007	**1,632,510,000**
2008	1,520,661,000
2009	1,329,849,000
Current Year	
2011	1,602,286,990
2012	1,388,703,250
2013	1,610,229,130
2014	**1,612,247,560**
2015	1,583,985,230
2016	1,593,226,320
2017	1,591,172,360
2018	1,590,691,160
2019	1,591,691,040
2020	1,591,312,500
2021	1,593,246,950
2022	1,580,519,410

[a] 10-year projection of future business activity following completion of the Project and return to regular operation.

Step 4 - Excludable Emissions (EE)

Under the Actual-to-Projected-Actual Applicability Test for NSR/PSD applicability, emission increases that are not directly related to the proposed project or modification (such as future business activity in the form of electrical demand growth) may be excluded from the PEI formula. For the purpose of this application, these types of emission increases are referred to as excludable emissions (EE). The EE are those emissions that could have been accommodated during the baseline period by the pre-project (unmodified) unit, and that are also unrelated to the proposed Project modifications themselves.

Table 2-4
Projected Actual Emissions Summary

Pollutant	PAE (tpy) [a]
CO	1,773
NO_X	2,711
PM	267
PM_{10}	90.8
$PM_{2.5}$	52.1
SO_2	7,181
VOCs	33.9
Lead	0.33
H_2SO_4	111
Fluorides	33.0
H_2S	Negligible
Total Reduced Sulfur	Negligible

[a] Detailed emission calculations are contained in Appendix B.

Because the future demand growth is not forecasted to exceed the baseline levels over the projection period (discussed in Step 3), there are no excludable emissions to consider in the NSR/PSD emission increase determination.

Step 5 - Projected Emissions Increase (PEI)

The projected emissions increase (PEI) is calculated as the difference between the PAE and the BAE for each pollutant. The PEI is then compared with the PSD significant emission rate (SER) to determine PSD applicability on a pollutant-by-pollutant basis. Table 2-5 summarizes the entire 5-step PEI calculation and compares these values with the corresponding PSD SER for each applicable pollutant to determine which of the Project's pollutants are subject to PSD review, as further discussed in Section 2.4.1.

2.4 Federal and State Air Quality Requirements

Air quality permitting in Kansas is the jurisdiction of the Kansas Department of Health and Environment (KDHE). The USEPA has given the KDHE authority to implement and enforce the federal Clean Air Act (CAA) provisions and state air regulations under its approved State Implementation Plan (SIP). The KDHE has further given the Unified Government of Wyandotte County the authority to administer the CAA provisions for sources located within that county. However, the KDHE has requested direct involvement with any air permit application at Nearman and will thus be responsible for the review of this application and the issuance of an air permit to construct and operate the proposed modifications to Nearman Unit 1. The following subsections discuss the applicable federal and state air quality programs, regulations, and standards.

2.4.1 New Source Review Applicability

The federal Clean Air Act (CAA) New Source Review (NSR) provisions are implemented for new major stationary sources and major modifications at existing major sources under two programs; the PSD program outlined in 40 CFR 52.21 for areas in attainment, and the NSR Non Attainment program outlined in 40 CFR 51 and 52 for areas considered nonattainment for certain pollutants.

The air quality in a given area is generally designated as being in attainment for a pollutant if the monitored concentrations of that pollutant are less than the applicable NAAQS. Likewise, a given area is generally classified as nonattainment for a pollutant if the monitored concentrations of that pollutant in the area are above the NAAQS. A review of the air quality status in the region reveals that Wyandotte County (the Project location) 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, *Prevention of Significant Deterioration of Air Quality*, will apply to the proposed Project.

The PSD regulations are designed to ensure that the air quality in existing attainment areas does not significantly deteriorate or exceed the NAAQS while providing a margin for future industrial and commercial growth. The primary provisions of the PSD regulations require that major modifications and new major stationary sources be carefully reviewed prior to construction to ensure compliance with the NAAQS, the applicable PSD air quality increments, and the requirements to apply Best Available Control Technology (BACT) to minimize the emissions of air pollutants.

To determine the trigger thresholds, and ultimately whether a modification then triggers the requirements of the PSD program listed above, one must understand if the existing facility being modified is a major stationary source or not. A major stationary source is defined under PSD as any one of the listed major source categories which emits, or has the potential to emit (PTE), 100 tons per year (tpy) or more of any regulated pollutant, or 250 tpy or more of any regulated pollutant if the stationary source does not

Table 2-5
Comparison of the Projected Emissions Increase to the PSD Significant Emission Rates

NSR Pollutant	PAE [a] (tpy)	BAE [b] (tpy)	PEI [c] (tpy)	PSD SER [d] (tpy)	PSD Review Required? (Yes/No)
CO	1,773	284	1,489	100	Yes
NO_X	2,711	4,512	-1,801	40	No
PM	267	267	0	25	No
PM_{10}	90.8	90.8	0	15	No
$PM_{2.5}$	52.1	52.1	0	10	No
SO_2	7,181	7,181	0	40	No
VOCs	33.9	33.9	0	40	No
Lead [e]	0.33	0.33	0	0.6	No
H_2SO_4	111	111	0	7	No
Fluorides [f]	33.0	33.0	0	3	No
H_2S	Negligible	Negligible	0	10	No
Total Reduced Sulfur	Negligible	Negligible	0	10	No

[a] PAE – Projected Actual Emissions – Step 3
[b] BAE – Baseline Actual Emissions – Step 1
[c] PEI – Projected Emissions Increase [PEI = PAE –BAE] – Step 5
[d] PSD SER – PSD Significant Emissions Rate
[e] The significant emission rate for lead was changed from 0.6 tpy to 1.0 tpy as referenced in the November 12, 2008, Federal Register. However, since Kansas is an approved SIP state, the current Kansas SIP has the 0.6 tpy limit. Therefore, the more restrictive 0.6 tpy limit was utilized. "National Ambient Air Quality Standards for Lead; Final Rule". 73 FR 219 (November 12, 2008), pp. 66964 – 67062.
[f] Based on the fluoride portion of the HF emissions.
Note: Detailed emission calculations are contained in Appendix B.

fall under one of the listed major source categories. The Nearman facility is one of the 28 major source categories (i.e., fossil fuel fired steam electric plant) and has a PTE greater than 100 tpy for at least one regulated pollutant; therefore, it is considered an existing major PSD source.

As the proposed Project will be located at an existing major stationary source, PSD applicability is determined on a pollutant-by-pollutant basis by using the 2002 NSR Reform Rules (discussed in detail in Section 2.3) which compares the PEI of each pollutant against the individual PSD SERs. The PEI can be determined by comparing the pre-project (BAE) baseline emissions with the post-project potential to emit (PTE) emissions. Alternatively, as provided for in the NSR/PSD reform rules, electric utility steam generating units (EUSGUs) have the option of using projected actual emissions (PAE) instead of PTE, and excluding those emission increases associated with increased business activity in determining the PEI.

As shown in Table 2-5, the estimated PEI of CO resulting from the Project exceeds the PSD SER. Therefore, the Project's emissions of CO are subject to PSD review, which includes a BACT analysis and an ambient air quality impact analysis (AAQIA). These analyses are included in Sections 3.0 and 4.0 of this application, respectively.

2.4.2 New Source Performance Standard

Standards of Performance for New Stationary Sources are contained in 40 CFR Part 60 and adopted by reference in K.A.R. 28-19-720. These standards are commonly referred to as New Source Performance Standards (NSPS). Applicability of NSPS regulations to the proposed Project is reviewed in this section.

The Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction is Commenced After August 17, 1971 found at 40 CFR 60, Subpart D is the NSPS of interest for the discussion pertaining to Unit 1. This NSPS includes emission standards for particulate matter, sulfur dioxide, and nitrogen oxides for affected facilities that commence construction, reconstruction, or modification after the date(s) specified in the regulation. In the following paragraphs, the proposed Project's activities are considered with respect to construction, reconstruction, and modification under NSPS.

With respect to NSPS applicability under Subpart D, the Project is clearly not considered construction of a new electric utility steam generating unit. Reconstruction under the NSPS definition found at 40 CFR 60.15 means the replacement of components of an existing facility to such an extent that the fixed capital cost of the new components exceeds 50 percent of the fixed capital cost that would be required to construct a comparable entirely new facility. Under this definition, the proposed activities are clearly not considered reconstruction under the NSPS definition. Finally, because CO is the only pollutant that will have an emissions increase, the Project is not considered a modification under NSPS as it does not result in an increase in an emissions rate to which a NSPS applies.

Since the Project does not meet the NSPS definitions of construction, reconstruction, or modification, it will not affect the current NSPS applicability status of the Nearman facility.

2.4.3 Applicable Kansas Air Quality Regulations

As mentioned earlier, the KDHE has permitting and review authority for all air quality projects in Kansas through the USEPA-approved SIP. Additionally, KDHE has promulgated regulations for new and modified air pollutant sources, which are published in K.A.R. 28-19 *Kansas Air Quality Regulations*. Several of these rules have already been addressed in previous sections of this application, as the Kansas rules adopt or incorporate several federal regulations by reference. Other applicable state regulations not previously discussed or referred to are presented below.

Kansas City Maintenance Area (KCMA) – Reduction of Nitrogen Oxides (K.A.R. 28-19-713 through 28-19-713D)

These regulations require the reduction of NO_X from certain stationary sources located in Wyandotte or Johnson County that annually emits at least 1,000 tons of NO_X from the facility. Nearman Unit 1 is required to achieve a NO_X emission limit of 0.26 lb/MBtu (30-day rolling average).

Continuous Emission Monitoring (K.A.R. 28-19-19)

All sources subject to the provisions of this regulation shall install, test and continuously operate a continuous emission monitoring system or systems (CEMS) and comply with data reduction requirements of the department and reporting, record keeping and quality assurance requirements established by this regulation. Nearman Unit 1 is currently subject to this regulation and the proposed Project does not change the applicability of this regulation.

Indirect Heating Equipment Emissions; General Provisions (K.A.R. 28-19-30)

These regulations apply to installations in which fuel is burned for the primary purpose of producing steam, hot water, or hot air or other indirect heating of liquids, gases, or solids and, in the course of doing so, the products of combustion do not come into direct contact with process materials. Nearman Unit 1 is currently subject to this regulation and the proposed Project does not change the applicability of this regulation.

Indirect Heating Equipment Emissions; Emission Limitations (K.A.R. 28-19-31)

This regulation lists the emission limitations for the emissions of particulate matter, opacity, sulfur dioxide, and nitrogen oxides for indirect heating units. Nearman Unit 1 is currently subject to this regulation and the proposed Project does not change the applicability of this regulation.

Construction Permits and Approvals; Applicability (K.A.R. 28-19-300)

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. The requirements of this rule are met through the submittal of this application.

Construction Permits and Approvals; Application and Issuance (K.A.R. 28-19-301)

Application for a permit or approval to construct or modify a stationary source or emissions unit shall be made by the owner or operator on forms provided or approved by KDHE. The applicable forms required by this regulation are provided in Appendix A of this document.

Construction Permits and Approvals; Additional Provisions; Construction Approvals (K.A.R. 28-19-303)

A construction approval shall not contain conditions that allow a source to avoid any requirement of the federal clean air act. Compliance of this regulation is met thought the submittal of this application.

Construction Permits and Approvals; Fees (K.A.R. 28-19-304)

An application for an approval or a permit to construct or modify an emissions unit or stationary source shall not be reviewed until the department has received an application fee that has been determined pursuant to the requirements of this regulation. The applicable application fee has been submitted with this application thus meeting the requirements of this regulation.

Mercury (K.A.R. 28-19-728)

The requirements of 40 CFR Part 60 Subpart HHHH were vacated by the DC Circuit Court of Appeals in a decision dated February 8, 2008.

3.0 Best Available Control Technology

As discussed in Section 2.4.1, the Project is classified as a major modification to an existing major source. Based on the Project's calculated emissions increase (Table 2-5), the Project is subject to a BACT review for CO. This section presents a summary of the BACT analysis methodology and the emissions control determinations for the Project's affected equipment. The complete regulatory BACT analysis is included as Appendix C of this application.

3.1 BACT Methodology

As required under the NSR/PSD regulations, the BACT analysis employed the USEPA's recommended top-down, five-step analysis process to determine the appropriate BACT emission limitations for the Project. In summary, the BACT analysis was conducted in the following manner:

- Step 1: Identify All Control Technologies
- Step 2: Eliminate Technically Infeasible Options
- Step 3: Rank Remaining Control Technologies by Effectiveness
- Step 4: Evaluate Most Effective Controls and Document Results
- Step 5: Select BACT

As the aforementioned BACT methodology suggests, if it cannot be shown that the top level of control is infeasible (for a similar type source and fuel category) on the basis of technical, economic, energy, or environmental impact considerations, then that level of control must be declared to represent BACT for the respective pollutant and air emissions source. Alternatively, upon proper documentation that the top level of control is not feasible for a specific unit and pollutant based on a site and project-specific consideration of the aforementioned screening criteria (i.e., technical, economic, energy, and environmental considerations), then the next most stringent level of control is identified and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any technical, economic, energy, or environmental considerations. BACT cannot be determined to be less stringent than the emissions limits established by an applicable NSPS for the affected air emission source.

3.2 Summary of the BACT Determination

Table 3-1 presents a summary of the proposed BACT control technology, emission limit determinations, and proposed averaging period for the Project.

Table 3-1
BACT Determination Summary

Unit	Control Technology	Proposed CO BACT Limit (lb/MBtu)	Proposed CO BACT Averaging Period
Unit 1	Good Combustion Controls (GCC)	0.17	30-day rolling

Note: The BACT analysis is included herein as Appendix C.

4.0 Ambient Air Quality Impact Analysis

The following sections discuss the air dispersion modeling methodology and the modeling results from the AAQIA for the proposed Project. This AAQIA has been performed for CO, which is the only pollutant subject to PSD review. The AAQIA was conducted in accordance with USEPA *Guideline on Air Quality Models* (incorporated as Appendix W of 40 CFR 51), as well as a mutually agreed upon air dispersion modeling protocol submitted to KDHE during the project kickoff meeting held at the KDHE offices on May 6, 2010. The KDHE provided written approval of the proposed modeling methodologies via a letter dated May 25, 2010. A copy of the protocol and the KDHE's approval letter are presented in Appendix D.

4.1 Model Selection and Description

Consistent with the available modeling applications provided for by Appendix W to Part 51 *Guideline on Air Quality Models*, the SCREEN3 (Version 96043) air dispersion model was used to predict maximum ground-level concentrations associated with the proposed Project's emissions. SCREEN3 is a single source Gaussian plume model that provides maximum ground-level concentrations for a variety of source types. SCREEN3 is a screening version of the ISCST3 model, the previous EPA-preferred short-range air dispersion model. The current EPA-preferred short-range model, AERMOD, has a screening version called AERSCREEN; however, it is currently not available to the public. As such, the SCREEN3 model was considered to be appropriate for the screening analysis. Some of the features included in SCREEN3 are its ability to determine pollutant concentrations in the cavity zone as well as concentrations due to inversion break-up and shoreline fumigation. SCREEN3 is also able to treat both simple and complex terrain.

The SCREEN3 model was used to determine the maximum predicted ground-level concentration for CO resulting from the emissions of the proposed Project. Since SCREEN3 only predicts a 1-hour average concentration value, the USEPA document *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised*[1] was utilized to obtain the scaling factors for determining the appropriate averaging period impact for CO (8-hour).

[1] USEPA Office of Air and Radiation. "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised". EPA-454/R-92-019. Research Triangle Park, NC. October 1992.

4.2 Model Options

Since the SCREEN3 model is specifically designed to support the USEPA's regulatory modeling programs, the regulatory modeling options are considered the default mode of operation for the model. Regulatory default mode consists of entering the appropriate input source characteristics representative of the proposed Project, selecting the appropriate regulatory options, and then using the recommended model defaults. Regulatory default options were utilized in the modeling analysis.

4.3 Model Input Source Parameters

The stack parameters listed in the annual emissions reporting forms were used in the modeling analyses. The modeled CO emission rate was conservatively based on a 0.50 lb/MBtu emission rate and Unit 1's heat input of 2,433.1 MBtu/hr. The modeled emission rate is conservatively high and protective of the air quality standards since the BACT emission limit for Unit 1 is 0.17 lb/MBtu.

Table 4-1
Stack Parameters and Pollutant Emission Rates Used in Modeling Analysis

Source	Stack Height (ft)	Stack Diameter (ft)	Exit Velocity (ft/s)	Exit Temp. (°F)	CO Emission Rate[a] (lb/hr)
Unit 1	400	23.3	44	305	1,216.55

[a] Emissions from this unit are based on a 0.50 lb/MBtu emission rate and Unit's 1 heat input rate of 2,433.1 MBtu/hr.

4.4 Dispersion Coefficients

The USEPA's Auer land use method was used to determine whether rural or urban dispersion coefficients were to be used in the SCREEN3 air dispersion model. In this procedure, land circumscribed within a 3 km radius of the site is classified as rural or urban using the Auer land use classification method. If rural land use types account for more than 50 percent of the land use area within the 3 km radius, then the rural dispersion coefficient option should be used. Otherwise, the urban coefficients are used.

Based on visual inspection of the USGS 7.5-minute topographic map of the proposed Project site location, illustrated in Figure 4-1, it was conservatively concluded that over 50 percent of the area surrounding the proposed Project may be classified as rural. Accordingly, the rural dispersion modeling option was used in the SCREEN3 model.

4.5 Good Engineering Practice and Building Downwash Evaluation

The dispersion of a plume can be affected by nearby structures when the stack is short enough to allow the plume to be significantly influenced by surrounding building turbulence. This phenomenon, known as structure-induced downwash, generally results in higher model predicted ground-level concentrations in the vicinity of the influencing structure. Sources included in a PSD permit application are subject to Good Engineering Practice (GEP) stack height requirements outlined in K.A.R. 28-19-18 (see also 40 CFR Part 51, Sections 51.100 and 51.118). GEP stack height is defined as the greater of:

1. 65 meters,
2. a height established by applying the formula:

$$H_{GEP} = H + 1.5\ L$$

   where:

   H_{GEP} = GEP stack height
   H = height of nearby structure(s)
   L = lesser dimension (height or projected width) of nearby structure(s)

3. a height demonstrated by a fluid model or a field study which ensures that emissions from a stack do not result in excessive concentrations of any pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, nearby structures, or nearby terrain features.

Since a fluid model analysis or a field study was not completed, the GEP stack height is defined by definition 1 or 2. Subsequently, the term *nearby* is defined as a distance up to five times the lesser of the height or width dimension of a structure or terrain feature, but not greater than 800 meters.

For this analysis, the buildings and structures of the existing Nearman facility were analyzed to determine the potential to influence the plume dispersion from Unit 1's stack. The stack for Unit 1 is built to a height of 400 feet above grade, which is below the calculated GEP stack height. Since Unit 1's stack height is below GEP, the effects of building downwash were included.

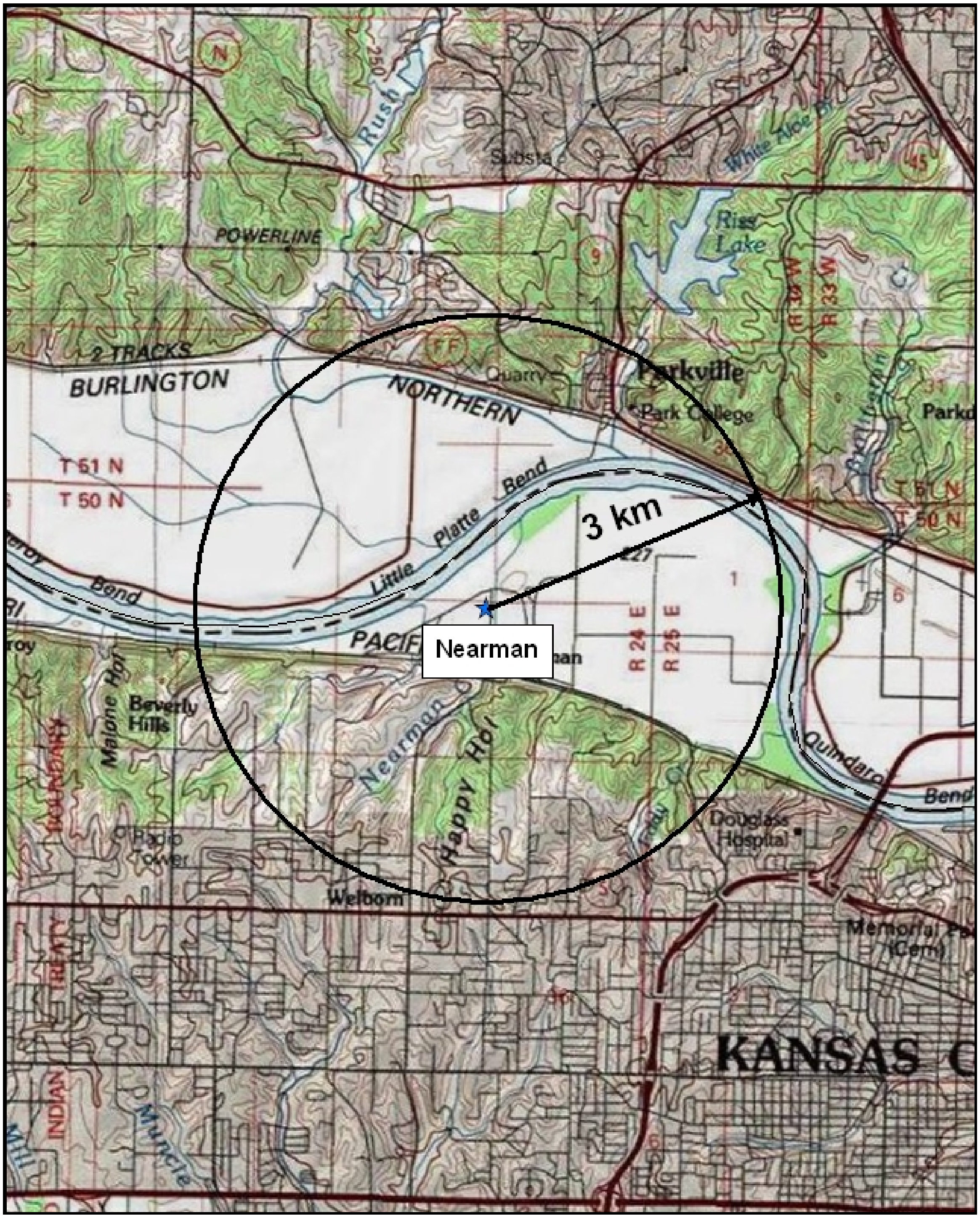

Figure 4-1 Site Location

4.6 Receptor Grid

The automated distance array option of SCREEN3 was selected to allow the model to use an iteration routine to determine the maximum impact and its associated distance. SCREEN3 allows the user to set a minimum and maximum distance; therefore, the minimum distance was set equal to 177 m (the distance from Unit 1 to the closest fenceline) and the maximum distance was set equal to 20 km which ensured that the maximum concentration was found.

4.7 Terrain Considerations

As mentioned previously, the SCREEN3 model was set to determine impacts out to a distance of 20 km. A review of Digital Elevation Model (DEM) files concluded that complex terrain does not exist, as such; the complex terrain option was not utilized. Complex terrain is simply a receptor whose elevation is above the source's release height. Unit 1 has a stack height of 400 ft with a base elevation of 753 ft above mean sea level (amsl) resulting in any elevation above 1,153 ft amsl being considered complex terrain. The maximum elevation within 20 km of the facility is 1,091 ft amsl.

For simple elevated terrain calculations, the model was run with several concentric rings using the minimum and maximum distance inputs of the automated distance option to define each ring, and using the maximum terrain elevation above stack base within each ring for terrain height input. The minimum and maximum distance inputs along with the corresponding maximum terrain elevation used in the modeling analysis are presented in Table 4-2.

4.8 Meteorological Data

For simple elevated terrain, SCREEN3 has the following options of meteorology: (1) full meteorology, (2) specifying a single stability class, or (3) specifying a single stability class and wind speed. For option (1) full meteorology, SCREEN3 examines a range of stability classes and wind speeds to identify the worst-case meteorological conditions. Option 1 was selected since it resulted in the maximum ground-level concentration.

Table 4-2
Concentric Rings' Distances and Elevations

Ring Number	Distance Range (m)		Maximum Elevation [a] (m)
	Minimum	Maximum	
1 [b]	177	500	0
2	500	1,000	54
3	1,000	2,000	71
4	2,000	3,000	86
5 [c]	3,000	5,000	96
6 [d]	5,000	20,000	104

[a] The maximum elevation is the difference between stack base and the maximum terrain elevation within that range. (Stack base is equal to 753 ft amsl.)
[b] The minimum distance from Unit 1's stack to the closest fenceline is 177 m; as such, the minimum distance for the modeling analysis was set to this distance.
[c] The maximum elevation within the 5,000 m ring was 1,052 ft. Since SCREEN3 does not allow terrain heights to decrease (or be equal to the previous ring) with distance, the 4,000 m ring was omitted and the maximum elevation within the 4,000 m ring was assumed to extend out to the 5,000 m ring.
[d] The maximum elevation within the 20 km modeling domain is 1,091 ft amsl, which is within the 10,000 m ring . Since SCREEN3 does not allow terrain heights to decrease (or be equal to the previous ring) with distance, the elevation for the last concentric ring was based on the maximum elevation.

4.9 Model Predicted Impacts

The dispersion modeling analysis usually involves two distinct phases: (1) a preliminary analysis and (2) a full impact analysis. The preliminary analysis models only the significant increase in potential emissions of a pollutant from a proposed new source, or the significant net emissions increase of a pollutant from a proposed modification. The results of this preliminary analysis determine whether the applicant must perform a full impact analysis, involving the estimation of background pollutant concentrations resulting from existing sources and growth associated with the proposed Project. Specifically, the preliminary analysis:

- determines whether the applicant can forego further air quality analyses for a particular pollutant; i.e., full impact analysis;
- allows the applicant to be exempted from the ambient monitoring data requirements; and
- is used to define the impact area within which a full impact analysis must be carried out if necessary.

In general, the full impact analysis is used to project ambient pollutant concentrations against which the applicable NAAQS and PSD increments are compared, and to assess the ambient impact of non-criteria pollutants. The full impact analysis is not required for a particular pollutant when emissions of that pollutant would not increase ambient concentrations by more than the applicable significant impact levels (SIL).

The preliminary analysis, otherwise known as the SIL analysis, and the applicability to ambient monitoring requirements are discussed below in Sections 4.9.1 and 4.9.2, respectively.

4.9.1 SIL Analysis

The SILs are trigger levels indicating whether more in-depth analyses, i.e., full impact analyses, need to be undertaken. Specifically, the SILs are the level at which a significant ambient impact for a pollutant occurs. As mentioned in Section 4.1, the preliminary, i.e., SIL analysis, was performed using the SCREEN3 model. Since the SCREEN3 model only predicts a 1-hour impact for simple terrain scenarios, a compilation of the applicable averaging periods impacts is necessary and is provided in Appendix F. The Project's maximum model-predicted impacts are presented in Table 4-3.

As the results in Table 4-3 indicate, the Project's model-predicted air quality impacts are less than the modeling significance levels, indicting that the Project is not subject to additional cumulative source air dispersion modeling analyses as part of the PSD review process. Electronic copies of all modeling input and output files are included in Appendix F.

Table 4-3
Comparison of Project's Maximum Modeled CO Impacts with the PSD Class II Modeling Significance and Monitoring de minimis Levels

Averaging Period	Model-Predicted Impact ($\mu g/m^3$)	PSD Class II Significant Impact Level ($\mu g/m^3$)	PSD Class II Significant Monitoring Concentration ($\mu g/m^3$)
8 hour	360.5	500	575
1 hour	515.0	2,000	--

4.9.2 Pre-Application Air Quality Monitoring

Pre-application air quality monitoring requirements are outlined in 40 CFR Part 52.21(m)(1)[2]. Pre-application air quality monitoring applicability is determined by comparing the pollutant's maximum, model-predicted concentration from the proposed Project to the applicable PSD significant monitoring concentration provided in 40 CFR Part 52.21(i)(5)(i)[2]. If the proposed Project's maximum model predicted concentration for that pollutant is less than the applicable PSD significant monitoring concentration, then, as provided for in 40 CFR Part 52.21(i)(5), an exemption from pre-application air quality monitoring requirements can be requested for that pollutant.

As presented in Table 4-3, the proposed Project's maximum-modeled predicted CO 8-hour impact is less than the PSD significant monitoring concentration. Therefore, by this application, the applicant requests an exemption from PSD pre-application air quality monitoring requirements.

4.10 Additional PSD Impact Analyses

A requirement of the PSD regulations is the need for an additional impact analysis as governed by 40 CFR §52.21(n)(2)(ii)[2]. The additional impact analysis pertains to the air quality impacts, and the nature and extent of any or all general commercial, residential, industrial, and other growth that has occurred since August 7, 1977, in the area the Project would affect. A characterization of the population trend of the area can be used as a surrogate for general growth. An evaluation of the growth as it relates to the August 7, 1977 date, as well as a projection of growth indicators related to the Project with respect to workforce, housing, and commercial/industrial growth and their potential impact to air quality are presented below in Section 4.10.1.

Additionally, 40 CFR §52.21(o)[2] requires that an analysis be performed that considers the impairment to visibility, vegetation, and soils that would occur as a result of the Project. Analyses for visibility impairment, vegetation, and soils were performed and are discussed in Sections 4.10.2, 4.10.3, and 4.10.4, respectively.

4.10.1 Commercial, Residential, and Industrial Growth Analysis

The Project is located in Wyandotte County, specifically in Kansas City, Kansas in an area zoned as industrial. Because the Project will not create additional generating capacity, the Project will not have an effect upon the industrial growth in the immediate area. There will be an increase in the local labor force during the construction phase of the Project. It is anticipated that most of the labor force during the construction phase will commute from nearby communities. This labor force increase will be temporary,

[2] 40 CFR Part 52.21 is adopted by reference according to K.A.R. 28-19-350(b)(1).

short-lived, and will not result in permanent commercial and residential growth occurring in the vicinity of the project.

The potential for housing shortages and thus the possibility of housing related growth and secondary air quality impacts have been an issue historically for the construction of large coal plants in sparsely populated areas. However, experience has also shown that smaller projects (modifications) like the proposed Project located in or near urban areas typically have no noticeable impacts on the housing market. The reason is that impacts are primarily a function of the size of the construction workforce and the need for the workforce to relocate during construction.

The need to relocate is a function of the available workforce within a reasonable commuting distance of the work site. Research by the Electric Power Research Institute (EPRI) has indicated that the construction workforce for a power plant project can reasonably be expected to commute without relocating during construction from a distance of more than 70 miles, with instances of a commuting distance of more than 100 miles found in each of the construction projects studied. When a 70 mile radius around the Nearman facility is considered, metropolitan areas including Lawrence and Topeka in Kansas, and Kansas City and St. Joseph, Missouri are within commuting distance to the site, and a 100 mile radius includes Emporia, Kansas.

