3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section is divided into the following resource topics:

- Air Resources, *Section 3.1*
- Geology and Soils, *Section 3.2*
- Groundwater, *Section 3.3*
- Surface Water, *Section 3.4*
- Floodplains, *Section 3.5*
- Farmland, *Section 3.6*
- Land Use, *Section 3.7*
- Public Lands, Recreation and Visual Resources, *Section 3.8*
- Vegetation, *Section 3.9*
- Wetlands, Riparian Areas, and Waters of the United States, *Section 3.10*
- Fisheries and Wildlife, *Section 3.11*
- Threatened, Endangered, Proposed, and Other Special Status Species, *Section 3.12*
- Cultural Resources, *Section 3.13*
- Socioeconomics and Environmental Justice, *Section 3.14*
- Public Safety and Services, *Section 3.15*
- Noise, *Section 3.16*
- Waste Management, *Section 3.17*

The following sections are presented for each resource topic listed above:

Affected Environment – this section succinctly describes the environment of the areas to be affected by the Proposed Action (Project) or alternatives. Because resource topics are often interrelated, one section may refer to another. The Affected Environment section includes the following:

> **Region of Influence**– This is the area that the Proposed Action or alternatives may reasonably affect. Regions of influence are specific to each resource topic. Limits of regions of influence may be natural features (such as an aquifer boundary), political boundaries (such as Carroll County), or industry-accepted norms for the resource (such as 50 kilometers (km) for one aspect of air quality).
>
> **Existing Conditions**– This discussion characterizes the resource within the region of influence and provides a framework for understanding the effects described in the Environmental Consequences section; the amount of information presented is commensurate with the importance of the effects.

Environmental Consequences – This section objectively evaluates the Proposed Action and reasonable alternatives. It presents a scientific analysis of the direct and indirect environmental impacts and forms the analytic basis for the summary comparison of impacts presented in *Section 2.0, Alternatives Including the Proposed Action*. All relevant reports prepared by AECI and its consultants were reviewed to independently evaluate and verify the accuracy and comprehensiveness of the information provided by AECI, and, where necessary, supplement this information. Because resource topics are often interrelated, one section may refer to another. The Environmental Consequences section includes the following:

> **Identification of Issues** – This discussion presents the issues analyzed, which were identified during the public scoping period for this environmental impact statement (EIS) (refer to *Section 6, Consultation and Coordination*), or by lead or cooperating agency personnel during preparation of this document.
>
> **Significance Criteria** – This discussion identifies thresholds where adverse impacts become significant.

Impact Assessment Methods – The methods used to accomplish the analysis of impacts are briefly described.

Actions Incorporated Into the Proposed Action to Reduce or Prevent Environmental Impact – These are actions that AECI has committed to implementing. Impacts have been assessed assuming these measures would be implemented if the Norborne Facility is constructed. Actions presented in this section are more fully described in *Section 2.4, Description of the Proposed Action*.

Impact Assessment – The results of the impact analysis for various components of the Proposed Action and alternatives are presented.

Mitigation – This includes measures not already included in the Proposed Action. The Council on Environmental Quality (CEQ) (1981) states that mitigation measures must be considered even for impacts that would not be considered significant, and where it is feasible to develop them. Mitigation can include things such as: (1) avoiding an impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of an action and its implementation; (3) rectifying an impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of an action; or (5) compensating for an impact by replacing or providing substitute resources or environments.

Cumulative impacts are discussed in *Section 4, Cumulative Impacts*. A description of the Proposed Action and alternatives is presented in *Section 2, Alternatives Including the Proposed Action*.

3.1 AIR RESOURCES

This section describes the existing air quality related factors in the area where emissions from the Project would have an effect. Also described are the consequences of the Project relative to air resources. The primary factors that determine the air quality of a region are the locations of air pollution sources, the type and magnitude of pollutant emissions, existing levels of ambient air pollutants, and the local meteorological conditions. These factors are discussed in *Section 3.1.1, Affected Environment*.

AECI conducted air quality modeling as part of the air quality permit application for the Project. This study took into account factors discussed in *Section 3.1.1, Affected Environment*, and through the modeling, provided an estimate of the air impacts that would occur. These air quality impacts are discussed in *Section 3.1.2, Environmental Consequences*.

3.1.1 Affected Environment

The general location of the Proposed Action (Project) and the Alternate Site is shown in Figure 3-1. The ambient air in these areas as well as in areas downwind of the emissions that result from the Project represent the affected air quality environment.

3.1.1.1 Region of Influence

As described later in this section, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six air pollutants.

The EPA has also established "significance levels" for nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns in size (PM_{10}), and carbon monoxide (CO) (EPA, 2006o). Significance levels define concentrations below which an impact of an air emissions source would be considered to be insignificant for the purposes of air quality modeling. The significance levels are shown in Table 3-1 below.

Table 3-1. Air Quality Significance Levels

Pollutant	Averaging Time				
	Annual	**24 hours**	**8 hours**	**3 hours**	**1 hour**
SO_2	1 ųgm/m^3	5 ųgm/m^3		25 ųgm/m^3	
PM_{10}	1 ųgm/m^3	5 ųgm/m^3			
NO_2	1 ųgm/m^3				
CO			500 ųmg/m^3		2000 ųmg/m^3

Significance levels as used here are only related to how the air quality modeling analysis is conducted. These significance levels do not have any relationship to potential adverse impacts. Earlier in this Section, the term significance criteria is used. This term is defined as indicating thresholds where adverse impacts become significant. For air resources, these adverse impact related criteria are described in *Section 3.1.2.2, Significance Criteria*.

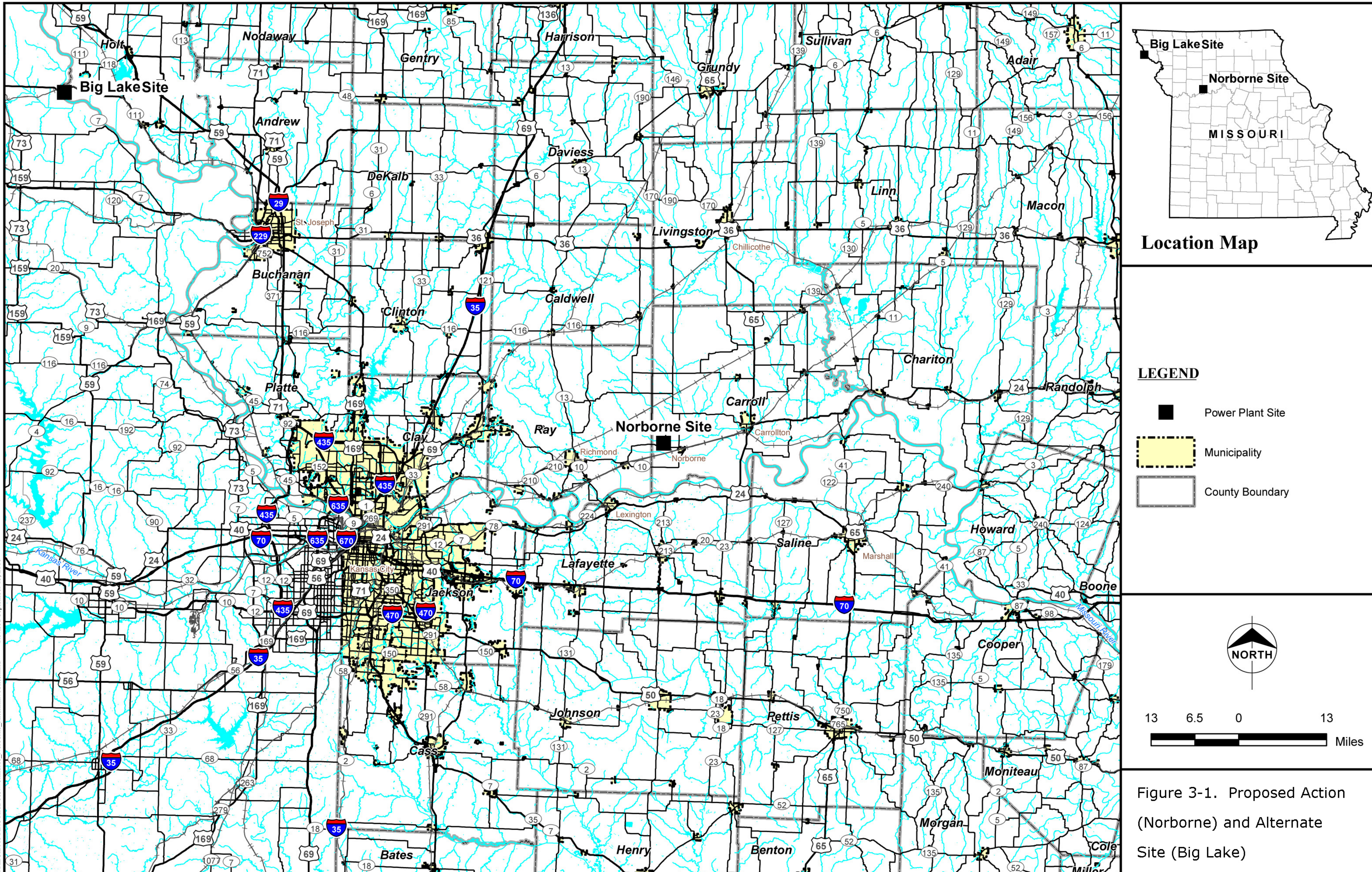

Figure 3-1. Proposed Action (Norborne) and Alternate Site (Big Lake)

Source: AECI, 2006n

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Table 3-2 shows the radius of the area of influence for each pollutant modeled for the proposed source.[30]

Table 3-2. Radius of Significant Impact

Pollutant	Radius of Influence (km)
Nitrogen Oxides (NO_X)	3.1
Sulfur Dioxide (SO_2)	7.1
Particulate Matter less than 10 Microns (PM_{10})	4.2
Carbon Monoxide (CO)	Maximum modeled results for CO showed that estimated levels were less than the significance level listed in Table 3-1; therefore, the proposed project is an insignificant contributor to CO levels, the radius of influence is zero, and no further ambient air quality demonstrations are required for CO.

A second measure of the region of influence of the Proposed Action relates to the potential impact of the proposed project on air quality related values such as visibility. The federal Clean Air Act (CAA) requires that a proposed major new air pollution source such as the Proposed Action evaluate the impact of the source on specially designated areas, called Class I areas, such as national parks and wilderness areas. Typically, the EPA requires an analysis of impacts on Class I areas that are with100 km (about 62 miles) of a major new source of air pollution. This distance can be increased for certain very large proposed sources. The term "very large" is not defined in federal guidance and in the case of the Proposed Action, AECI was required to consider the impact of the proposed project on a Class I area in Missouri even though it is further than 100 km from the Proposed Action.

<ins>How are areas classified under the Prevention of Significant Deterioration (PSD) program?</ins>
The PSD provisions of the federal CAA assign one of three classes to all areas within the United States. A Class I area is one in which visibility is protected more stringently than under the national ambient air quality standards. Class I areas include national parks, wilderness areas, monuments, and other areas of special national and cultural significance. All other areas are Class II unless a state petitions the EPA to redesignate a Class II area to Class III in order to provide added ability to accommodate emissions growth.

[30] Air Quality Permit Application, Section XX.

The Hercules Glades Wilderness Area (HGWA) in Taney County Missouri (about 295 km from the Proposed Action) is the closest Class I area (EPA, 2006r and 2006s). This area was considered to be included in the region of influence of the Proposed Action, even though it is more than 100 km distant.

3.1.1.2 Existing Conditions

3.1.1.2.1 Federal and State Laws and Regulations

The federal CAA that serves as the basis for air quality regulation was first made law in 1970. There were subsequent major amendments to the law in 1977 and 1990 (EPA, 2006a). The CAA envisions that the states will be the primary regulators of air quality and that the federal government, through the EPA, will establish the minimum set of requirements that a state must incorporate into their air quality control regulations and plans.

Section 110 of the CAA requires state and local air pollution control agencies to adopt federally approved control strategies to minimize air pollution. The resulting body of regulations is known as a State Implementation Plan (SIP). SIPs generally establish limits or work practice standards to minimize emissions of the air pollutants or their precursors. The Project must meet the requirements of the Missouri SIP. A summary of the elements of the Missouri SIP is maintained by the EPA (EPA, 2006b).

A key element of the Missouri SIP related to the Project is the requirement that the Project obtain an air quality construction permit.[31] For the air quality construction permit, the Missouri SIP refers to the federal PSD requirements.[32] Generally, this regulation requires the proponent of a proposed new air pollution source to show that the source will:

- Employ Best Available Control Technology (BACT) to reduce emissions to the ambient air,
- Not cause or significantly contribute to a violation of a NAAQS,
- Not cause or significantly contribute to exceeding a PSD increment (a cap on the amount of air quality degradation caused by new air pollution sources),

[31] Title 10 of the Missouri Code of State Regulations, Section 10-6.060 (10 CSR 10-6.060).
[32] Title 40 of the Code of Federal Regulations, Section 52.21 (40 CFR 52.21).

- Comply with all applicable New Source Performance Standards (NSPS),
- Not significantly degrade visibility in Class I areas, and
- Comply with all other applicable requirements.