The area offers a wide variety of temporary lodging. Given the expected population of the commuting workforce, the fact that during the construction period most workers will be onsite for less than the total construction period, and an abundance of hotel and other short-term lodging options in Kansas City, it is unlikely that a substantial number of the construction workforce would choose to relocate during the construction period. Therefore, the anticipated housing growth will be minimal or nonexistent, and is not expected to have a significant impact on the air quality.

Population increase is a secondary growth indicator of potential increases in air quality levels. Changes in air quality due to population increase are related to the amount of vehicle traffic, commercial/institutional facilities, and home fuel use. Since there will be no or only minimal number of new, permanent jobs created by the Project, secondary residential, commercial, and industrial growth is not expected to have a significant impact on the air quality.

Finally, because the maximum model-predicted CO concentrations for the proposed Project are well below the NSR/PSD significant impact levels, air concentrations in the region are expected to fully comply with the ambient air quality standards when the proposed Project becomes operational. Therefore, from an air quality impact standpoint, the proposed Project is consistent with the balanced growth demonstrated by the county to date.

4.10.2 Visibility Impairment Analysis

An additional impacts visibility analysis may be used to determine if the emissions increases associated with a proposed PSD project will have an impact on Class II sensitive areas such as state parks, wilderness areas, or scenic sites and over looks. Visibility impairment is a function of the emissions of primary particulate matter (PM), nitrogen oxides (NO_X), primary nitrogen dioxide (NO_2), soot (elemental carbon), and primary sulfate (SO_4^-). However, as shown in Table 2-5, the Project will substantially decrease the emissions of NO_X, improving visibility over current conditions. As CO, a non-visibility impairing pollutant, is the only pollutant with an emission increase, the Project is not predicted to negatively impact visibility.

4.10.3 Vegetation Analysis

The NSR Workshop Manual states that the analysis of air pollution impacts on vegetation should be based on an inventory of species found in the impact area, i.e., significant impact area (SIA). Since the emissions from the proposed Project did not result in any exceedances of the significant impact levels, no SIA exists. Therefore, an area with a 3-km radius centered at the facility was chosen for this analysis instead. A review of information gathered from topographic maps and aerial photography concluded that there are no state parks or designated sensitive areas within this 3-km area.

The US Department of Agriculture's Natural Resources Conservation Service (NRCS) was utilized to determine the inventory of plant species in a 3-km radius (a 6x6-km area) surrounding the Nearman facility. According to the NRCS, there are a total of 1,522 different plant species that are located within all of Wyandotte County, Kansas and/or Platte County, Missouri (included in Appendix E). For the purpose of defining the quantitative/qualitative impacts from CO emissions, it was conservatively assumed that at least one "sensitive" species is included among the list of 1,521 plant species and that all 1,521 plant species are within the 3-km radius of the Nearman facility.

Unlike fauna, CO does not poison vegetation since it is rapidly oxidized to form carbon dioxide which is used for photosynthesis. However, extremely high concentrations can reduce the photosynthetic rate. According to the USEPA document *A Screening Procedure for the Impacts of Air Pollution Sources on Plant, Soils, and Animals*, hereafter referred to as USEPA Screening Document, for the most sensitive vegetation, a CO concentration of 1,800,000 $\mu g/m^3$ (1-week averaging period) could potentially reduce the photosynthetic rate. The maximum model-predicted 1-hour CO impact of 515.0 $\mu g/m^3$ produced by the proposed Project is significantly lower than this screening level (even at a conservative 1-hour averaging period). Consequently, no adverse impacts to vegetation at or near the proposed Project are expected from CO emissions.

4.10.4 Soils Analysis

A soil inventory was completed by obtaining a soil survey within the 3-km radius study area surrounding the facility. The soil survey was obtained from the NRCS. The different soil survey classification series that were found to be in excess of 1 percent of the total land area of the 3-km study area are listed in Table 4-4. A complete breakdown of the percentage of each soil survey classification series is provided in Appendix E.

Table 4-4
Soil Inventory

Gosport-Sogn complex	Made land
Gravel pits and quarries	Nodaway silt loam
Haynie silt loam	Onawa silty clay loam
Haynie silt loam, clayey substratum	Onawa soils
Kennebec silt loam	Parkville silty clay loam
Knox complex	Sarpy-Haynie complex
Knox silt loam	Snead-Rock outcrop complex
Knox silty clay loam	Snead-Urban land complex
Knox-Urban land complex	Waldron silty clay loam
Ladoga silt loam	Water
Leta silty clay	Wiota silt loam

NOTES:
Data taken from the Natural Resources Conservation Service's Web Soil Survey (http://websoilsurvey.nrcs.usda.gov/app/) for the 6x6-km domain centered on the Nearman Facility.

As presented in Section 4.9, the maximum model-predicted ambient concentrations of CO resulting from the Project is 515.0 $\mu g/m^3$, which is significantly less than the applicable National Ambient Air Quality Standards (NAAQS) and the NSR/PSD significant impact levels. Because the predicted CO air quality impacts resulting from the Project are not significant, and are in fact orders of magnitude less than the applicable NAAQS designed to protect public health (note that secondary NAAQS which protect flora and the soils they grow in have not been established, thus the more protective primary standards were used), it is reasonable to conclude that the proposed emissions of CO will not affect soils.

4.11 Class I Areas Analyses

Federally designated Class I areas are afforded special protection in the air permitting process. Generally, Class I area analyses are only conducted for Projects located within 100 km of a Class I area. The Nearman facility is approximately 312 km from the closest Class I area, Hercules-Glades Wilderness Area in Missouri. Another Class I area in relatively close proximity to the Nearman facility is the Upper Buffalo

Wilderness Area in Arkansas, located approximately 378 km from the Nearman facility. Figure 4-2 presents the location of the Nearman facility with respect to the Class I areas.

As the proposed Project results in a substantial decrease in NO_X emissions and no increase in any other visibility impairing pollutants (i.e., SO_2, PM_{10}, and H_2SO_4), a Class I area analysis is not required for this Project.

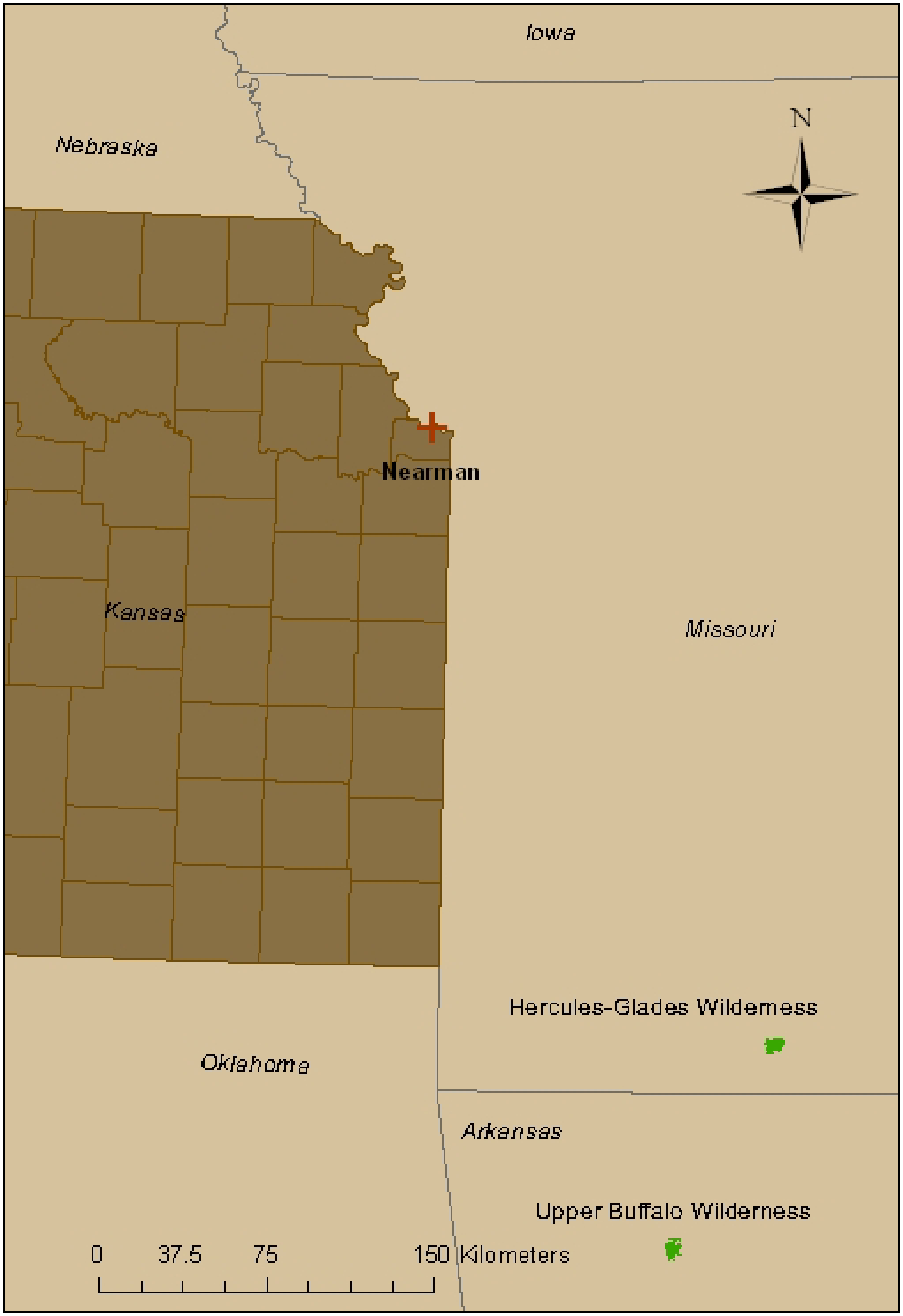

Figure 4-2 Class I Areas Location

Appendix A
KDHE Application Forms

Appendix A
KDHE Application Forms

This appendix provides the following forms:

- – Notification of Construction or Modification
- – Form 6-1.0: Indirect Heating Unit – Boiler

Kansas Department of Health and Environment
Bureau of Air and Radiation
Phone (785) 296-1570 Fax (785) 291-3953

Notification of Construction or Modification

(K.A.R. 28-19-300 Construction permits and approvals; applicability)

Check one: ☒**Applying for a Permit under K.A.R. 28-19-300(a)** ☐**Applying for an Approval under K.A.R. 28-19-300(b)***

1) Source ID Number: 2090008

2) Mailing Information:
   Company Name: Kansas City, Kansas Board of Public Utilities – Nearman Creek Power Station
   Address: PO Box 4088 City,
   State, Zip: Kansas City, KS 66104

3) Source Location:
   Street Address: 4240 N. 55th Street
   City, County, State, Zip: Kansas City, KS 66104
   Section, Township, Range: S23 T10S R24E
   Latitude & Longitude Coordinates:

4) NAICSC/SIC Code (Primary): 221112 / 4911

5) Primary Product Produced at the Source: Electricity Generation

6) Would this modification require a change in the current operating permit for your facility? ☒ Yes ☐ No

   If no, please explain:

7) Is a permit fee being submitted? ☒ Yes ☐ No

   If yes, please include the facility=s federal employee identification number (FEIN #) 486031185

8) Person to Contact at the Site: John Fuentez Phone: (913) 573-9786
   Title: Director Electric Production Opertions

9) Person to Contact Concerning Permit: Tiffany Le Phone: (913) 573-9789
   Title: Sr. Environmental Scientist

   Email: tle@bpu.com Fax: (913) 328-6281

Please read before signing:

Reporting forms provided may not adequately describe some processes. Modify the forms if necessary. Include a written description of the activity being proposed, a description of where the air emissions are generated and exhausted and how they are controlled. A simple diagram showing the proposed activity addressed in this notification which produces air pollutants at the facility (process flow diagrams, plot plan, etc.) with emission points labeled must be submitted with reporting forms. Information that, if made public, would divulge methods or processes entitled to protection as trade secrets may be held confidential. See the reverse side of this page for the procedure to request information be held confidential. A copy of the Kansas Air Quality Statutes and Regulations will be provided upon request.

Name and Title : Don Gray, General Manager
Address: 540 Minnesota, Kansas City, KS 66101-2930

Signature: Don ? Gray Date: 9/22/10 Phone: (913) 573-9000

* If you do not know whether to apply for a permit or an approval, follow approval application procedures.

Procedures For Requesting Information To Be Held Confidential

An applicant may request that information submitted to the Department, other than emission data or information in any air quality permit or approval, be treated as confidential if the information would divulge methods or processes entitled to protection as trade secrets.

A request to designate information within the Department's air quality files as confidential must include:

(1) An uncensored copy of the document clearly marked as confidential;

(2) A copy of the document, or copies if more than one is required to be filed with the Department, with the confidential information masked;

(3) Specification of the type of information to be held as confidential (i.e., product formulations, process rates);

(4) Specification and justification of the reason the information is qualified by statute to be treated as confidential (competitive advantage, company developed secret formulation, trade secret); and

(5) A reference at each place in the document or documents where information is masked referring to the specification of the type of information masked and the specification and justification the information is qualified by statute to be treated as confidential.

ONLY THE CONFIDENTIAL INFORMATION ON ANY DOCUMENT MAY BE MASKED. ALL INFORMATION ON ANY DOCUMENT WHICH IS NOT CONFIDENTIAL MUST REMAIN LEGIBLE.

The information will be treated as confidential until the secretary has acted upon the request and the owner or operator has had the opportunity to exhaust any available remedies if the secretary determines the information is not confidential.

Complete this and all reporting forms and submit to:

Kansas Department of Health and Environment
Bureau of Air and Radiation
1000 SW Jackson, Suite 310
Topeka, KS 66612-1366
(785) 296-1570

Sources located in Wyandotte County should obtain forms from, and submit forms to:

Unified Government of Wyandotte County
Department of Air Quality
619 Ann Avenue
Kansas City, KS 66101
(913) 573-6700

CALCULATING THE CONSTRUCTION PERMIT APPLICATION FEE

[These requirements are found at K.A.R. 28-19-304(b).]

Calculate the construction permit application fee as follows:

Estimated capital cost of the proposed activity for which the application is made, including the total cost of equipment and services to be capitalized.	**Line 1** $	29,494,000
Multiply by .05% (.0005)	x	.0005
Total	**Line 2** $	14,747

If Line 2 is less than $100, enter $100 on Line 3.
If Line 2 is greater than $4,000, enter $4,000 on Line 3.

Otherwise, copy Line 2 to Line 3.

Construction permit application fee.	**Line 3** $	4,000	Minimum fee is $100

Don Gray
(Print)

Certifier of Capital Cost

Don L Gray
(Signature)

9/22/10
Date

K.A.R. 28-19-350 is a complex regulation pertaining to prevention of significant deterioration (PSD). An additional fee of $1,500 will be required if a PSD review is necessary. If you believe the proposed activity in this Notification of Construction or Modification will be subject to the requirements of K.A.R. 28-19-350, contact the Department for further evaluation.

For purposes of construction permit or approval applications, the following are not considered modifications:

1. Routine maintenance or parts replacement.
2. An increase or decrease in operating hours or production rates if:
   a. production rate increases do not exceed the originally approved design capacity of the stationary source or emissions unit; and
   b. the increased potential-to-emit resulting from the change in operating hours or production rates do not exceed any emission or operating limitations imposed as a permit condition.

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

INDIRECT HEATING UNIT (BOILER)

1) Source ID Number: _2090008_

2) Company/Source Name: _Kansas City, Kansas Board of Public Utilities – Nearman Creek Power Station______

3) Emission Unit Identification:_EU-MAINBOILER______________________________

4) Manufacturer:_Riley__________________Model No.: _3913 (Boiler Serial No.)___

5) Maximum design heat-input rate: _____2,433,100,000____ BTU/hr
   Heat-release Rate: ______ BTU/hr/cu. ft. of furnace volume
   Annual load factor: ______
   Heater design: Cyclone ______; Underfeed stoker ______; Spreader stoker ______;
   Pulverized (dry-tangential or normal/wet) __X__; Other (specify) _______________
   Normal Operating Schedule: _8,760_ hours/year
   Date of latest modification: ________________

6) Primary Fuel Type:
   Natural Gas ____ Oil ____Coal _X_ Other (specify) _____________________
   Secondary Fuel Type:
   Natural Gas ____ Oil _X_ Coal ____ Other (specify) _____________________

7) If other fuel is waste liquid:
   What is the source of the waste? _______________________________________
   Will the waste be pretreated to remove any of the contaminants? Yes ____; No ____ If yes, describe method of pretreatment:
   ____
   ____

   If waste liquid is used in combination with fuel oil:
   Specify the volume percent of waste liquid:______ %
   Specify the anticipated annual operating hours during which the fuel and waste combination will be used: ______ hrs.
   Fill in the data below for the fuel oil.

Include the chemical and physical characteristics of the waste liquid. Also, include any source emissions test data that is available from testing similar facilities that have disposed of this type liquid waste.

8) Fuel Specific Data: (if other is specified, give appropriate data)
Natural Gas:
Heating value: ___________ BTU/cu. ft.
(If fuel gas is used, also specify %Sulfur: _____)
Coal:
Fuel Parameters: %Sulfur: 0.27 – 0.87 % Ash: 6.04 – 8.83
Heating value: 7,954 – 8,909 BTU/lb.
Fuel Oil:
Fuel Parameters: %Sulfur: ≤ 0.015%(wt) Grade: No. 2
Heating value: 19,500 BTU/gal.
Density: 6.99 – 7.05 lb./gal.

9) Air Emissions Control Technology: NOx _X_ SOx ____ CO ____ Particulate _X_
If yes, breakdown of Control Technology: Low NO_X burner system for NO_X control. ESP and SO_2 injection for particulate control.

10) Soot blowing (if applicable): frequency: ________ duration: ________

11) Has boiler been derated because of:
Fuel change __________ Equip. limitations ____________ Regulatory compliance ______________

12) Emissions discharge to atmosphere _400_ ft. above grade through stack or duct _23.3_ ft. diameter at _305_ E F temperature, with _1,125,656_ cfm flow rate and _44_ fps velocity.

13) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting

14) Did construction, modification, or reconstruction commence after August 17, 1971 and on or before September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes _X_; No ___
If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart D.

15) Did construction, modification, or reconstruction commence after September 18, 1978 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 250 million BTU/hour? Yes ______; No _X_
If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Da.

16) Did construction, modification, or reconstruction commence after June 19, 1984 and does the indirect heating unit have a maximum design heat-input capacity to combust more than 100 million BTU/hour but less than 250 million BTU/hour? Yes ______; No _X_
If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Db.

(cont.)

17) Did construction, modification, or reconstruction commence after June 9, 1989 and does the indirect heating unit have a maximum design heat-input capacity to combust 10 million or more BTU/hour but less than 100 million BTU/hour? Yes ______; No _X_

If yes, this plant may be subject to NSPS, 40 CFR Part 60, Subpart Dc.

Appendix B
Emissions Calculations

Board of Public Utilities

Nearman Creek Power Station

Unit 1 Low NO_X Combustion System

PSD Applicability Determination

Background:

These calculations are the basis of the emissions presented in Section 2.3 of the permit application technical support document.

Methodology:

A project at an existing major source will be subject to PSD review for each pollutant that results in a significant emissions increase and a net emissions increase.

The following five steps will help determine if the project is significant.

Step 1. Determine the Baseline Actual Emissions (BAE).
Step 2. Determine the Projection Period.
Step 3. Determine the Projected Actual Emissions (PAE).
Step 4. Determine the Excludable Emissions (EE).
Step 5. Determine the Projected Emissions Increase (PEI) and Compare to PSD Significant Emission Rate (SER).

Calculations:

Step 1. Determine the Baseline Actual Emissions (BAE).

The BAE is the average rate an emission unit actually emitted a given pollutant during any consecutive 24-month period within the last 5 years preceding the date the application is submitted. For this Project, the only applicable emission unit is Nearman Unit 1.

Table B1 Baseline Actual Emissions Summary

Pollutant	BAE [1] (tpy)
CO	284
NO_x	4,512
PM	267
PM_{10}	90.8
$PM_{2.5}$	52.1
SO_2	7,181
VOC	33.9
Lead	0.33
H_2SO_4	111
Fluorides	33.0
TRS (including H_2S)	--

Step 2. Determine the Projection Period.

The projection period begins on the date the affected facility resumes regular operation and typically encompasses the subsequent first 5 years of operation. Under certain circumstances (such as a design capacity or PTE increase), the projection period must be extended an additional 5 years, for a total of 10 years following the date the affected unit resumes normal operation. Since the proposed Project will increase the unit's CO PTE, a 10 year projection period is utilized

Step 3. Determine the Projected Actual Emissions (PAE).

The Projected Actual Emissions (PAE) is the maximum annual rate, in tpy, at which an existing emissions unit is projected to emit a regulated NSR pollutant in any one of the 5 or 10 years following the date the unit resumes regular operation after the project, and shall exclude that portion of the unit's emissions following the project that an existing unit could have accommodated during the consecutive 24-month period used to establish the BAE and that are also unrelated to the particular project, including any increased utilization due to product demand growth.

Basis:

Forecasted Demand Increase: 0 % [2]

The PAE is calculated using the following equations:

$$\text{Emissions Ratio} = \frac{\text{Post - Project [lb / mmBtu]}}{\text{Pre - Project [lb / mmBtu]}}$$

where,
Emission Ratio = ratio showing the increase/decrease of emissions from baseline
Pre-Project [lb/mmBtu] = baseline emission rate, lb/mmBtu
Post-Project [lb/mmBtu] = post-project emission rate, lb/mmBtu

$$\text{PAE} = \text{BAE} \times (\text{Emission Ratio}) \times (\text{Forecasted Demand Increase})$$

where,
PAE = Projected Actual Emissions, tons
BAE = Baseline Actual Emissions, tons
Emission Ratio = ratio showing the increase/decrease of emissions from baseline
Forecasted Demand Increase = the projected electrical demand increase, %

Table B2 Unit 1 Projected Actual Emissions

Pollutant	BAE (tpy)	Pre-Project [3] (lb/mmBtu)	Post-Project [4] (lb/mmBtu)	Emissions Ratio	PAE (tpy)
CO	284	0.0272	0.1700	6.245	1,773
NO_x	4,512	0.4327	0.2600	0.601	2,711
PM	267	0.0256	0.0256	1.000	267
PM_{10}	91	0.0087	0.0087	1.000	90.8
$PM_{2.5}$	52	0.0055	0.0055	1.000	52.1
SO_2	7,181	0.6887	0.6887	1.000	7,181
VOC	34	0.0033	0.0033	1.000	33.9
Lead	0.33	3.173E-05	3.173E-05	1.000	0.33
H_2SO_4	111	0.0107	0.0107	1.000	111
Fluorides	33	3.491E-03	3.491E-03	1.000	33.0
TRS (including H_2S)	--	--	--	--	--

Step 4. Determine the Excludable Emissions (EE).

Excludable emissions are, as defined above, that portion of the unit's emissions following the change that could have been accommodated during the representative baseline period and is attributable to an increase in projected capacity utilization at the unit that is unrelated to the particular change, including any increased utilization due to the rate of electricity demand growth for the utility system as a whole.

The EE is calculated using the following equations:

$$\text{Demand Growth} = \text{BAE} \times \text{Forecasted Demand Increase}$$

where,

Demand Growth = projected actual emissions associated with the projected demand growth, tons
BAE = Baseline Actual Emissions, tons
Forecasted Demand Increase = the projected electrical demand increase, %

$$EE = BAE + \text{Demand Growth}$$

where,
EE = Excludable Emissions, tons
BAE = Baseline Actual Emissions, tons
Demand Growth = projected actual emissions associated with the projected demand growth, tons

Table B4 Unit 1 Excludable Emissions

Pollutant	BAE (tpy)	Demand Growth (tpy)	EE (tpy)
CO	284	0	284
NO_x	4,512	0	4,512
PM	267	0	267
PM_{10}	90.8	0	90.8
$PM_{2.5}$	52.1	0	52.1
SO_2	7,181	0	7,181
VOC	33.9	0	33.9
Lead	0.33	0	0.33
H_2SO_4	111	0	111
Fluorides	33.0	0	33.0
TRS (including H_2S)	--	--	--

Step 5. Determine the Projected Emissions Increase (PEI) and Compare to PSD Significant Emission Rate.

The PEI is simply the difference of the PAE to the BAE/EE, as shown by the following equation:

PEI = PAE - (greater of BAE or EE)

Table B6 Projected Emission Increase and PSD Applicability Determination

Pollutant	PAE (tpy)	BAE (tpy)	EE (tpy)	PEI (tpy)	PSD SER [5] (tpy)	Exceed the SER? Yes/No
CO	1,773	284	284	1,489	100	Yes
NO_x	2,711	4,512	4,512	-1,801	40	No
PM	267	267	267	0	25	No
PM_{10}	90.8	90.8	90.8	0	15	No
$PM_{2.5}$	52.1	52.1	52.1	0	10	No
SO_2	7,181	7,181	7,181	0	40	No
VOC	33.9	33.9	33.9	0	40	No
Lead [6]	0.33	0.33	0.33	0	0.6	No
H_2SO_4	111	111	111	0	7	No
Fluorides	33.0	33.0	33.0	0	3	No
TRS (including H_2S)	--	--	--	--	10	--

Notes [ ]:

1. See "Table B12 Unit 1 Monthly Emissions Summary" of this appendix for detailed calculations.
2. The forecasted electrical demand growth based on BPU's ten-year projection.
3. The Pre-Project emission rate is calculated as the sum of the emissions during the baseline period divided by the sum of the heat input during the baseline period.
4. The Project only affects the CO and NO_X emissions; therefore, all other pollutants' post-project emission rate are equal to its pre-project emission rate. The CO emission rate is based on vendor data. The NO_X emission rate is based on the limit in the KS SIP of 0.26 lb/MBtu.
5. PSD Significant Emission Rate (SER) as defined in 40 CFR 51.166(b)(23) [K.A.R. 28-19-300(a)(1)].
6. The SER for lead was changed from 0.6 tpy to 1.0 tpy as referenced in the November 12, 2008, Federal Register. However, since Kansas is an approved SIP state, the current Kansas SIP has the 0.6 tpy limit. Therefore, the more restrictive 0.6 tpy limit was utilized. "National Ambient Air Quality Standards for Lead; Final Rule". 73 FR 219 (November 12, 2008), pp. 66964 – 67062.

Board of Public Utilities
Nearman Creek Power Station
Unit 1 Low NO_X Combustion System

Actual Emissions - Unit 1 Boiler

Methodology:
The Baseline Actual Emissions (BAE) is the average rate, in tons per year (tpy), at which the unit actually emitted the regulated NSR pollutant during any consecutive 24-month period within the 5-year period immediately preceding the date that a complete permit application is received by the agency.

Unit 1 is a Riley stoker boiler that is capable of combusting liquid and/or solid fossil fuel. The calculations below determine the monthly pollutant emissions from Boiler 1 to be used in determining the BAE.

Basis:
The monthly pollutant emissions are based on the information in the Clean Air Markets database and information used to complete the annual Kansas Emissions Inventory forms. Specifically, the following hierarchy was used as the basis for data input.

1. Clean Air Markets database [1] (heat input, SO2 and NOx emissions)
2. Annual KS Emissions Inventory (EI) forms [2]

The following table lists the annual emissions as reported in the EI forms.

Table B8 Unit 1 KS EI Coal Summary

Year	Pollutant										Coal Usage (tpy)
	SO2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	PM (tpy)	PM10 (tpy)	PM2.5 (tpy)	Pb (tpy)	HF (tpy)	SAM (tpy)	
2005	7,242.000	4,057.250	268.370	32.200	229.730	52.860	13.780	--	--	--	1,073,486
2006	6,019.500	3,778.500	226.277	27.153	241.528	98.086	66.444	--	67.883	--	905,106
2007	7,326.900	4,586.000	276.051	33.126	246.866	74.721	36.715	0.232	0.000	--	1,104,204
2008	5,991.700	3,521.300	264.997	31.800	229.777	68.027	32.316	0.223	0.000	--	1,059,987
2009	5,930.800	3,130.300	232.269	27.872	201.383	61.048	30.065	0.195	1.304	--	929,075

Table B9 Unit 1 KS EI Fuel Oil Summary

Year	Pollutant										FO Usage (gal/yr)
	SO2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	PM (tpy)	PM10 (tpy)	PM2.5 (tpy)	Pb (tpy)	HF (tpy)	SAM (tpy)	
2005	0.000	0.000	7.05E-04	2.82E-05	2.26E-06	1.13E-06	2.82E-07	--	--	--	282,107
2006	0.000	0.000	2.355	0.094	1.562	1.087	0.731	0.075	--	--	942,000
2007	0.000	0.000	1.010	0.040	0.667	0.465	0.313	0.095	--	--	403,968
2008	0.000	0.000	1.058	0.042	0.702	0.488	0.328	0.081	--	--	423,218
2009	0.000	0.000	1.166	0.047	0.769	0.536	0.361	0.078	--	--	466,267

Baseline Determination Notes:
The following section characterizes the calculations that represent the total actual pollutant emissions that will be used in the baseline determination.

SO_2
The SO_2 annual emissions are the summation of monthly emissions obtained from the Clean Air Markets database.

NO_X
The NO_X annual emissions are the summation of monthly emissions obtained from the Clean Air Markets database.

CO
The CO annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

VOC
The VOC annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

PM
The PM annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

PM_{10}
The PM_{10} annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

$PM_{2.5}$
The $PM_{2.5}$ annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

Pb

The KS EI forms did not report lead emissions for 2005 and for coal usage during 2006. As such, the lead emissions for these non-reported instances are based on the following equations. For years where the lead emissions were reported, the annual emissions are the summation of the coal and fuel oil annual emissions as reported in the KS EI forms.

Coal

$$E = EF \times \text{Coal Usage} \times \frac{1\ \text{ton}}{2{,}000\ \text{lbs}}$$

where,

E = emissions, tons

EF = emission factor, lb/ton 4.2E-04 lb/ton [3]

Coal Usage = coal burned, tons

Fuel Oil

$$E = EF \times HV \times \text{FO Usage} \times \frac{1\ \text{ton}}{2{,}000\ \text{lbs}} \times \frac{1\ \text{mmBtu}}{10^6\ \text{Btu}}$$

where,

E = emissions, tons

EF = emission factor, lb/mmBtu 9.0E-06 lb/mmBtu [4]

HV = heating value, Btu/gal 140,000 Btu/gal [5]

FO Usage = fuel oil burned, gal

Fluorides (F)

The KS EI forms did not report any fluoride emissions in 2005, 2007, and 2008. For the 2006 and 2009 reports, hydrogen flouride emissions were listed; however, the baseline determination is only based on the fluoride portion. The firing of fuel oil is assumed to produce no flouride emissions; therefore, only the coal-firing operation will have flouride emissions. The fluoride emissions are based on the following equations.

Years: 2005, 2007, 2008

$$E = EF \times HI \times \frac{MW_F}{MW_{HF}}$$

where,

E = emissions, tons

EF = emission factor, lb/mmBtu 0.00015 lb/mmBtu [6]

HI = heat input, mmBtu

MW_F = molecular weight of F, lb/mol 18.9984 [7]

MW_{HF} = molecular weight of HF, lb/mol 20.0063 [7]

Years: 2006, 2009

$$E = HF \times \frac{MW_F}{MW_{HF}}$$

where,

E = emissions, tons

HF = HF emissions, tons

MW_F = molecular weight of F, lb/mol 18.9984 [7]

MW_{HF} = molecular weight of HF, lb/mol 20.0063 [7]

Sulfuric Acid Mist

The KS EI forms do not report SAM emissions. As such, the SAM emissions are based on the following equation.

$$E = ER_{SO_2} \times \%C \times \frac{MW_{H_2SO_4}}{MW_{SO_2}}$$

where,

E = emissions, tons

ER_{SO2} = SO_2 emission rate, tpy

%C = SAM conversion, % 1 % [8]

MW_{H2SO4} = molecular weight of H_2SO_4, lb/mol 98.0785 [7]

MW_{SO2} = molecular weight of SO_2, lb/mol 64.0638 [7]

Table B10 Unit 1 Annual Emissions Summary

Year	Pollutant										Heat Input (mmBtu/yr)
	SO2 (tpy)	NO_X (tpy)	CO (tpy)	VOC (tpy)	PM (tpy)	PM10 (tpy)	PM2.5 (tpy)	Pb (tpy)	HF (tpy)	SAM (tpy)	
2005	7,241.996	4,137.378	268.371	32.200	229.730	52.860	13.780	0.226	1.344	110.871	18,870,938
2006	6,019.500	3,828.839	228.632	27.247	243.090	99.173	67.175	0.265	64.463	92.156	16,608,851
2007	7,326.906	4,646.538	277.061	33.166	247.533	75.185	37.028	0.327	1.509	112.171	21,182,464
2008	5,991.732	3,595.237	266.055	31.842	230.479	68.516	32.645	0.303	1.276	91.730	17,920,166
2009	5,930.834	3,230.698	233.435	27.919	202.152	61.584	30.426	0.273	1.239	90.798	17,390,608

The average yearly emission rates are based on the total yearly emissions and heat input. The 2010 yearly average is the average of the previous five years' yearly emission rates, except for SO_2, NO_X, and SAM, which SO_2 and NO_X are based on CEMs data and SAM is based on the SO_2 emissions and the above referenced conversion.

Table B11 Unit 1 Average Yearly Emission Rates

Year	Pollutant									
	SO2 (lb/mmBtu)	NOx (lb/mmBtu)	CO (lb/mmBtu)	VOC (lb/mmBtu)	PM (lb/mmBtu)	PM10 (lb/mmBtu)	PM2.5 (lb/mmBtu)	Pb (lb/mmBtu)	F (lb/mmBtu)	SAM (lb/mmBtu)
2005	0.768	0.438	0.028	0.0034	0.024	0.006	0.001	2.39E-05	1.42E-04	0.012
2006	0.725	0.461	0.028	0.0033	0.029	0.012	0.008	3.19E-05	7.76E-03	0.011
2007	0.692	0.439	0.026	0.0031	0.023	0.007	0.003	3.09E-05	1.42E-04	0.011
2008	0.669	0.401	0.030	0.0036	0.026	0.008	0.004	3.38E-05	1.42E-04	0.010
2009	0.682	0.372	0.027	0.0032	0.023	0.007	0.003	3.14E-05	1.42E-04	0.010
2010	0.639	0.385	0.028	0.0033	0.025	0.008	0.004	3.04E-05	1.67E-03	0.010

Calculations:

The monthly pollutant emissions and the 24-month rolling averages are calculated using the following equations:

Monthly Summary

$$E_p = ER_p \times HI \times \frac{1 \text{ ton}}{2{,}000 \text{ lbs}}$$

where,

E_p = monthly pollutant emissions, tons

ER_p = pollutant emission rate, lb/mmBtu

HI = monthly heat input, mmBtu

24-Month Rolling Average

$$E_{24\text{-month}} = \frac{\sum_{i=1}^{N} E_i}{2}$$

where,

$E_{24\text{-month}}$ = 24-month rolling yearly average pollutant emissions, tons

E_i = project monthly pollutant emissions, tons

N = preceding 24 months

Table B12 Unit 1 Monthly Emissions Summary

Year	Month	Monthly Summaries											24-Month Rolling Average									
		Heat Input (mmBtu)	SO2 (tons)	NOx (tons)	CO (tons)	VOC (tons)	PM (tons)	PM10 (tons)	PM2.5 (tons)	Pb (tons)	F (tons)	SAM (tons)	SO2 (tons)	NOx (tons)	CO (tons)	VOC (tons)	PM (tons)	PM10 (tons)	PM2.5 (tons)	Pb (tons)	F (tons)	SAM (tons)
2005	January	1,984,082	743.2	391.2	28.22	3.39	24.15	5.56	1.45	0.02372	0.141	11.66	--	--	--	--	--	--	--	--	--	--
2005	February	1,098,467	434.9	209.5	15.62	1.87	13.37	3.08	0.80	0.01313	0.078	6.45	--	--	--	--	--	--	--	--	--	--
2005	March	1,493,635	563.0	287.6	21.24	2.55	18.18	4.18	1.09	0.01786	0.106	8.78	--	--	--	--	--	--	--	--	--	--
2005	April	833,452	342.0	160.7	11.85	1.42	10.15	2.33	0.61	0.00996	0.059	4.90	--	--	--	--	--	--	--	--	--	--
2005	May	1,374,096	560.5	323.5	19.54	2.34	16.73	3.85	1.00	0.01643	0.098	8.07	--	--	--	--	--	--	--	--	--	--
2005	June	2,065,103	841.3	479.5	29.37	3.52	25.14	5.78	1.51	0.02469	0.147	12.13	--	--	--	--	--	--	--	--	--	--
2005	July	2,031,010	760.1	470.0	28.88	3.47	24.72	5.69	1.48	0.02428	0.145	11.93	--	--	--	--	--	--	--	--	--	--
2005	August	1,832,376	679.8	413.1	26.06	3.13	22.31	5.13	1.34	0.02191	0.131	10.77	--	--	--	--	--	--	--	--	--	--
2005	September	1,717,342	687.5	390.4	24.42	2.93	20.91	4.81	1.25	0.02053	0.122	10.09	--	--	--	--	--	--	--	--	--	--
2005	October	1,283,070	479.5	285.4	18.25	2.19	15.62	3.59	0.94	0.01534	0.091	7.54	--	--	--	--	--	--	--	--	--	--
2005	November	1,382,496	497.6	309.8	19.66	2.36	16.83	3.87	1.01	0.01653	0.098	8.12	--	--	--	--	--	--	--	--	--	--
2005	December	1,775,809	652.7	416.7	25.25	3.03	21.62	4.97	1.30	0.02123	0.126	10.43	--	--	--	--	--	--	--	--	--	--
2006	January	1,819,270	701.0	436.2	25.04	2.98	26.63	10.86	7.36	0.02900	7.061	10.09	--	--	--	--	--	--	--	--	--	--
2006	February	1,525,584	577.5	370.8	21.00	2.50	22.33	9.11	6.17	0.02432	5.921	8.46	--	--	--	--	--	--	--	--	--	--
2006	March	113,767	39.2	25.3	1.57	0.19	1.67	0.68	0.46	0.00181	0.442	0.63	--	--	--	--	--	--	--	--	--	--
2006	April	0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00000	0.000	0.00	--	--	--	--	--	--	--	--	--	--
2006	May	105,909	46.2	25.9	1.46	0.17	1.55	0.63	0.43	0.00169	0.411	0.59	--	--	--	--	--	--	--	--	--	--
2006	June	1,578,691	621.2	420.1	21.73	2.59	23.11	9.43	6.39	0.02517	6.127	8.76	--	--	--	--	--	--	--	--	--	--
2006	July	2,012,416	698.7	432.3	27.70	3.30	29.45	12.02	8.14	0.03208	7.811	11.17	--	--	--	--	--	--	--	--	--	--
2006	August	1,939,030	716.5	442.3	26.69	3.18	28.38	11.58	7.84	0.03091	7.526	10.76	--	--	--	--	--	--	--	--	--	--
2006	September	1,968,782	639.0	435.5	27.10	3.23	28.82	11.76	7.96	0.03139	7.641	10.92	--	--	--	--	--	--	--	--	--	--
2006	October	2,058,792	715.3	455.1	28.34	3.38	30.13	12.29	8.33	0.03282	7.991	11.42	--	--	--	--	--	--	--	--	--	--
2006	November	1,601,023	585.5	362.9	22.04	2.63	23.43	9.56	6.48	0.02552	6.214	8.88	--	--	--	--	--	--	--	--	--	--
2006	December	1,885,589	679.4	422.5	25.96	3.09	27.60	11.26	7.63	0.03006	7.318	10.46	--	--	--	--	--	--	--	--	--	--
2007	January	2,056,688	833.6	605.8	26.90	3.22	24.03	7.30	3.60	0.03177	0.146	10.89	--	--	--	--	--	--	--	--	--	--
2007	February	1,687,735	647.7	398.1	22.08	2.64	19.72	5.99	2.95	0.02607	0.120	8.94	--	--	--	--	--	--	--	--	--	--
2007	March	1,438,143	547.1	322.8	18.81	2.25	16.81	5.10	2.51	0.02221	0.102	7.62	--	--	--	--	--	--	--	--	--	--
2007	April	1,272,690	412.3	275.6	16.65	1.99	14.87	4.52	2.22	0.01966	0.091	6.74	--	--	--	--	--	--	--	--	--	--
2007	May	1,970,950	674.0	433.0	25.78	3.09	23.03	7.00	3.45	0.03044	0.140	10.44	--	--	--	--	--	--	--	--	--	--
2007	June	1,757,206	557.5	375.0	22.98	2.75	20.53	6.24	3.07	0.02714	0.125	9.31	6,724	4,262	252.2	30.15	242.05	81.70	46.15	0.27094	32.95	102.5
2007	July	1,964,835	642.8	417.2	25.70	3.08	22.96	6.97	3.43	0.03035	0.140	10.40	6,666	4,236	250.6	29.95	241.17	82.34	47.12	0.27398	32.95	101.7
2007	August	1,942,180	629.1	416.6	25.40	3.04	22.70	6.89	3.39	0.03000	0.138	10.28	6,640	4,238	250.3	29.91	241.36	83.22	48.15	0.27802	32.95	101.5
2007	September	1,849,507	601.6	388.4	24.19	2.90	21.61	6.56	3.23	0.02857	0.132	9.79	6,598	4,237	250.1	29.89	241.71	84.10	49.14	0.28204	32.96	101.3
2007	October	1,661,993	556.1	328.4	21.74	2.60	19.42	5.90	2.91	0.02567	0.118	8.80	6,636	4,258	251.9	30.10	243.61	85.25	50.12	0.28720	32.97	102.0
2007	November	1,798,641	600.7	348.0	23.53	2.82	21.02	6.38	3.14	0.02778	0.128	9.52	6,687	4,277	253.8	30.33	245.71	86.50	51.19	0.29283	32.99	102.7

Year	Month	Monthly Summaries											24-Month Rolling Average									
		Heat Input (mmBtu)	SO2 (tons)	NOx (tons)	CO (tons)	VOC (tons)	PM (tons)	PM10 (tons)	PM2.5 (tons)	Pb (tons)	F (tons)	SAM (tons)	SO2 (tons)	NOx (tons)	CO (tons)	VOC (tons)	PM (tons)	PM10 (tons)	PM2.5 (tons)	Pb (tons)	F (tons)	SAM (tons)
2007	December	1,781,895	624.4	337.7	23.31	2.79	20.82	6.32	3.11	0.02752	0.127	9.44	6,673	4,238	252.8	30.21	245.31	87.18	**52.10**	0.29598	**32.99**	102.2
2008	January	1,684,483	521.9	314.6	25.01	2.99	21.66	6.44	3.07	0.02850	0.120	8.62	6,584	4,177	252.8	30.21	242.83	84.97	49.96	0.29573	29.52	101.4
2008	February	1,606,855	482.6	295.8	23.86	2.86	20.67	6.14	2.93	0.02719	0.114	8.23	6,536	4,139	254.3	30.39	242.00	83.49	48.33	0.29716	26.61	101.3
2008	March	1,498,118	493.5	282.0	22.24	2.66	19.27	5.73	2.73	0.02535	0.107	7.67	6,763	4,268	264.6	31.63	250.80	86.01	49.47	0.30893	26.44	104.8
2008	April	1,131,263	381.2	220.9	16.80	2.01	14.55	4.33	2.06	0.01914	0.081	5.79	6,954	4,378	273.0	32.63	258.08	88.17	50.50	0.31850	26.48	107.7
2008	May	1,563,421	501.2	294.3	23.21	2.78	20.11	5.98	2.85	0.02645	0.111	8.00	**7,181**	**4,512**	**283.9**	**33.93**	**267.35**	**90.84**	51.71	**0.33088**	26.33	**111.4**
2008	June	1,032,382	338.2	186.8	15.33	1.83	13.28	3.95	1.88	0.01747	0.074	5.28	7,040	4,396	280.7	33.55	262.44	88.10	49.46	0.32703	23.31	109.7
2008	July	1,221,851	399.9	228.0	18.14	2.17	15.71	4.67	2.23	0.02067	0.087	6.25	6,891	4,294	275.9	32.99	255.57	84.43	46.50	0.32132	19.45	107.2
2008	August	1,634,812	538.0	304.6	24.27	2.90	21.03	6.25	2.98	0.02766	0.116	8.37	6,801	4,225	274.7	32.85	251.89	81.77	44.07	0.31970	15.74	106.0
2008	September	1,321,496	485.8	376.7	19.62	2.35	17.00	5.05	2.41	0.02236	0.094	6.76	6,725	4,195	270.9	32.41	245.98	78.42	41.29	0.31519	11.97	104.0
2008	October	1,377,327	513.3	386.3	20.45	2.45	17.71	5.27	2.51	0.02330	0.098	7.05	6,624	4,161	267.0	31.95	239.77	74.90	38.38	0.31043	8.02	101.8
2008	November	1,896,790	631.2	337.5	28.16	3.37	24.40	7.25	3.46	0.03209	0.135	9.71	6,647	4,148	270.1	32.32	240.26	73.75	36.87	0.31371	4.98	102.2
2008	December	1,951,368	704.9	367.8	28.97	3.47	25.10	7.46	3.55	0.03302	0.139	9.99	6,659	4,121	271.6	32.50	239.01	71.85	34.84	0.31519	1.39	102.0
2009	January	1,640,214	558.9	298.5	22.02	2.63	19.07	5.81	2.87	0.02578	0.117	8.56	6,522	3,967	269.1	32.21	236.52	71.10	34.47	0.31220	1.38	100.8
2009	February	1,379,099	463.7	232.0	18.51	2.21	16.03	4.88	2.41	0.02168	0.098	7.20	6,430	3,884	267.3	32.00	234.68	70.55	34.20	0.31000	1.37	99.9
2009	March	713,429	234.8	112.8	9.58	1.15	8.29	2.53	1.25	0.01121	0.051	3.72	6,274	3,779	262.7	31.44	230.42	69.26	33.57	0.30450	1.34	98.0
2009	April	1,238,832	448.7	208.2	16.63	1.99	14.40	4.39	2.17	0.01947	0.088	6.47	6,292	3,746	262.7	31.44	230.18	69.20	33.54	0.30441	1.34	97.8
2009	May	1,375,219	462.2	230.0	18.46	2.21	15.99	4.87	2.41	0.02162	0.098	7.18	6,186	3,644	259.0	31.00	226.66	68.13	33.02	0.30000	1.32	96.2
2009	June	1,415,577	502.8	242.8	19.00	2.27	16.45	5.01	2.48	0.02225	0.101	7.39	6,159	3,578	257.1	30.76	224.62	67.52	32.73	0.29755	1.31	95.3
2009	July	1,503,331	550.4	317.1	20.18	2.41	17.48	5.32	2.63	0.02363	0.107	7.85	6,113	3,528	254.3	30.43	221.88	66.70	32.32	0.29419	1.29	94.0
2009	August	1,747,937	688.1	462.5	23.46	2.81	20.32	6.19	3.06	0.02748	0.124	9.13	6,142	3,551	253.3	30.31	220.69	66.34	32.16	0.29293	1.28	93.4
2009	September	1,623,195	503.3	272.7	21.79	2.61	18.87	5.75	2.84	0.02551	0.116	8.47	6,093	3,493	252.1	30.17	219.32	65.94	31.96	0.29140	1.27	92.7
2009	October	1,632,246	561.6	291.7	21.91	2.62	18.97	5.78	2.86	0.02566	0.116	8.52	6,096	3,475	252.2	30.18	219.09	65.88	31.93	0.29140	1.27	92.6
2009	November	1,272,492	399.2	221.0	17.08	2.04	14.79	4.51	2.23	0.02000	0.091	6.64	5,995	3,411	249.0	29.79	215.98	64.94	31.48	0.28751	1.26	91.2
2009	December	1,849,035	557.2	341.4	24.82	2.97	21.49	6.55	3.24	0.02906	0.132	9.65	5,961	3,413	249.7	29.88	216.32	65.05	31.54	0.28828	1.26	91.3
2010	January	1,667,726	524.8	317.1	23.13	2.77	21.01	6.57	3.37	0.02534	1.390	8.15	5,963	3,414	248.8	29.77	215.99	65.11	31.68	0.28670	1.89	91.0
2010	February	1,761,156	582.1	336.1	24.42	2.92	22.18	6.93	3.56	0.02676	1.467	8.61	6,012	3,434	249.1	29.80	216.75	65.51	32.00	0.28649	2.57	91.2
2010	March	1,749,407	543.1	361.7	24.26	2.90	22.04	6.89	3.53	0.02658	1.458	8.55	6,037	3,474	250.1	29.92	218.13	66.09	32.40	0.28710	3.24	91.7
2010	April	721,170	244.4	125.7	10.00	1.20	9.08	2.84	1.46	0.01096	0.601	3.53	5,969	3,427	246.7	29.51	215.40	65.35	32.10	0.28301	3.50	90.5
2010	May	1,717,359	560.0	319.4	23.82	2.85	21.63	6.76	3.47	0.02610	1.431	8.40	5,998	3,439	247.0	29.55	216.16	65.74	32.41	0.28284	4.16	90.7
2010	June	1,576,129	481.4	309.2	21.86	2.61	19.85	6.21	3.18	0.02395	1.313	7.71	6,070	3,500	250.3	29.94	219.45	66.87	33.06	0.28608	4.78	91.9
24-Month Rolling Average Maximum Value (BAE) -->													**7,181**	**4,512**	**283.9**	**33.93**	**267.35**	**90.84**	**52.10**	**0.33088**	**32.99**	**111.4**

Notes [ ]:
1. Clean Air Markets database. http://www.epa.gov/airmarkt/
2. Kansas Emissions Inventory reports. Submitted to KDHE on an annual basis.
3. Lead emission factor obtained from AP-42 (9/98), Tables 1.1-18.
4. Lead emission factor obtained from AP-42 (9/98), Tables 1.3-10.
5. Fuel oil heating value obtained from AP-42 (9/85), Appendix A.
6. "Gaseous Emission Test". Performed by GE Energy on July 30, 2009. Report No. M22E1925A.
7. IUPAC, version dated 30 March, 2007.
8. Sulfuric acid mist (SAM) emissions were based on a 1% conversion of SO_2 emissions to SAM.

Appendix C
BACT Analysis

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

Appendix C of the PSD Air Permit Application Technical Support Document

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Prepared for:

Kansas City Board of Public Utilities

Unit 1 LNB/OFA Project
Nearman Creek Power Station

September 2010

BLACK & VEATCH
Building a world of difference.

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Tables

1.0 Introduction

The Kansas City Board of Public Utilities (BPU) is proposing to install a LNC system to reduce emissions of NO_X on Nearman Creek Power Station Unit 1 (hereinafter referred to as the Project).

The Project is classified as a New Source Review/Prevention of Significant Deterioration (NSR/PSD) major modification to an existing major source, and as a result of the calculated emissions increases is subject to a Best Available Control Technology (BACT) review for carbon monoxide (CO), as previously discussed in Section 2.4.1 of the air permit application document. As required under the NSR/PSD regulations, the BACT analysis presented herein employs a "top-down," five-step analysis process to determine the appropriate emission limit and corresponding control technology for the CO emissions from Nearman Unit 1. The BACT analysis was conducted in accordance with the United States Environmental Protection Agency's (USEPA's) recommended methodology:

- Step 1 - Identify All Control Technologies.
- Step 2 - Eliminate Technically Infeasible Options.
- Step 3 - Rank Remaining Control Technologies by Control Effectiveness.
- Step 4 - Evaluate Most Effective Controls.
- Step 5 - Select BACT.

1.1 BACT Methodology

The BACT methodology presented herein is based on USEPA's recommended "top-down," 5-step analysis process to evaluate the available and applicable emission control technologies for the affected pollutants. The applicable regulations governing the BACT process can be found at K.A.R 28-19-350, as well as the federal regulations at 40 CFR 52.21, which define BACT as: "*An Emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall the application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic* *limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results.*

In practice, USEPA's top-down BACT analysis methodology results in the most stringent control technology and emissions limitation combination available for a similar source or source category of emission units. At the head of the list in the top-down analysis are the control technologies and emissions limits that represent the Lowest Achievable Emission Rate (LAER) determinations, which, under NSR/PSD regulations, represent the most effective control alternative and must be considered under the BACT analysis process. BACT cannot be determined to be less stringent than the emission limits established by an applicable New Source Performance Standard (NSPS) for the affected air emission source. As previously mentioned, the methodology uses a 5-step process, which is summarized below.

Step 1 - Identify All Control Technologies

The first step in a "top-down" analysis is to identify all available control options for the emission unit in question. Identifying all the potential available control options consists of those air pollution control technologies or techniques with a practical potential for application to the emission unit and the regulated pollutant under evaluation. The potential available control technologies and techniques include lower emitting processes, practices, and post-combustion controls. Lower emitting practices can include fuel cleaning, treatment, or innovative fuel combustion techniques that are classified as pre-combustion controls. Post-combustion controls include the various add-on controls for the pollutant being controlled.

Step 2 - Eliminate Technically Infeasible Options

The second step of the "top-down" analysis is to eliminate the technically infeasible control options from those identified in Step 1. A control option that is determined to be technically infeasible is eliminated from further consideration in the BACT analysis process. A technically infeasible control option is one that has not been "demonstrated"; or more specifically, a technology that has not been installed and operated successfully on a similar type of unit of comparable size. A technology is considered "demonstrated" for a given unit based on its "availability" and "applicability".

"Availability" is defined as technology that can be obtained through commercial channels or is otherwise available within the common sense meaning of the term. A technology that is being offered commercially by vendors or is in licensing and commercial demonstration is deemed an available technology. Technologies that are in development (concept stage/research and patenting) and testing stages (bench-scale/laboratory testing/pilot scale testing) are classified as not available.

The second demonstration requirement; "applicability," is defined as an available control option that can reasonably be installed and operated on the unit type under consideration. In summary, the commercially available technology is applicable if it has been previously installed and operated at a similar type of unit of comparable size, or a source with similar gas stream characteristics.

Step 3 - Rank Remaining Control Technologies by Control Effectiveness

The third step of the "top-down" analysis is to rank all the remaining (feasible) control alternatives not eliminated in Step 2, based on their control effectiveness for the pollutant under review. In this step, the feasible technologies are reviewed in order to determine the control effectiveness on either a percent removal basis or emission level, or both, based on an engineering analysis and document review of the technology applied to similar units. The following informational databases, clearinghouses, documents, and studies were used to identify recent control technology determinations for similar source categories and emission units:

- USEPA's RACT/BACT/LAER Clearinghouse (RBLC).
- USEPA's National Coal Fired Utility Projects Spreadsheet.
- Federal/State/Local new source review permits, permit applications, and associated inspection/test reports.
- Technical journals, newsletters, and reports.
- Information from air quality control (AQC) technology suppliers.
- AQC Engineering design studies for this and similar units.

Step 4 - Evaluate Most Effective Controls

Once the hierarchy of control effectiveness is established in Step 3 for all the feasible control technologies identified in Step 2, additional evaluations of each technology are performed in order to assist in the final control technology decision. The additional evaluations consider and compare the energy, environmental, and economic impacts associated with implementing the viable control alternatives.

The energy impact evaluation considers the energy penalty or benefit resulting from the operation of the control technology at the facility. Direct energy impacts include such items as the auxiliary power consumption of the control technology and the additional draft system power consumption to overcome the additional system resistance of the control technology in the flue gas flow path. The costs of these energy impacts are defined either in additional fuel costs or the cost of lost generation, which ultimately affects the cost-effectiveness of the control technology.

The environmental impact evaluation considers the collateral environmental effects resulting from the operation of each viable control alternative. Example environmental impacts may include additional water discharge and consumption, collateral emission increases, as well as disposable solids and waste generation.

The third and final impact analysis addresses the economics of the proposed control technologies in order to evaluate and compare two or more alternatives. This analysis is performed to assess the cost to purchase and operate the control technology. The capital and operating/annual cost is estimated based on the established design parameters. Information for the design parameters is obtained from established reference sources. Documented assumptions can be made in the absence of available information for the design parameters. The estimated cost of control is represented as an annualized cost ($/year) and, with the estimated quantity of pollutant removed (tons/year), the cost-effectiveness ($/tons) of the control technology is determined. Cost-effectiveness is used to assess the economic cost to achieve the required emissions reduction in the most economical manner. Two types of cost-effectiveness are considered in a BACT analysis: average and incremental cost-effectiveness. Average cost-effectiveness is defined as the total annualized cost of control divided by the annual quantity of pollutant removed for each control technology. The incremental cost-effectiveness is a comparison of the cost and performance level of a control technology to the next most stringent option. It has a unit of (dollars/incremental ton removed). The incremental cost-effectiveness is a useful measure of economic viability when comparing technologies that have similar removal efficiencies.

Step 5 - Select BACT

The highest ranked control technology from Step 3 that is not eliminated in Step 4 based on unacceptable economic, energy, or environmental impacts, is proposed as BACT for the pollutant and emission unit under review. Alternatively, upon proper documentation that the top level of control is not feasible for a specific unit and pollutant based on a site- and/or project-specific consideration of the aforementioned screening criteria (e.g., technical, energy, environmental, and economic considerations), then the next most stringent level of control is identified and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any technical, economic, energy, or environmental consideration.

1.2 Applicable NSPS Emission Limits

As previously discussed, a proposed BACT emissions limit, established in accordance with the top-down, five-step process, cannot be determined to be less stringent than the emissions limit(s) established by the applicable NSPS regulations found in 40 CFR Part 60. The following is a review of the applicable NSPS regulations for Nearman Unit 1.

Nearman Unit 1 is subject to *NSPS Subpart D – Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction is Commenced After August 17, 1971*. NSPS Subpart D includes emissions limitations for certain NSR/PSD pollutants, including SO_2, NO_X, and PM, but does not include an emission standard for CO. As such, there is not an applicable NSPS emission standard for CO to serve as a minimum BACT limitation.

2.0 Basis for Technology Analysis

This section includes a description of the design basis for Nearman Unit 1 that is used to evaluate and select BACT for the Project.

2.1 Nearman Unit 1 Design Basis

Nearman Unit 1 is a 256 MW (gross) Riley Stoker, pulverized coal fired steam boiler, with a maximum design heat input of 2,433.1 MBtu/h. The unit was put into commercial operation in 1982, and designed to burn subbituminous, powder river basin (PRB) coal. Table 2-1 summarizes the Nearman Unit 1 design basis used in the CO BACT analysis.

Table 2-1
Nearman Unit 1 Design Basis for CO BACT Analysis

Size	Unit 1 – 256 MW (gross)
Maximum Design Heat Input	2,433.1 MBtu/h
Operating Hours	8,760
Fuels	PRB subbituminous coal
Startup Fuel	Fuel Oil

2.2 CO Baseline (Current CO Emissions)

Because of the considerable variability in CO emissions, manufacturer emission performance guarantees for LNB/OFA installations are contingent upon the baseline emissions of the unit prior to the new burner installation. As such, Riley Power (burner manufacturer) determined the CO emissions baseline over the period of May 24-25, 2010 on Nearman Unit 1.

Table 2-3 presents the measured CO baseline concentration and emission rate that were used as a basis for the emission guarantees, as well as this BACT analysis. These baseline CO emission data points are used in conjunction with the LNB/OFA manufacturers' information in Step 5 of the BACT process to establish the lb/MBtu emission rate proposed herein as CO BACT for the Project.

Table 2-2
CO Baseline Emissions for Nearman Unit 1

Baseline Test Date	CO Concentration[1] (ppmv)	CO Emissions (lb/MBtu)
May 24-25, 2010	< 1	< 0.01

[1]Average over the test period.

2.3 Existing Air Quality Control Equipment

Existing air control equipment at Nearman includes an electrostatic precipitator (ESP) on Unit 1 for the control of particulate matter.

3.0 CO BACT Analysis

This section presents the top-down, five-step, BACT process used to evaluate and determine the CO emission limit and control technology for Nearman Unit 1. As this analysis will demonstrate, the proposed CO BACT limit is 0.17 lb/MBtu (200 ppmv) using good combustion control technology.

3.1 Step 1 - Identify All Control Technologies

The first step in a top-down analysis, according to the USEPA's October 1990, Draft New Source Review Workshop Manual, is to identify all available control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emission units and the CO emission limits that are being evaluated. CO is formed during the combustion process as a result of the incomplete oxidation of the carbon contained in the fuel; or simply, it is the product of incomplete combustion. The following subsections review the available CO control technologies.

3.1.1 Good Combustion Controls

As products of incomplete combustion, CO emissions are very effectively controlled by ensuring the complete and efficient combustion of the fuel in the boilers (i.e., good combustion controls). Typically, the measures taken to minimize the formation of NO_X during combustion (such as the installation of LNB/OFA) tend to inhibit complete combustion, which increases the emissions of CO. On the other hand, high combustion temperatures, adequate excess air, and good air/fuel mixing during combustion minimize CO emissions, but tend to increase NO_X formation. Therefore, in terms of combustion controls, the best control technology for CO directly conflicts with the LNB/OFA's ability to reduce NO_X. Nonetheless, LNB burner manufacturers' strive for the delicate balance of decreasing NO_X emissions while at the same time limiting CO formation, resulting in good combustion control practices based on a boiler-specific and fuel-specific LNB/OFA burner design.

3.1.2 Oxidation Catalysts

The CO oxidation catalyst process utilizes a platinum/vanadium catalyst that oxidizes CO to CO_2. The chemical process is a straight catalytic oxidation/reduction reaction requiring no reagent. Catalytic oxidation emission reduction methods have been proven in the industry for use on natural gas and oil fueled combustion turbine sources, but not coal fired boilers. The primary technical challenge faced with trying to install an oxidation catalyst on a coal fired boiler is that the location of the catalyst needs to be in a high flue gas temperature region, which would most likely be upstream of the air heater. This location, along with the potential fouling effects of the flue gas, would render the catalyst ineffective, even on a short-term basis, for this type of application.

3.2 Step 2 - Eliminate Technically Infeasible Options

Step 2 of the BACT analysis involves the evaluation of all the identified available control technologies in Step 1 of the BACT analysis to determine their technical feasibility. A control technology is technically feasible if it has been previously installed and operated successfully at a similar type of source of comparable size, or there is technical agreement that the technology can be applied to the source. Available and applicable are the two terms used to define the technical feasibility of a control technology.