Regulation of Hazardous Air Pollutants (HAPs)

Coal fired power plants emit mercury, a Hazardous Air Pollutant (HAP) listed in the CAA. When congress amended the CAA in 1990, they recognized that mercury emissions from power plants required special study in order to determine whether those emissions should be regulated as a HAP. Section 112(n) of the CAA specifies:

> "The Administrator shall perform a study of the hazards to public health reasonably anticipated to occur as a result of emissions by electric utility steam generating units of pollutants listed under subsection (b) after imposition of the requirements of this Act. The Administrator shall report the results of this study to the Congress within 3 years after the date of the enactment of the Clean Air Act Amendments of 1990. The Administrator shall develop and describe in the Administrator's report to Congress alternative control strategies for emissions which may warrant regulation under this section. The Administrator shall regulate electric utility steam generating units under this section, if the Administrator finds such regulation is appropriate and necessary after considering the results of the study required by this subparagraph."

On May 18, 2005, EPA finalized its regulatory approach to controlling mercury emissions from power plants. The rule published on that date is known as the Clean Air Mercury Rule (CAMR).

3.1.1.2.2 Criteria Air Pollutants

The EPA has established primary air quality standards to protect human health including the health of "sensitive" populations such as asthmatics, children, and the elderly by setting maximum ambient air concentrations for six common air pollutants, called criteria pollutants. The six criteria pollutants, described below, are CO, ozone (O_3), NO_X, SO_2, lead (Pb), and PM. The EPA also sets secondary air quality standards. These standards are designed to protect the public welfare. Examples of what secondary standards are designed to protect include crops, visibility, and effects on material and coatings such as metals and paints. Collectively these standards are referred to as the National Ambient Air Quality Standards (NAAQS).

The sources and potential health effects of each of these pollutants is described below.

Carbon Monoxide (CO)

CO is a colorless, odorless, and (at high levels) poisonous gas, formed when carbon in fuels is not burned completely. It is a product of motor vehicle exhaust, which contributes about 60 percent of all CO emissions nationwide. High concentrations of CO generally occur in areas with heavy traffic congestion. In cities, as much as 95 percent of all CO emissions may emanate from automobile exhaust. Other sources of CO emissions include industrial processes such as carbon black manufacturing, non-transportation fuel combustion, and natural sources such as wildfires. Woodstoves, cooking, cigarette smoke, and space heating are sources of CO in indoor environments. Peak CO concentrations typically occur during the colder months of the year when CO automotive emissions are greater and nighttime inversion conditions are more frequent.

Ozone (O_3)

Ground-level O_3 (sometimes referred to as smog) is formed by the reaction of volatile organic compounds (VOCs) and NO_X in the atmosphere in the presence of sunlight. These two pollutants, often referred to as O_3 precursors, are emitted by many types of pollution sources, including on-road and off-road motor vehicles and engines, power plants and industrial facilities, and smaller sources, collectively referred to as area sources. O_3 is predominately a summertime air pollutant. Changing weather patterns contribute to yearly differences in O_3 concentrations from region to region. O_3 and the pollutants that form O_3 also can be transported into an area from pollution sources found hundreds of miles upwind.

O_3 is a health concern, particularly for children and people with asthma and other respiratory diseases. O_3 has also been associated with increased hospitalizations and emergency room visits for respiratory causes, school absences, and reduced activity and productivity because people are suffering from ozone-related respiratory symptoms (FR, 2004).

Nitrogen Oxides (NO_X)

NO_X is a reddish brown, highly reactive gas that is formed in the ambient air through the oxidation of nitric oxide (NO). NO_X, the generic term for a group of highly reactive gases that contain nitrogen and oxygen in varying amounts, play a major role in the formation of O_3, PM, haze, and acid rain. The major sources of man-made NO_X emissions are high-temperature combustion processes such as those that occur in automobiles and power plants. Home heaters and gas stoves can also produce substantial amounts of nitrogen dioxide (NO_2) in indoor settings.

Long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause irreversible alterations in lung structure. NO_X react in the air to form ground-level O_3 and fine particle pollution, which are associated with adverse health effects.

NO_X contribute to a wide range of environmental effects directly and when combined with other precursors in acid rain and O_3. Increased nitrogen inputs to terrestrial and wetland systems can lead to changes in plant species composition and diversity. Similarly, direct nitrogen inputs to aquatic ecosystems such as those found in estuarine and coastal waters can lead to eutrophication (a condition that promotes excessive algae growth, which can lead to a severe depletion of DO and increased levels of toxins harmful to aquatic life). Nitrogen, alone or in acid rain, also can acidify soils and surface waters. Acidification of soils causes the loss of essential plant nutrients and increased levels of soluble aluminum that are toxic to plants. Acidification of surface waters creates conditions of low pH and levels of aluminum that are toxic to fish and other aquatic organisms. NO_X also contribute to visibility impairment (EPA, 2006c).

Sulfur Dioxide (SO_2)

SO_2, a colorless, reactive gas, is produced during the burning of sulfur-containing fuels such as coal and oil, during metal smelting, and by other industrial processes. Major sources include power plants, industrial boilers, petroleum refineries, smelters, and iron and steel mills. Generally, the highest concentrations of sulfur dioxide are found near large fuel combustion sources.

Acid deposition or "acid rain" occurs when SO_2 and NO_X react with water, oxygen, and oxidants to form acidic compounds. It is deposited in dry form (gas, articles) or wet form (rain, snow, fog), and can be carried by wind hundreds of miles across state and national borders. Acid rain harms lakes and streams, damages trees, crops, historic buildings, and monuments (EPA, 2006d).

Lead (Pb)

Lead is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been from fuels in motor vehicles (such as cars and trucks) and industrial sources. Emissions from on-road vehicles decreased 99% between 1970 and 1995 due primarily to the use of unleaded gasoline. Use of leaded gasoline in highway vehicles was prohibited on December 31, 1995. Due to the phase out of leaded gasoline, ore and metals processing is the major source of lead emissions to the air today.

The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. Combustion and smelting processes operate at high temperatures and emit submicron PM lead. Material handling and mechanical operations emit larger particles of lead (EPA, 2006e).

Particulate Matter (PM)

The term "particulate matter" includes both solid particles and liquid droplets found in air. Many manmade and natural sources emit PM directly or emit other pollutants that react in the atmosphere to form PM. These solid and liquid particles come in a wide range of sizes.

Particles less than 10 micrometers in aerodynamic diameter (PM_{10}) pose a health concern because they can be inhaled into and accumulate in the respiratory system. Particles less than aerodynamic 2.5 micrometers in diameter ($PM_{2.5}$) are referred to as "fine" particles and are believed to pose the largest health risks. Because of their small size (less than one-seventh the average width of a human hair), fine particles can lodge deeply into the lungs.

Health studies have shown a significant association between exposure to fine particles and premature mortality. Other important effects include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children.

While fine particulate matter is categorized as a single pollutant, fine particulates are in reality a category of pollutants. Some fine particulate matter is formed through atmospheric reactions involving other pollutants such as sulfur dioxide and nitrogen oxides. These reactions result in formation of specific categories of fine particulates such as sulfates and nitrates. In other cases, pollutants become attached to fine particulates. An example of this is organic pollutants that become attached to fine particulates. Each of these specific types of fine particulate matter has specific, sometimes different, health effects.

Sources of fine particles include all types of combustion activities (motor vehicles, power plants, wood burning, etc.) and certain industrial processes. Particles with aerodynamic diameters between 2.5 and 10 micrometers are referred to as "coarse." Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads (EPA, 2006f).

3.1.1.2.3 National Ambient Air Quality Standards

The primary and secondary NAAQS are presented in Table 3-3 (EPA, 2006g).

Table 3-3. National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None
	35 ppm (40 mg/m^3)	1-hour[1]	None
Lead	1.5 µgm/m^3	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 µgm/m^3)	Annual (Arith Mean)	Same as Primary
Particulate Matter (PM_{10})	50 µgm/m^3	Annual[2] (Arith Mean)	Same as Primary
	150 µgm/m^3	24-hour[1]	
Particulate Matter ($PM_{2.5}$)	15 µgm/m^3	Annual[3] (Arith Mean)	Same as Primary
	65 µgm/m^3	24-hour[4]	

Table 3-3. National Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Ozone	0.08 ppm (157 µgm/m^3)	8-hour[5]	Same as Primary
Sulfur Oxides	0.03 ppm (80 µgm/m^3)	Annual (Arith Mean)	- - - - -
	0.14 ppm (365 µgm/m^3)	24-hour[1]	- - - - -
	- - - -	3-hour[1]	0.5 ppm (1,300 µgm/m^3)

[1] Not to be exceeded more than once per year.
[2] To attain this standard, the 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.
[3] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.
[4] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.
[5] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

3.1.1.2.4 Hazardous Air Pollutants (HAPs)

The CAA Amendments of 1990 contained a list of 189 substances which were categorized as HAPs. The law also provides the EPA administrator with a procedure to add or remove substances from the list. Since the time that the list was originally published in the CAA, the EPA administrator has removed three of the original substances.

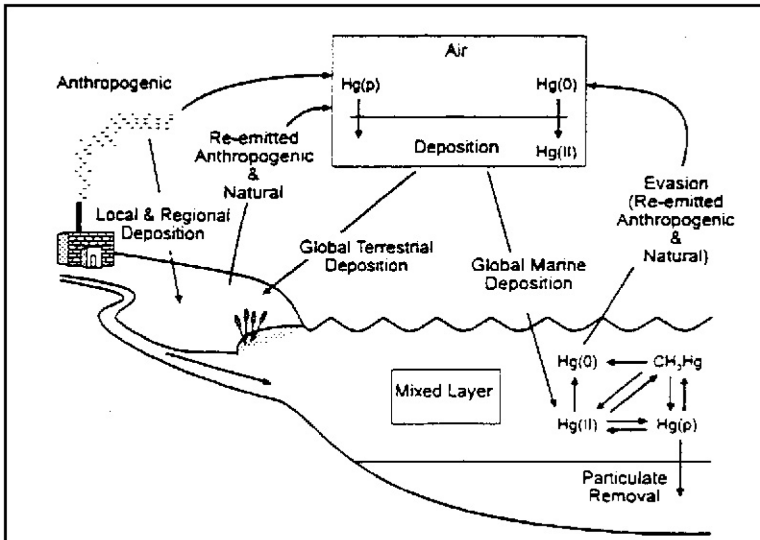
<u>What is a Hazardous Air Pollutant?</u>
Hazardous Air Pollutants, called HAPs, are air pollutants which are not covered by ambient air quality standards, but which, as defined in the CAA, may present a threat of adverse human health effects or adverse environmental effects. Examples of HAPs are asbestos, beryllium, mercury, benzene, hydrogen chloride, radionuclides, and vinyl chloride.

Mercury[33]

Of the entire list of HAPs, there is one HAP that is of primary concern when considering emissions impact of coal fired power plants. That HAP is mercury. (There are two other HAPs, hydrogen chloride and hydrogen fluoride that, absent the air pollution controls incorporated into the design of modern coal-fired power plants, could be emitted in significant quantities.)

[33] The majority of the discussion of mercury is taken from: Draft Environmental Impact Statement, Highwood Generating Station, Southern Montana Electric Generation and Transmissions Cooperative, Inc., June 2006. State specific portions of the text were modified to reflect the situation in Missouri.

At typical temperatures and pressures, elemental mercury (Hg) is a heavy, silver-white liquid metal (EPA, 1997a). As a chemical element common in the earth's crust (Levin, 2001), mercury can neither be created nor destroyed. However, mercury can cycle through the environment – including air, land and water – as part of both natural and human (anthropogenic) activities (Figure 3-2). Measured data and modeling results both indicate that the amount of mercury mobilized and released into the biosphere has increased since the beginning of the industrial age (EPA, 1997b). Figure 3-3 is a graph displaying a profile of historic concentrations of mercury developed from an age-dated, 160-m (530-ft) deep ice core from the Upper Fremont Glacier in Wyoming's Wind River Range (Abbott, 2004). Increasing background mercury deposition from the atmosphere is evident, with occasional spikes in concentration caused by volcanic eruptions.