A review of the USEPA RACT/BACT/LAER Clearinghouse (RBLC) reveals that the database contains no record of add-on control equipment for the control of CO on a solid fuel boiler, and BPU is not aware of this control technology having ever been applied to a solid fuel boiler. Furthermore, there are many technical challenges that render an oxidation catalyst control technically infeasible for Nearman Unit 1, including the following:

- An oxidation catalyst will not only oxidize CO, but will also oxidize a significant portion of SO_2 to SO_3 in the gas stream. SO_3 in the presence of water (H_2O) forms sulfuric acid mist which is highly corrosive to equipment downstream.
- Catalyst vendors do not generally have catalyst material suitable for coal fired boilers if the oxidation catalyst is to be located upstream of the particulate control device. Therefore, the acid gases, particulate, and trace metals in the flue gas from the combustion of solid fuel would quickly poison standard catalysts, making the control technology ineffective in its intended role.

The use of an oxidation catalyst on a coal fired boiler presents many substantial challenges that render this control technology not technically feasible for further consideration as a control alternative for CO.

While the CO oxidation catalyst is eliminated from further consideration for the reasons stated above, good combustion controls are well demonstrated and available, and thus considered technically feasible for the control of CO in this BACT analysis. Table 3-1 summarizes the evaluation of the technically feasible CO options.

Table 3-1
Summary of Step 2 – Eliminate Technically Infeasible Options

Technology Alternative	Technically Feasible (Yes/No)	
	Available	Applicable
Good Combustion Controls	Yes	Yes
Oxidation Catalyst	Yes	No – The RBLC contained no documented installations on similar coal fired boilers that demonstrate it as a viable option.

3.3 Step 3 - Rank Remaining Control Technologies by Effectiveness

A search of the information contained in the USEPA RACT/BACT/LAER Clearinghouse (RBLC) was conducted to determine the top level of CO control for new and LNB/OFA retrofit coal boilers. A search was also conducted for recently permitted new and LNB/OFA retrofit coal fired facilities whose BACT determinations have not yet been included in the current database. The results, which are documented in Attachment A, indicate that good combustion controls (GCC) is the top control for CO emissions from coal fired boilers. In fact, GCC is the only control identified for similar sources to reduce CO emissions.

The data presented in Attachment A exhibit a very large range of CO BACT emission limit determinations by various permitting authorities across the country for new coal-fired boilers and LNB/OFA retrofits. With the data sorted from lowest to highest (i.e., top down BACT methodology) the CO BACT emission limit determinations range from 0.10 lb/MBtu for newly proposed coal fired boilers to as high as 1.26 lb/MBtu for an OFA retrofit. The more than an order of magnitude range in CO BACT determinations are reflective of the high variability of this pollutant's formation and indicative of the boiler-specific design and fuel conditions that must be taken into consideration when determining a CO BACT emission limit.

As previously mentioned, the lowest (top of the list in Attachment A) CO BACT emission limit determinations are for newly proposed boilers, while the higher CO BACT emission limit determinations are generally associated with LNB/OFA retrofit projects such as that proposed for Nearman Unit 1. The reason for this variability is that LNB/OFA retrofits are installed on existing coal fired boilers for the sole purpose of reducing NO_X emissions; and as such, cannot be optimized as effectively for CO reduction as they can for a new unit because of the fixed design characteristics of the existing boiler. Additionally, new units typically have SCR systems for the control of NOx emissions, which allows the burners to be tuned for greater CO control.

CO emissions, as a product of incomplete combustion, are by their nature a function of the specific boiler type and the fuel characteristics, which is reflected in the emissions guarantees that vendors are willing to make for a LNB/OFA retrofit project. Therefore, when evaluating the CO BACT emission limit for Nearman Unit 1, it is appropriate to focus the review and analysis of previous BACT determinations on existing units that have recently undergone similar LNB/OFA retrofit installations and permit actions. The following list of recent LNB/OFA retrofit CO BACT determinations (listed here in chronological order) were extracted from Attachment A (shaded results) to illustrate the CO BACT determinations recently made by permitting authorities for similar LNB/OFA retrofit projects as that proposed for Nearman Unit 1.

- 0.30 lb/MBtu (24-hour): Consumers Energy's Tes Filer City Plant, MI, Jun 2010.
- 0.33 lb/MBtu: NRG's Limestone Plant (Units 1 and 2), TX, Feb 2010.
- 0.33 lb/MBtu (30-day rolling average): Southwest Public Service Company's Harrington Plant (Unit 1), TX, Jan 2010.
- 0.25 lb/MBtu (30-day rolling average): Pacificorp's Wyodak Plant (Unit 1), WY, May 2009.
- 0.25 lb/MBtu (30-day rolling average): Pacificorp's Naughton Plant (Units 1 and 2), WY, May 2009.
- 0.50 lb/MBtu (30-day rolling average): Omaha Public Power District's (OPPD) Nebraska City Station, NE, February 2009.
- 0.50 lb/MBtu (30-day rolling average): Salt River Project's Coronado Generating Station (Units 1 and 2), AZ, January 2009.
- 0.25 and 0.20 lb/MBtu (30-day rolling average): Pacificorp's Dave Johnston Plant (Units 3 and 4, respectively), WY, June 2008.
- 0.18 and 0.15 lb/MBtu (30-day rolling average): Orlando Utilities Commission's Stanton Energy Center (Units 1 and 2), FL, February 2008.
- 0.25 lb/MBtu (30-day rolling average): Westar Energy's Tecumseh Energy Center (Units 7/9 and 8/10), KS, November 2007.
- 0.17 lb/MBtu (30-day rolling average): Progress Energy's Crystal River Plant (Units 4 and 5), FL, May 2007.
- 0.20 lb/MBtu (30-day rolling average): Tampa Electric Company's Big Bend Station (Unit 4), FL, May 2007.

- 0.163 lb/MBtu (30-day rolling average): Iowa Power and Light's (IPL) Ottumwa Generating Station, IA, February 2007.
- 0.35 lb/MBtu (30-day rolling average): City Utilities of Springfield's James River Power Station (Units 3, 4, and 5), MO, December 2006.
- 0.20 lb/MBtu (30-day rolling average): Lakeland Electric's McIntosh Plant, FL, December 2006.
- 0.20 lb/MBtu (30-day rolling average): Cleco Corp's Dolet Hills Power Station, LA, November 2006.
- 0.15 lb/MBtu (8-hour rolling average): Platte River Power Authority's Rawhide Energy Station, CO, September 2006.
- 0.50 lb/MBtu (30-day rolling average): Nebraska Public Power District's Gerald Gentleman Station (Unit 1), NE, August 2006.
- 1.26 lb/MBtu (3-hour average): MidAmerica Energy's George Neal North Plant (Unit 1), IA, December 2005.
- 0.25 lb/MBtu (30-day rolling average): Westar Energy's Jeffrey Energy Center (Unit 3), KS, October 2005.
- 0.42 lb/MBtu (calendar day): MidAmerica Energy's Neal Energy Center South, IA, September 2005.

These CO BACT determinations range from 0.15 to 1.26 lb/MBtu over the last 4 to 5 years. All but 4 of the CO BACT determinations specified above require a 30-day rolling average as a basis for compliance. The top, and only control technology determination listed, is the use of GCC for the reduction of CO emissions from coal fired boilers.

3.4 Step 4 - Evaluate Most Effective Controls

In the following subsections, the technically feasible control alternatives are evaluated in a comparative approach with respect to their energy, environmental, and economic impacts on the Project.

3.4.1 Energy Evaluation of Alternatives

There are no significant energy impacts that would preclude the use of GCC to limit the emissions of CO.

3.4.2 Environmental Evaluation of Alternatives

As previously discussed, the typical good combustion measures taken to minimize the formation of CO, namely higher combustion temperatures, additional excess air, and optimum air/fuel mixing during combustion, are often counterproductive to the control of NO_X emissions. A proper balance of this phenomenon is a necessary task in obtaining and complying with the manufacturer's guarantees, since overly aggressive CO limits can jeopardize NO_X emissions design considerations.

3.4.3 Economic Evaluation of Alternatives

Since there is only one feasible control technology to limit the emissions of CO from Nearman Unit 1 (i.e., GCC), a comparative cost analysis is not applicable.

3.5 Step 5 - Select BACT

Based on the preceding BACT analysis, BPU proposes the only feasible control, GCC, as BACT for the emissions of CO resulting from the LNB/OFA Project for Nearman Unit 1. BPU has received an emissions guarantee from the burner manufacturer (Riley Power) for CO emissions based on baseline emissions plus 200 ppmv. Based on the CO baseline tests presented previously in Table 2-3, the guaranteed CO emission rate is 200 ppmv, or 0.17 lb/MBtu.

Table 3-2 presents the proposed CO BACT control technology, emissions limit, and averaging period for Nearman Unit 1. The proposed BACT for CO on Neaman Unit 1 is good combustion controls (GCC) to achieve an emission limit of 200 ppm (0.17 lb/MBtu) based on a 30-day rolling average.

Table 3-2
Proposed CO BACT Determinations for Nearman Unit 1

		Proposed CO BACT	
Unit	Control Technology	Limit (lb/MBtu)	Averaging Period
Unit 1	Good Combustion Controls (GCC)	0.17	30-day rolling

The proposed BACT determination is supported by the USEPA RBLC Clearinghouse database review presented in Section 3.3, where good combustion control practices for recently permitted LNB/OFA retrofit projects are documented as BACT for CO.

Attachment A
USEPA National Coal Projects Spreadsheet and RBLC Clearinghouse Database Search Results

CO Top Down RBLC and EPA National Coal Plant Spreadsheet Review Results

FACILITY	COMPANY	STATE	FUEL	SIZE (MW)	BOILER TECHNOLOGY	LIMIT (LB/MBTU)	AVERAGING PERIOD	CONTROL TECHNOLOGY	STATUS	NSR BASIS	DATA SOURCE
HIGHWOOD GENERATING STATION	SOUTHERN MONTANA ELECTRIC GENERATION & TRANSMISSION COOP	MT	Subbituminous	270	CFB	0.100	1-Hr	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
SUTHERLAND STATION UNIT 4	INTERSTATE POWER & LIGHT	IA	Subbituminous/ Bituminous Blend	650	PC	0.100	24-Hr	GCC	Draft Permit Feb 09 Cancelled	BACT-PSD	EPA National Coal Projects Spreadsheet Draft Permit
INDECK ELWOOD	INDECK ELWOOD	IL	Bituminous	2X330	CFB	0.100		GCC	Permit Issued - Under Appeal - EAB remand	BACT-PSD	EPA National Coal Projects Spreadsheet
TRIMBLE COUNTY GENERATINIG STATION	LOUISVILLE GAS & ELECTRIC COMPANY	KY	Subbituminous/ Bituminous Blend	750	PC	0.1 (0.5)	30-Day (3-Hr)	GCC	Permit Issued Feb 08	BACT-PSD	EPA National Coal Projects Spreadsheet
THOROUGHBRED GENERATING STATION	THOROUGHBRED GENERATING COMPANY, LLC (PEABODY)	KY	Bituminous	2X750	PC	0.100	30-Day	GCC	Permit Issued Apr 08 Under Appeal	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
DESERT ROCK ENERGY FACILITY	SITHE GLOBAL	NM	Subbituminous	2X750	PC	0.100	24-Hr	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet
TOQUOP	TOQUOP ENERGY PROJECT	NV	Subbituminous	750	PC	0.100	24-Hr	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
ELY ENERGY CENTER	SIERRA PACIFIC & NV POWER	NV	Subbituminous	2X750	PC	0.100	24-Hr	GCC	Prostponed	BACT-PSD	EPA National Coal Projects Spreadsheet
SPURLOCK POWER STA (UNIT 4)	EAST KENTUCKY POWER COOP., INC.	KY	Bituminous/Tires	300	CFB	0.100	30-Day	GCC	Permit Issued Mar 08	BACT-PSD	EPA National Coal Projects Spreadsheet
MAIDSVILLE	LONGVIEW POWER, LLC	WV	Bituminous	600	PC	0.110	3-Hr	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
SEVIER GENERATING STATION	NEVCO - SEVIER POWER COMPANY	UT	Subbituminous	270	CFB	0.1150	1-Hr	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
COLETO CREEK UNIT 2	IPA	TX	Subbituminous/ Bituminous Blend	750	PC	0.120	30-Day	GCC	Draft Permit	BACT-PSD	Draft Permit
CLIFFSIDE	DUKE ENERGY	NC	Subbituminous/ Bituminous Blend	2x800	PC	0.120	Stack Test	GCC	Permit Issued Jan 08	BACT-PSD	EPA National Coal Projects Spreadsheet
ELM ROAD GENERATING STATION (EXISTING OAK CREEK FACILITY	WISCONSIN ENERGY	WI	Subbituminous	2X615	PC	0.120		GCC	Permit Issued Jan 04	BACT-PSD	EPA National Coal Projects Spreadsheet
DALLMAN POWER PLANT	CITY OF SPRINGFIELD	IL:	Subbituminous	250	PC	0.120	3-Hr	GCC	Permit Issued	BACT-PSD	RBLC
KARN/WEADOCK STATION	CONSUMERS ENERGY	MI	Subbituminous	730	PC	0.125	30-Day	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
COMANCHE STATION (UNIT 3)	XCEL ENERGY	CO	Subbituminous	750	PC	0.130	8-Hr	GCC	Permit Issued Jul 05	BACT-PSD	EPA National Coal Projects Spreadsheet
BIG CAJUN II POWER PLANT	LOUISIANA GENERATING, LLC	LA	Subbituminous	675	PC	0.135	12-Month	GCC	Permit Issued Aug 05	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
IATAN GENERATING STATION (UNIT 2)	KANSAS CITY POWER & LIGHT	MO	Subbituminous	800	PC	0.140	30-Day	GCC	Permit Issued Jan 06	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC

CO Top Down RBLC and EPA National Coal Plant Spreadsheet Review Results

FACILITY	COMPANY	STATE	FUEL	SIZE (MW)	BOILER TECHNOLOGY	LIMIT (LB/MBTU)	AVERAGING PERIOD	CONTROL TECHNOLOGY	STATUS	NSR BASIS	DATA SOURCE
COTTONWOOD ENERGY CENTER	BHP BILLITON	NM	Subbituminous	500	PC	0.140		GCC	Postponed	BACT-PSD	EPA National Coal Projects Spreadsheet
DRY FORK STATION	BASIN ELECTRIC POWER COOP	WY	Subbituminous	385	PC	0.150	12-Month	GCC	Permit Issued	BACT-PSD	RBLC
NORBORNE	ASSOCIATED ELECTRIC COOPERATIVE	MO	Subbiuminous	690	PC	0.150		GCC	Permit Issued May 08 Postponed	BACT-PSD	EPA National Coal Projects Spreadsheet
PLANT WASHINGTON	POWER 4 GEORGIANS	GA	Subbituminous/ Bituminous Blend	850	PC	0.150	30-Day	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
WOLVERINE	WOLVERINE CLEAN ENERGY	MI	Coal	2X300	CFB	0.150	30-Day	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
VIRGINIA CITY HYBRID ENERGY CENTER	DOMINION	VA	Bituminous	2X300	CFB	0.150	30-Day	GCC	Permit Isssued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
SPIRITWOOD	GREAT RIVER ENERGY	WY	Subbituminous	40	CFB	0.150	30-Day	GCC	Permit Issued	BACT-PSD	RBLC
SPRINGERVILLE GENERATING STATION	TUCSON ELECTRIC POWER	AZ	Subbituminous	2x360	PC	0.150		GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet Permit
SOUTH HEART POWER PROJECT	GREAT NORTHERN POWER DEVELOPMENT	ND	Lignite	2X250	CFB	0.150		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
WYGEN 3	BLACK HILLS CORPORATION	WY	Subbituminous	100	PC	0.150		GCC	Permit Issued	BACT-PSD	RBLC
TS POWER PLANT	NEWMONT NEVADA ENERGY INVESTMENT, LLC	NV	PRB	200	PC	0.150	24-Hr	GCC	Permit Issued May 05	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
HOLCOMB POWER PLANT	SUNFLOWER ELECTRIC POWER	KS	PRB	3x700	PC	0.150		GCC	Draft Permit Under Appeal	BACT-PSD	EPA National Coal Projects Spreadsheet
INTERMOUNTAIN POWER GENERATING STATION - UNIT #3	INTERMOUNTAIN POWER SERVICE CORPORATION	UT	Subbituminous/Bituminous Blend	900	PC	0.150	30-Day	GCC	Permit Issued	BACT-PSD	RBLC
WYGEN 2	BLACK HILLS CORPORATION	WY	Subbituminous	500	PC	0.150	Stack Test	GCC	Permit Issued Sep 02	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
BEECH HOLLOW POWER PROJECT	ROBINSON POWER COMPANY LLC	PA	Waste Coal	250	CFB	0.150	30-Day	GCC	Permit Issued Under Appeal	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
DESERET	DESERET GENERATION & TRANSMISSION	UT	Waste Coal	110	CFB	0.150		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
HARDIN GENERATOR PROJECT	ROCKY MOUNTAIN POWER, INC.	MT	Subbituminous	116	PC	0.150	Stack Test	GCC	Permit Issued Jun 02	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
LAMAR LIGHT & POWER POWER PLANT	LAMAR UTILITIES BOARD DBA LAMAR LIGHT & POWER	CO	Subbituminous/Bituminous Blend	44	CFB	0.150	3-Hr (75.3 lb/h)	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
GLADES POWER PARK	FLORIDA POWER & LIGHT COMPANY	FL	Bituminous/Pet Coke	2X980	PC	0.150		GCC	Cancelled	BACT-PSD	EPA National Coal Projects Spreadsheet
WHITEPINE ENERGY STATION	LS POWER DEVELOPMENT	NV	PRB	3x530	PC	0.150	24-Hr	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
JOHN W. TURK JR. POWER PLANT	SOUTHWEST ELECTRIC POWER COMPANY	AR	PRB	600	PC	0.150		GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet
BULL MOUNTAIN, NO. 1, LLC - ROUNDUP POWER PROJECT	BULL MOUNTAIN DEV. COMPANY	MT	Subbituminous	2X390	PC	0.150	Stack Test	GCC	Permit Issued July 03	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC

CO Top Down RBLC and EPA National Coal Plant Spreadsheet Review Results

FACILITY	COMPANY	STATE	FUEL	SIZE (MW)	BOILER TECHNOLOGY	LIMIT (LB/MBTU)	AVERAGING PERIOD	CONTROL TECHNOLOGY	STATUS	NSR BASIS	DATA SOURCE
ESTILL COUNTY ENERGY PARTNERS	ESTILL COUNTY ENERGY PARTNERS	KY	Bituminous	110	CFB	0.150	30-Day	GCC	Cancelled	BACT-PSD	EPA National Coal Projects Spreadsheet
OHIO GENERATING STATION (UNITS 1 & 2)	AMERICAN MUNICIPAL POWER	OH	Subbituminous/ Bituminous Blend	2x480	PC	0.150	3-Hr	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
SPURLOCK POWER STA (UNIT 3)	EAST KENTUCKY POWER COOP., INC.	KY	Bituminous	270	CFB	0.150	30-Day	GCC	Permit Issued Jun 02	BACT-PSD	EPA National Coal Projects Spreadsheet
OTTER TAIL	OTTER TAIL POWER COMPANY	SD	Subbituminous	600	PC	0.150	Stack Test	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
PALATKA GENERATIING STATION	SEMINOLE ELECTRIC COORP	FL	Bituminous	800	PC	0.150	3-Hr	GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
WPS - WESTON PLANT (UNIT 4)	WISCONSIN PUBLIC SERVICE	WI	PRB	500	PC	0.150	24-Hr	GCC	Permit Issued Oct 04	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
WHELAN ENERGY CENTER	HASTINGS UTILITIES	NE	Subbituminous	220	PC	0.150	3-Hr	GCC	Permit Issued Mar 04	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
PRAIRIE STATE GENERATING STATION	PEABODY	IL	Bituminous	2X750	PC	0.150		GCC	Permit Issued Jan 05 Under Appeal	BACT-PSD	EPA National Coal Projects Spreadsheet
CALAVERAS LAKE STATION (J K SPRUCE)	CITY PUBLIC SERVICE OF SAN ANTONIO	TX	Subbituminous	750	PC	0.150		GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet
HUGO STATION	WESTERN FARMERS ELECTRIC COOP	OK	Subbituminous	750	PC	0.150		GCC	Permit Issued Feb 07 Postponed	BACT-PSD	EPA National Coal Projects Spreadsheet
MANITOWOC	MANITOWOC PUBLIC UTILITIES	WI	Coal/Pet Coke	64	CFB	0.150		GCC	Permit Issued Cancelled	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
LONGLEAF ENERGY ASSOCIATES	LS POWER DEVELOPMENT	GA	Subbituminous/ Bituminous Blend	2x600	PC	0.150	30-Day	GCC	Permit Issued May 07	BACT-PSD	EPA National Coal Projects Spreadsheet
TWIN OAKS POWER PLANT (UNIT 3)	SEMPRA GENERATION	TX	Lignite	600	PC	0.150		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
SANDY CREEK ENERGY STATION	SANDY CREEK ENERGY ASSOCIATES	TX	Subbituminous	800	PC	0.150		GCC	Permit issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
TXU UNITS (SEVERAL)	TXU	TX	Subbituminous	800	PC	0.150		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
PEE DEE GENERATING STATION	SANTEE COOPER	SC	Bituminous/Pet Coke	2X660	PC	0.150	Stack Test	GCC	Draft Permit Dec 07	BACT-PSD	EPA National Coal Projects Spreadsheet
FORMOSA	FORMOSA PLASTICS CORP	TX	Subbituminous/ Pet Coke	2X150	CFB	0.150		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
ELK RUN ENERGY STATION	LS POWER DEVELOPMENT	IA	Subbituminous/ Bituminous Blend	750	PC	0.150	30-Day	GCC	Cancelled	BACT-PSD	EPA National Coal Projects Spreadsheet Draft Application
OUC CURTIS H. STANTON ENERGY CENTER UNIT 2	OUC	FL	Coal	468	PC	0.150	30-Day	GCC	Permit Issued Feb 08	BACT-PSD LNB/OFA RETROFIT	RBLC
RAWHIDE ENERGY CENTER UNIT 1	PLATTE RIVER POWER AUTHORITY	CO	Coal		PC	0.150	8-Hr	GCC	Permit Issued Sep 06	BACT-PSD LNB/OFA RETROFIT	RBLC
GASCOYNE GENERATING STATION	MONTANA DAKOTA UTILITIES / WESTMORELAND POWER	ND	Lignite	175	CFB	0.154	3-Hr	GCC	Permit Issued Jun 05	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC

CO Top Down RBLC and EPA National Coal Plant Spreadsheet Review Results

FACILITY	COMPANY	STATE	FUEL	SIZE (MW)	BOILER TECHNOLOGY	LIMIT (LB/MBTU)	AVERAGING PERIOD	CONTROL TECHNOLOGY	STATUS	NSR BASIS	DATA SOURCE
COUNCIL BLUFFS	MIDAMERICAN ENERGY COMPANY	IA	PRB	790	PC	0.154	24-Hr	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
SANTEE COOPER CROSS GENERATING STATION	SANTEE COOPER	SC	Bituminous	2X660	PC	0.160	3-Hr	GCC	Permit Issued Feb 04	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
NEBRASKA CITY STATION	OMAHA PUBLIC POWER DISTRICT	NE	Subbituminous	660	PC	0.160	Stack Test	GCC	Permit Issued Mar 05	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
SOUTHWEST POWER STATION	CITY UTILITIES OF SPRINGFIELD	MO	Subbituminous	275	PC	0.160	3-Hr	GCC	Permit Issued Dec 04	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
PLUM POINT	PLUM POINT ASSOCIATES, LLC	AR	Subbituminous	2x800	PC	0.160		GCC	Permit Issued Aug 03	BACT-PSD	RBLC
OTTUMWA GENERATING STATION BOILER # 1	IOWA POWER AND LIGHT	IA	Subbituminous		PC	0.163	30-Day	GCC	Permit Issued Feb 07	BACT-PSD LNB/OFA RETROFIT	RBLC
LIMESTONE PLANT	NRG	TX	Subbituminous	800	PC	0.170		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
OAK GROVE (UNITS 1 & 2)	TXU	TX	Lignite	2x800	PC	0.170		GCC	Proposed	BACT-PSD	EPA National Coal Projects Spreadsheet
CRYSTAL RIVER POWER PLANT UNITS 4 & 5	PROGRESS ENERGY	FL	Coal	760 Total		0.170	30-Day	GCC	Permit Issued May 07	BACT-PSD LNB/OFA RETROFIT	RBLC
OUC CURTIS H. STANTON ENERGY CENTER UNIT 1	OUC	FL	Coal	468	PC	0.180	30-Day	GCC	Permit Issued Feb 08	BACT-PSD LNB/OFA RETROFIT	RBLC
GREENE ENERGY RESOURCE RECOVERY PROJECT	WELLINGTON DEV/GREENE ENERGY	PA	Waste Coal	2X250	CFB	0.200		GCC	Permit Issued Under Appeal	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
WESTERN GREENBRIER	WESTERN GREENBRIER CO-GENERATION, LLC	WV	Waste Coal	98	CFB	0.200	24-Hr	GCC	Permit Issued	BACT-PSD	RBLC
BIG BEND STATION UNIT 4	TAMPA ELECTRIC COMPANY BIG BEND STATION	FL	Coal/Pet Coke			0.200	30-Day	GCC	Permit Issued May 07	BACT-PSD LNB/OFA RETROFIT	RBLC
MCINTOSH. POWER PLANT UNIT 3	LAKELAND ELECTRIC	FL	Coal/Pet Coke	364		0.200	30-Day	GCC	Permit Issued Dec 06	BACT-PSD LNB/OFA RETROFIT	RBLC
DOLET HILLS POWER STATION	CLECO CORP	LA	Lignite			0.200	30-Day	GCC	Permit Issued Nov 06	BACT-PSD LNB/OFA RETROFIT	RBLC
DAVE JOHNSON UNIT 4	PACIFICORP	WY	Subbituminous			0.200	30-Day	GCC	Permit Issued Jun 08	BACT-PSD LNB/OFA RETROFIT	RBLC
RIVER HILL POWER COMPANY, LLC	RIVER HILL POWER COMPANY, LLC	PA	Waste Coal	290	CFB	0.200	12-Month	GCC	Permit Issued	BACT-PSD	EPA National Coal Projects Spreadsheet RBLC
TECUMSEH ENERGY CENTER UNITS 7/9 & 8/10	WESTAR ENERGY	KS	Subbituminous		PC	0.250	30-Day	GCC	Permit Issued	BACT-PSD LNB/OFA RETROFIT	Permit Application
JEFFREY ENERGY CENTER UNIT 3	WESTAR ENERGY	KS	Subbituminous		PC	0.250	30-Day	GCC	Permit Issued Oct 05	BACT-PSD LNB/OFA RETROFIT	Permit

CO Top Down RBLC and EPA National Coal Plant Spreadsheet Review Results

FACILITY	COMPANY	STATE	FUEL	SIZE (MW)	BOILER TECHNOLOGY	LIMIT (LB/MBTU)	AVERAGING PERIOD	CONTROL TECHNOLOGY	STATUS	NSR BASIS	DATA SOURCE
DAVE JOHNSON UNIT 3	PACIFICORP	WY	Subbituminous			0.250	30-Day	GCC	Permit Issued Jun 08	BACT-PSD LNB/OFA RETROFIT	RBLC
NAUGHTON PLANT UNITS 1 & 2	PACIFICORP	WY	Subbituminous			0.250	30-Day	GCC	Permit Issued May 09	BACT-PSD LNB/OFA RETROFIT	RBLC
WYODAK PLANT UNIT 1	PACIFICORP	WY	Subbituminous			0.250	30-Day	GCC	Permit Issued May 09	BACT-PSD LNB/OFA RETROFIT	RBLC
TES FILER CITY STATIOIN	CONSUMERS ENERGY	MI	Coal	54	PC	0.300	24-Hour	GCC	Permit Issued Jun 10	BACT-PSD OFA CHANGE AVG TIME	RBLC
HARRINGTON STATION UNIT 1	SOUTHWEST PUBLIC SERVICE COMPANY	TX	Coal	289	PC	0.330	30-Day	GCC	Permit Issued Jan 10	BACT-PSD LNB/OFA RETROFIT	RBLC
LIMESTONE PLANT UNITS 1 AND 2	NRG TEXAS POWER LLC	TX	Coal/Pet Coke		PC	0.330		GCC	Permit Issued Feb 10	BACT-PSD LNB/OFA TUNING	RBLC
JAMES RIVER POWER STATION UNITS 3, 4 & 5	CITY UTILITIES OF SPRINGFIELD	MO	Subbituminous	253	PC	0.350	30-Day	GCC	Permit Issued Dec 06	BACT-PSD LNB/OFA RETROFIT	Permit
NEAL ENERGY CENTER SOUTH UNIT 4	MIDAMERICAN ENERGY COMPANY	IA	Coal			0.420	1 Calander Day	GCC	Permit Issued Sep 05	BACT-PSD LNB/OFA RETROFIT	RBLC
NEBRASKA CITY STATION UNIT 1	OMAHA PUBLIC POWER DISTRICT	NE	Subbituminous			0.500	30-Day	GCC	Permit Issued Feb 09	BACT-PSD LNB/OFA RETROFIT	RBLC
CORONADO GENERATING STATION UNITS 1 & 2	SALT RIVER PROJECT	AZ	Coal			0.500	30-Day	GCC	Permit Issued Jan 09	BACT-PSD LNB/OFA RETROFIT	RBLC
GERALD GENTLEMAN STATION UNIT 1	NEBRASKA PUBLIC POWER DISTRICT	NE	Subbituminous			0.500	30-Day	GCC	Permit Issued Aug 06	BACT-PSD LNB/OFA RETROFIT	Permit
GEORGE NEAL NORTH UNIT 1	MIDAMERICAN ENERGY COMPANY	IA	Coal			1.260	3-Hr	GCC	Permit Issued Dec 05	BACT-PSD OFA RETROFIT	RBLC

Data Sources: RBLC, EPA National Coal Project Spreadsheet (Aug 24, 2009 Version), Draft and Final Air Permits

Appendix D
Air Dispersion Modeling Protocol

KANSAS

DEPARTMENT OF HEALTH
AND ENVIRONMENT
Division of Environment

Mark Parkinson, Governor
Roderick L. Bremby, Secretary

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May 25, 2010

Source ID No. 2090008 BPU- Nearman
2090048 BPU- Quindaro

John D. Frick
Director of Electric Production Engineering
Kansas City Board of Public Utilities
3601 N. 12th Street
Kansas City, KS 66104

RE: Air Quality Prevention of Significant Deterioration (PSD) Permit Modeling Protocol

Dear Mr. Frick:

KDHE has reviewed the modeling protocol submitted by the Kansas City Board of Public Utilities (BPU) on May 6, 2010. We do not have any comments about the submitted protocol at this time.

If you have any questions or need any additional information, please contact me at (785) 296-0365. Please include the source ID numbers listed above in all communications with KDHE in reference to these facilities.