Source: EPA, 1997a

Figure 3-2. The Mercury Cycle

Mercury plays an important role as a process or product ingredient in several industrial sectors. It has also been used in many household products, including thermometers, lamps, paints, batteries, electrical switches, pesticides, and even toys and shoes (Ohio EPA, 2000 and MNDR 2006). In the electrical industry, it is used in components such as fluorescent lamps, wiring devices and switches (e.g., thermostats) and mercuric oxide batteries (MNDR 2006). Furthermore, it is a component of dental amalgams used in repairing dental caries (cavities). In addition to specific products, mercury is utilized in numerous industrial processes, the largest of which in the United States (U.S.) is the production of chlorine and caustic soda by mercury cell chlor-alkali plants (EPA, 1997b).

ng/L = nanograms (billionths of a gram) per liter

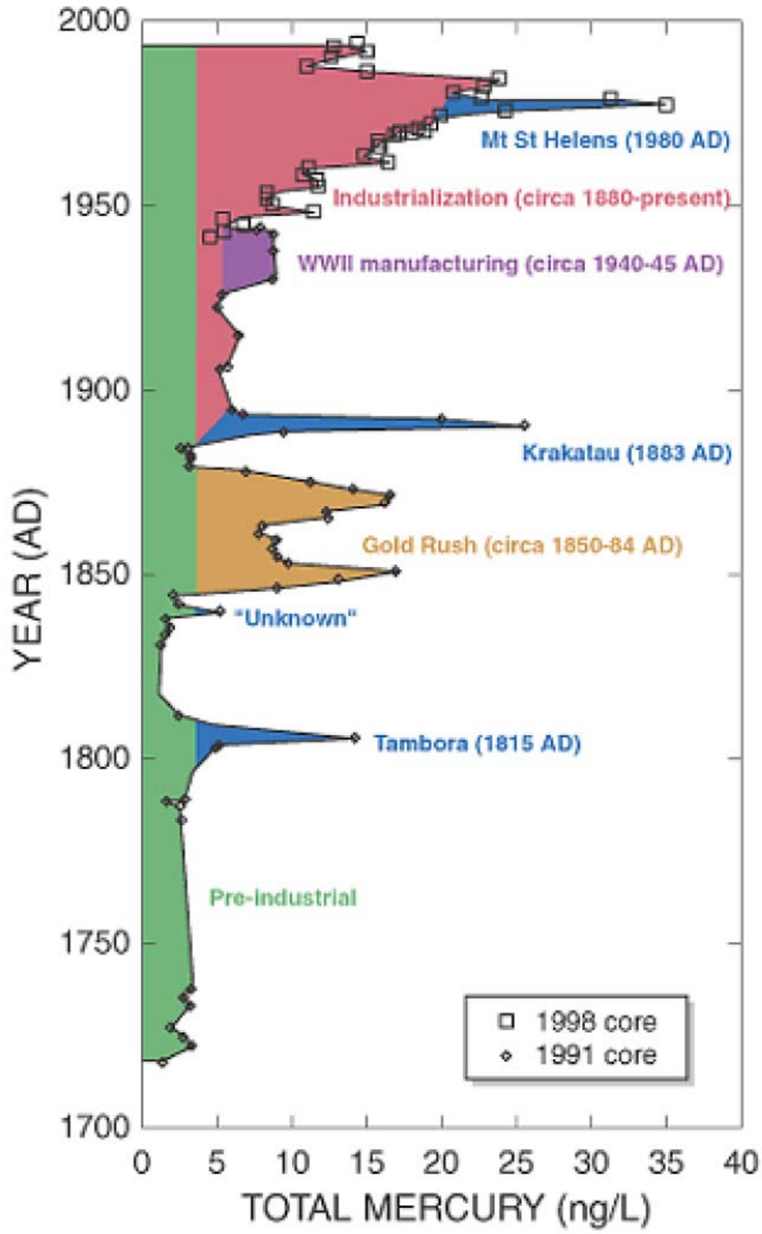


Figure 3-3. Historic Mercury Concentrations from 160-m Ice Core in Upper Fremont Glacier, Wind River Range, Wyoming

Source: Abbott, 2004

Mercury can exist in three different oxidation or valence states: Hg^0 (metallic or elemental), Hg^+ (mercurous) and Hg^{2+} (mercuric). The properties and behavior of mercury depend on its oxidation state. Elemental mercury is a liquid but also has a fairly substantial vapor pressure, meaning that mercury vapor will be present at normal environmental temperatures. The inorganic forms of mercury generally exist as solids in combination with other chemicals and do not have a measurable vapor pressure.

Mercury can also be combined with organic molecules (primarily by bacteria in sediments) to form organic mercury compounds.

The most dominant form of mercury in the atmosphere is elemental or metallic mercury (Hg^0), which is present as mercury vapor. Reactions with other chemicals and solar radiation in the atmosphere can convert elemental mercury to ionic or charged forms (Hg^{2+}, Hg^+). Most of the mercury occurring in water, soil, sediments, or biota (i.e., all environmental media except the atmosphere) is in the form of inorganic mercury salts and organic forms of mercury (EPA, 1997b).

Mercury Emissions and Deposition

Scientists estimate that natural sources of mercury – such as volcanic eruptions, forest fires, and emissions from the ocean – constitute roughly a third of current worldwide mercury air emissions (EPA, 2006h). Mercury emissions can originate from natural sources such as geysers and hot springs in Yellowstone National Park. Recent measurements have shown that Yellowstone's Norris and Mammoth thermal areas are emitting mercury to the air at the rate of 205-450 lbs/year (93-205 kg/yr) (NPS, 2005).

Anthropogenic sources account for the other two-thirds of mercury emissions. Recent estimates of annual total global mercury emissions from all sources, both natural and anthropogenic, are about 4,400 to 7,500 metric tons per year (EPA, 2006h). Much of the mercury circulating through today's environment was released years ago, when mercury was more commonly used than at present in many industrial, commercial, and residential applications. Land and water surfaces can repeatedly re-emit mercury into the atmosphere after its initial release into the environment (refer to Figure 3-2). Figure 3-4 shows that anthropogenic emissions are roughly split evenly between these re-emitted emissions from previous human activity, and direct emissions from current human activity (EPA, 2006h).

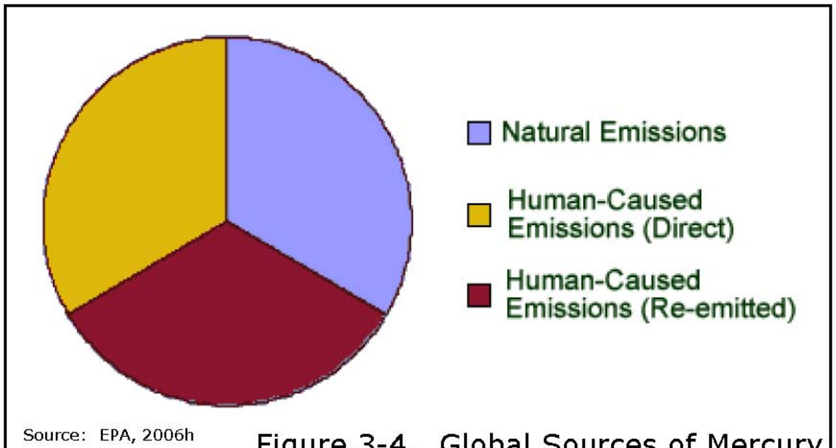


Figure 3-4. Global Sources of Mercury

U.S. anthropogenic mercury emissions are estimated to account for roughly three percent of the global total, and emissions from the U.S. power sector are estimated to account for about one percent of total global emissions (UNEP, 2002) (refer to Figure 3-5). In recent years, with increasing awareness of mercury's toxicity, increasing regulation, and technological innovation and substitution, U.S. anthropogenic emissions of mercury have decreased. They have declined 45 percent since 1990 (EPA, 2006i) (refer to Figure 3-6). The two biggest declines were in emissions from medical waste incinerators and municipal waste combustors.

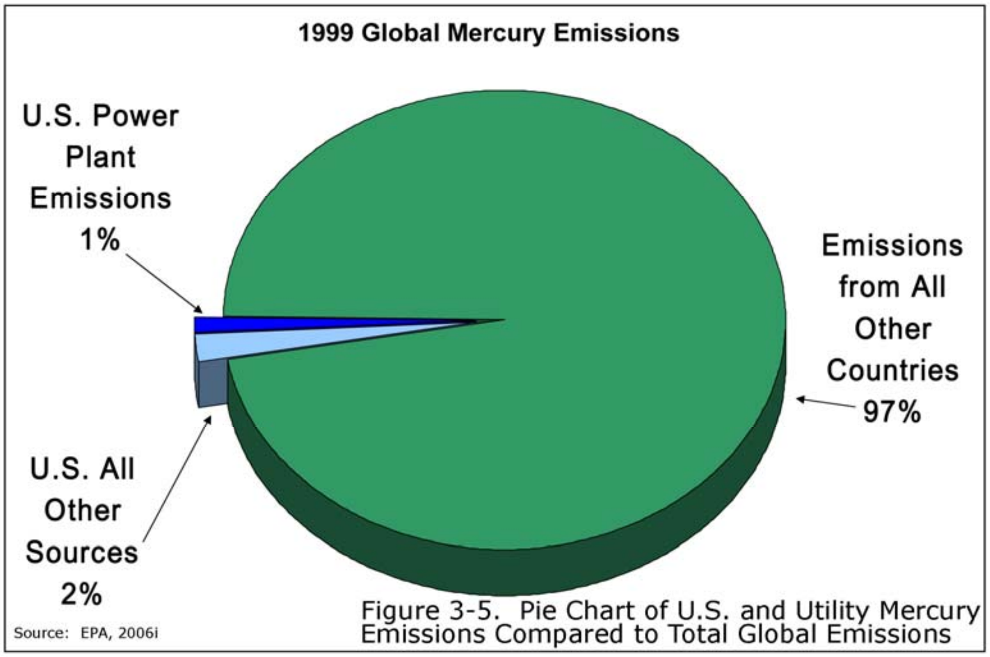


Figure 3-5. Pie Chart of U.S. and Utility Mercury Emissions Compared to Total Global Emissions

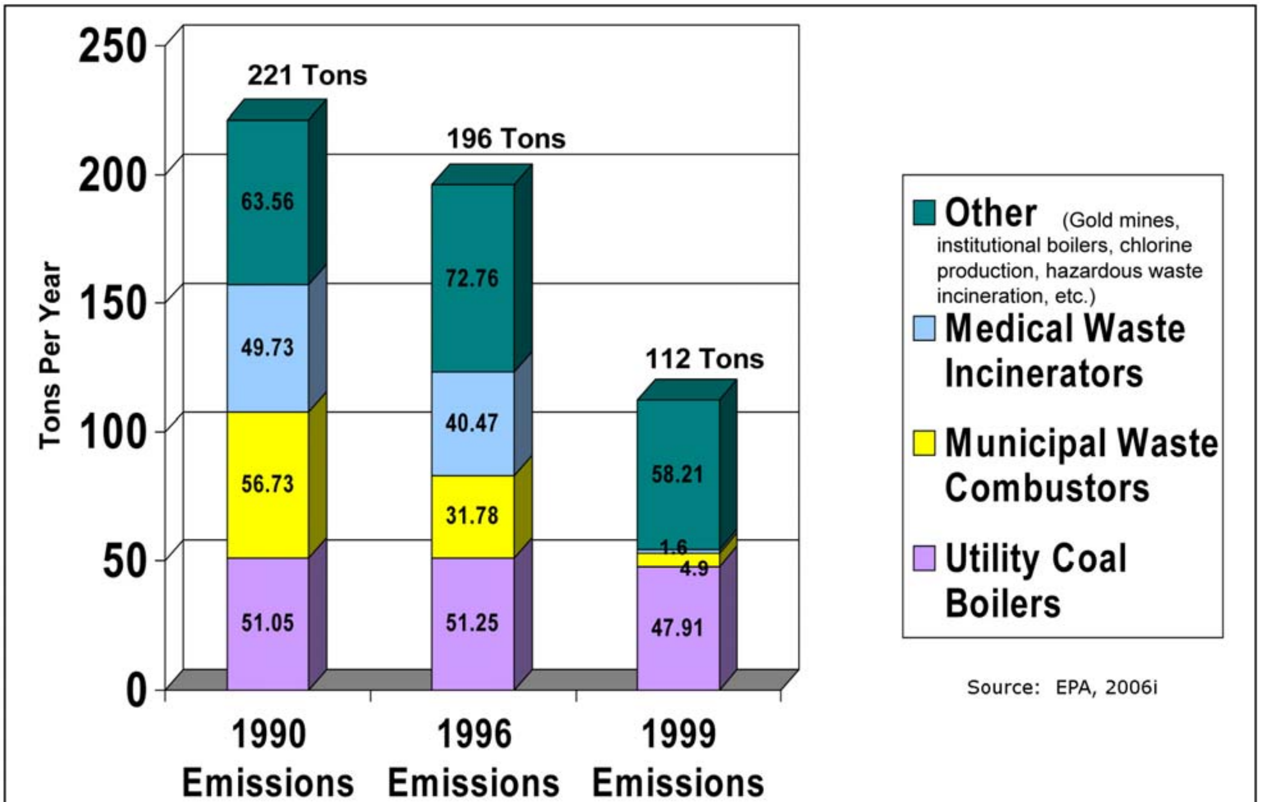
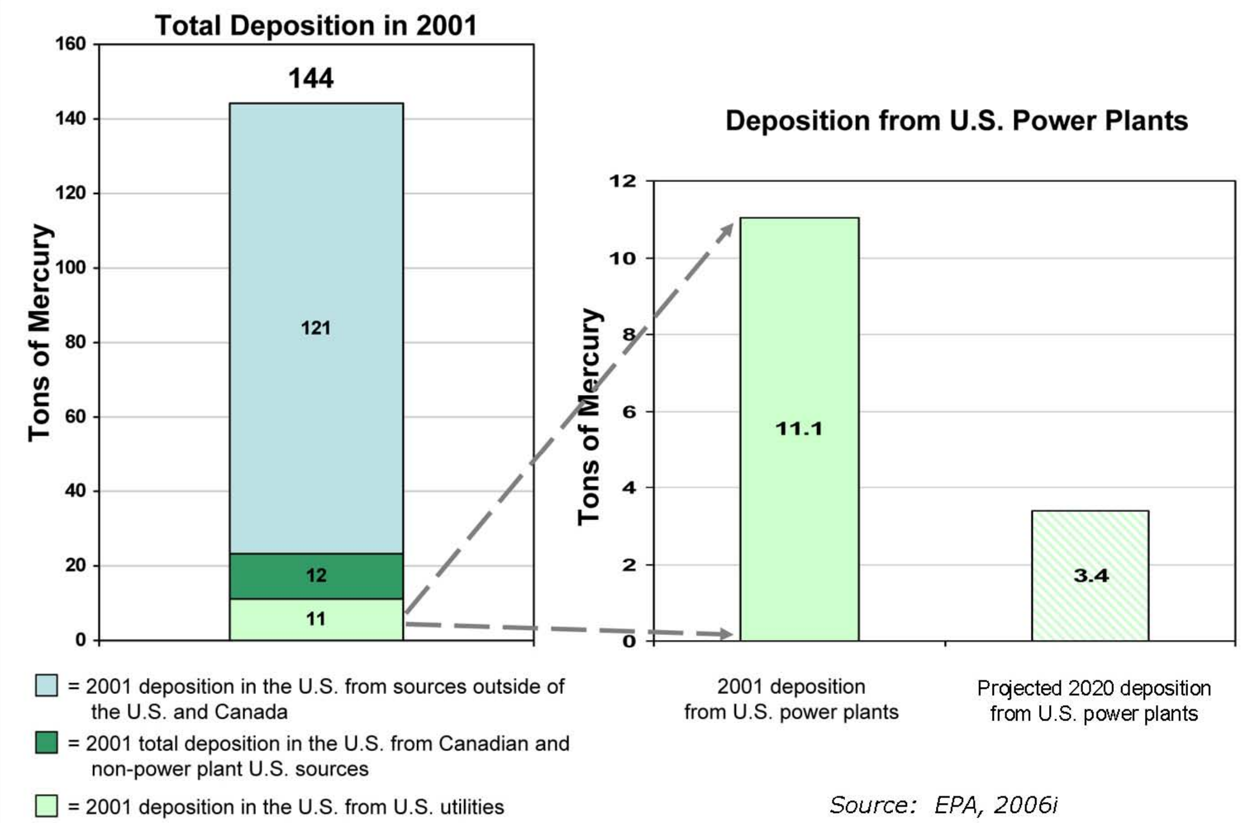


Figure 3-6. Declines in Anthropogenic U.S. Mercury Emissions Since 1990

While the overall trend in the global mercury burden since pre-industrial times appears to be increasing (by an estimated two to five times), there is some evidence that mercury concentrations in certain locations have been stable or decreasing over the past few decades. The downward trend in mercury concentrations observed in the environment in some geographic locations over the last few decades generally corresponds to declining regional mercury use and consumption patterns over the same time frame (EPA, 1997a).

Mercury occurs naturally in coal at trace amounts, and unless controlled, is released to the atmosphere when coal is burned. It is estimated that 48 tons of mercury, or about one-third of the total amount of mercury released annually by human activities in the U.S., are released into the atmosphere annually by coal-fired power plants (EPA, 2006i). Missouri power plants emitted slightly more than one and one-half tons (3,326 lbs) of mercury, or about three and one-half percent (3.52%) of total U.S. power plant emissions according the 2004 toxic release inventory data (most recent available data) submitted to US EPA (EPA, 2006j). Current estimates are that 80 percent or more of the mercury deposited within the U.S. was emitted from sources outside the U.S. and Canada (EPA, 2006i; see Figure 3-7).



Source: EPA, 2006i

Figure 3-7. Mercury Deposition in the United States (2001) by Source

On May 18, 2005, EPA published the CAMR, which will permanently cap and reduce mercury emissions from coal-fired power plants (EPA, 2005a). This rule will reduce mercury emissions in two phases. The first will reduce emissions using currently mandated technology by 2010 and the second will reduce emissions further by 2018. Additional and updated information related to CAMR from electric generating units is available at http://www.epa.gov/mercury/. CAMR relies on markets to reduce pollution, and allows companies to buy and sell allotted pollution limits. EPA assigned most states and two Indian tribes an emissions budget for mercury, and these states must submit a SIP revision detailing when they will meet their budget for reducing mercury from coal-fired power plants (EPA, 2006k).

Missouri's statewide cap on mercury emissions will be 1.393 tons in 2010 and 0.55 tons in 2018. On October 2, 2006, the Missouri Department of Natural Resources (MDNR) filed a proposed rule, 10 CSR 10-6.368, Control of Mercury from Electric Generating Units, with the secretary of state.

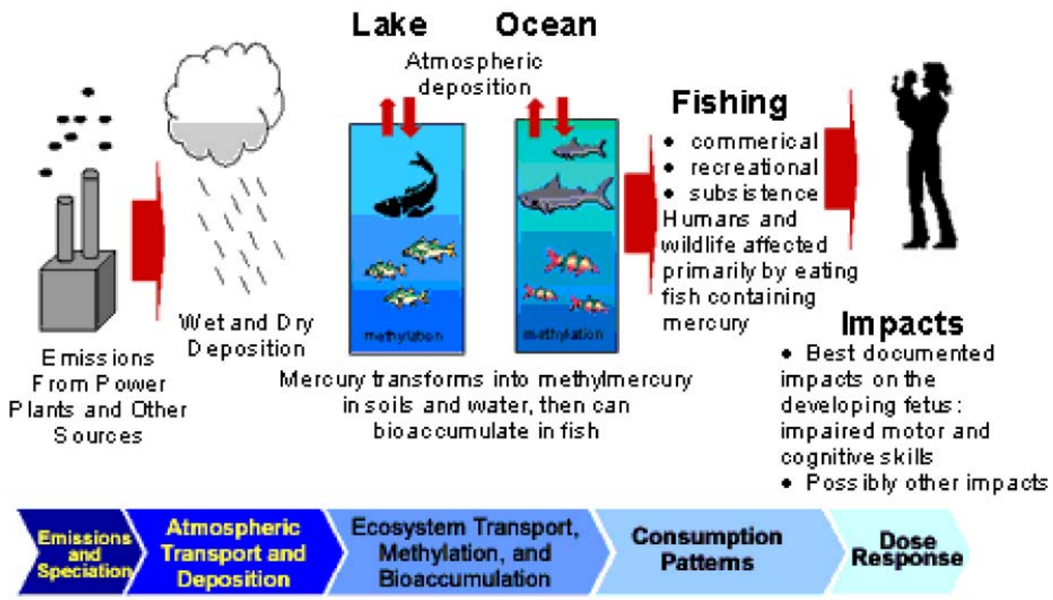
Transformation to Methylmercury and Exposure Pathways

Once in aquatic systems, mercury can exist in dissolved or particulate forms and can undergo a number of chemical transformations (Figure 3-8). Sediments contaminated with mercury at the bottom of surface waters can serve as an important reservoir of the element, with sediment-bound mercury recycling back into the aquatic ecosystem for decades or longer. Mercury also has a long retention time in soils, from which it may continue to be released to surface waters and other media for long periods of time, possibly hundreds of years (EPA, 1997b).

Mercury that enters water bodies and sediments can ultimately be transformed through "methylation" (attachment of one carbon and three hydrogen atoms) into a more toxic form, methylmercury (CH_3Hg). Methylmercury can be formed in the environment both by microbial metabolism as well as by abiotic, chemical processes, although it is generally believed that microbial metabolism is the dominant process (UNEP, 2002).

Plants, animals and humans can be exposed to mercury by direct contact with contaminated environmental media or ingestion of mercury-contaminated water and food. Unlike other forms of mercury, methylmercury is readily absorbed across biological barriers and the gastrointestinal tract. Methylmercury can build up in tissues of organisms (bioaccumulation) and increase in concentration along the food chain (biomagnification) (EPA, 1997a).

Almost all human exposure to methylmercury is through fish consumption (EPA, 1997c). Estimates developed by the World Health Organization and published by the U.S. Agency of Toxic Substances and Disease Registry (ATSDR) indicate that 99.6 percent of methylmercury intake arises from fish consumption and that 97.7 percent of inorganic mercury intake is associated with the diet (ATSDR, 1999).



Source: EPA, 2006h

Figure 3-8. Mercury Exposure Pathways

As of the 2004, forty-four (44) states (including Missouri) had issued fish consumption advisories for mercury (methylmercury) on certain water bodies, twenty-one (21) states had statewide advisories for mercury in freshwater lakes and rivers, and twelve (12) states had statewide advisories for mercury in their coastal waters (EPA, 2005b). The Missouri Department of Health and Senior Services provides recommendations on the amount and type of sport fish that can be safely eaten, how to prepare caught fish, and what special precautions should be taken by higher-risk individuals. These recommendations are published annually. The most recent recommendations are detailed in the 2006 Fish Advisory – A Guide to Eating Fish in Missouri (MDHSS, 2006). By employing a margin of safety, the guidelines are intended to protect consumers from the first symptoms of mercury toxicity. The guidelines are generally designed to protect higher-risk segments of the population, in particular, pregnant women, women of childbearing age, children, and anglers who regularly consume fish caught in Missouri waters in larger quantities over long periods of time (MDHSS, 2006, MDNR, 2006, and EPA, 2005b).

Missouri fish consumption guidelines vary substantially by fish species and size, water body, and consumer (adult men or women and children). They apply to approximately 30 water bodies in the state, all but two of which are lakes and reservoirs. The 2006 Fish Advisory – A Guide to Eating Fish in Missouri added both the Mississippi and Missouri Rivers to the advisory for mercury (MDHSS, 2006).

Mercury levels in Missouri fish appear to be mostly related to their size and the type of food they consume. For example, large fish that feed on other fish exhibit higher concentrations of mercury than smaller fish or bottom feeding fish. Sampling and analysis of largemouth bass, smallmouth bass, and spotted bass greater than 12 inches in length have been found to have the highest mercury concentrations in Missouri lakes. Fish species found in the Missouri and Mississippi rivers with high mercury concentrations were flathead, channel, and blue catfish. Certain fish species and size do not contain levels that warrant concern for consumption on a frequent or prolonged basis except for sensitive populations (MDHSS, 2006).

Health and Ecological Effects

The study of mercury's effects on health reflect the dose-response principle, which states that organisms respond to toxic substances according to the amount or dose of the substance that gets into their bodies. This is one of the fundamental principles of the field of toxicology – with increasing dose or exposure to a substance, there are likely to be greater effects.

Mercury is a well-documented human toxin at certain doses. Clinically observable neurotoxicity has been observed following exposure to large amounts of mercury (e.g., "Mad Hatters' Disease") and consumption of highly contaminated food also has induced acute mercury neurotoxicity. Generally, the most subtle indicators of methylmercury toxicity are neurological changes. These impaired motor skills and sensory ability occur at comparatively low doses, and progress to tremors, inability to walk, convulsions and death at extremely high exposures (EPA, 1997d). Mercury poisoning can also permanently damage kidneys and fetuses (EPA, 2003).

Links between mercury exposure and autism have been suggested, but these possible links remain speculative rather than definitive. For example, a recent study in Texas reported a positive correlation between environmentally released mercury pollution and rates of special education and autism at the county level (Palmer et al., 2005). However, this study did not look specifically at mercury released from power plants and it is unclear what significance power plant emissions played in their reported association.

In addition to neurotoxicity from acute and chronic exposure in human beings, mercury poisoning can potentially cause adverse health effects on individual animals and plants, up to and including mortality, and therefore may potentially affect wildlife populations and ecological communities (EPA, 1997b). Severe neurological effects were already observed in animals at Minamata, Japan, prior to the recognition of human poisonings – birds experienced severe difficulty in flying and exhibited other grossly abnormal behavior (UNEP, 2002). However, these effects occurred at levels of fish contamination that were 10 to 20 times higher than the U.S. Food and Drug Administration (FDA) limit for human consumption of 1 ppm (FDA, 2004).

Adverse effects of elevated mercury levels in fish include death, reduced reproductive success, impaired growth and development, and behavioral abnormalities. Reproductive effects are the primary concern for mercury poisoning in wildlife and can occur at dietary concentrations well below those which cause overt toxicity. Effects of mercury on birds and mammals include death, reduced reproductive success, impaired growth and development and behavioral abnormalities. Sub-lethal effects of mercury on birds and mammals include liver damage, kidney damage, and neurobehavioral effects (EPA, 1997b).

In sum, mercury is ubiquitous in the earth's biosphere, occurring in the air, water, land, and soil, as well as in living organisms. In the industrialized era, human activities have mobilized greater amounts of mercury, thereby exposing organisms, ecosystems, and human beings to a particularly toxic form, methylmercury. Almost all human exposure to methylmecury is from ingesting contaminated fish. In low doses, methylmercury can be voided by the body and is not generally problematic; at sustained, excessive doses, it may accumulate in certain tissues and organs to concentrations that can cause a variety of adverse health effects on humans and wildlife. These negative effects may be acute or chronic, and from sub-lethal to lethal. While mercury contamination is widespread, indeed global, the incidents to date have tended to involve specific point source discharges to water rather than dispersed emissions to air.