Sincerely,

Sergio Guerra

Sergio Guerra
Engineering Associate
Air Permitting Section

SG:saw
c: Timothy M. Hillman, Black & Veatch
Bruce Andersen, WYCO

DIVISION OF ENVIRONMENT
Bureau of Air
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Kansas City Board of Public Utilities

Kansas City Board of Public Utilities

LNB/OFA PROJECT

NEARMAN CREEK POWER STATION – UNIT 1

QUINDARO POWER STATION – UNIT 2

AIR DISPERSION MODELING PROTOCOL

May 2010

BLACK & VEATCH

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Table of Contents

1.0 Project Overview

The Kansas City's Ozone Maintenance Plan requires the Kansas City Board of Public Utilities (BPU) to reduce the NO_X emissions at two of their existing electric generating facilities located in Kansas City, Kansas; specifically their Nearman Creek Power Station (Nearman) and Quindaro Power Station (Quindaro) (See Figure 1-1). To comply with the Kansas City's Ozone Maintenance Plan, BPU is proposing to reduce NO_X emissions on Nearman Unit 1 and Quindaro Unit 2 through the use of low NO_X burners (LNB)/overfire air (OFA) combustion control methods (hereinafter referred to as the NO_X Reduction Project).

BPU anticipates that the NO_X Reduction Project will trigger air permitting review requirements under the Prevention of Significant Deterioration (PSD) program of Kansas Administrative Regulations, Agency 28, Article 19, Section 350 (K.A.R. 28-19-350) for each facility (herein after each review will be referred to as the Project). This Ambient Air Quality Impact Analysis (AAQIA) Protocol (hereinafter referred to as the Protocol) describes the air quality impact analysis methodology for obtaining a construction permit for the proposed Project under the PSD review program. After Kansas Department of Health and Environment's (KDHE) review and approval, this Protocol will provide the basis of a mutually agreed upon procedure for the final ambient air quality impact analysis in support of the air construction permit application.

This Protocol describes site and source characteristics, the determination of pollutants applicable to the air quality review, and the analytical procedures that will be used to conduct the ambient air quality impact analysis. The construction permit application and supporting AAQIA will include a determination of compliance with the National Ambient Air Quality Standards (NAAQS), New Source Performance Standards (NSPS), the PSD increments, as well as an assessment of additional impacts.

1.1 Regulatory Applicability

The federal Clean Air Act (CAA) New Source Review (NSR) provisions are implemented for new major stationary sources and major modifications at existing major sources under two programs; the PSD program outlined in 40 CFR 52.21 for areas in attainment, and the NSR program outlined in 40 CFR 51 and 52 for areas considered nonattainment for certain pollutants.

The air quality in a given area is generally designated as being in attainment for a pollutant if the monitored concentrations of that pollutant are less than the applicable NAAQS. Likewise, a given area is generally classified as nonattainment for a pollutant if the monitored concentrations of that pollutant in the area are above the NAAQS. A review of the air quality status in the region reveals that Wyandotte County (the Project location) 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. It is possible that Wyandotte County could be classified as nonattainment for ozone during the permitting effort for this Project. Should this occur the precursors to ozone (NO_X and VOC) would need to be evaluated with respect to the nonattainment regulations mentioned previously. However, since this Project is for the installation of LNB/OFA which will result in reductions in NO_X with no impact to VOC, the project would not be expected to trigger nonattainment NSR review and as such any change in the attainment status during the permitting effort would be mute.

The PSD regulations are designed to ensure that the air quality in existing attainment areas does not significantly deteriorate or exceed the NAAQS while providing a margin for future industrial and commercial growth. The primary provisions of the PSD regulations require that major modifications and new major stationary sources be carefully reviewed prior to construction to ensure compliance with the NAAQS, the applicable PSD air quality increments, and the requirements to apply Best Available Control Technology (BACT) to minimize the emissions of air pollutants.

A major stationary source is defined as any one of the listed major source categories which emits, or has the potential to emit (PTE), 100 tons per year (tpy) or more of any regulated pollutant, or 250 tpy or more of any regulated pollutant if the stationary source does not fall under one of the listed major source categories. Both the Nearman and Quindaro facilities are one of the 28 major source categories (i.e., fossil fuel fired steam electric plant) and has a PTE greater than 100 tpy for at least one regulated pollutant; therefore, each are considered an existing major PSD source.

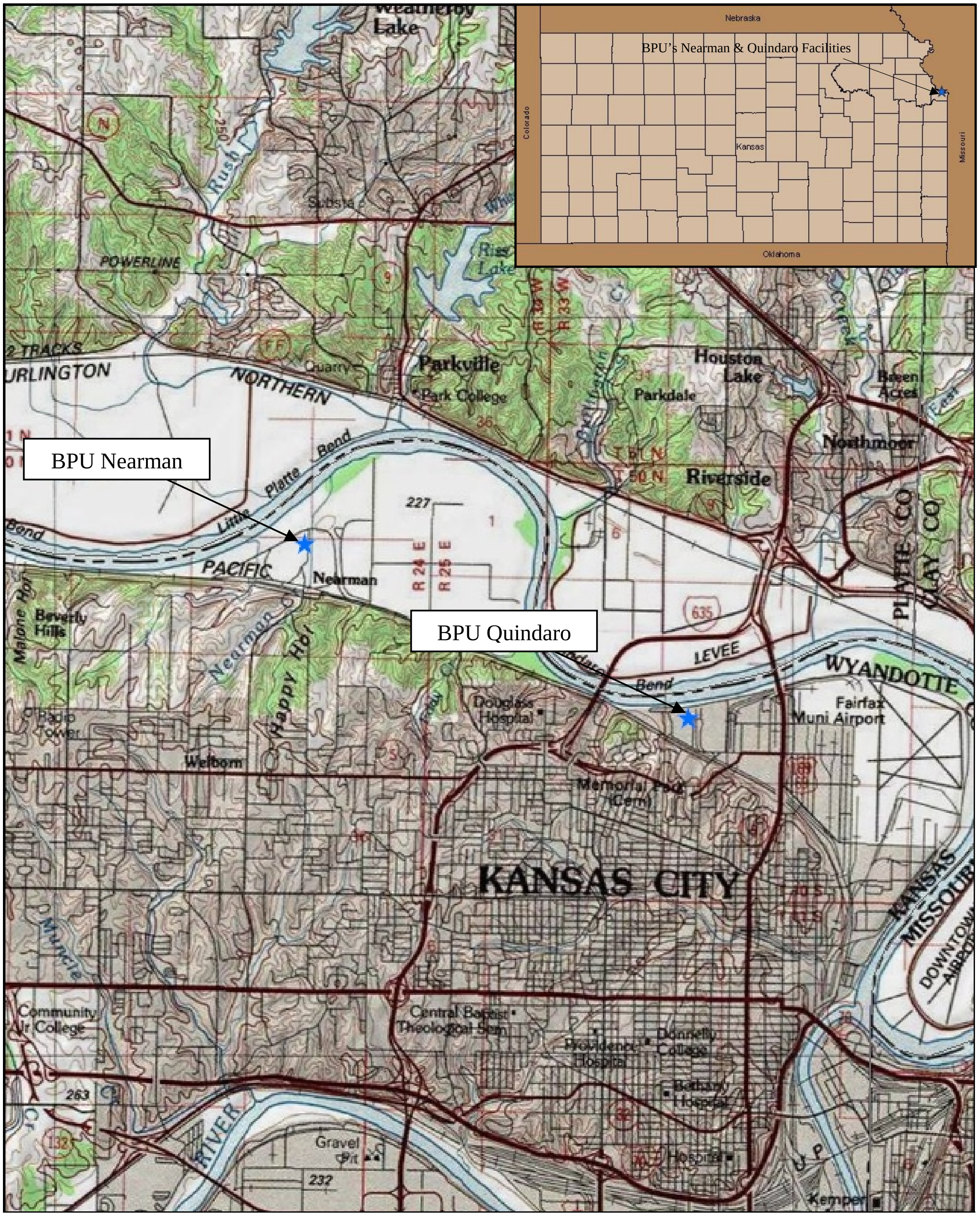


Figure 1-1 Site Location

Because the proposed Project is located at an existing major stationary source, PSD applicability is determined on a pollutant-by-pollutant basis by comparing the emissions increase of each pollutant against the PSD significant emission rates (SERs). The PSD SERs are presented in Table 1-1.

A project must have both an emissions increase and a net emissions increase above the PSD SER (on a pollutant-by-pollutant basis) for PSD to apply to the project. Due to the nature of the proposed Project, it is expected that the emissions of CO will exceed the PSD SER threshold for the proposed Project; therefore, the Project will be required to perform a BACT analysis along with an AAQIA for CO. The remainder of this document describes the methodologies to be used in performing the AAQIA for the proposed Project.

Table 1-1
PSD Significant Emission Rates

Pollutant	PSD SER [1] (tpy)
Nitrogen Oxides (NO_X)	40
Sulfur Dioxide (SO_2)	40
Particulate Matter (PM)	25
Particulate Matter less than 10 microns (PM_{10})	15
Carbon Monoxide (CO)	100
Ozone (O_3) –Volatile Organic Compounds (VOC) or NO_X	40
Lead (Pb)	0.6 [2]
Fluorides (F)	3
Sulfuric Acid Mist (H_2SO_4)	7
Total Reduced Sulfur Compounds	10

Notes [ ]:
1. SERs are defined in 40 CFR §52.21(b)(23)(i), as revised on July 1, 2007, as adopted by reference in K.A.R. 28-19-350(b)(1).
2. The significant emission rate for lead was changed from 0.6 tpy to 1.0 tpy as referenced in the November 12, 2008, Federal Register. However, since Kansas is an approved SIP state, the current Kansas SIP has the 0.6 tpy limit. Therefore, the more restrictive 0.6 tpy limit will be utilized. “National Ambient Air Quality Standards for Lead; Final Rule”. 73 FR 219 (November 12, 2008), pp. 66964 – 67062.

2.0 Ambient Air Quality Analysis

Air Dispersion Model: SCREEN3 (Latest version)

Pollutant Averaging Periods: Since SCREEN3 can only predict the 1-hour averaging concentration in simple terrain and the 24-hour averaging concentration in complex terrain, the EPA document *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised*[1] will be utilized to obtain the scaling factors which will be used to determine the appropriate averaging period impacts for all applicable pollutants.

Model Options: USEPA recommended regulatory default options.

Dispersion Coefficients: The USEPA's Auer land use method will be used to determine whether rural or urban dispersion coefficients will be used in the SCREEN3 air dispersion model. In this procedure, land circumscribed within a 3 km radius of the site is classified as rural or urban using the Auer land use classification method. If rural land use types account for more than 50 percent of the land use area within the 3 km radius, then the rural dispersion coefficient option should be used. Otherwise, the urban coefficients are used.

Based on visual inspection of the USGS 7.5-minute topographic map of the proposed Project site location, illustrated in Figure 1-1, it is conservatively concluded that over 50 percent of the area surrounding the proposed Project may be classified as rural. Accordingly, the rural dispersion modeling option will be used in the SCREEN3 model.

[1] US EPA Office of Air and Radiation. "Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised". EPA-454/R-92-019. Research Triangle Park, NC. October 1992.

GEP & Downwash: The applicability of building downwash will be determined for the proposed Project and if necessary the effects of building downwash will be included.

Receptor Grids: The automated distance array option of SCREEN3 will be selected to allow the model to use an iteration routine to determine the maximum impact and its associated distance. SCREEN3 allows the user to set a minimum and maximum distance; therefore, the minimum distance will be set equal to the distance from the applicable emission source to the closest fence line and the maximum distance will be set equal to 20 km which will ensure that the maximum concentration is found.

Terrain Considerations: As mentioned previously, the SCREEN3 model will be set to determine impacts out to a distance of 20 km from the applicable emission source. A review of Digital Elevation Model (DEM) files concluded that complex terrain does not exist within this distance, as such; the complex terrain option will not be utilized.

For simple elevated terrain calculations, it will be conservatively assumed that the terrain elevation is equal to the maximum elevation within several concentric rings, out to 20 km from the applicable emission source.

Meteorological Data: For simple elevated terrain, SCREEN3 has the following options of meteorology: (1) full meteorology, (2) specifying a single stability class, or (3) specifying a single stability class and wind speed. For option (1) full meteorology, SCREEN3 examines a range of stability classes and wind speeds to identify the worst-case meteorological conditions. Option 1 will be selected since it results in the model-predicted maximum ground-level concentration.

Pollutants to be Modeled: As mentioned in Section 1.1, CO is the only pollutant that is expected to be subject to the PSD requirements and thus require an AAQIA.

Source Modeling Parameters: Boiler performance data taken from the current annual Emissions Inventory report will be used in the modeling analyses. The emission rate will be based on burner data from vendors.

Significant Impact Area: It is anticipated that the maximum model predicted CO impacts will be less than their respective PSD SILs. However, if a predicted impact of one or more applicable averaging periods is greater than the PSD SILs, then a refined modeling protocol will be proposed.

Preconstruction Monitoring: It is anticipated that the maximum model predicted CO 8-hour impact will be less than the applicable PSD significant monitoring concentration and the net emission increase of VOC will be less than 100 tpy. Therefore, an exemption from pre-application monitoring requirements is requested.

Additional Impacts: An analysis considering the impairment to soils and vegetation, as well as projected air quality impacts that may occur as the result of general commercial, residential, industrial, and other growth associated with the new major stationary source will be performed. The USEPA document *A Screening Procedure for the Impacts of Air Pollution Sources on Plant, Soils, and Animals*[2] will serve as a basis for assessing the vegetation and soil impacts.

As the Project will not result in an increase of emissions of any visibility impairing pollutants, visibility analyses are not proposed.

[2] US EPA Office of Air and Radiation. "A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals". EPA-450/2-81-078. Research Triangle Park, NC. December, 1980.

Appendix E
Attachments

Appendix E
Attachments

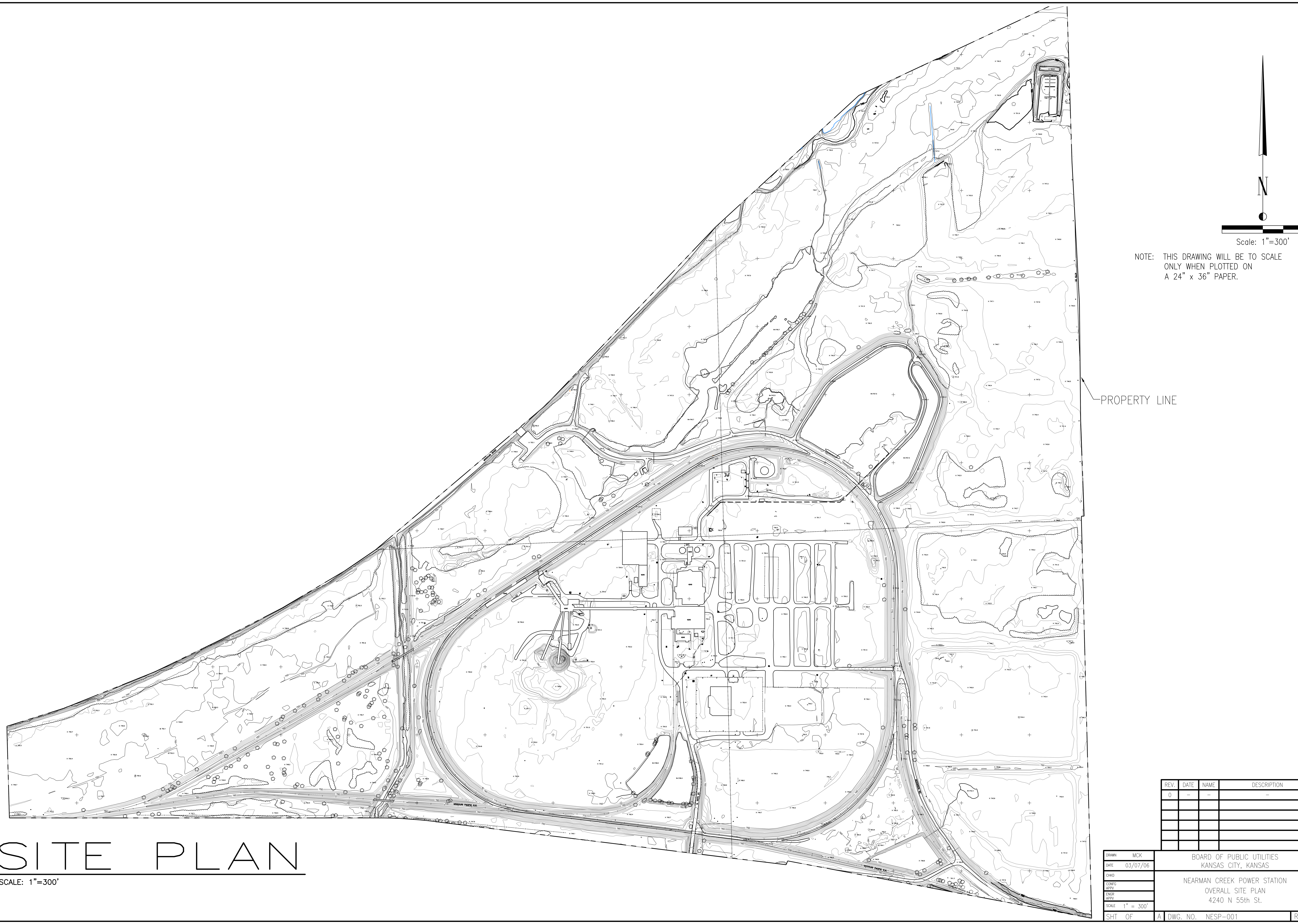
This appendix provides the following attachments:

Attachment A: Area Map

Attachment C: Process Flow Diagram

Attachment D: NRCS Plant Species

Attachment E: NRCS Soil Survey



SITE PLAN

SCALE: 1"=300'

REV.	DATE	NAME	DESCRIPTION
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DRAWN	MCK	BOARD OF PUBLIC UTILITIES KANSAS CITY, KANSAS
DATE	03/07/06	
CHKD		NEARMAN CREEK POWER STATION OVERALL SITE PLAN 4240 N 55th St.
CONFG APPV		
ENGR APPV		
SCALE	1" = 300'	
SHT OF	A	DWG. NO. NESP-001 REV

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Scale: 1:200

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DATE	3/23/07
CHKD	—
CONFG APPV	—
ENGR APPV	—
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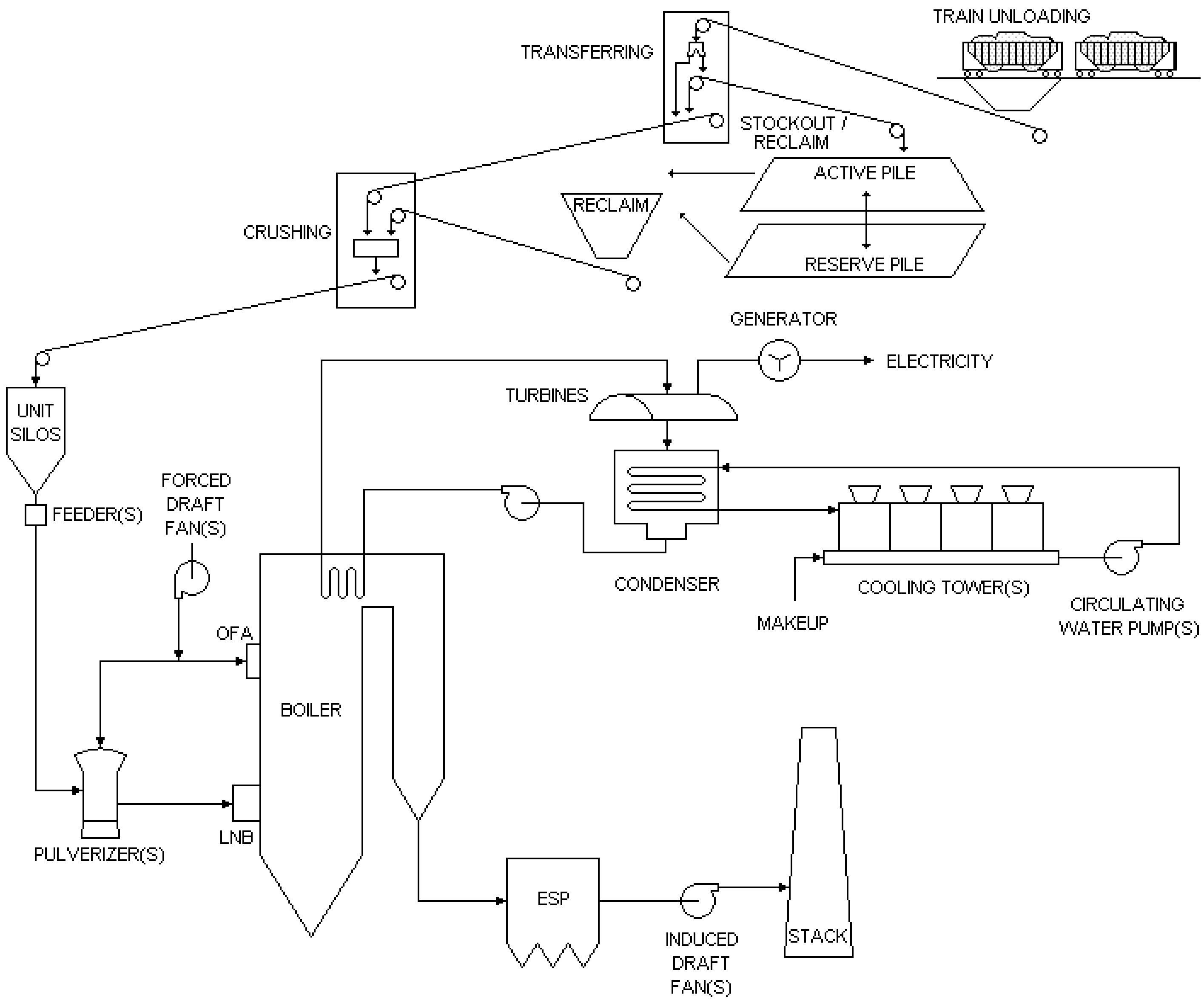
Sheet 1 of 12	

Kansas City Board of Public Utilities

BOARD OF PUBLIC UTILITIES
NEARMAN CREEK POWER STATION
UNDERGROUND DISTRIBUTION

DWG. NO. OVERALL REV 1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ACTIVE PILE
RECLAIM
CRUSHING
RESERVE PILE
GENERATOR
ELECTRICITY
TURBINES
UNIT SILOS
FORCED DRAFT FAN(S)
FEEDER(S)
CONDENSER
COOLING TOWER(S)
MAKEUP
CIRCULATING WATER PUMP(S)
OFA
BOILER
PULVERIZER(S)
LNB
ESP
STACK
INDUCED DRAFT FAN(S)

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Scientific Name	County
Abutilon	KS(Wyandotte), MO(Platte)
Abutilon theophrasti	KS(Wyandotte), MO(Platte)
Acalypha	KS(Wyandotte), MO(Platte)
Acalypha monococca	KS(Wyandotte)
Acalypha rhomboidea	KS(Wyandotte), MO(Platte)
Acalypha virginica	KS(Wyandotte), MO(Platte)
Acer	KS(Wyandotte), MO(Platte)
Acer negundo	KS(Wyandotte), MO(Platte)
Acer negundo var. interius	MO(Platte)
Acer negundo var. negundo	MO(Platte)
Acer saccharinum	KS(Wyandotte), MO(Platte)
Acer saccharum	KS(Wyandotte), MO(Platte)
Acer saccharum var. saccharum	KS(Wyandotte)
Acer saccharum var. schneckii	MO(Platte)
Achillea	KS(Wyandotte), MO(Platte)
Achillea millefolium	KS(Wyandotte), MO(Platte)
Achillea millefolium var. occidentalis	KS(Wyandotte)
Acorus	MO(Platte)
Acorus calamus	MO(Platte)
Adiantum	KS(Wyandotte)
Adiantum pedatum	KS(Wyandotte)
Aegilops	KS(Wyandotte)
Aegilops cylindrica	KS(Wyandotte)
Aesculus	KS(Wyandotte), MO(Platte)

Aesculus glabra	KS(Wyandotte), MO(Platte)
Aesculus glabra var. arguta	KS(Wyandotte), MO(Platte)
Aesculus glabra var. glabra	KS(Wyandotte), MO(Platte)
Agastache	KS(Wyandotte), MO(Platte)
Agastache nepetoides	KS(Wyandotte), MO(Platte)
Ageratina	KS(Wyandotte), MO(Platte)
Ageratina altissima	KS(Wyandotte), MO(Platte)
Ageratina altissima var. altissima	KS(Wyandotte), MO(Platte)
Agrimonia	KS(Wyandotte), MO(Platte)
Agrimonia pubescens	KS(Wyandotte), MO(Platte)
Agrimonia rostellata	KS(Wyandotte), MO(Platte)
Agrostemma	MO(Platte)
Agrostemma githago	MO(Platte)
Agrostis	KS(Wyandotte)
Agrostis hyemalis	KS(Wyandotte)
Agrostis perennans	KS(Wyandotte)
Agrostis stolonifera	KS(Wyandotte)
Ailanthus	KS(Wyandotte), MO(Platte)
Ailanthus altissima	KS(Wyandotte), MO(Platte)
Alcea	KS(Wyandotte)
Alcea rosea	KS(Wyandotte)
Alisma	KS(Wyandotte)
Alisma subcordatum	KS(Wyandotte)
Allium	KS(Wyandotte), MO(Platte)
Allium canadense	KS(Wyandotte), MO(Platte)
Allium canadense var. canadense	KS(Wyandotte)
Allium canadense var. lavandulare	KS(Wyandotte), MO(Platte)
Allium vineale	KS(Wyandotte), MO(Platte)
Allium vineale ssp. vineale	KS(Wyandotte)
Alopecurus	KS(Wyandotte)
Alopecurus carolinianus	KS(Wyandotte)
Amaranthus	KS(Wyandotte), MO(Platte)
Amaranthus albus	KS(Wyandotte)
Amaranthus blitoides	KS(Wyandotte), MO(Platte)
Amaranthus hybridus	MO(Platte)
Amaranthus palmeri	KS(Wyandotte)
Amaranthus retroflexus	KS(Wyandotte), MO(Platte)
Amaranthus spinosus	KS(Wyandotte)
Amaranthus tuberculatus	KS(Wyandotte), MO(Platte)
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Ambrosia artemisiifolia	KS(Wyandotte), MO(Platte)
Ambrosia artemisiifolia var. elatior	KS(Wyandotte), MO(Platte)
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Ambrosia psilostachya	KS(Wyandotte), MO(Platte)

Ambrosia trifida	KS(Wyandotte), MO(Platte)
Ammannia	KS(Wyandotte), MO(Platte)
Ammannia coccinea	KS(Wyandotte), MO(Platte)
Amorpha	KS(Wyandotte), MO(Platte)
Amorpha canescens	KS(Wyandotte)
Amorpha fruticosa	KS(Wyandotte), MO(Platte)
Ampelopsis	KS(Wyandotte), MO(Platte)
Ampelopsis cordata	KS(Wyandotte), MO(Platte)
Amphiachyris	MO(Platte)
Amphiachyris dracunculoides	MO(Platte)
Amphicarpaea	KS(Wyandotte), MO(Platte)
Amphicarpaea bracteata	KS(Wyandotte), MO(Platte)
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Anagallis arvensis	KS(Wyandotte), MO(Platte)
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Anemone	KS(Wyandotte), MO(Platte)
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Anemone virginiana	KS(Wyandotte), MO(Platte)
Anemone virginiana var. virginiana	KS(Wyandotte), MO(Platte)
Antennaria	KS(Wyandotte), MO(Platte)
Antennaria neglecta	KS(Wyandotte), MO(Platte)
Antennaria parlinii	KS(Wyandotte), MO(Platte)
Antennaria parlinii ssp. fallax	KS(Wyandotte), MO(Platte)
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Astragalus canadensis var. canadensis	KS(Wyandotte), MO(Platte)
Atriplex	KS(Wyandotte)
Atriplex argentea	KS(Wyandotte)

Atriplex argentea ssp. argentea	KS(Wyandotte)
Atriplex argentea ssp. argentea var. argentea	KS(Wyandotte)
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Azolla mexicana	MO(Platte)
Baptisia	KS(Wyandotte), MO(Platte)
Baptisia alba	KS(Wyandotte), MO(Platte)
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Baptisia australis var. minor	KS(Wyandotte)
Baptisia bracteata	KS(Wyandotte)
Baptisia bracteata var. leucophaea	KS(Wyandotte)
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Bidens bipinnata	KS(Wyandotte), MO(Platte)
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Bidens frondosa	KS(Wyandotte)
Bidens tripartita	KS(Wyandotte), MO(Platte)
Bidens vulgata	MO(Platte)
Blephilia	KS(Wyandotte), MO(Platte)
Blephilia ciliata	KS(Wyandotte)
Blephilia hirsuta	KS(Wyandotte), MO(Platte)
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Brassica nigra	KS(Wyandotte), MO(Platte)
Brickellia	KS(Wyandotte), MO(Platte)
Brickellia eupatorioides	KS(Wyandotte), MO(Platte)
Brickellia eupatorioides var. corymbulosa	KS(Wyandotte)
Bromus	KS(Wyandotte), MO(Platte)
Bromus arvensis	KS(Wyandotte), MO(Platte)
Bromus inermis	KS(Wyandotte), MO(Platte)
Bromus inermis ssp. inermis	KS(Wyandotte), MO(Platte)
Bromus inermis ssp. inermis var. inermis	KS(Wyandotte), MO(Platte)
Bromus pubescens	KS(Wyandotte), MO(Platte)
Bromus racemosus	KS(Wyandotte)
Bromus secalinus	KS(Wyandotte)
Bromus secalinus var. secalinus	KS(Wyandotte)
Bromus tectorum	KS(Wyandotte), MO(Platte)
Buglossoides	KS(Wyandotte), MO(Platte)
Buglossoides arvensis	KS(Wyandotte), MO(Platte)
Callirhoe	KS(Wyandotte), MO(Platte)
Callirhoe alcaeoides	MO(Platte)
Callirhoe involucrata	KS(Wyandotte)
Calylophus	KS(Wyandotte)
Calylophus serrulatus	KS(Wyandotte)
Calystegia	KS(Wyandotte), MO(Platte)
Calystegia hederacea	MO(Platte)
Calystegia sepium	KS(Wyandotte), MO(Platte)
Calystegia sepium ssp. angulata	KS(Wyandotte), MO(Platte)
Camelina	KS(Wyandotte), MO(Platte)
Camelina microcarpa	KS(Wyandotte), MO(Platte)
Campanulastrum	KS(Wyandotte), MO(Platte)
Campanulastrum americanum	KS(Wyandotte), MO(Platte)
Campsis	KS(Wyandotte), MO(Platte)
Campsis radicans	KS(Wyandotte), MO(Platte)
Cannabis	KS(Wyandotte), MO(Platte)
Cannabis sativa	KS(Wyandotte), MO(Platte)
Cannabis sativa ssp. sativa	KS(Wyandotte), MO(Platte)
Cannabis sativa ssp. sativa var. sativa	KS(Wyandotte)
Capsella	KS(Wyandotte), MO(Platte)
Capsella bursa-pastoris	KS(Wyandotte), MO(Platte)
Cardamine	KS(Wyandotte), MO(Platte)