3.1.1.2.5 Global Climate Change[34]

The average temperature on the earth's surface increased by about one degree Fahrenheit from 1900 to 2000 with a definite overall upward trend since about 1970 (Figure 3-9). While the earth has experienced large climate changes, in recent decades climatologists and other earth scientists have expressed concern that the current trends in increasing global temperatures may be caused by an accumulation of green house gases (GHGs) caused by human activities.

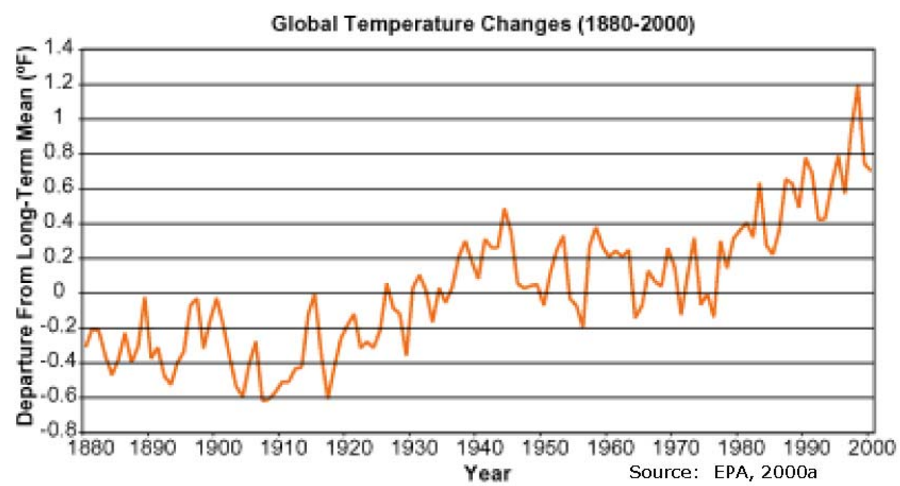


Figure 3-9. Average Global Temperature Trend from 1880 to 2000

Some GHGs occur naturally in the atmosphere, while others result from human activities (EPA, 2005c). Naturally occurring GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, and O_3. Certain GHGs are being released in growing quantities by expanding human populations and economic activities, particularly the combustion of fossil fuels (oil, natural gas, and coal) and the clearing/burning of forests, all of which emit CO_2, the principal GHG, adding to the levels of this naturally occurring gas. Another important GHG – methane – escapes to the atmosphere from cattle flatulence and rice paddies, as well as from natural gas pipeline leaks and decomposition in landfills; in other words, methane levels in the atmosphere are rising due to expanding food and energy production and waste generation. Still other

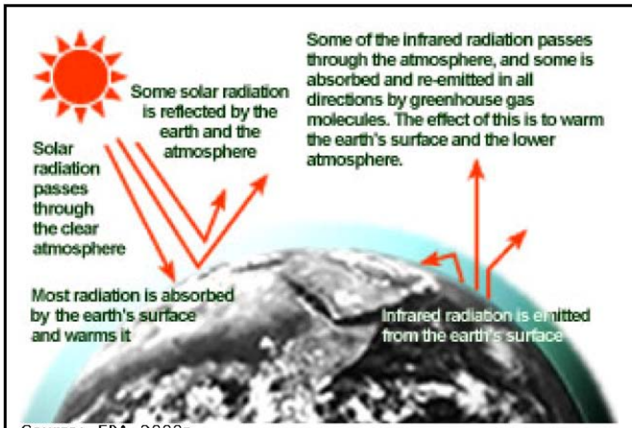
[34] The majority of the discussion of carbon dioxide emissions is taken from: Draft Environmental Impact Statement, Highwood Generating Station, Southern Montana Electric Generation and Transmissions Cooperative, Inc., June 2006. State specific portions of the text were modified to reflect the situation in Missouri.

GHGs include nitrous oxide emitted during combustion and chlorofluorocarbons (or CFCs, which also attack the stratospheric ozone layer), now banned as a result of the Montreal Protocol and other international agreements (EPA, 2000).

In 1999, MDNR revised the estimated inventoried GHG emissions in Missouri for 1990, during which approximately 148 million tons of carbon dioxide equivalent were emitted in the state. CO_2 was the major GHG emitted in Missouri, comprising 83 percent of 1990 emissions. Methane was next, accounting for approximately 11.3 percent of emissions, followed by halocarbons at 3.1 percent, and nitrous oxide at 2.6 percent (MDNR, 1999).

Fossil fuel consumption was the major source of GHGs released in Missouri, accounting for 77 percent of the total GHG emissions. That 77 percent is broken down as follows: coal 49 percent, petroleum 39 percent, and natural gas 12 percent (MDNR, 1999). In 2002, funded by a grant from EPA, MDNR prepared the "Missouri Action Options for Reducing Greenhouse Gas Emissions" to control GHG emissions in the state; among other emissions sectors it considered, this document investigated strategies to reduce or offset electric utility industry GHG emissions (MDNR, 2002).

Energy from the sun heats the earth's surface and drives the earth's weather and climate; in turn, the earth radiates energy back out to space (Figure 3-10). GHGs are transparent to incoming solar radiation but trap some of the outgoing infrared (heat) energy, retaining heat rather like the glass panels of a greenhouse. Without this natural "greenhouse effect," temperatures would be much lower than they are now, and life as we know it would not be possible. Because of GHGs, the earth's average temperature is a more hospitable 60 degrees Fahrenheit (EPA, 2000a).



Source: EPA, 2000a

Figure 3-10. The Greenhouse Effect

Since the beginning of the Industrial Revolution, atmospheric concentrations of CO_2 have increased nearly 30 percent, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15 percent. These increases have enhanced the heat-trapping capability of the earth's atmosphere. Sulfate aerosols, common air pollutants, cool the atmosphere by reflecting light back into space; however, sulfates are short-lived in the atmosphere and vary regionally (EPA, 2000). Also, with national and worldwide efforts to curb emissions of these pollutants, their offsetting influence is believed to be diminishing.

The National Research Council of the National Academy of Sciences (NAS) concluded in 2001 that the "warming process has intensified in the past 20 years, accompanied by retreating glaciers, thinning arctic ice, rising sea levels, lengthening of the growing season in many areas, and earlier arrival of migratory birds" (NRC, 2001). Among the predicted changes in the U.S. are "potentially severe droughts, increased risk of flood, mass migrations of species, substantial shifts in agriculture and widespread erosion of coastal zones" (NAST, 2000). While U.S. agricultural production could increase, due to "fertilization" of the air with CO_2, "many long-suffering ecosystems, such as alpine meadows, coral reefs, coastal wetlands and Alaskan permafrost, will likely deteriorate further. Some may disappear altogether." (Suplee, 2000; Anon., 2000).

In 2001, the Intergovernmental Panel on Climate Change (IPCC) released *Climate Change 2001: Impacts, Adaptation and Vulnerability,* a report prepared by Working Group II (which included approximately 50 lead authors from more than 20 countries). The report concludes:

> *The stakes associated with projected changes in climate are high* [emphasis in original]. Numerous Earth systems that sustain human societies are sensitive to climate and will be impacted by changes in climate…Impacts can be expected in ocean circulation; sea level; the water cycle; carbon and nutrient cycles; air quality; the productivity and structure of natural ecosystems; the productivity of agricultural, grazing, and timber lands; and the geographic distribution, behavior, abundance, and survival of plant and animal species, including vectors and hosts of human disease. Changes in these systems in response to climate change, as well as direct effects of climate change on humans, would affect human welfare, positively and negatively. Human welfare would be impacted through changes in supplies of and demands for water, food, energy, and other tangible goods that are derived from these systems; changes in opportunities for nonconsumptive uses of the

> environment for recreation and tourism; changes in non-use values of the environment such as cultural and preservation values; changes in incomes; changes in loss of property and lives from extreme climate phenomena; and changes in human health (IPCC, 2001).

Climate changes have been documented in Missouri. For example, during the past century, the average temperature in Jefferson City increased 0.5°F and precipitation has increased by up to 10 percent in many parts of the state (EPA, 1997e). It is not known whether these changes represent local variations in climate, or whether they are part of a global trend.

There is agreement among most scientists that global temperatures are rising and that temperature changes are related to global greenhouse gas emissions and natural temperature cycles. What is not entirely clear is the relative role of natural temperature cycles and CO_2 emissions increases.

3.1.1.3 Existing Conditions – Meteorological Conditions

The following paragraphs present information on the meteorological conditions in the area where the new unit is proposed to be built. Information is also presented on existing ambient air quality.

Meteorological Conditions

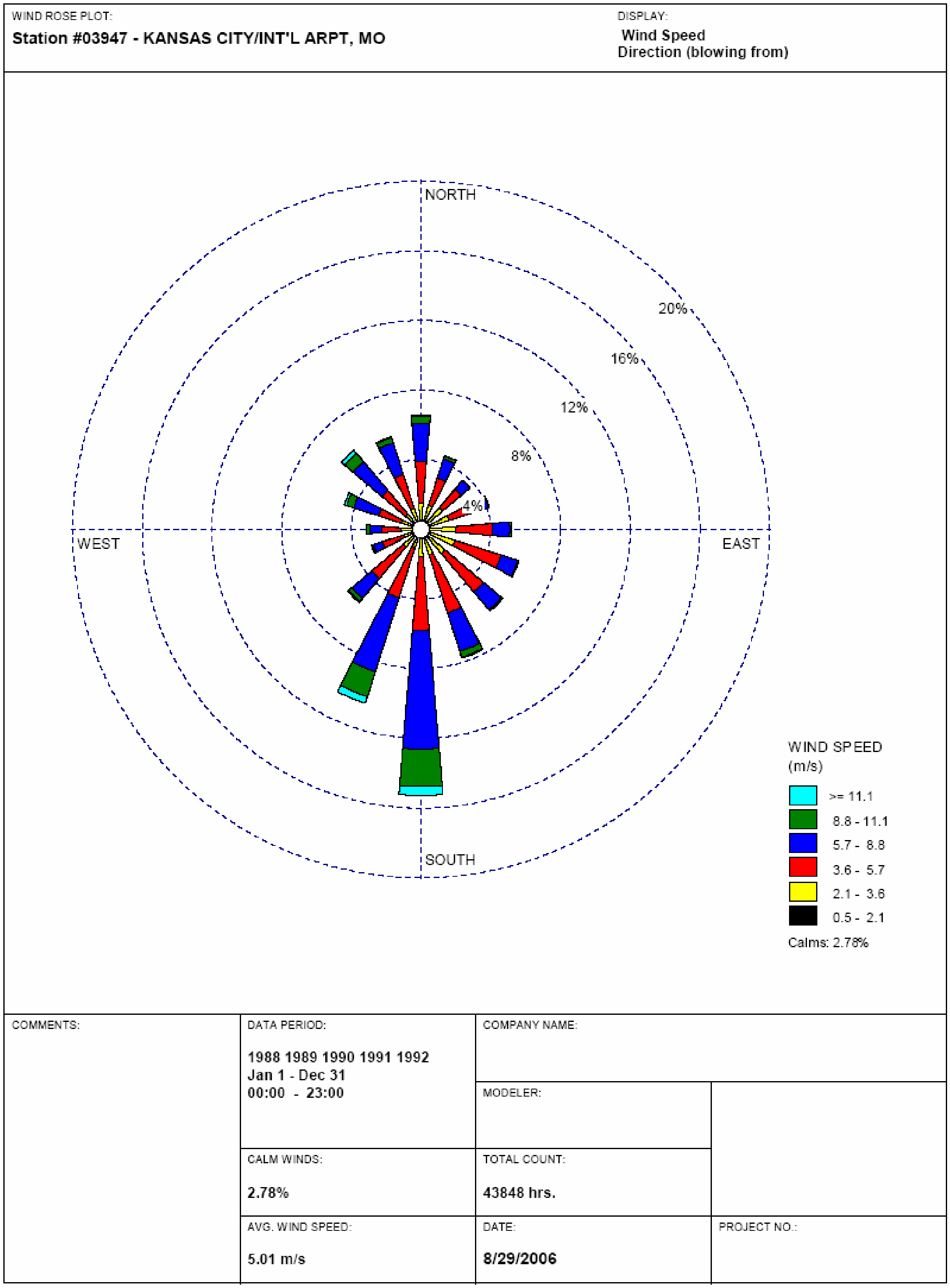
The nearest National Weather Service long term weather observation data are from the Kansas City International Airport. Table 3-4 shows a summary of temperature and precipitation data for the period 1971 through 2000 (EPA, 2006k). The annual mean temperature is 54.2°F with a monthly mean maximum temperature of 88.8°F in July and a monthly mean minimum temperature of 26.9°F in January. The annual precipitation is 37.98 inches with May being the month with the highest mean precipitation, 5.39 inches.

Figure 3-11 shows an annual windrose (five years of data) for Kansas City International Airport (EPA, 2006l). The average wind speed is 11.2 miles per hour and the predominant wind directions are from the south and the south-southwest.

Table 3-4. Average Temperature and Precipitation Data – 1971 to 2000, Kansas City Airport

	Parameter			
	Max °F	**Min °F**	**Mean °F**	**Precipitation (in)**
Jan	36	17.8	26.9	1.15
Feb	42.6	23.3	33	1.31
Mar	54.4	33.2	43.8	2.44
Apr	65.2	43.5	54.4	3.38
May	74.6	53.9	64.3	5.39
Jun	83.9	63.2	73.6	4.44
Jul	88.8	68.2	78.5	4.42
Aug	87.1	66.1	76.6	3.54
Sep	79	57.2	68.1	4.64
Oct	67.6	45.9	56.8	3.33
Nov	52	33.4	42.7	2.30
Dec	40	22.5	31.3	1.64
Ann	64.3	44	54.2	37.98

Source: Midwest Regional Climate Center (http://mcc.sws.uiuc.edu/climate_midwest/historical/precip/mo/234358_psum.html)



Source: Data obtained from USEPA Web Site (http://www.epa.gov/scram001/surfacemetdata.htm#mo)

Figure 3-11. Annual Wind Rose – Kansas City International Airport

A windrose for the “ozone season” is shown in Figure 3-12. The ozone season starts on May 1 and runs through September 30. In western Missouri, it is very unlikely that elevated O_3 levels would be measured outside of the ozone season and therefore, the state monitoring system measures O_3 levels in the ozone season only. Since the ozone season is the portion of the year that is most likely to have elevated O_3 levels, and since O_3 is formed in the atmosphere over a period of hours, it is important to know predominant wind directions during the ozone season to determine potential contributors to elevated O_3 levels.

The windrose shown in Figure 3-12 shows that the predominant wind directions during the ozone season are from the south, the south-southeast, and the south-southwest. This demonstrates that the proposed project, located to the northeast of Kansas City would not be expected to be a contributor to elevated O_3 levels in Kansas City.

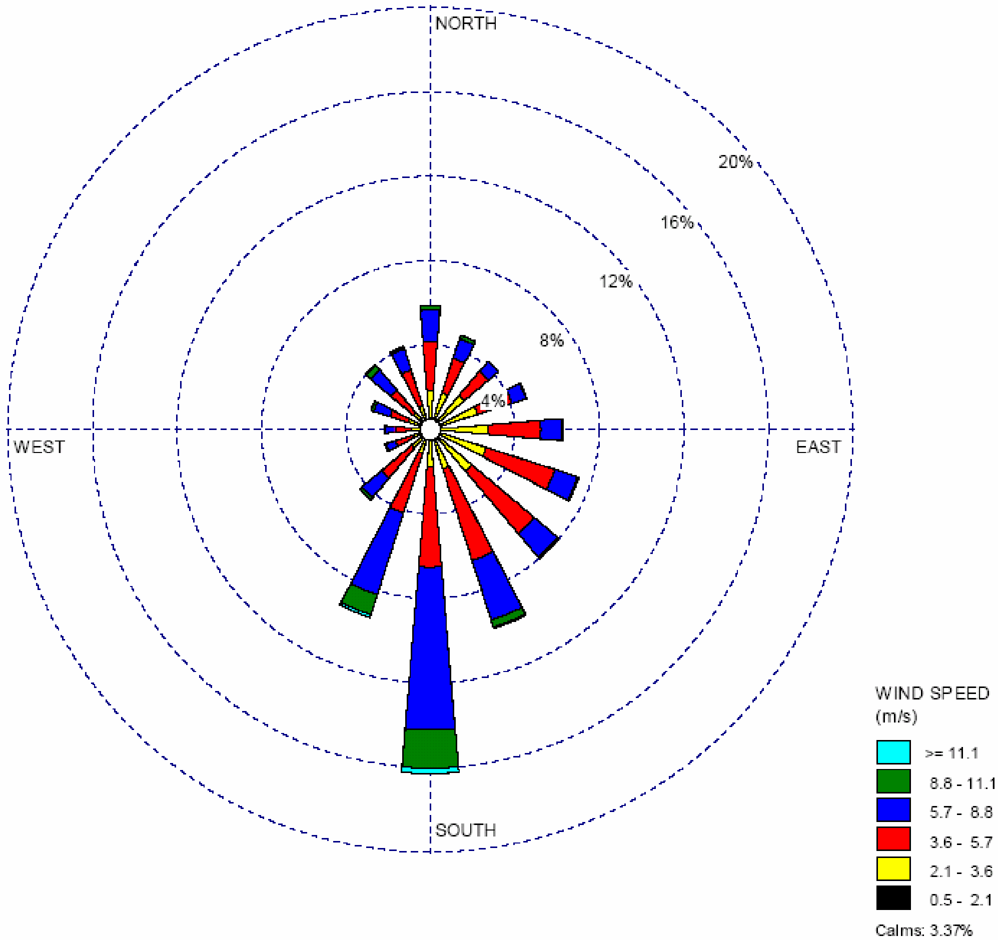
Existing Ambient Air Quality

The existing air quality in the area around the proposed site location shows that NAAQS are being met consistently in the area. This is based on review of monitoring data collected by the MDNR (mostly in the Kansas City area) and also data that have been collected by AECI in the area near the proposed site location. MDNR monitoring site locations are shown in Figure 3-13 and AECI monitoring site locations are shown in Figures 3-14 and 3-15. Appendix C contains summary tables showing ambient air quality measured pollutant levels.

Table 3-5 summarizes the ambient air quality data collected by AECI in the vicinity of the proposed project and Table 3-6 summarizes data collected by the MDNR for the years 2002 through 2005 (EPA,2006m).

WIND ROSE PLOT:
Station #03947 - KANSAS CITY/INT'L ARPT, MO

DISPLAY:
Wind Speed
Direction (blowing from)



COMMENTS:	DATA PERIOD:	COMPANY NAME:	
	1988 1989 1990 1991 1992 Apr 1 - Sep 30 00:00 - 23:00	MODELER:	
	CALM WINDS: 3.37%	TOTAL COUNT: 21960 hrs.	
	AVG. WIND SPEED: 4.64 m/s	DATE: 8/29/2006	PROJECT NO.:

Source: Data obtained from USEPA Web Site (http://www.epa.gov/scram001/surfacemetdata.htm#mo)

Figure 3-12. Ozone Season Wind Rose – Kansas City International Airport

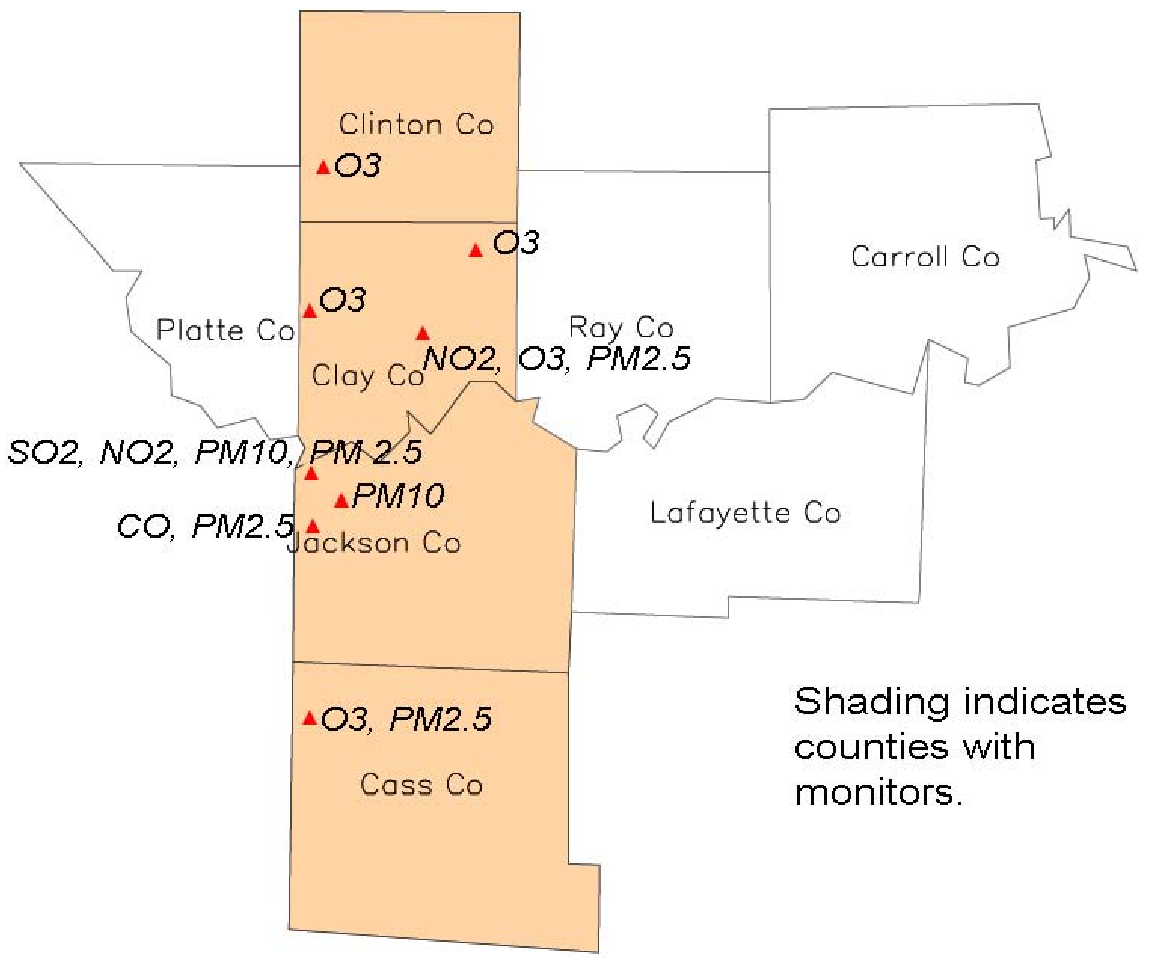
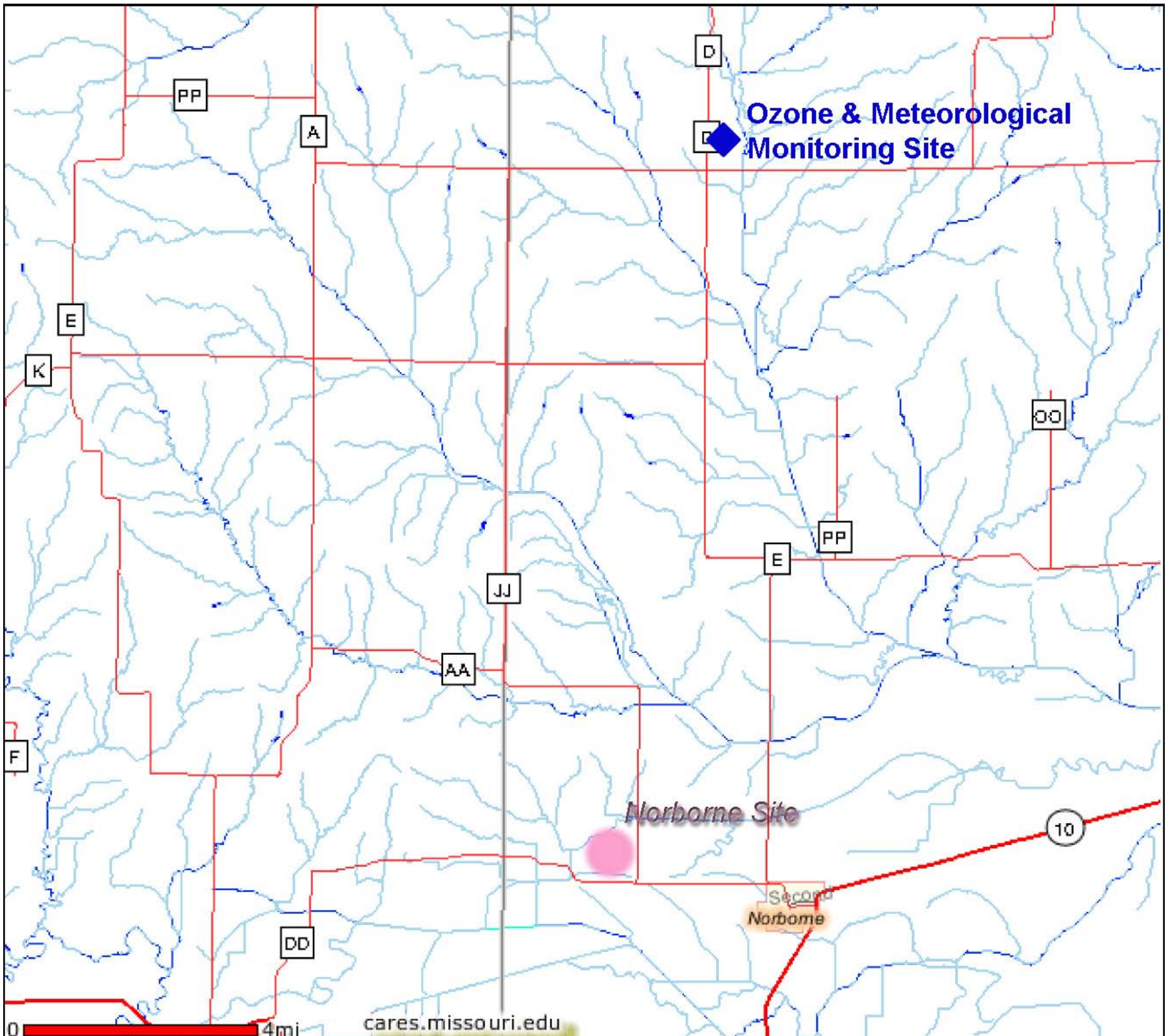