Cardamine concatenata	KS(Wyandotte), MO(Platte)
Cardaria	MO(Platte)
Cardaria draba	MO(Platte)
Cardiospermum	KS(Wyandotte)
Cardiospermum halicacabum	KS(Wyandotte)
Carduus	KS(Wyandotte)
Carduus nutans	KS(Wyandotte)
Carex	KS(Wyandotte), MO(Platte)
Carex aggregata	MO(Platte)
Carex albicans	KS(Wyandotte)
Carex albicans var. albicans	KS(Wyandotte)
Carex blanda	KS(Wyandotte), MO(Platte)
Carex brevior	KS(Wyandotte), MO(Platte)
Carex cephalophora	KS(Wyandotte), MO(Platte)
Carex comosa	MO(Platte)
Carex conjuncta	KS(Wyandotte), MO(Platte)
Carex cristatella	KS(Wyandotte), MO(Platte)
Carex crus-corvi	KS(Wyandotte)
Carex davisii	KS(Wyandotte), MO(Platte)
Carex frankii	KS(Wyandotte), MO(Platte)
Carex granularis	KS(Wyandotte)
Carex gravida	KS(Wyandotte)
Carex gravida var. lunelliana	KS(Wyandotte)
Carex grayi	MO(Platte)
Carex grisea	KS(Wyandotte), MO(Platte)
Carex hirtifolia	KS(Wyandotte)
Carex hitchcockiana	KS(Wyandotte), MO(Platte)
Carex hyalinolepis	KS(Wyandotte), MO(Platte)
Carex jamesii	KS(Wyandotte), MO(Platte)
Carex laeviconica	MO(Platte)
Carex lupulina	KS(Wyandotte), MO(Platte)
Carex molesta	KS(Wyandotte), MO(Platte)
Carex muehlenbergii	KS(Wyandotte), MO(Platte)
Carex muehlenbergii var. enervis	KS(Wyandotte), MO(Platte)
Carex muskingumensis	KS(Wyandotte)
Carex normalis	KS(Wyandotte)
Carex oligocarpa	KS(Wyandotte), MO(Platte)
Carex praegracilis	KS(Wyandotte)
Carex radiata	MO(Platte)
Carex rosea	KS(Wyandotte), MO(Platte)
Carex shortiana	KS(Wyandotte), MO(Platte)
Carex sparganioides	KS(Wyandotte), MO(Platte)
Carex stipata	KS(Wyandotte), MO(Platte)
Carex stipata var. stipata	KS(Wyandotte)

Carex sychnocephala	MO(Platte)
Carex texensis	KS(Wyandotte)
Carex tribuloides	MO(Platte)
Carex vulpinoidea	KS(Wyandotte), MO(Platte)
Carex vulpinoidea var. vulpinoidea	KS(Wyandotte), MO(Platte)
Carya	KS(Wyandotte), MO(Platte)
Carya alba	MO(Platte)
Carya cordiformis	KS(Wyandotte), MO(Platte)
Carya illinoinensis	KS(Wyandotte), MO(Platte)
Carya laciniosa	KS(Wyandotte)
Carya ovata	KS(Wyandotte), MO(Platte)
Catalpa	MO(Platte)
Catalpa bignonioides	MO(Platte)
Ceanothus	KS(Wyandotte)
Ceanothus americanus	KS(Wyandotte)
Ceanothus herbaceus	KS(Wyandotte)
Celastrus	KS(Wyandotte), MO(Platte)
Celastrus scandens	KS(Wyandotte), MO(Platte)
Celosia	MO(Platte)
Celosia argentea	MO(Platte)
Celtis	KS(Wyandotte), MO(Platte)
Celtis occidentalis	KS(Wyandotte), MO(Platte)
Cenchrus	KS(Wyandotte), MO(Platte)
Cenchrus longispinus	KS(Wyandotte), MO(Platte)
Centaurea	KS(Wyandotte)
Centaurea solstitialis	KS(Wyandotte)
Cephalanthus	KS(Wyandotte), MO(Platte)
Cephalanthus occidentalis	KS(Wyandotte), MO(Platte)
Cerastium	KS(Wyandotte), MO(Platte)
Cerastium fontanum	KS(Wyandotte), MO(Platte)
Cerastium fontanum ssp. vulgare	KS(Wyandotte), MO(Platte)
Cerastium nutans	KS(Wyandotte), MO(Platte)
Cerastium nutans var. nutans	KS(Wyandotte), MO(Platte)
Ceratophyllum	MO(Platte)
Ceratophyllum demersum	MO(Platte)
Cercis	KS(Wyandotte), MO(Platte)
Cercis canadensis	KS(Wyandotte), MO(Platte)
Cercis canadensis var. canadensis	KS(Wyandotte), MO(Platte)
Chaenorhinum	MO(Platte)
Chaenorhinum minus	MO(Platte)
Chaerophyllum	KS(Wyandotte), MO(Platte)
Chaerophyllum procumbens	KS(Wyandotte), MO(Platte)
Chaerophyllum procumbens var. procumbens	MO(Platte)
Chamaecrista	KS(Wyandotte), MO(Platte)

Chamaecrista fasciculata	KS(Wyandotte), MO(Platte)
Chamaecrista fasciculata var. fasciculata	KS(Wyandotte), MO(Platte)
Chamaesyce	KS(Wyandotte), MO(Platte)
Chamaesyce geyeri	KS(Wyandotte)
Chamaesyce geyeri var. geyeri	KS(Wyandotte)
Chamaesyce glyptosperma	KS(Wyandotte), MO(Platte)
Chamaesyce humistrata	MO(Platte)
Chamaesyce maculata	KS(Wyandotte), MO(Platte)
Chamaesyce missurica	KS(Wyandotte)
Chamaesyce nutans	KS(Wyandotte), MO(Platte)
Chamaesyce prostrata	KS(Wyandotte), MO(Platte)
Chamaesyce serpens	KS(Wyandotte), MO(Platte)
Chamaesyce stictospora	KS(Wyandotte)
Chasmanthium	KS(Wyandotte), MO(Platte)
Chasmanthium latifolium	KS(Wyandotte), MO(Platte)
Chenopodium	KS(Wyandotte), MO(Platte)
Chenopodium album	MO(Platte)
Chenopodium ambrosioides	KS(Wyandotte)
Chenopodium ambrosioides var. ambrosioides	KS(Wyandotte)
Chenopodium berlandieri	KS(Wyandotte), MO(Platte)
Chenopodium berlandieri var. bushianum	MO(Platte)
Chenopodium botrys	KS(Wyandotte)
Chenopodium glaucum	KS(Wyandotte)
Chenopodium pallescens	MO(Platte)
Chenopodium simplex	MO(Platte)
Chenopodium standleyanum	KS(Wyandotte)
Chloris	KS(Wyandotte)
Chloris verticillata	KS(Wyandotte)
Cichorium	KS(Wyandotte), MO(Platte)
Cichorium intybus	KS(Wyandotte), MO(Platte)
Cicuta	KS(Wyandotte), MO(Platte)
Cicuta maculata	KS(Wyandotte), MO(Platte)
Circaea	KS(Wyandotte), MO(Platte)
Circaea lutetiana	KS(Wyandotte), MO(Platte)
Circaea lutetiana ssp. canadensis	KS(Wyandotte), MO(Platte)
Cirsium	KS(Wyandotte), MO(Platte)
Cirsium altissimum	KS(Wyandotte)
Cirsium arvense	KS(Wyandotte)
Cirsium undulatum	KS(Wyandotte)
Cirsium undulatum var. undulatum	KS(Wyandotte)
Cirsium vulgare	KS(Wyandotte), MO(Platte)
Claytonia	KS(Wyandotte), MO(Platte)
Claytonia virginica	KS(Wyandotte), MO(Platte)
Claytonia virginica var. virginica	KS(Wyandotte), MO(Platte)

Clematis	KS(Wyandotte)
Clematis pitcheri	KS(Wyandotte)
Clematis pitcheri var. pitcheri	KS(Wyandotte)
Cleome	KS(Wyandotte)
Cleome serrulata	KS(Wyandotte)
Comandra	KS(Wyandotte)
Comandra umbellata	KS(Wyandotte)
Comandra umbellata ssp. umbellata	KS(Wyandotte)
Commelina	KS(Wyandotte)
Commelina erecta	KS(Wyandotte)
Commelina erecta var. erecta	KS(Wyandotte)
Conium	KS(Wyandotte), MO(Platte)
Conium maculatum	KS(Wyandotte), MO(Platte)
Conoclinium	KS(Wyandotte)
Conoclinium coelestinum	KS(Wyandotte)
Consolida	MO(Platte)
Consolida ajacis	MO(Platte)
Convolvulus	KS(Wyandotte), MO(Platte)
Convolvulus arvensis	KS(Wyandotte), MO(Platte)
Conyza	KS(Wyandotte), MO(Platte)
Conyza canadensis	KS(Wyandotte), MO(Platte)
Conyza canadensis var. canadensis	KS(Wyandotte), MO(Platte)
Conyza ramosissima	KS(Wyandotte)
Corallorhiza	KS(Wyandotte)
Corallorhiza odontorhiza	KS(Wyandotte)
Corallorhiza odontorhiza var. odontorhiza	KS(Wyandotte)
Corallorhiza wisteriana	KS(Wyandotte)
Cornus	KS(Wyandotte), MO(Platte)
Cornus drummondii	KS(Wyandotte), MO(Platte)
Cornus obliqua	KS(Wyandotte)
Corydalis	KS(Wyandotte), MO(Platte)
Corydalis flavula	KS(Wyandotte), MO(Platte)
Corydalis micrantha	KS(Wyandotte), MO(Platte)
Corydalis micrantha ssp. micrantha	MO(Platte)
Corylus	KS(Wyandotte), MO(Platte)
Corylus americana	KS(Wyandotte), MO(Platte)
Crataegus	KS(Wyandotte), MO(Platte)
Crataegus crus-galli	MO(Platte)
Crataegus mollis	KS(Wyandotte), MO(Platte)
Crotalaria	KS(Wyandotte), MO(Platte)
Crotalaria sagittalis	KS(Wyandotte), MO(Platte)
Croton	KS(Wyandotte), MO(Platte)
Croton capitatus	KS(Wyandotte), MO(Platte)
Croton capitatus var. capitatus	KS(Wyandotte), MO(Platte)

Croton glandulosus	KS(Wyandotte), MO(Platte)
Croton glandulosus var. septentrionalis	KS(Wyandotte), MO(Platte)
Croton monanthogynus	KS(Wyandotte), MO(Platte)
Croton texensis	KS(Wyandotte)
Croton texensis var. texensis	KS(Wyandotte)
Cryptotaenia	KS(Wyandotte), MO(Platte)
Cryptotaenia canadensis	KS(Wyandotte), MO(Platte)
Cucurbita	KS(Wyandotte)
Cucurbita foetidissima	KS(Wyandotte)
Cuscuta	KS(Wyandotte), MO(Platte)
Cuscuta cuspidata	MO(Platte)
Cuscuta glomerata	KS(Wyandotte)
Cuscuta pentagona	MO(Platte)
Cuscuta pentagona var. pentagona	MO(Platte)
Cuscuta polygonorum	KS(Wyandotte)
Cyclachaena	KS(Wyandotte)
Cyclachaena xanthifolia	KS(Wyandotte)
Cycloloma	KS(Wyandotte)
Cycloloma atriplicifolium	KS(Wyandotte)
Cynanchum	KS(Wyandotte), MO(Platte)
Cynanchum laeve	KS(Wyandotte), MO(Platte)
Cynodon	KS(Wyandotte)
Cynodon dactylon	KS(Wyandotte)
Cynoglossum	KS(Wyandotte)
Cynoglossum officinale	KS(Wyandotte)
Cyperus	KS(Wyandotte), MO(Platte)
Cyperus bipartitus	KS(Wyandotte)
Cyperus erythrorhizos	KS(Wyandotte), MO(Platte)
Cyperus esculentus	KS(Wyandotte), MO(Platte)
Cyperus esculentus var. leptostachyus	KS(Wyandotte), MO(Platte)
Cyperus lupulinus	KS(Wyandotte)
Cyperus lupulinus ssp. lupulinus	KS(Wyandotte)
Cyperus odoratus	KS(Wyandotte), MO(Platte)
Cyperus schweinitzii	KS(Wyandotte)
Cyperus squarrosus	KS(Wyandotte), MO(Platte)
Cyperus strigosus	KS(Wyandotte)
Cypripedium	KS(Wyandotte)
Cypripedium parviflorum	KS(Wyandotte)
Cypripedium parviflorum var. pubescens	KS(Wyandotte)
Cystopteris	KS(Wyandotte), MO(Platte)
Cystopteris protrusa	KS(Wyandotte), MO(Platte)
Cystopteris tennesseensis	KS(Wyandotte), MO(Platte)
Dactylis	KS(Wyandotte), MO(Platte)
Dactylis glomerata	KS(Wyandotte), MO(Platte)

Dactylis glomerata ssp. glomerata	KS(Wyandotte), MO(Platte)
Dalea	KS(Wyandotte)
Dalea candida	KS(Wyandotte)
Dalea candida var. candida	KS(Wyandotte)
Dalea enneandra	KS(Wyandotte)
Dalea leporina	KS(Wyandotte)
Dalea purpurea	KS(Wyandotte)
Dalea purpurea var. purpurea	KS(Wyandotte)
Danthonia	MO(Platte)
Danthonia spicata	MO(Platte)
Dasistoma	KS(Wyandotte), MO(Platte)
Dasistoma macrophylla	KS(Wyandotte), MO(Platte)
Datura	KS(Wyandotte), MO(Platte)
Datura stramonium	KS(Wyandotte), MO(Platte)
Daucus	KS(Wyandotte), MO(Platte)
Daucus carota	KS(Wyandotte), MO(Platte)
Delphinium	KS(Wyandotte), MO(Platte)
Delphinium carolinianum	KS(Wyandotte)
Delphinium carolinianum ssp. virescens	KS(Wyandotte)
Delphinium tricorne	KS(Wyandotte), MO(Platte)
Descurainia	KS(Wyandotte), MO(Platte)
Descurainia pinnata	KS(Wyandotte), MO(Platte)
Descurainia pinnata ssp. brachycarpa	KS(Wyandotte), MO(Platte)
Desmanthus	KS(Wyandotte), MO(Platte)
Desmanthus illinoensis	KS(Wyandotte), MO(Platte)
Desmodium	KS(Wyandotte), MO(Platte)
Desmodium canescens	KS(Wyandotte)
Desmodium cuspidatum	KS(Wyandotte)
Desmodium glutinosum	KS(Wyandotte), MO(Platte)
Desmodium illinoense	KS(Wyandotte)
Desmodium paniculatum	KS(Wyandotte)
Desmodium paniculatum var. paniculatum	KS(Wyandotte)
Dianthus	KS(Wyandotte), MO(Platte)
Dianthus armeria	KS(Wyandotte), MO(Platte)
Dicentra	KS(Wyandotte), MO(Platte)
Dicentra cucullaria	KS(Wyandotte), MO(Platte)
Dichanthelium	KS(Wyandotte), MO(Platte)
Dichanthelium acuminatum	MO(Platte)
Dichanthelium acuminatum var. acuminatum	MO(Platte)
Dichanthelium clandestinum	KS(Wyandotte)
Dichanthelium latifolium	KS(Wyandotte)
Dichanthelium sphaerocarpon	KS(Wyandotte)
Dichanthelium sphaerocarpon var. sphaerocarpon	KS(Wyandotte)
Digitaria	KS(Wyandotte), MO(Platte)

Digitaria ciliaris	KS(Wyandotte)
Digitaria ischaemum	KS(Wyandotte), MO(Platte)
Digitaria sanguinalis	KS(Wyandotte), MO(Platte)
Dioscorea	KS(Wyandotte), MO(Platte)
Dioscorea villosa	KS(Wyandotte), MO(Platte)
Diospyros	KS(Wyandotte), MO(Platte)
Diospyros virginiana	KS(Wyandotte), MO(Platte)
Diplazium	KS(Wyandotte)
Diplazium pycnocarpon	KS(Wyandotte)
Dipsacus	KS(Wyandotte), MO(Platte)
Dipsacus fullonum	KS(Wyandotte), MO(Platte)
Draba	KS(Wyandotte)
Draba brachycarpa	KS(Wyandotte)
Draba reptans	KS(Wyandotte)
Dracopis	KS(Wyandotte)
Dracopis amplexicaulis	KS(Wyandotte)
Dyssodia	KS(Wyandotte), MO(Platte)
Dyssodia papposa	KS(Wyandotte), MO(Platte)
Echinacea	KS(Wyandotte)
Echinacea pallida	KS(Wyandotte)
Echinochloa	KS(Wyandotte), MO(Platte)
Echinochloa crus-galli	KS(Wyandotte), MO(Platte)
Echinochloa muricata	KS(Wyandotte)
Echinochloa muricata var. microstachya	KS(Wyandotte)
Echinocystis	MO(Platte)
Echinocystis lobata	MO(Platte)
Echinodorus	KS(Wyandotte), MO(Platte)
Echinodorus berteroi	KS(Wyandotte), MO(Platte)
Eclipta	KS(Wyandotte), MO(Platte)
Eclipta prostrata	KS(Wyandotte), MO(Platte)
Eleocharis	KS(Wyandotte), MO(Platte)
Eleocharis atropurpurea	MO(Platte)
Eleocharis engelmannii	KS(Wyandotte)
Eleocharis erythropoda	MO(Platte)
Eleocharis macrostachya	KS(Wyandotte)
Eleocharis palustris	MO(Platte)
Eleocharis palustris var. palustris	MO(Platte)
Eleusine	KS(Wyandotte), MO(Platte)
Eleusine indica	KS(Wyandotte), MO(Platte)
Ellisia	KS(Wyandotte), MO(Platte)
Ellisia nyctelea	KS(Wyandotte), MO(Platte)
Elymus	KS(Wyandotte), MO(Platte)
Elymus canadensis	KS(Wyandotte), MO(Platte)
Elymus hystrix	KS(Wyandotte)

Elymus hystrix var. hystrix	KS(Wyandotte)
Elymus repens	KS(Wyandotte)
Elymus submuticus	MO(Platte)
Elymus villosus	KS(Wyandotte), MO(Platte)
Elymus virginicus	KS(Wyandotte), MO(Platte)
Elymus virginicus var. virginicus	KS(Wyandotte), MO(Platte)
Enemion	KS(Wyandotte), MO(Platte)
Enemion biternatum	KS(Wyandotte), MO(Platte)
Epilobium	KS(Wyandotte)
Epilobium coloratum	KS(Wyandotte)
Equisetum	KS(Wyandotte), MO(Platte)
Equisetum arvense	KS(Wyandotte), MO(Platte)
Equisetum ×ferrissii	KS(Wyandotte), MO(Platte)
Equisetum hyemale	KS(Wyandotte), MO(Platte)
Equisetum hyemale var. affine	KS(Wyandotte), MO(Platte)
Eragrostis	KS(Wyandotte), MO(Platte)
Eragrostis cilianensis	KS(Wyandotte)
Eragrostis frankii	KS(Wyandotte), MO(Platte)
Eragrostis hypnoides	MO(Platte)
Eragrostis pectinacea	KS(Wyandotte)
Eragrostis spectabilis	KS(Wyandotte), MO(Platte)
Eragrostis trichodes	KS(Wyandotte)
Erechtites	MO(Platte)
Erechtites hieraciifolia	MO(Platte)
Erechtites hieraciifolia var. hieraciifolia	MO(Platte)
Erigeron	KS(Wyandotte), MO(Platte)
Erigeron annuus	KS(Wyandotte), MO(Platte)
Erigeron philadelphicus	KS(Wyandotte), MO(Platte)
Erigeron philadelphicus var. philadelphicus	KS(Wyandotte), MO(Platte)
Erigeron strigosus	KS(Wyandotte), MO(Platte)
Erigeron strigosus var. beyrichii	MO(Platte)
Erigeron strigosus var. strigosus	KS(Wyandotte)
Eriochloa	MO(Platte)
Eriochloa contracta	MO(Platte)
Erodium	MO(Platte)
Erodium cicutarium	MO(Platte)
Erodium cicutarium ssp. cicutarium	MO(Platte)
Eryngium	KS(Wyandotte)
Eryngium yuccifolium	KS(Wyandotte)
Eryngium yuccifolium var. yuccifolium	KS(Wyandotte)
Erysimum	KS(Wyandotte), MO(Platte)
Erysimum repandum	KS(Wyandotte), MO(Platte)
Erythronium	KS(Wyandotte), MO(Platte)
Erythronium albidum	KS(Wyandotte), MO(Platte)

Erythronium mesochoreum	MO(Platte)
Euonymus	KS(Wyandotte), MO(Platte)
Euonymus atropurpureus	KS(Wyandotte), MO(Platte)
Euonymus atropurpureus var. atropurpureus	KS(Wyandotte), MO(Platte)
Eupatorium	KS(Wyandotte), MO(Platte)
Eupatorium altissimum	KS(Wyandotte)
Eupatorium perfoliatum	KS(Wyandotte)
Eupatorium perfoliatum var. perfoliatum	KS(Wyandotte)
Eupatorium purpureum	KS(Wyandotte), MO(Platte)
Eupatorium serotinum	KS(Wyandotte)
Euphorbia	KS(Wyandotte), MO(Platte)
Euphorbia corollata	KS(Wyandotte), MO(Platte)
Euphorbia cyathophora	KS(Wyandotte), MO(Platte)
Euphorbia davidii	KS(Wyandotte), MO(Platte)
Euphorbia dentata	KS(Wyandotte), MO(Platte)
Euphorbia dentata var. dentata	KS(Wyandotte), MO(Platte)
Euphorbia hexagona	KS(Wyandotte)
Euphorbia marginata	KS(Wyandotte), MO(Platte)
Euthamia	MO(Platte)
Euthamia graminifolia	MO(Platte)
Euthamia graminifolia var. graminifolia	MO(Platte)
Festuca	KS(Wyandotte)
Festuca subverticillata	KS(Wyandotte)
Flaveria	KS(Wyandotte)
Flaveria campestris	KS(Wyandotte)
Fragaria	KS(Wyandotte)
Fragaria virginiana	KS(Wyandotte)
Fragaria virginiana ssp. grayana	KS(Wyandotte)
Fraxinus	KS(Wyandotte), MO(Platte)
Fraxinus americana	KS(Wyandotte), MO(Platte)
Fraxinus pennsylvanica	KS(Wyandotte), MO(Platte)
Froelichia	KS(Wyandotte), MO(Platte)
Froelichia gracilis	KS(Wyandotte), MO(Platte)
Fuirena	MO(Platte)
Fuirena simplex	MO(Platte)
Fuirena simplex var. simplex	MO(Platte)
Gaillardia	MO(Platte)
Gaillardia pulchella	MO(Platte)
Gaillardia pulchella var. pulchella	MO(Platte)
Galearis	KS(Wyandotte)
Galearis spectabilis	KS(Wyandotte)
Galium	KS(Wyandotte), MO(Platte)
Galium aparine	KS(Wyandotte), MO(Platte)
Galium circaezans	KS(Wyandotte), MO(Platte)

Galium circaezans var. circaezans	KS(Wyandotte)
Galium circaezans var. hypomalacum	MO(Platte)
Galium concinnum	KS(Wyandotte), MO(Platte)
Galium obtusum	KS(Wyandotte)
Galium obtusum ssp. obtusum	KS(Wyandotte)
Galium triflorum	KS(Wyandotte), MO(Platte)
Gaura	KS(Wyandotte), MO(Platte)
Gaura longiflora	KS(Wyandotte), MO(Platte)
Gaura mollis	KS(Wyandotte), MO(Platte)
Gentiana	MO(Platte)
Gentiana andrewsii	MO(Platte)
Gentiana andrewsii var. andrewsii	MO(Platte)
Geranium	KS(Wyandotte), MO(Platte)
Geranium carolinianum	KS(Wyandotte), MO(Platte)
Geranium carolinianum var. carolinianum	MO(Platte)
Geranium maculatum	KS(Wyandotte), MO(Platte)
Geum	KS(Wyandotte), MO(Platte)
Geum canadense	KS(Wyandotte), MO(Platte)
Geum canadense var. canadense	KS(Wyandotte), MO(Platte)
Glandularia	KS(Wyandotte), MO(Platte)
Glandularia canadensis	KS(Wyandotte), MO(Platte)
Glechoma	KS(Wyandotte), MO(Platte)
Glechoma hederacea	KS(Wyandotte), MO(Platte)
Gleditsia	KS(Wyandotte), MO(Platte)
Gleditsia triacanthos	KS(Wyandotte), MO(Platte)
Glyceria	KS(Wyandotte), MO(Platte)
Glyceria striata	KS(Wyandotte), MO(Platte)
Gratiola	MO(Platte)
Gratiola neglecta	MO(Platte)
Grindelia	KS(Wyandotte)
Grindelia papposa	KS(Wyandotte)
Grindelia squarrosa	KS(Wyandotte)
Grindelia squarrosa var. squarrosa	KS(Wyandotte)
Gymnocladus	KS(Wyandotte), MO(Platte)
Gymnocladus dioicus	KS(Wyandotte), MO(Platte)
Hackelia	KS(Wyandotte), MO(Platte)
Hackelia virginiana	KS(Wyandotte), MO(Platte)
Hedeoma	KS(Wyandotte), MO(Platte)
Hedeoma hispida	KS(Wyandotte), MO(Platte)
Hedeoma pulegioides	KS(Wyandotte)
Helenium	MO(Platte)
Helenium autumnale	MO(Platte)
Helenium autumnale var. autumnale	MO(Platte)
Helianthus	KS(Wyandotte), MO(Platte)

Helianthus annuus	KS(Wyandotte), MO(Platte)
Helianthus grosseserratus	KS(Wyandotte), MO(Platte)
Helianthus hirsutus	KS(Wyandotte), MO(Platte)
Helianthus maximiliani	KS(Wyandotte)
Helianthus petiolaris	KS(Wyandotte), MO(Platte)
Helianthus petiolaris ssp. petiolaris	KS(Wyandotte), MO(Platte)
Helianthus strumosus	MO(Platte)
Helianthus tuberosus	KS(Wyandotte), MO(Platte)
Heliopsis	KS(Wyandotte)
Heliopsis helianthoides	KS(Wyandotte)
Heliopsis helianthoides var. scabra	KS(Wyandotte)
Hesperis	KS(Wyandotte), MO(Platte)
Hesperis matronalis	KS(Wyandotte), MO(Platte)
Heterotheca	KS(Wyandotte), MO(Platte)
Heterotheca subaxillaris	KS(Wyandotte), MO(Platte)
Heuchera	KS(Wyandotte)
Heuchera americana	KS(Wyandotte)
Heuchera americana var. hirsuticaulis	KS(Wyandotte)
Hibiscus	KS(Wyandotte), MO(Platte)
Hibiscus laevis	KS(Wyandotte)
Hibiscus moscheutos	MO(Platte)
Hibiscus trionum	KS(Wyandotte)
Holosteum	KS(Wyandotte)
Holosteum umbellatum	KS(Wyandotte)
Hordeum	KS(Wyandotte), MO(Platte)
Hordeum jubatum	KS(Wyandotte), MO(Platte)
Hordeum jubatum ssp. jubatum	KS(Wyandotte)
Hordeum pusillum	KS(Wyandotte), MO(Platte)
Houstonia	KS(Wyandotte)
Houstonia pusilla	KS(Wyandotte)
Humulus	KS(Wyandotte), MO(Platte)
Humulus lupulus	KS(Wyandotte), MO(Platte)
Humulus lupulus var. lupulus	MO(Platte)
Hybanthus	KS(Wyandotte), MO(Platte)
Hybanthus concolor	KS(Wyandotte), MO(Platte)
Hybanthus verticillatus	KS(Wyandotte)
Hydrophyllum	KS(Wyandotte), MO(Platte)
Hydrophyllum appendiculatum	KS(Wyandotte), MO(Platte)
Hydrophyllum virginianum	KS(Wyandotte), MO(Platte)
Hydrophyllum virginianum var. virginianum	KS(Wyandotte), MO(Platte)
Hypericum	KS(Wyandotte), MO(Platte)
Hypericum perforatum	KS(Wyandotte), MO(Platte)
Hypericum punctatum	MO(Platte)
Hypoxis	KS(Wyandotte)

Hypoxis hirsuta	KS(Wyandotte)
Impatiens	KS(Wyandotte), MO(Platte)
Impatiens capensis	KS(Wyandotte)
Impatiens pallida	KS(Wyandotte), MO(Platte)
Iodanthus	KS(Wyandotte), MO(Platte)
Iodanthus pinnatifidus	KS(Wyandotte), MO(Platte)
Ipomoea	KS(Wyandotte), MO(Platte)
Ipomoea hederacea	KS(Wyandotte), MO(Platte)
Ipomoea lacunosa	KS(Wyandotte), MO(Platte)
Ipomoea pandurata	KS(Wyandotte), MO(Platte)
Ipomoea purpurea	KS(Wyandotte)
Iris	KS(Wyandotte), MO(Platte)
Iris brevicaulis	KS(Wyandotte)
Iris germanica	MO(Platte)
Iris orientalis	MO(Platte)
Iris virginica	MO(Platte)
Iris virginica var. shrevei	MO(Platte)
Iva	KS(Wyandotte)
Iva annua	KS(Wyandotte)
Iva annua var. annua	KS(Wyandotte)
Juglans	KS(Wyandotte), MO(Platte)
Juglans nigra	KS(Wyandotte), MO(Platte)
Juncus	KS(Wyandotte), MO(Platte)
Juncus diffusissimus	KS(Wyandotte)
Juncus interior	MO(Platte)
Juncus interior var. interior	MO(Platte)
Juncus tenuis	KS(Wyandotte)
Juncus torreyi	KS(Wyandotte), MO(Platte)
Juniperus	KS(Wyandotte)
Juniperus virginiana	KS(Wyandotte)
Juniperus virginiana var. virginiana	KS(Wyandotte)
Justicia	KS(Wyandotte)
Justicia americana	KS(Wyandotte)
Kallstroemia	KS(Wyandotte)
Kallstroemia parviflora	KS(Wyandotte)
Kummerowia	KS(Wyandotte), MO(Platte)
Kummerowia stipulacea	KS(Wyandotte), MO(Platte)
Kummerowia striata	KS(Wyandotte)
Kyllinga	KS(Wyandotte)
Kyllinga pumila	KS(Wyandotte)
Lactuca	KS(Wyandotte), MO(Platte)
Lactuca canadensis	KS(Wyandotte), MO(Platte)
Lactuca floridana	KS(Wyandotte)
Lactuca saligna	KS(Wyandotte), MO(Platte)

Lactuca serriola	KS(Wyandotte), MO(Platte)
Lamium	KS(Wyandotte), MO(Platte)
Lamium amplexicaule	KS(Wyandotte), MO(Platte)
Lamium purpureum	KS(Wyandotte)
Lamium purpureum var. purpureum	KS(Wyandotte)
Laportea	KS(Wyandotte), MO(Platte)
Laportea canadensis	KS(Wyandotte), MO(Platte)
Lappula	KS(Wyandotte)
Lappula occidentalis	KS(Wyandotte)
Lappula occidentalis var. occidentalis	KS(Wyandotte)
Lappula squarrosa	KS(Wyandotte)
Leersia	KS(Wyandotte), MO(Platte)
Leersia oryzoides	KS(Wyandotte), MO(Platte)
Leersia virginica	MO(Platte)
Lemna	KS(Wyandotte)
Lemna minor	KS(Wyandotte)
Lemna perpusilla	KS(Wyandotte)
Leonurus	KS(Wyandotte), MO(Platte)
Leonurus cardiaca	KS(Wyandotte), MO(Platte)
Leonurus cardiaca ssp. cardiaca	KS(Wyandotte), MO(Platte)
Lepidium	KS(Wyandotte), MO(Platte)
Lepidium densiflorum	KS(Wyandotte), MO(Platte)
Lepidium densiflorum var. densiflorum	KS(Wyandotte), MO(Platte)
Lepidium virginicum	KS(Wyandotte), MO(Platte)
Lepidium virginicum var. virginicum	KS(Wyandotte), MO(Platte)
Leptochloa	KS(Wyandotte), MO(Platte)
Leptochloa fusca	KS(Wyandotte), MO(Platte)
Leptochloa fusca ssp. fascicularis	KS(Wyandotte), MO(Platte)
Lespedeza	KS(Wyandotte), MO(Platte)
Lespedeza capitata	KS(Wyandotte)
Lespedeza cuneata	MO(Platte)
Lespedeza frutescens	MO(Platte)
Lespedeza violacea	KS(Wyandotte), MO(Platte)
Lespedeza virginica	KS(Wyandotte), MO(Platte)
Lesquerella	KS(Wyandotte)
Lesquerella gracilis	KS(Wyandotte)
Lesquerella gracilis ssp. nuttallii	KS(Wyandotte)
Leucanthemum	KS(Wyandotte), MO(Platte)
Leucanthemum vulgare	KS(Wyandotte), MO(Platte)
Leucospora	KS(Wyandotte)
Leucospora multifida	KS(Wyandotte)
Lilium	KS(Wyandotte)
Lilium michiganense	KS(Wyandotte)
Lindernia	KS(Wyandotte), MO(Platte)

Lindernia dubia	KS(Wyandotte), MO(Platte)
Lindernia dubia var. anagallidea	KS(Wyandotte), MO(Platte)
Linum	KS(Wyandotte), MO(Platte)
Linum sulcatum	KS(Wyandotte)
Linum sulcatum var. sulcatum	KS(Wyandotte)
Linum usitatissimum	KS(Wyandotte), MO(Platte)
Lipocarpha	KS(Wyandotte), MO(Platte)
Lipocarpha drummondii	KS(Wyandotte)
Lipocarpha micrantha	MO(Platte)
Lithospermum	KS(Wyandotte)
Lithospermum canescens	KS(Wyandotte)
Lithospermum incisum	KS(Wyandotte)
Lithospermum latifolium	KS(Wyandotte)
Lobelia	KS(Wyandotte), MO(Platte)
Lobelia siphilitica	KS(Wyandotte), MO(Platte)
Lobelia siphilitica var. ludoviciana	KS(Wyandotte)
Lolium	KS(Wyandotte)
Lolium perenne	KS(Wyandotte)
Lolium perenne ssp. perenne	KS(Wyandotte)
Lomatium	KS(Wyandotte)
Lomatium foeniculaceum	KS(Wyandotte)
Lomatium foeniculaceum ssp. daucifolium	KS(Wyandotte)
Lotus	MO(Platte)
Lotus corniculatus	MO(Platte)
Lotus corniculatus var. corniculatus	MO(Platte)
Ludwigia	KS(Wyandotte)
Ludwigia peploides	KS(Wyandotte)
Ludwigia peploides ssp. glabrescens	KS(Wyandotte)
Lycopus	KS(Wyandotte), MO(Platte)
Lycopus americanus	KS(Wyandotte), MO(Platte)
Lysimachia	KS(Wyandotte), MO(Platte)
Lysimachia ciliata	KS(Wyandotte), MO(Platte)
Lysimachia nummularia	MO(Platte)
Lythrum	MO(Platte)
Lythrum alatum	MO(Platte)
Lythrum alatum var. alatum	MO(Platte)
Maclura	KS(Wyandotte)
Maclura pomifera	KS(Wyandotte)
Maianthemum	KS(Wyandotte)
Maianthemum racemosum	KS(Wyandotte)
Maianthemum racemosum ssp. racemosum	KS(Wyandotte)
Maianthemum stellatum	KS(Wyandotte)
Malus	KS(Wyandotte), MO(Platte)
Malus ioensis	KS(Wyandotte), MO(Platte)

Malus ioensis var. ioensis	KS(Wyandotte), MO(Platte)
Malva	KS(Wyandotte), MO(Platte)
Malva neglecta	KS(Wyandotte), MO(Platte)
Malvastrum	KS(Wyandotte)
Malvastrum hispidum	KS(Wyandotte)
Marrubium	KS(Wyandotte)
Marrubium vulgare	KS(Wyandotte)
Marsilea	MO(Platte)
Marsilea quadrifolia	MO(Platte)
Matricaria	KS(Wyandotte), MO(Platte)
Matricaria discoidea	KS(Wyandotte), MO(Platte)
Medicago	KS(Wyandotte), MO(Platte)
Medicago lupulina	KS(Wyandotte), MO(Platte)
Medicago sativa	KS(Wyandotte), MO(Platte)
Medicago sativa ssp. sativa	MO(Platte)
Melica	KS(Wyandotte)
Melica nitens	KS(Wyandotte)
Melilotus	KS(Wyandotte), MO(Platte)
Melilotus officinalis	KS(Wyandotte), MO(Platte)
Melissa	KS(Wyandotte)
Melissa officinalis	KS(Wyandotte)
Menispermum	KS(Wyandotte), MO(Platte)
Menispermum canadense	KS(Wyandotte), MO(Platte)
Mentha	KS(Wyandotte)
Mentha arvensis	KS(Wyandotte)
Mertensia	MO(Platte)
Mertensia virginica	MO(Platte)
Mimosa	KS(Wyandotte)
Mimosa nuttallii	KS(Wyandotte)
Mimulus	KS(Wyandotte)
Mimulus alatus	KS(Wyandotte)
Mirabilis	KS(Wyandotte), MO(Platte)
Mirabilis linearis	KS(Wyandotte)
Mirabilis nyctaginea	KS(Wyandotte), MO(Platte)
Mollugo	KS(Wyandotte), MO(Platte)
Mollugo verticillata	KS(Wyandotte), MO(Platte)
Monarda	KS(Wyandotte), MO(Platte)
Monarda citriodora	KS(Wyandotte)
Monarda citriodora ssp. citriodora	KS(Wyandotte)
Monarda citriodora ssp. citriodora var. citriodora	KS(Wyandotte)
Monarda fistulosa	KS(Wyandotte), MO(Platte)
Monarda fistulosa ssp. fistulosa	KS(Wyandotte), MO(Platte)
Monarda fistulosa ssp. fistulosa var. fistulosa	MO(Platte)
Monarda fistulosa ssp. fistulosa var. mollis	KS(Wyandotte)

Monolepis	KS(Wyandotte)
Monolepis nuttalliana	KS(Wyandotte)
Monotropa	KS(Wyandotte), MO(Platte)
Monotropa uniflora	KS(Wyandotte), MO(Platte)
Morus	KS(Wyandotte), MO(Platte)
Morus alba	KS(Wyandotte), MO(Platte)
Morus rubra	KS(Wyandotte), MO(Platte)
Morus rubra var. rubra	KS(Wyandotte), MO(Platte)
Muhlenbergia	KS(Wyandotte), MO(Platte)
Muhlenbergia frondosa	KS(Wyandotte), MO(Platte)
Muhlenbergia glabriflora	MO(Platte)
Muhlenbergia racemosa	KS(Wyandotte)
Muhlenbergia schreberi	KS(Wyandotte)
Myosurus	MO(Platte)
Myosurus minimus	MO(Platte)
Najas	KS(Wyandotte)
Najas guadalupensis	KS(Wyandotte)
Najas guadalupensis ssp. guadalupensis	KS(Wyandotte)
Nasturtium	KS(Wyandotte), MO(Platte)
Nasturtium officinale	KS(Wyandotte), MO(Platte)
Nelumbo	KS(Wyandotte), MO(Platte)
Nelumbo lutea	KS(Wyandotte), MO(Platte)
Nelumbo nucifera	MO(Platte)
Nepeta	KS(Wyandotte), MO(Platte)
Nepeta cataria	KS(Wyandotte), MO(Platte)
Nymphaea	MO(Platte)
Nymphaea odorata	MO(Platte)
Oenothera	KS(Wyandotte), MO(Platte)
Oenothera biennis	KS(Wyandotte)
Oenothera laciniata	KS(Wyandotte), MO(Platte)
Oenothera villosa	MO(Platte)
Oenothera villosa ssp. villosa	MO(Platte)
Oligoneuron	KS(Wyandotte)
Oligoneuron rigidum	KS(Wyandotte)
Oligoneuron rigidum var. rigidum	KS(Wyandotte)
Ornithogalum	KS(Wyandotte), MO(Platte)
Ornithogalum umbellatum	KS(Wyandotte), MO(Platte)
Orobanche	MO(Platte)
Orobanche uniflora	MO(Platte)
Osmorhiza	KS(Wyandotte), MO(Platte)
Osmorhiza claytonii	KS(Wyandotte), MO(Platte)
Osmorhiza longistylis	KS(Wyandotte), MO(Platte)
Ostrya	KS(Wyandotte), MO(Platte)
Ostrya virginiana	KS(Wyandotte), MO(Platte)

Ostrya virginiana var. virginiana	KS(Wyandotte), MO(Platte)
Oxalis	KS(Wyandotte), MO(Platte)
Oxalis corniculata	MO(Platte)
Oxalis dillenii	KS(Wyandotte), MO(Platte)
Oxalis stricta	KS(Wyandotte), MO(Platte)
Oxalis violacea	KS(Wyandotte), MO(Platte)
Packera	KS(Wyandotte), MO(Platte)
Packera glabella	KS(Wyandotte), MO(Platte)
Packera obovata	KS(Wyandotte), MO(Platte)
Packera plattensis	KS(Wyandotte)
Panax	MO(Platte)
Panax quinquefolius	MO(Platte)
Panicum	KS(Wyandotte), MO(Platte)
Panicum capillare	KS(Wyandotte), MO(Platte)
Panicum dichotomiflorum	KS(Wyandotte), MO(Platte)
Panicum dichotomiflorum var. dichotomiflorum	KS(Wyandotte), MO(Platte)
Panicum philadelphicum	MO(Platte)
Panicum virgatum	KS(Wyandotte), MO(Platte)
Panicum virgatum var. virgatum	KS(Wyandotte), MO(Platte)
Parietaria	KS(Wyandotte), MO(Platte)
Parietaria pensylvanica	KS(Wyandotte), MO(Platte)
Paronychia	KS(Wyandotte), MO(Platte)
Paronychia canadensis	KS(Wyandotte), MO(Platte)
Parthenocissus	KS(Wyandotte), MO(Platte)
Parthenocissus quinquefolia	KS(Wyandotte), MO(Platte)
Parthenocissus vitacea	KS(Wyandotte)
Pascopyrum	KS(Wyandotte), MO(Platte)
Pascopyrum smithii	KS(Wyandotte), MO(Platte)
Paspalum	KS(Wyandotte)
Paspalum pubiflorum	KS(Wyandotte)
Paspalum setaceum	KS(Wyandotte)
Passiflora	KS(Wyandotte)
Passiflora incarnata	KS(Wyandotte)
Pastinaca	KS(Wyandotte), MO(Platte)
Pastinaca sativa	KS(Wyandotte), MO(Platte)
Pedicularis	KS(Wyandotte)
Pedicularis canadensis	KS(Wyandotte)
Pedicularis canadensis ssp. canadensis	KS(Wyandotte)
Pediomelum	KS(Wyandotte)
Pediomelum argophyllum	KS(Wyandotte)
Pellaea	KS(Wyandotte)
Pellaea atropurpurea	KS(Wyandotte)
Pennisetum	KS(Wyandotte), MO(Platte)
Pennisetum glaucum	KS(Wyandotte), MO(Platte)

Penstemon	KS(Wyandotte)
Penstemon digitalis	KS(Wyandotte)
Penthorum	KS(Wyandotte), MO(Platte)
Penthorum sedoides	KS(Wyandotte), MO(Platte)
Phalaris	KS(Wyandotte), MO(Platte)
Phalaris arundinacea	KS(Wyandotte), MO(Platte)
Phalaris canariensis	KS(Wyandotte)
Phemeranthus	KS(Wyandotte)
Phemeranthus parviflorus	KS(Wyandotte)
Phleum	KS(Wyandotte)
Phleum pratense	KS(Wyandotte)
Phlox	KS(Wyandotte), MO(Platte)
Phlox divaricata	KS(Wyandotte), MO(Platte)
Phlox divaricata ssp. laphamii	KS(Wyandotte), MO(Platte)
Phlox glaberrima	MO(Platte)
Phlox glaberrima ssp. interior	MO(Platte)
Phlox pilosa	MO(Platte)
Phlox pilosa ssp. fulgida	MO(Platte)
Phragmites	MO(Platte)
Phragmites australis	MO(Platte)
Phryma	KS(Wyandotte), MO(Platte)
Phryma leptostachya	KS(Wyandotte), MO(Platte)
Phyla	KS(Wyandotte), MO(Platte)
Phyla lanceolata	KS(Wyandotte), MO(Platte)
Physalis	KS(Wyandotte), MO(Platte)
Physalis heterophylla	KS(Wyandotte), MO(Platte)
Physalis heterophylla var. heterophylla	KS(Wyandotte), MO(Platte)
Physalis hispida	KS(Wyandotte)
Physalis longifolia	KS(Wyandotte), MO(Platte)
Physalis longifolia var. longifolia	KS(Wyandotte), MO(Platte)
Physalis longifolia var. subglabrata	MO(Platte)
Physalis missouriensis	KS(Wyandotte), MO(Platte)
Physalis pubescens	KS(Wyandotte), MO(Platte)
Physalis pubescens var. integrifolia	KS(Wyandotte), MO(Platte)
Physalis pubescens var. pubescens	MO(Platte)
Physalis pumila	KS(Wyandotte)
Physostegia	KS(Wyandotte)
Physostegia virginiana	KS(Wyandotte)
Physostegia virginiana ssp. virginiana	KS(Wyandotte)
Phytolacca	KS(Wyandotte), MO(Platte)
Phytolacca americana	KS(Wyandotte), MO(Platte)
Phytolacca americana var. americana	KS(Wyandotte), MO(Platte)
Pilea	KS(Wyandotte), MO(Platte)
Pilea pumila	KS(Wyandotte), MO(Platte)

Pilea pumila var. pumila	MO(Platte)
Plantago	KS(Wyandotte), MO(Platte)
Plantago aristata	KS(Wyandotte), MO(Platte)
Plantago lanceolata	KS(Wyandotte), MO(Platte)
Plantago patagonica	KS(Wyandotte)
Plantago rugelii	KS(Wyandotte), MO(Platte)
Plantago rugelii var. rugelii	KS(Wyandotte), MO(Platte)
Plantago virginica	KS(Wyandotte), MO(Platte)
Platanus	KS(Wyandotte), MO(Platte)
Platanus occidentalis	KS(Wyandotte), MO(Platte)
Poa	KS(Wyandotte), MO(Platte)
Poa annua	KS(Wyandotte)
Poa compressa	KS(Wyandotte), MO(Platte)
Poa pratensis	KS(Wyandotte), MO(Platte)
Poa pratensis ssp. pratensis	KS(Wyandotte), MO(Platte)
Poa sylvestris	KS(Wyandotte)
Podophyllum	KS(Wyandotte), MO(Platte)
Podophyllum peltatum	KS(Wyandotte), MO(Platte)
Polemonium	MO(Platte)
Polemonium reptans	MO(Platte)
Polemonium reptans var. reptans	MO(Platte)
Polygala	KS(Wyandotte)
Polygala sanguinea	KS(Wyandotte)
Polygala verticillata	KS(Wyandotte)
Polygala verticillata var. isocycla	KS(Wyandotte)
Polygonatum	KS(Wyandotte)
Polygonatum biflorum	KS(Wyandotte)
Polygonatum biflorum var. commutatum	KS(Wyandotte)
Polygonum	KS(Wyandotte), MO(Platte)
Polygonum amphibium	KS(Wyandotte), MO(Platte)
Polygonum amphibium var. emersum	KS(Wyandotte), MO(Platte)
Polygonum arenastrum	KS(Wyandotte)
Polygonum aviculare	MO(Platte)
Polygonum convolvulus	KS(Wyandotte), MO(Platte)
Polygonum convolvulus var. convolvulus	KS(Wyandotte), MO(Platte)
Polygonum cuspidatum	KS(Wyandotte)
Polygonum hydropiper	KS(Wyandotte)
Polygonum lapathifolium	KS(Wyandotte), MO(Platte)
Polygonum pensylvanicum	KS(Wyandotte), MO(Platte)
Polygonum persicaria	KS(Wyandotte), MO(Platte)
Polygonum punctatum	KS(Wyandotte), MO(Platte)
Polygonum ramosissimum	KS(Wyandotte), MO(Platte)
Polygonum scandens	KS(Wyandotte), MO(Platte)
Polygonum scandens var. dumetorum	KS(Wyandotte)

Polygonum virginianum	KS(Wyandotte), MO(Platte)
Polytaenia	KS(Wyandotte)
Polytaenia nuttallii	KS(Wyandotte)
Populus	KS(Wyandotte), MO(Platte)
Populus alba	KS(Wyandotte)
Populus deltoides	KS(Wyandotte), MO(Platte)
Populus deltoides ssp. deltoides	MO(Platte)
Populus deltoides ssp. monilifera	KS(Wyandotte)
Portulaca	KS(Wyandotte)
Portulaca oleracea	KS(Wyandotte)
Portulaca pilosa	KS(Wyandotte)
Potamogeton	KS(Wyandotte)
Potamogeton foliosus	KS(Wyandotte)
Potamogeton foliosus ssp. foliosus	KS(Wyandotte)
Potamogeton nodosus	KS(Wyandotte)
Potentilla	KS(Wyandotte), MO(Platte)
Potentilla norvegica	KS(Wyandotte), MO(Platte)
Potentilla norvegica ssp. monspeliensis	KS(Wyandotte), MO(Platte)
Potentilla paradoxa	KS(Wyandotte), MO(Platte)
Potentilla recta	KS(Wyandotte), MO(Platte)
Potentilla rivalis	KS(Wyandotte), MO(Platte)
Potentilla simplex	KS(Wyandotte), MO(Platte)
Proboscidea	KS(Wyandotte)
Proboscidea louisianica	KS(Wyandotte)
Proboscidea louisianica ssp. louisianica	KS(Wyandotte)
Prunella	KS(Wyandotte), MO(Platte)
Prunella vulgaris	KS(Wyandotte), MO(Platte)
Prunella vulgaris ssp. lanceolata	KS(Wyandotte), MO(Platte)
Prunus	KS(Wyandotte), MO(Platte)
Prunus americana	KS(Wyandotte)
Prunus mexicana	KS(Wyandotte)
Prunus munsoniana	MO(Platte)
Prunus serotina	KS(Wyandotte), MO(Platte)
Prunus serotina var. serotina	KS(Wyandotte), MO(Platte)
Prunus virginiana	KS(Wyandotte), MO(Platte)
Prunus virginiana var. virginiana	MO(Platte)
Pycnanthemum	KS(Wyandotte), MO(Platte)
Pycnanthemum tenuifolium	KS(Wyandotte), MO(Platte)
Pycnanthemum virginianum	KS(Wyandotte)
Pyrrhopappus	KS(Wyandotte), MO(Platte)
Pyrrhopappus carolinianus	KS(Wyandotte), MO(Platte)
Quercus	KS(Wyandotte), MO(Platte)
Quercus alba	KS(Wyandotte), MO(Platte)
Quercus imbricaria	KS(Wyandotte), MO(Platte)

Quercus macrocarpa	KS(Wyandotte), MO(Platte)
Quercus macrocarpa var. macrocarpa	KS(Wyandotte)
Quercus marilandica	KS(Wyandotte)
Quercus muehlenbergii	KS(Wyandotte), MO(Platte)
Quercus palustris	MO(Platte)
Quercus prinoides	KS(Wyandotte), MO(Platte)
Quercus rubra	KS(Wyandotte), MO(Platte)
Quercus rubra var. rubra	KS(Wyandotte), MO(Platte)
Quercus shumardii	KS(Wyandotte)
Quercus stellata	KS(Wyandotte)
Quercus velutina	KS(Wyandotte), MO(Platte)
Ranunculus	KS(Wyandotte), MO(Platte)
Ranunculus abortivus	KS(Wyandotte), MO(Platte)
Ranunculus bulbosus	KS(Wyandotte)
Ranunculus hispidus	KS(Wyandotte), MO(Platte)
Ranunculus hispidus var. hispidus	MO(Platte)
Ranunculus hispidus var. nitidus	KS(Wyandotte), MO(Platte)
Ranunculus micranthus	KS(Wyandotte), MO(Platte)
Ranunculus recurvatus	KS(Wyandotte), MO(Platte)
Ranunculus recurvatus var. recurvatus	KS(Wyandotte), MO(Platte)
Ranunculus repens	MO(Platte)
Ranunculus sceleratus	MO(Platte)
Ranunculus sceleratus var. sceleratus	MO(Platte)
Raphanus	KS(Wyandotte)
Raphanus sativus	KS(Wyandotte)
Ratibida	KS(Wyandotte), MO(Platte)
Ratibida columnifera	KS(Wyandotte), MO(Platte)
Ratibida pinnata	KS(Wyandotte), MO(Platte)
Rhamnus	KS(Wyandotte)
Rhamnus lanceolata	KS(Wyandotte)
Rhamnus lanceolata ssp. glabrata	KS(Wyandotte)
Rhus	KS(Wyandotte), MO(Platte)
Rhus aromatica	KS(Wyandotte), MO(Platte)
Rhus aromatica var. aromatica	MO(Platte)
Rhus aromatica var. serotina	KS(Wyandotte)
Rhus copallinum	KS(Wyandotte), MO(Platte)
Rhus copallinum var. latifolia	KS(Wyandotte), MO(Platte)
Rhus glabra	KS(Wyandotte), MO(Platte)
Ribes	KS(Wyandotte), MO(Platte)
Ribes missouriense	KS(Wyandotte), MO(Platte)
Robinia	KS(Wyandotte), MO(Platte)
Robinia hispida	MO(Platte)
Robinia hispida var. hispida	MO(Platte)
Robinia pseudoacacia	KS(Wyandotte)

Rorippa	KS(Wyandotte), MO(Platte)
Rorippa curvipes	KS(Wyandotte)
Rorippa curvipes var. truncata	KS(Wyandotte)
Rorippa palustris	KS(Wyandotte), MO(Platte)
Rorippa palustris ssp. fernaldiana	KS(Wyandotte), MO(Platte)
Rorippa sessiliflora	KS(Wyandotte), MO(Platte)
Rorippa sinuata	MO(Platte)
Rosa	KS(Wyandotte), MO(Platte)
Rosa arkansana	KS(Wyandotte), MO(Platte)
Rosa arkansana var. suffulta	MO(Platte)
Rosa setigera	KS(Wyandotte), MO(Platte)
Rosa setigera var. tomentosa	MO(Platte)
Rubus	KS(Wyandotte), MO(Platte)
Rubus flagellaris	KS(Wyandotte), MO(Platte)
Rubus occidentalis	KS(Wyandotte), MO(Platte)
Rubus roribaccus	MO(Platte)
Rudbeckia	KS(Wyandotte), MO(Platte)
Rudbeckia hirta	KS(Wyandotte), MO(Platte)
Rudbeckia hirta var. pulcherrima	KS(Wyandotte), MO(Platte)
Rudbeckia laciniata	MO(Platte)
Rudbeckia laciniata var. laciniata	MO(Platte)
Rudbeckia triloba	KS(Wyandotte), MO(Platte)
Rudbeckia triloba var. triloba	KS(Wyandotte), MO(Platte)
Ruellia	KS(Wyandotte), MO(Platte)
Ruellia humilis	KS(Wyandotte), MO(Platte)
Ruellia strepens	KS(Wyandotte), MO(Platte)
Rumex	KS(Wyandotte), MO(Platte)
Rumex acetosella	KS(Wyandotte), MO(Platte)
Rumex altissimus	KS(Wyandotte), MO(Platte)
Rumex crispus	KS(Wyandotte), MO(Platte)
Rumex crispus ssp. crispus	KS(Wyandotte), MO(Platte)
Rumex maritimus	KS(Wyandotte), MO(Platte)
Rumex obtusifolius	KS(Wyandotte), MO(Platte)
Rumex patientia	KS(Wyandotte), MO(Platte)
Rumex salicifolius	KS(Wyandotte)
Rumex salicifolius var. mexicanus	KS(Wyandotte)
Rumex stenophyllus	KS(Wyandotte)
Rumex verticillatus	KS(Wyandotte), MO(Platte)
Sagittaria	KS(Wyandotte), MO(Platte)
Sagittaria brevirostra	MO(Platte)
Sagittaria calycina	KS(Wyandotte), MO(Platte)
Sagittaria calycina var. calycina	KS(Wyandotte), MO(Platte)
Salix	KS(Wyandotte), MO(Platte)
Salix amygdaloides	KS(Wyandotte), MO(Platte)

Salix ×bebbii	MO(Platte)
Salix eriocephala	MO(Platte)
Salix interior	KS(Wyandotte), MO(Platte)
Salix nigra	MO(Platte)
Salsola	KS(Wyandotte), MO(Platte)
Salsola tragus	KS(Wyandotte), MO(Platte)
Salvia	KS(Wyandotte), MO(Platte)
Salvia azurea	KS(Wyandotte), MO(Platte)
Salvia azurea var. grandiflora	KS(Wyandotte), MO(Platte)
Salvia reflexa	MO(Platte)
Sambucus	KS(Wyandotte), MO(Platte)
Sambucus nigra	KS(Wyandotte), MO(Platte)
Sambucus nigra ssp. canadensis	KS(Wyandotte), MO(Platte)
Sanguinaria	KS(Wyandotte), MO(Platte)
Sanguinaria canadensis	KS(Wyandotte), MO(Platte)
Sanicula	KS(Wyandotte), MO(Platte)
Sanicula canadensis	KS(Wyandotte), MO(Platte)
Sanicula canadensis var. canadensis	KS(Wyandotte), MO(Platte)
Sanicula odorata	KS(Wyandotte), MO(Platte)
Saponaria	KS(Wyandotte), MO(Platte)
Saponaria officinalis	KS(Wyandotte), MO(Platte)
Schedonnardus	KS(Wyandotte)
Schedonnardus paniculatus	KS(Wyandotte)
Schedonorus	KS(Wyandotte), MO(Platte)
Schedonorus pratensis	KS(Wyandotte), MO(Platte)
Schizachyrium	KS(Wyandotte)
Schizachyrium scoparium	KS(Wyandotte)
Schizachyrium scoparium var. scoparium	KS(Wyandotte)
Schoenoplectus	KS(Wyandotte), MO(Platte)
Schoenoplectus acutus	MO(Platte)
Schoenoplectus acutus var. acutus	MO(Platte)
Schoenoplectus fluviatilis	MO(Platte)
Schoenoplectus saximontanus	MO(Platte)
Schoenoplectus tabernaemontani	KS(Wyandotte), MO(Platte)
Scirpus	KS(Wyandotte), MO(Platte)
Scirpus atrovirens	KS(Wyandotte), MO(Platte)
Scirpus georgianus	KS(Wyandotte), MO(Platte)
Scirpus pendulus	MO(Platte)
Scrophularia	KS(Wyandotte), MO(Platte)
Scrophularia lanceolata	KS(Wyandotte)
Scrophularia marilandica	KS(Wyandotte), MO(Platte)
Scutellaria	KS(Wyandotte), MO(Platte)
Scutellaria ovata	KS(Wyandotte), MO(Platte)
Scutellaria ovata ssp. bracteata	MO(Platte)

Scutellaria parvula	KS(Wyandotte)
Scutellaria parvula var. missouriensis	KS(Wyandotte)
Securigera	KS(Wyandotte)
Securigera varia	KS(Wyandotte)
Sedum	MO(Platte)
Sedum pulchellum	MO(Platte)
Selaginella	KS(Wyandotte)
Selaginella rupestris	KS(Wyandotte)
Sesbania	KS(Wyandotte)
Sesbania herbacea	KS(Wyandotte)
Setaria	KS(Wyandotte), MO(Platte)
Setaria faberi	KS(Wyandotte), MO(Platte)
Setaria italica	KS(Wyandotte)
Setaria viridis	KS(Wyandotte), MO(Platte)
Setaria viridis var. viridis	KS(Wyandotte), MO(Platte)
Sibara	MO(Platte)
Sibara virginica	MO(Platte)
Sicyos	KS(Wyandotte)
Sicyos angulatus	KS(Wyandotte)
Sida	KS(Wyandotte), MO(Platte)
Sida spinosa	KS(Wyandotte), MO(Platte)
Sideroxylon	KS(Wyandotte)
Sideroxylon lanuginosum	KS(Wyandotte)
Sideroxylon lanuginosum ssp. oblongifolium	KS(Wyandotte)
Silene	KS(Wyandotte), MO(Platte)
Silene antirrhina	KS(Wyandotte), MO(Platte)
Silene latifolia	MO(Platte)
Silene latifolia ssp. alba	MO(Platte)
Silene stellata	KS(Wyandotte), MO(Platte)
Silene vulgaris	MO(Platte)
Silphium	KS(Wyandotte), MO(Platte)
Silphium integrifolium	MO(Platte)
Silphium integrifolium var. integrifolium	MO(Platte)
Silphium integrifolium var. laeve	MO(Platte)
Silphium laciniatum	KS(Wyandotte)
Silphium laciniatum var. laciniatum	KS(Wyandotte)
Silphium perfoliatum	KS(Wyandotte), MO(Platte)
Silphium perfoliatum var. perfoliatum	KS(Wyandotte), MO(Platte)
Sisymbrium	KS(Wyandotte), MO(Platte)
Sisymbrium officinale	KS(Wyandotte), MO(Platte)
Sisyrinchium	KS(Wyandotte)
Sisyrinchium angustifolium	KS(Wyandotte)
Sisyrinchium campestre	KS(Wyandotte)
Sium	KS(Wyandotte)