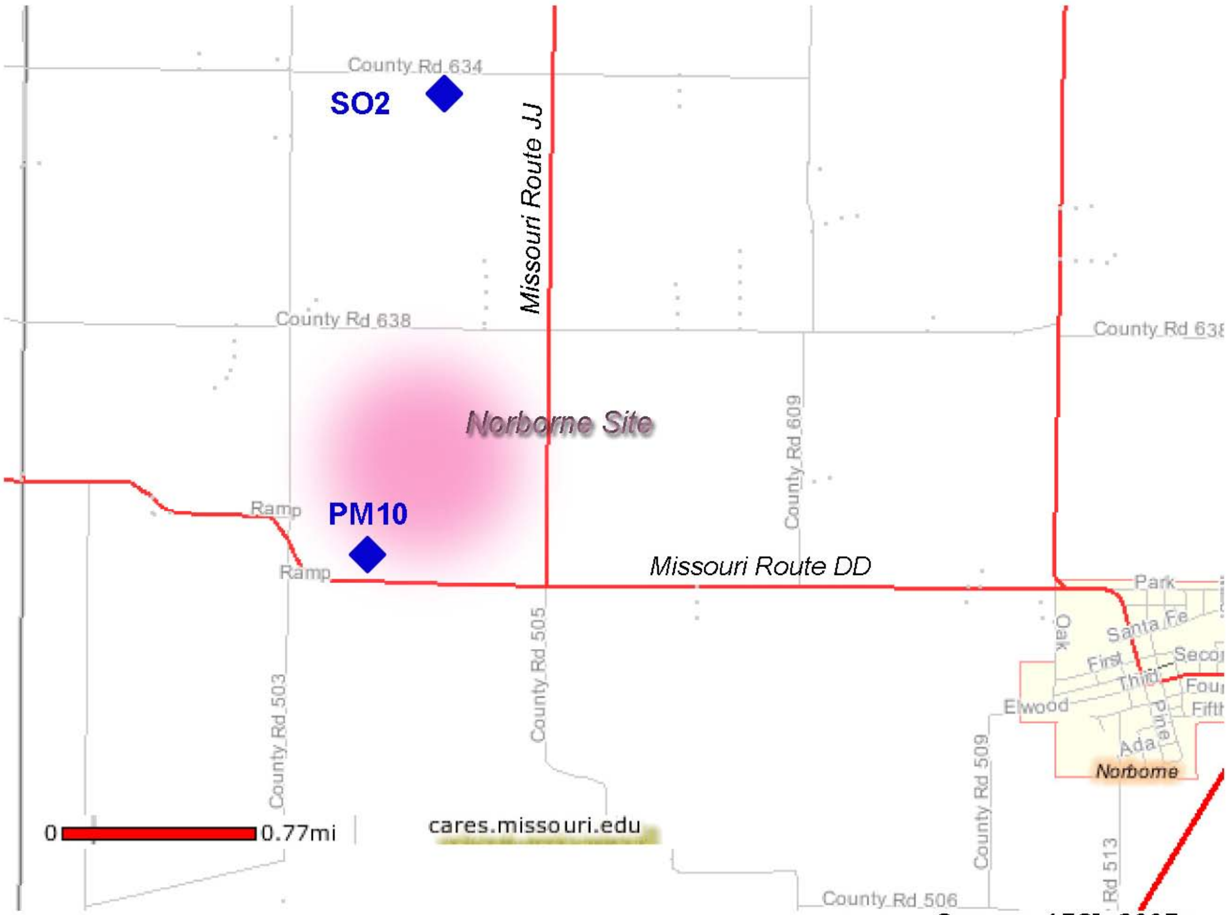
Figure 3-13. Locations of Monitors Missouri Portion of Kansas City Area

Source: EPA, 2006m



Source: AECI, 2005g

Figure 3-14. Ozone and Meteorlogical Monitor Location



Source: AECI, 2005g

Figure 3-15. AECI SO2 and PM10 Monitor Locations

Table 3-5. Monitoring Data – Vicinity of Proposed Project

	O_3				SO_2			PM_{10}	
	8-Hour Max (ppm)	**8-Hour 2nd High (ppm)**	**8-Hour 2nd High (ppm)**	**8-Hour 2nd High (ppm)**	**3-Hour (ppm)**	**24-Hour (ppm)**	**Mean (ppm)**	**24-Hour (ųgm/m^3)**	**Mean (ųgm/m^3)**
Period/NAAQS	0.08 ppm(1)				0.5 ppm(2)	0.14 ppm(2)	0.03 ppm(3)	150 ųgm/m^3(2)	50 ųgm/m^3(4)
Aug 05	0.084	0.080	0.076	0.070	0.005	0.002	0.001	58.7	28.7
Sept 05	0.070	0.067	0.065	0.065	0.004	0.002	0.001	75.2	30.8
Oct 05	0.058	0.057	0.055	0.053	0.005	0.003	0.001	65.1	29.4
Nov 05	0.052	0.046	0.046	0.042	0.005	0.003	0.002	38.7	27.1
Dec 05	0.035	0.035	0.033	0.031	0.011	0.0052	0.002	20.2	23.6
Jan 06	0.040	0.038	0.037	0.037	0.006	0.003	0.002	30.2	12.9
Feb 06	0.055	0.050	0.050	0.046	0.008	0.004	0.003	46.9	15.5
Mar 06	0.056	0.055	0.054	0.052	0.007	0.005	0.003	55.6	15.6
Apr 06	0.063	0.063	0.061	0.060	0.006	0.004	0.003	62.0	18.3
May 06	0.069	0.064	0.064	0.062	0.007	0.005	0.003	48.4	18.9
Jun 06	0.081	0.080	0.080	0.080	0.007	0.005	0.003	42.5	19.5
Jul 06	0.087	0.072	0.072	0.068	0.006	0.005	0.004	46.7	20.2
Aug 06	0.086	0.085	0.083	0.083	(5)	(5)	(5)	(5)	(5)
Sept 06	0.062	0.062	0.059	0.056	(5)	(5)	(5)	(5)	(5)

Source: AECI Monitoring Data Summaries

Notes:

1. 3-year average of the 4th highest daily maximum 8-hour average ozone concentration
2. Not to be exceeded more than once per year.
3. Annual arithmetic mean.
4. 3-year average of the weighted annual mean concentration.
5. Monitoring ended.

Table 3-6. Maximum 2002 – 2005 Recorded Pollutant Levels Compared to NAAQS

Pollutant	Recorded Level	NAAQS	Averaging Time	Location	Year
CO	10.2 ppm	35 ppm	2nd High 1-hour	4928 Main Street Kansas City	2002
CO	3.3 ppm	9 ppm	2nd High 8-hour	4928 Main Street Kansas City	2002
O_3	0.083 ppm	0.084 ppm	Average 4th High 8-hour	13131 Highway 169 NE Kansas City	2004
NO_2	0.022 ppm	0.053 ppm	Annual Average	Kansas City	2003
SO_2	0.155 ppm	0.5 ppm	2nd High 3-hour	724 Troost, Kansas City	2003
SO_2	0.073 ppm	0.14 ppm	2nd High 24-hour	724 Troost, Kansas City	2003
SO_2	0.008 ppm	0.03	Annual Average	724 Troost, Kansas City	2003
PM_{10}	66 ɥgm/m^3	150 ɥgm/m^3	2nd High 24-hour	1517 Locust St. Kansas City	2002
PM_{10}	36 ɥgm/m^3	50 ɥgm/m^3	Annual Average	1517 Locust St. Kansas City	2002
$PM_{2.5}$	35 ɥgm/m^3	65 ɥgm/m^3	3-year Average 98%tile	Highway 33 & County Home Rd. Clay County	2004
$PM_{2.5}$	13.6 ɥgm/m^3	15 ɥgm/m^3	3-year Average Annual Mean	Highway 33 & County Home Rd. Clay County	2004

Existing Major Air Emission Sources

Major sources of an air pollutant are often defined as sources that emit more than 100 tons per year of a pollutant. Table 3-7 shows major sources of CO, VOC, NO_X, SO_2, PM_{10}, and $PM_{2.5}$ located in the Missouri portion of the Kansas City metropolitan area (EPA, 2006n). Figure 3-16 depicts the location of major air emission sources in the Missouri portion of the Kansas City area.

This information is taken from a database maintained by the EPA and is for the calendar year 1999. These are the most recent data available from the EPA database. MDNR maintains a database with more recent information. That information is forwarded to the EPA annually; however, that information is not available on EPA's emission inventory website and it is not readily accessible from the MDNR.

Table 3-7. Major Sources

Facility	Address	County	SIC	Annual Emissions inTons						Location Number from Figure 3-16
				CO	NO_X	VOC	SO_2	$PM_{2.5}$	PM_{10}	
St. Joseph Light & Power Co	Lower Lake Road, St. Joseph, MO 64502	Buchanan	4911	182	4,070	9	2,302	66	76	1
Ag Processing Inc	900 Lower Lake Road, St. Joseph, MO 64504	Buchanan	2075	3	4	0	0	75	115	2
Silgan Containers Corp	2115 Lower Lake Road, St. Joseph, MO 64504	Buchanan	3411	10	12	617	0	1	1	3
Ford Motor Co	8121 E US Highway 69, Kansas City, MO 64119	Clay	3711	78	95	1,743	8	158	158	4
ADM Processing	200 West 10th Ave, North Kansas City, MO 64116	Clay	2075	22	24	307	0	9	19	5
Independence Power & Light	22225 210 Hwy, Missouri City, MO 64072	Clay	4911	7	384	1	1,596	89	97	6
Exide Corporation	Canon Hollow Road, Forest City, MO 64451	Holt	3341	2	7	51	175	19	21	7
GST Steel Co	8116 Wilson Rd, Kansas City, MO 64125	Jackson	3312	241	282	70	304	186	203	8
Folgers Coffee Co	701 Broadway, Kansas City, MO 64141	Jackson	2095	239	43	42	6	7	37	9
Trigen Energy Corporation	115 Grand Ave, Kansas City, MO 64106	Jackson	4911	21	504	2	4,201	10	17	10
Kansas City Power & Light Co	8700 Hawthorn Road, Kansas City, MO 64120	Jackson	4911	153	574	29	822	79	88	11
Kansas City Power & Light Co	920 North Olive, Kansas City, MO 64120	Jackson	4911	54	784	20	318	69	69	12
Lafarge Corporation	North River Rd, Sugar Creek, MO 64051	Jackson	3241	315	1,190	27	1,657	125	289	13
Missouri Public Service Co	33200 East Johnson Rd, Sibley, MO 64088	Jackson	4911	411	18,863	86	26,183	872	889	14
Independence Power And Light	21500 East Truman, Independence, MO 64056	Jackson	4911	20	663	2	7,880	400	436	15
Utilicorp United Inc	14015 Smart Rd, Greenwood, MO 64034	Jackson	4911	111	446	2	1	16	16	16
Ball Corporation	1800 Ball Corporation Ave, Kansas City, MO 64120	Jackson	3411	7	8	118	0	3	3	17

Table 3-7. Major Sources

Facility	Address	County	SIC	Annual Emissions inTons						Location Number from Figure 3-16
				CO	NO_X	VOC	SO_2	$PM_{2.5}$	PM_{10}	
Cargill Inc	2335 Rochester, Kansas City, MO 64120	Jackson	2075	25	30	272	0	25	45	18
Higginsville Municipal Power Facility	102 East 22nd St, Higginsville, MO 64037	Lafayette	4911	120	41	9	0	2	2	19
ANR Pipeline Company	County Road TT, Maitland, MO 64466	Nodaway	4613	296	1,170	100	0	16	16	20
Pittsburgh-Corning Corp	2700 West 16th Street, Sedalia, MO 65301	Pettis	3296	31	185	6	154	26	36	21
Waterloo Industries Inc	1500 Waterloo Drive, Sedalia, MO 65301	Pettis	3499	5	6	134	0	8	8	22
Panhandle Eastern Pipe Line Co	16076 Highway T, Lamonte, MO 65337	Pettis	4922	319	2,052	96	0	29	31	23
Kansas City Power & Light Co	4 Miles N Of Weston On Hwy 45, Weston, MO 64098	Platte	4911	677	6,430	81	17,397	466	585	24
Marshall Municipal Utilities	765 W North Street, Marshall, MO 65340	Saline	4911	9	263	1	1,641	94	103	25

Source: USEPA Air Data (http://www.epa.gov/air/data)