Sium suave	KS(Wyandotte)
Smilax	KS(Wyandotte)
Smilax lasioneura	KS(Wyandotte)
Smilax tamnoides	KS(Wyandotte)
Solanum	KS(Wyandotte), MO(Platte)
Solanum americanum	MO(Platte)
Solanum carolinense	KS(Wyandotte), MO(Platte)
Solanum carolinense var. carolinense	KS(Wyandotte), MO(Platte)
Solanum elaeagnifolium	KS(Wyandotte), MO(Platte)
Solanum ptycanthum	KS(Wyandotte), MO(Platte)
Solanum rostratum	KS(Wyandotte), MO(Platte)
Solanum triflorum	KS(Wyandotte)
Solidago	KS(Wyandotte), MO(Platte)
Solidago altissima	KS(Wyandotte), MO(Platte)
Solidago canadensis	KS(Wyandotte)
Solidago canadensis var. hargeri	KS(Wyandotte)
Solidago flexicaulis	MO(Platte)
Solidago gigantea	KS(Wyandotte), MO(Platte)
Solidago nemoralis	KS(Wyandotte)
Solidago petiolaris	KS(Wyandotte)
Solidago petiolaris var. angusta	KS(Wyandotte)
Solidago ulmifolia	KS(Wyandotte), MO(Platte)
Solidago ulmifolia var. ulmifolia	MO(Platte)
Sonchus	KS(Wyandotte), MO(Platte)
Sonchus asper	KS(Wyandotte), MO(Platte)
Sorghastrum	KS(Wyandotte)
Sorghastrum nutans	KS(Wyandotte)
Sorghum	KS(Wyandotte), MO(Platte)
Sorghum halepense	KS(Wyandotte), MO(Platte)
Sparganium	KS(Wyandotte)
Sparganium eurycarpum	KS(Wyandotte)
Spartina	KS(Wyandotte)
Spartina pectinata	KS(Wyandotte)
Spermolepis	KS(Wyandotte)
Spermolepis inermis	KS(Wyandotte)
Sphenopholis	KS(Wyandotte), MO(Platte)
Sphenopholis intermedia	KS(Wyandotte)
Sphenopholis obtusata	KS(Wyandotte), MO(Platte)
Spiranthes	KS(Wyandotte)
Spiranthes cernua	KS(Wyandotte)
Spiranthes lacera	KS(Wyandotte)
Spiranthes lacera var. gracilis	KS(Wyandotte)
Spiranthes vernalis	KS(Wyandotte)
Spirodela	KS(Wyandotte)

Spirodela polyrrhiza	KS(Wyandotte)
Sporobolus	KS(Wyandotte), MO(Platte)
Sporobolus compositus	KS(Wyandotte)
Sporobolus compositus var. compositus	KS(Wyandotte)
Sporobolus cryptandrus	KS(Wyandotte)
Sporobolus neglectus	KS(Wyandotte)
Sporobolus vaginiflorus	MO(Platte)
Stachys	KS(Wyandotte), MO(Platte)
Stachys pilosa	KS(Wyandotte)
Stachys pilosa var. pilosa	KS(Wyandotte)
Stachys tenuifolia	KS(Wyandotte), MO(Platte)
Staphylea	KS(Wyandotte), MO(Platte)
Staphylea trifolia	KS(Wyandotte), MO(Platte)
Stellaria	KS(Wyandotte), MO(Platte)
Stellaria media	KS(Wyandotte), MO(Platte)
Stellaria media ssp. media	MO(Platte)
Strophostyles	KS(Wyandotte)
Strophostyles helvola	KS(Wyandotte)
Symphoricarpos	KS(Wyandotte), MO(Platte)
Symphoricarpos orbiculatus	KS(Wyandotte), MO(Platte)
Symphyotrichum	KS(Wyandotte), MO(Platte)
Symphyotrichum drummondii	KS(Wyandotte), MO(Platte)
Symphyotrichum drummondii var. drummondii	KS(Wyandotte)
Symphyotrichum ericoides	KS(Wyandotte), MO(Platte)
Symphyotrichum ericoides var. ericoides	KS(Wyandotte), MO(Platte)
Symphyotrichum laeve	KS(Wyandotte), MO(Platte)
Symphyotrichum laeve var. laeve	KS(Wyandotte), MO(Platte)
Symphyotrichum lanceolatum	KS(Wyandotte), MO(Platte)
Symphyotrichum lanceolatum ssp. lanceolatum	KS(Wyandotte)
Symphyotrichum lanceolatum ssp. lanceolatum var. lanceolatum	KS(Wyandotte)
Symphyotrichum novae-angliae	KS(Wyandotte), MO(Platte)
Symphyotrichum oblongifolium	KS(Wyandotte)
Symphyotrichum oolentangiense	KS(Wyandotte)
Symphyotrichum oolentangiense var. oolentangiense	KS(Wyandotte)
Symphyotrichum pilosum	KS(Wyandotte)
Symphyotrichum pilosum var. pilosum	KS(Wyandotte)
Symphyotrichum praealtum	KS(Wyandotte)
Symphyotrichum praealtum var. praealtum	KS(Wyandotte)
Taenidia	KS(Wyandotte)
Taenidia integerrima	KS(Wyandotte)
Tagetes	MO(Platte)
Tagetes erecta	MO(Platte)

Taraxacum	KS(Wyandotte), MO(Platte)
Taraxacum laevigatum	KS(Wyandotte)
Taraxacum officinale	KS(Wyandotte), MO(Platte)
Taraxacum officinale ssp. officinale	KS(Wyandotte), MO(Platte)
Teucrium	KS(Wyandotte), MO(Platte)
Teucrium canadense	KS(Wyandotte), MO(Platte)
Teucrium canadense var. canadense	KS(Wyandotte), MO(Platte)
Teucrium canadense var. occidentale	KS(Wyandotte)
Thalictrum	KS(Wyandotte), MO(Platte)
Thalictrum dasycarpum	KS(Wyandotte), MO(Platte)
Thalictrum thalictroides	KS(Wyandotte)
Thlaspi	KS(Wyandotte), MO(Platte)
Thlaspi arvense	KS(Wyandotte), MO(Platte)
Tilia	KS(Wyandotte), MO(Platte)
Tilia americana	KS(Wyandotte), MO(Platte)
Tilia americana var. americana	KS(Wyandotte), MO(Platte)
Torilis	KS(Wyandotte), MO(Platte)
Torilis arvensis	KS(Wyandotte), MO(Platte)
Torilis arvensis ssp. arvensis	KS(Wyandotte), MO(Platte)
Toxicodendron	KS(Wyandotte), MO(Platte)
Toxicodendron radicans	KS(Wyandotte), MO(Platte)
Toxicodendron radicans ssp. negundo	KS(Wyandotte), MO(Platte)
Tradescantia	KS(Wyandotte), MO(Platte)
Tradescantia bracteata	KS(Wyandotte)
Tradescantia ohiensis	KS(Wyandotte), MO(Platte)
Tragopogon	KS(Wyandotte), MO(Platte)
Tragopogon dubius	KS(Wyandotte), MO(Platte)
Tribulus	KS(Wyandotte)
Tribulus terrestris	KS(Wyandotte)
Tridens	KS(Wyandotte), MO(Platte)
Tridens flavus	KS(Wyandotte), MO(Platte)
Tridens flavus var. flavus	KS(Wyandotte), MO(Platte)
Trifolium	KS(Wyandotte), MO(Platte)
Trifolium hybridum	MO(Platte)
Trifolium pratense	KS(Wyandotte), MO(Platte)
Trifolium repens	KS(Wyandotte), MO(Platte)
Triodanis	KS(Wyandotte), MO(Platte)
Triodanis holzingeri	KS(Wyandotte)
Triodanis leptocarpa	KS(Wyandotte)
Triodanis perfoliata	KS(Wyandotte), MO(Platte)
Triosteum	KS(Wyandotte), MO(Platte)
Triosteum perfoliatum	KS(Wyandotte), MO(Platte)
Triphora	KS(Wyandotte)
Triphora trianthophora	KS(Wyandotte)

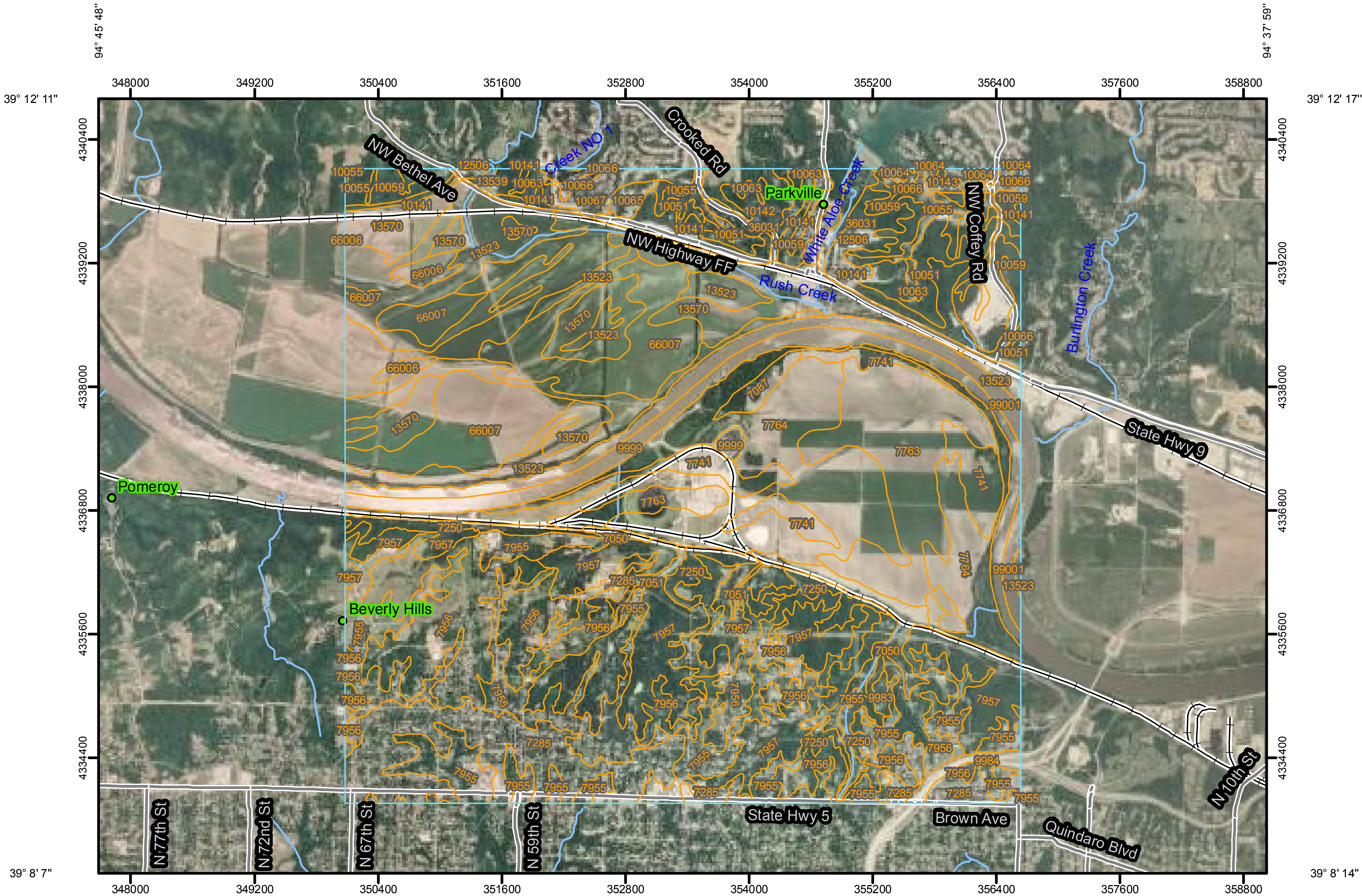
Triplasis	KS(Wyandotte)
Triplasis purpurea	KS(Wyandotte)
Tripsacum	KS(Wyandotte)
Tripsacum dactyloides	KS(Wyandotte)
Typha	KS(Wyandotte), MO(Platte)
Typha angustifolia	KS(Wyandotte), MO(Platte)
Typha latifolia	KS(Wyandotte), MO(Platte)
Ulmus	KS(Wyandotte), MO(Platte)
Ulmus americana	KS(Wyandotte), MO(Platte)
Ulmus pumila	KS(Wyandotte)
Ulmus rubra	KS(Wyandotte), MO(Platte)
Ulmus thomasii	MO(Platte)
Urtica	KS(Wyandotte), MO(Platte)
Urtica dioica	KS(Wyandotte), MO(Platte)
Urtica dioica ssp. gracilis	KS(Wyandotte), MO(Platte)
Utricularia	MO(Platte)
Utricularia macrorhiza	MO(Platte)
Uvularia	KS(Wyandotte)
Uvularia grandiflora	KS(Wyandotte)
Valerianella	MO(Platte)
Valerianella radiata	MO(Platte)
Veratrum	KS(Wyandotte)
Veratrum virginicum	KS(Wyandotte)
Verbascum	KS(Wyandotte), MO(Platte)
Verbascum blattaria	KS(Wyandotte), MO(Platte)
Verbascum thapsus	KS(Wyandotte), MO(Platte)
Verbena	KS(Wyandotte), MO(Platte)
Verbena bracteata	KS(Wyandotte), MO(Platte)
Verbena hastata	KS(Wyandotte), MO(Platte)
Verbena hastata var. hastata	MO(Platte)
Verbena simplex	KS(Wyandotte)
Verbena stricta	KS(Wyandotte), MO(Platte)
Verbena urticifolia	KS(Wyandotte), MO(Platte)
Verbena urticifolia var. urticifolia	MO(Platte)
Verbesina	KS(Wyandotte), MO(Platte)
Verbesina alternifolia	KS(Wyandotte)
Verbesina helianthoides	MO(Platte)
Vernonia	KS(Wyandotte), MO(Platte)
Vernonia baldwinii	KS(Wyandotte), MO(Platte)
Vernonia baldwinii ssp. interior	KS(Wyandotte), MO(Platte)
Vernonia fasciculata	MO(Platte)
Vernonia fasciculata ssp. fasciculata	MO(Platte)
Vernonia ×illinoensis	MO(Platte)
Vernonia missurica	MO(Platte)

Veronica	KS(Wyandotte), MO(Platte)
Veronica arvensis	KS(Wyandotte), MO(Platte)
Veronica peregrina	KS(Wyandotte), MO(Platte)
Veronica peregrina ssp. peregrina	KS(Wyandotte), MO(Platte)
Veronica peregrina ssp. xalapensis	KS(Wyandotte), MO(Platte)
Veronica polita	MO(Platte)
Viburnum	KS(Wyandotte), MO(Platte)
Viburnum prunifolium	KS(Wyandotte), MO(Platte)
Vicia	KS(Wyandotte), MO(Platte)
Vicia americana	MO(Platte)
Vicia americana ssp. americana	MO(Platte)
Vicia sativa	KS(Wyandotte)
Vicia sativa ssp. nigra	KS(Wyandotte)
Vicia villosa	KS(Wyandotte), MO(Platte)
Vicia villosa ssp. villosa	MO(Platte)
Vinca	MO(Platte)
Vinca minor	MO(Platte)
Viola	KS(Wyandotte), MO(Platte)
Viola affinis	MO(Platte)
Viola bicolor	KS(Wyandotte), MO(Platte)
Viola missouriensis	KS(Wyandotte), MO(Platte)
Viola nephrophylla	MO(Platte)
Viola pedata	MO(Platte)
Viola pubescens	KS(Wyandotte), MO(Platte)
Viola pubescens var. pubescens	MO(Platte)
Viola sororia	KS(Wyandotte), MO(Platte)
Viola tricolor	MO(Platte)
Vitis	KS(Wyandotte), MO(Platte)
Vitis aestivalis	KS(Wyandotte), MO(Platte)
Vitis aestivalis var. aestivalis	KS(Wyandotte), MO(Platte)
Vitis cinerea	KS(Wyandotte), MO(Platte)
Vitis cinerea var. cinerea	KS(Wyandotte), MO(Platte)
Vitis riparia	KS(Wyandotte), MO(Platte)
Vitis vulpina	KS(Wyandotte)
Vulpia	KS(Wyandotte)
Vulpia octoflora	KS(Wyandotte)
Vulpia octoflora var. octoflora	KS(Wyandotte)
Woodsia	KS(Wyandotte), MO(Platte)
Woodsia obtusa	KS(Wyandotte), MO(Platte)
Woodsia obtusa ssp. obtusa	MO(Platte)
Xanthium	KS(Wyandotte), MO(Platte)
Xanthium strumarium	KS(Wyandotte), MO(Platte)
Xanthium strumarium var. canadense	MO(Platte)
Zanthoxylum	KS(Wyandotte), MO(Platte)

Zanthoxylum americanum	KS(Wyandotte), MO(Platte)
Zizia	KS(Wyandotte)
Zizia aurea	KS(Wyandotte)

Time Generated:

Soil Map—Platte County, Missouri, and Wyandotte County, Kansas



Map Scale: 1:53,800 if printed on A size (8.5" x 11") sheet.

N

Meters: 0, 500, 1,000, 2,000, 3,000

Feet: 0, 2,500, 5,000, 10,000, 15,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features

- Gully
- Short Steep Slope
- Other

Political Features

- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:53,800 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 15N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Platte County, Missouri
Survey Area Data: Version 9, Jun 3, 2009

Soil Survey Area: Wyandotte County, Kansas
Survey Area Data: Version 4, Dec 28, 2009

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Date(s) aerial images were photographed: 7/15/2007; 7/6/2007

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Platte County, Missouri (MO165)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
10051	Knox silt loam, 20 to 35 percent slopes, eroded	245.6	2.5%
10055	Knox silt loam, 5 to 9 percent slopes, eroded	95.5	1.0%
10059	Knox silty clay loam, 14 to 20 percent slopes, severely eroded	185.0	1.9%
10063	Knox silty clay loam, 9 to 14 percent slopes, severely eroded	79.5	0.8%
10064	Knox-Urban land complex, 14 to 20 percent slopes	24.4	0.2%
10065	Knox-Urban land complex, 20 to 30 percent slopes	24.4	0.2%
10066	Knox-Urban land complex, 5 to 9 percent slopes	32.6	0.3%
10067	Knox-Urban land complex, 9 to 14 percent slopes	112.4	1.1%
10141	Snead-Rock outcrop complex, 14 to 30 percent slopes	367.1	3.7%
10142	Snead-Rock outcrop complex, 5 to 14 percent slopes	69.0	0.7%
10143	Snead-Urban land complex, 9 to 30 percent slopes	19.2	0.2%
12506	Wiota silt loam, 0 to 2 percent slopes, rarely flooded	16.7	0.2%
13523	Haynie silt loam, clayey substratum, 0 to 2 percent slopes, occasionally flooded	701.8	7.0%
13539	Kennebec silt loam, 0 to 2 percent slopes, frequently flooded	8.2	0.1%
13570	Parkville silty clay loam, 0 to 2 percent slopes, occasionally flooded	896.9	9.0%
36031	Nodaway silt loam, 0 to 2 percent slopes, frequently flooded	56.3	0.6%
66006	Waldron silty clay loam, 0 to 2 percent slopes, occasionally flooded	48.5	0.5%
66007	Leta silty clay, 0 to 2 percent slopes, occasionally flooded	674.5	6.8%
99001	Water, greater than 40 acres	253.4	2.5%
99007	Arents, earthen dam	0.5	0.0%
Subtotals for Soil Survey Area		**3,911.7**	**39.2%**
Totals for Area of Interest		**9,969.4**	**100.0%**

Wyandotte County, Kansas (KS209)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
7050	Kennebec silt loam, occasionally flooded	138.8	1.4%
7051	Kennebec silt loam, frequently flooded	22.4	0.2%
7087	Sarpy-Haynie complex, occasionally flooded	42.0	0.4%

Wyandotte County, Kansas (KS209)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
7250	Gosport-Sogn complex, 7 to 35 percent slopes	216.3	2.2%
7285	Ladoga silt loam, 3 to 8 percent slopes	501.2	5.0%
7741	Haynie silt loam, occasionally flooded	266.4	2.7%
7763	Onawa silty clay loam, occasionally flooded	579.9	5.8%
7764	Onawa soils, occasionally flooded, overwash	1,007.7	10.1%
7955	Knox silt loam, 7 to 12 percent slopes	1,018.1	10.2%
7956	Knox silt loam, 12 to 18 percent slopes	927.9	9.3%
7957	Knox complex, 18 to 30 percent slopes	983.3	9.9%
9983	Gravel pits and quarries	12.5	0.1%
9984	Made land	34.1	0.3%
9999	Water	307.1	3.1%
Subtotals for Soil Survey Area		**6,057.7**	**60.8%**
Totals for Area of Interest		**9,969.4**	**100.0%**

Appendix F
Air Dispersion Modeling Files

Appendix F
Air Dispersion Modeling Files

This appendix provides the following attachments:

Attachment A: SCREEN3 Input Files

Attachment B: SCREEN3 Output Files

Attachment C: Impact Determination for Applicable Averaging Times

```
BPU NEARMAN LNB/OFA PROJECT, UNIT 1 CO IMPACTS
P           10.0
   153.283
   121.920
   7.10180
   13.4112
   424.817
   293.000
   .000000
R
Y
   63.8600
   33.5800
   53.3300
N
Y
           1
Y
    0.000000E+00
     1.00,  500.00
Y
       54.000000
   500.00, 1000.00
Y
       71.000000
  1000.00, 2000.00
Y
       86.000000
  2000.00, 3000.00
Y
       96.000000
  3000.00, 5000.00
Y
      104.000000
  5000.00,20000.00
N
N
N
N
```

04/02/10
12:52:15

*** SCREEN3 MODEL RUN ***
*** VERSION DATED 96043 ***

BPU NEARMAN LNB/OFA PROJECT, UNIT 1 CO IMPACTS

SIMPLE TERRAIN INPUTS:

SOURCE TYPE	=	POINT
EMISSION RATE (G/S)	=	153.283
STACK HEIGHT (M)	=	121.9200
STK INSIDE DIAM (M)	=	7.1018
STK EXIT VELOCITY (M/S)	=	13.4112
STK GAS EXIT TEMP (K)	=	424.8167
AMBIENT AIR TEMP (K)	=	293.0000
RECEPTOR HEIGHT (M)	=	.0000
URBAN/RURAL OPTION	=	RURAL
BUILDING HEIGHT (M)	=	63.8600
MIN HORIZ BLDG DIM (M)	=	33.5800
MAX HORIZ BLDG DIM (M)	=	53.3300

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

BUOY. FLUX = 514.532 M**4/S**3; MOM. FLUX = 1564.149 M**4/S**2.

*** FULL METEOROLOGY ***

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	1	1.0	1.2	1499.0	1498.01	7.57	7.57	NO
100.	.0000	1	1.0	1.2	1499.0	1498.01	71.48	67.70	NO
200.	58.13	4	20.0	29.1	6400.0	122.23	16.15	45.05	HS
300.	69.45	4	20.0	29.1	6400.0	126.90	23.30	51.86	HS
400.	84.75	6	4.0	15.8	10000.0	156.63	19.29	59.59	HS
500.	97.36	6	4.0	15.8	10000.0	163.68	23.14	66.56	HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

631.	120.3	6	4.0	15.8	10000.0	172.31	28.05	77.52	HS

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 54. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
500.	515.0	6	4.0	15.8	10000.0	109.68	23.14	66.56	HS
600.	446.7	6	4.0	15.8	10000.0	116.28	26.87	73.52	HS
700.	376.0	6	4.0	15.8	10000.0	122.51	30.51	77.83	HS
800.	300.7	6	4.0	15.8	10000.0	128.46	34.08	78.29	HS
900.	244.1	6	4.0	15.8	10000.0	134.16	37.58	78.77	HS
1000.	213.9	6	3.5	13.8	10000.0	142.67	41.24	79.37	HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 500. M:

500.	515.0	6	4.0	15.8	10000.0	109.68	23.14	66.56	HS

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 71. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1000.	323.5	6	1.5	5.9	10000.0	160.08	46.05	81.97	HS
1100.	308.5	6	1.5	5.9	10000.0	160.08	48.36	82.02	HS
1200.	294.5	6	1.5	5.9	10000.0	160.08	50.73	82.06	HS
1300.	281.6	6	1.5	5.9	10000.0	160.08	53.15	82.11	HS
1400.	269.5	6	1.5	5.9	10000.0	160.08	55.62	82.15	HS
1500.	258.3	6	1.5	5.9	10000.0	160.08	58.11	82.20	HS
1600.	248.0	6	1.5	5.9	10000.0	160.08	60.63	82.24	HS
1700.	238.3	6	1.5	5.9	10000.0	160.08	63.18	82.29	HS
1800.	229.4	6	1.5	5.9	10000.0	160.08	65.74	82.33	HS
1900.	221.1	6	1.5	5.9	10000.0	160.08	68.31	82.37	HS
2000.	213.3	6	1.5	5.9	10000.0	160.08	70.90	82.42	HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1000. M:

1000.	323.5	6	1.5	5.9	10000.0	160.08	46.05	81.97	HS

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 86. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
2000.	298.8	6	1.5	5.9	10000.0	145.08	70.90	82.42	HS
2100.	288.6	6	1.5	5.9	10000.0	145.08	73.50	82.46	HS
2200.	279.0	6	1.5	5.9	10000.0	145.08	76.11	82.51	HS
2300.	270.0	6	1.5	5.9	10000.0	145.08	78.72	82.55	HS
2400.	261.6	6	1.5	5.9	10000.0	145.08	81.34	82.60	HS
2500.	253.8	6	1.5	5.9	10000.0	145.08	83.96	82.64	HS
2600.	246.3	6	1.5	5.9	10000.0	145.08	86.58	82.68	HS
2700.	239.4	6	1.5	5.9	10000.0	145.08	89.20	82.73	HS
2800.	232.8	6	1.5	5.9	10000.0	145.08	91.82	82.77	HS
2900.	226.6	6	1.5	5.9	10000.0	145.08	94.45	82.82	HS
3000.	220.7	6	1.5	5.9	10000.0	145.08	97.07	82.86	HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 2000. M:

2000.	298.8	6	1.5	5.9	10000.0	145.08	70.90	82.42	HS

****
*** SCREEN AUTOMATED DISTANCES ***
****

*** TERRAIN HEIGHT OF 96. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
3000.	270.6	6	1.5	5.9	10000.0	135.08	97.07	82.86	HS
3500.	239.5	6	1.5	5.9	10000.0	135.08	110.16	83.08	HS

```
  4000.   215.1         6     1.5     5.9 10000.0  135.08  123.18   83.29    HS
  4500.   195.5         6     1.5     5.9 10000.0  135.08  136.12   83.51    HS
  5000.   179.3         6     1.5     5.9 10000.0  135.08  148.97   83.72    HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND  3000. M:
  3000.   270.6         6     1.5     5.9 10000.0  135.08   97.07   82.86    HS

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF  104. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC              U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)   STAB  (M/S)  (M/S)    (M)    HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------   ------  ------  ------  -----
  5000.   208.3         6     1.5     5.9 10000.0  127.08  148.97   83.72    HS
  5500.   192.5         6     1.5     5.9 10000.0  127.08  161.73   83.93    HS
  6000.   179.1         6     1.5     5.9 10000.0  127.08  174.39   84.14    HS
  6500.   167.6         6     1.5     5.9 10000.0  127.08  186.96   84.35    HS
  7000.   157.6         6     1.5     5.9 10000.0  127.08  199.45   84.56    HS
  7500.   148.8         6     1.5     5.9 10000.0  127.08  211.85   84.76    HS
  8000.   141.0         6     1.5     5.9 10000.0  127.08  224.17   84.97    HS
  8500.   134.1         6     1.5     5.9 10000.0  127.08  236.41   85.17    HS
  9000.   127.9         6     1.5     5.9 10000.0  127.08  248.57   85.37    HS
  9500.   122.3         6     1.5     5.9 10000.0  127.08  260.67   85.57    HS
 10000.   117.3         6     1.5     5.9 10000.0  127.08  272.69   85.77    HS
 15000.   84.17         6     1.5     5.9 10000.0  127.08  389.68   87.68    HS
 20000.   65.73         6     1.5     5.9 10000.0  127.08  501.92   88.15    HS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND  5000. M:
  5000.   208.3         6     1.5     5.9 10000.0  127.08  148.97   83.72    HS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

 ********************************************
 *  SUMMARY OF TERRAIN HEIGHTS ENTERED FOR  *
 *    SIMPLE ELEVATED TERRAIN PROCEDURE     *
 ********************************************

      TERRAIN        DISTANCE RANGE (M)
       HT (M)       MINIMUM     MAXIMUM
      -------      --------    --------
           0.            1.        500.
          54.          500.       1000.
          71.         1000.       2000.
          86.         2000.       3000.
          96.         3000.       5000.
         104.         5000.      20000.

****************************************
     *** REGULATORY (Default) ***
    PERFORMING CAVITY CALCULATIONS
  WITH ORIGINAL SCREEN CAVITY MODEL
          (BRODE, 1988)
****************************************


 *** CAVITY CALCULATION - 1 ***       *** CAVITY CALCULATION - 2 ***
```

```
  CONC (UG/M**3)      =    3001.        CONC (UG/M**3)      =    .0000
  CRIT WS @10M (M/S) =    13.86        CRIT WS @10M (M/S) =    99.99
  CRIT WS @ HS (M/S) =    22.85        CRIT WS @ HS (M/S) =    99.99
  DILUTION WS (M/S)  =    10.00        DILUTION WS (M/S)  =    99.99
  CAVITY HT (M)      =   115.44        CAVITY HT (M)      =    98.36
  CAVITY LENGTH (M)  =   115.78        CAVITY LENGTH (M)  =    59.35
  ALONGWIND DIM (M)  =    33.58        ALONGWIND DIM (M)  =    53.33

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S.  CONC SET = 0.0

****************************************
      END OF CAVITY CALCULATIONS
****************************************


     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION         MAX CONC    DIST TO   TERRAIN
  PROCEDURE         (UG/M**3)    MAX (M)    HT (M)
--------------    -----------   -------   -------
SIMPLE TERRAIN      515.0          500.       54.

BLDG. CAVITY-1      3001.          116.       --  (DIST = CAVITY LENGTH)

BLDG. CAVITY-2      .0000           59.       --  (DIST = CAVITY LENGTH)


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```

Kansas City Board of Public Utilities

Nearman Creek Power Station

Unit 1 Low NO_X Combustion System

Maximum Model-Predicted Impacts Determination

Background:

The SCREEN3 model can only predict the 1-hour maximum concentration, with the exception of the 24-hour estimate for complex terrain impacts. As such, scaling factors were used to determine the appropriate averaging period impacts for all applicable pollutants.

Methodology:

The USEPA document *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised* [1] was utilized to obtain the scaling factors which were used to determine the appropriate averaging period impacts for all applicable pollutants.

Basis:

Since the complex terrain option in the SCREEN3 model was not applicable, the maximum model-predicted impact results from the simple terrain algorithm.

Maximum Model-Predicted Impact = 515.0 $\mu g/m^3$ (1-hour averaging period)

Calculations:

The following equation is utilized to determine the short-term averaging impacts based on the 1-hour maximum concentration.

$$X_i = X_{1-hour} \times F_i$$

where,

X_i = the i^{th} averaging time concentration, $\mu g/m^3$

X_{1-hour} = the 1-hour concentration, $\mu g/m^3$

F_i = the i^{th} averaging time multiplying factor, dimensionless = 0.7 for 8-hour

Maximum Model-Predicted Impact = 360.5 $\mu g/m^3$ (8-hour averaging period)

Notes [ ]:

1. USEPA Office of Air and Radiation. “Screening Procedures for Estimating the Air Quality Impact of Stationary Sources-Revised”. EPA-454/R-92-019. Research Triangle Park, NC. October 1992.