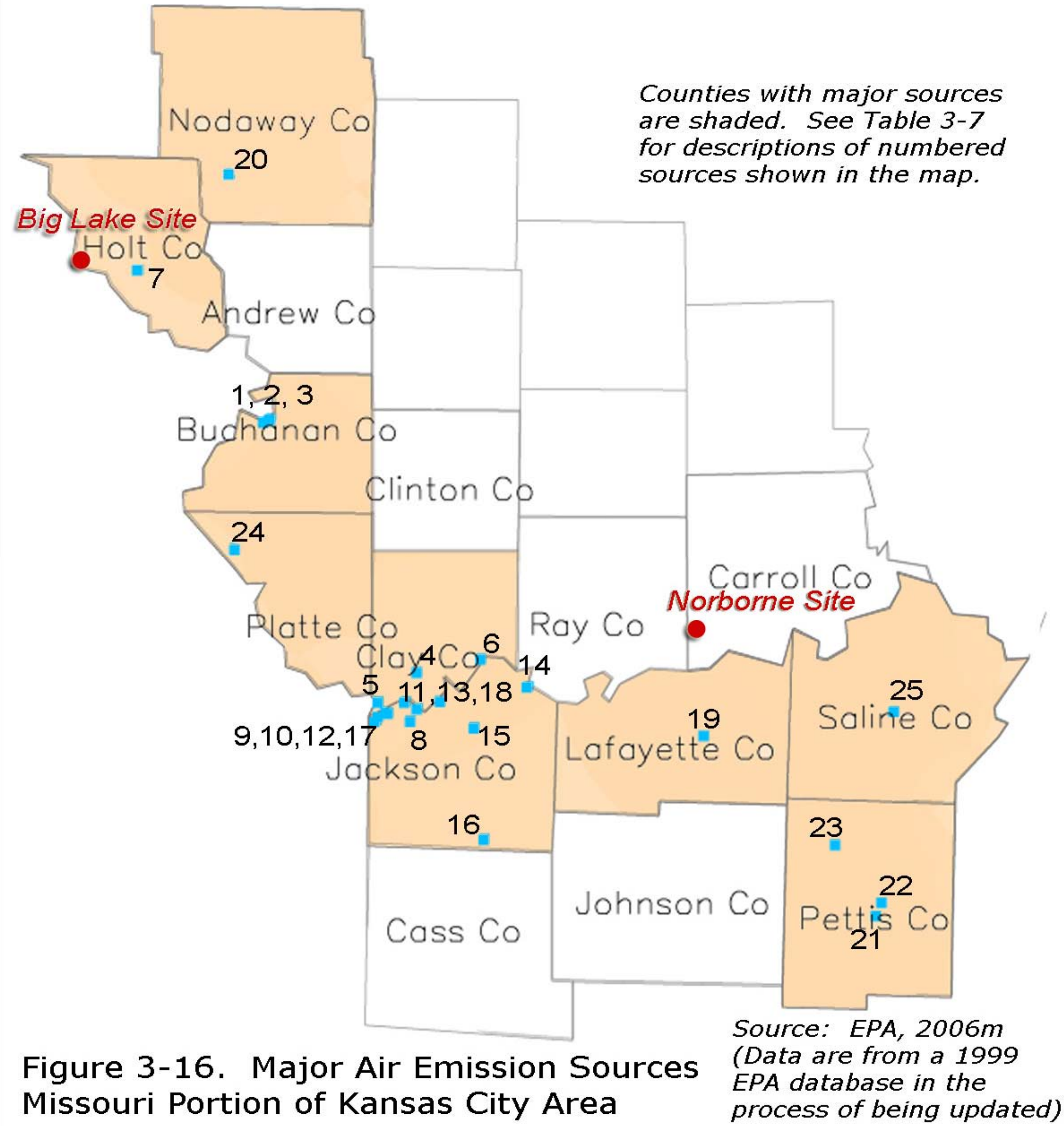


Figure 3-16. Major Air Emission Sources Missouri Portion of Kansas City Area

3.1.2 Environmental Consequences

3.1.2.1 Identification of Issues

The EIS scoping process resulted in the identification of several air quality related issues. They include:

- the addition of new emissions into the air in an area that currently does not have air quality problems
- storage of ammonia and chlorine
- acid rain
- global climate change
- mercury emissions
- impact on agricultural products grown in the area
- potential health effects
- effect of incremental emissions over those already there
- transport of emissions to the Kansas City area
- impact of emissions trading
- control of fugitive dust from plant operations

3.1.2.2 Significance Criteria

If any of the following conditions are met, the project is considered to have a significant impact on air quality:

- the ambient air quality impact of the Proposed Action on areas currently meeting NAAQS is greater than EPA allowed PSD increments
- the Proposed Action causes or significantly contributes to a violation of a health or welfare related NAAQS
- the Proposed Action significantly contributes to the health risk caused by eating mercury contaminated fish
- the Proposed Action causes deterioration in visibility in excess of EPA allowed impacts
- not incorporating appropriate controls to meet regulatory requirements related to operations, such as equipment and techniques used to store and use ammonia and chlorine
- significant increase in CO_2 emissions relative to existing emissions that may contribute to climate change

There are a number of regulatory requirements that must be met in order for the Proposed Action to receive an air quality permit. These requirements are intended to ensure that any proposed major new air pollution source does not have a significant impact on air quality. The proponent of the Proposed Action must apply for and receive such a permit prior to beginning construction. AECI has applied to the DNR for an air quality permit and the DNR is presently reviewing that application. A permit can be issued only if the DNR (and the EPA) find that on the basis of the information in the application, the project would meet all regulatory requirements designed to ensure that the project does not have a significant impact on air quality.

3.1.2.3 Impact Assessment Methods

The Proposed Action would have emission impacts that cannot be directly measured because direct measurements cannot occur until after the facility is built. However, impacts need to be assessed, and estimation methods described below were used. These methods use assumptions that are intended to overestimate impacts. This approach is consistent with historic air quality and risk assessments. The assessment methodologies require the use of either generic assumptions or site specific data to evaluate risk or impact to air quality. The generic assumptions are considered by state and federal agencies to be protective of human health and the environment under almost any circumstance. Site specific data provide more accurate assessments of an individual facility, but they are often costly and time consuming to obtain or develop. For example, in assessments to determine impact of air emissions over a year's period of time, the proposed plant is assumed to be in operation continuously for the entire year even though there would be periods of time when the plant would not be in operation in order to carry out needed maintenance activities.

Air quality and risk assessments can go through several iterations of assumptions. The first assessment combines many generic assumptions with some site specific data which result in impacts that are almost certain to be greater than those that would actually occur. If the impacts using these initial assumptions are not acceptable, then more site specific data are developed and used instead of assumptions that over-estimate impacts. The results of the assessment methods described below incorporate initial generic assumptions without any reassessment of those assumptions in order to reflect additional site specific details.

Ambient Air Quality Standards

Air quality impacts are assessed through the use of air quality dispersion models. These models use as input data the Proposed Action's emissions and the meteorological conditions that cause the emissions to disperse after they leave the plant site. The EPA has detailed requirements for the modeling that must be done in order for a new emission source to receive an air quality construction permit. The air quality permit application prepared by the project proponent must contain the results of the required modeling and a demonstration, based on those results, that the proposed source would not cause or significantly contribute to a violation of an ambient air quality standard.

Visibility, Soils, and Vegetation

The impact of the Proposed Action on visibility is assessed using EPA screening models that have been developed to estimate worst case impacts of air pollutant emitting sources. Visibility impacts were assessed for the Hercules Glades Wilderness Area (a Class I area), which is about 295 km from the proposed plant site. Typically, Class I areas that are this far distant from the Proposed Action are not evaluated using modeling techniques since available techniques tend to over estimate impacts at such long distances.

Impacts to soils and vegetation were evaluated using an EPA developed air quality model that estimates the magnitude of pollutant deposition. This model also estimates ambient air concentrations of pollutants for comparison with EPA standards set for the protection of soils and vegetation.

Mercury Emissions

The EPA has established a regulatory system to control mercury emissions from power plants that does not rely on air quality modeling. Rather, the system is based on each existing and new coal fired power plant keeping mercury emission levels below a limit that is set by state air quality regulators, working with the EPA. This system of controlling mercury emissions would result in a significant reduction in current levels of nationwide emissions from coal fired power plants.

Some people, however, have a concern that while mercury may be properly controlled on a national scale, there might be local "hotspots" where mercury levels could create a potential localized health threat.

The proponents of the Proposed Action must demonstrate, as part of their air quality permit application, that the proposed plant would meet EPA limits on mercury emissions. However, there is no requirement that the permit application demonstrate that there would be no localized "hotspots" created. For this reason, the impact of maximum allowable mercury emissions from the proposed plant was modeled to determine the maximum amount of mercury deposition that could be created by emissions from the plant.

The results of this modeling effort were then evaluated using a health risk assessment to determine the incremental health risk that would be posed by mercury deposition from the proposed plant.

Global Climate Change (Greenhouse Gas Emissions)

The impact of emissions from the proposed project that might affect global climate change (primarily CO_2 emissions) is difficult to quantify. The sources that contribute to global climate change are national and international in scope. The best available measure of the impact of the Proposed Action to global climate change is to relate its CO_2 emissions to US and worldwide CO_2 emissions. The Proposed Action is considered to have a significant impact if its CO_2 emissions are greater than 1% of total US emissions.

3.1.2.4 Actions Incorporated into the Proposed Action to Reduce or Prevent Impacts

There are a number of elements incorporated into the Proposed Action that would reduce or prevent air quality impacts. These include:

- use of operating techniques that reduce emissions
  - low sulfur coal
  - combustion techniques that reduce emissions
- air pollution emissions control equipment
  - selective catalytic reduction (SCR) to control NO_X emissions
  - scrubber to control SO_2 emissions
  - a particulate control device (baghouse) to control particulate matter emissions

- use of BACT to control potential fugitive emissions from materials handling operations

3.1.2.4.1 Impact Assessment

Ambient Air Quality Standards

The impact of the Proposed Action is described in "Prevention of Significant Deterioration Construction Permit Application, 660-MW Pulverized Coal Fired Generating Facility, Carroll County, Missouri", dated January 2006. (The initial application has been updated periodically to incorporate additional material.)

The impact of the proposed action, as described in this application, is based on estimates of potential emissions from the plant, information concerning the physical characteristics of the plant such as the height and exit diameter of the stack, and information about the meteorology in the area around the proposed plant. The projected potential emissions associated with the plant (including cooling tower emissions) are shown in Table 3-8.

Table 3-8. Projected Emissions

Pollutant	Potential Emissions (tons per year)
SO_2	3,010
CO	4,816
NO_X	2,408
PM_{10}	843
VOC	114
Lead	0.2
H_2SO_4	114
Mercury	0.267[35]

[35] EPA's New Source Performance Standard (NSPS) codified at 40 CFR 60.45Da(a)(2)(i) would limit mercury emissions to 0.000066 lb/MWh (approximately 0.2 tons per year). Also, the MDNR's proposed rule to implement EPA's Clean Air Mercury Rule does not allocate any mercury budget for new units. Therefore, if the proposed project is built, a mercury emission allocation will have to be either purchased from the open market, or, the proposed project's emissions will have to be accommodated within AECI's budget for it's existing units. The actual emissions cannot be higher than what would be allowed by the NSPS; therefore, the potential emissions listed in the table are higher than what would be allowed. Actual mercury emissions would be monitored using EPA certified technology.

Based on the information described above, AECI has estimated the maximum ambient air quality impacts for the proposed action. These impacts are shown in Table 3-9.

Table 3-9. Highest Model-Predicted Concentration For All Norborne Sources

Pollutant	Averaging Time	Highest Concentration ($\mu gm/m^3$)
SO_2	3-hour	25.6
	24-hour	9.1
	annual	0.49
NO_2	annual	3.74
PM_{10}	24-hour	Modeling results not available.
	annual	Modeling results not available.
CO	one-hour	295.7
	8-hour	96.9

The results for SO_2, NO_2, and CO show that the maximum ambient air quality impact of the Proposed Action is well below applicable standards. The modeling results for PM_{10} are not yet available; however, the MDNR is prohibited from issuing an air quality construction permit if the results show that the Proposed Action would cause or significantly contribute to a violation of ambient air quality standards. Therefore, the Proposed Action would not have a significant impact on air quality for those pollutants for which there are ambient air quality standards.

Visibility, Soils, and Vegetation

The impact of the Proposed Action on visibility, soils, and vegetation was analyzed for AECI as part of the process of applying for an air quality permit. The results of that analysis are summarized in “Additional Impacts Analysis for a 688 MW Electric Generating Facility, Norborne, Missouri”, November 2006.

The visibility analysis was conducted using an EPA developed model called VISCREEN. The analysis was conducted for five areas that were specified by the MDNR. Those areas are:

- Norborne R8 High School,
- Stet Xv School District,
- Carroll County memorial Hospital,
- Van Meter State Park, and
- Swan Lake National Wildlife Refuge.

The results show that visibility impacts exceeded plume perceptibility thresholds for Class I areas at each of the receptor areas with the exception of Swan Lake National Wildlife Refuge. However, none of these areas are a Class I area.

The locations where visibility criteria do have meaning are Class I areas. The closest Class I area to the Proposed Action is Hercules Glades Wilderness Area (HGWA) in southwest Missouri, about 295 km from the Proposed Action location. A visibility analysis was conducted for HGWA in response to comments from the Federal Land Manager.

The analysis was conducted using several "worst case" assumptions and showed that the greatest change in light extinction was 6.8%, less than the 10 % change that is considered to be significant. (AECI, 2006). The visibility analyses show that the Proposed Action would have no significant impact on visibility.

The impact of the Proposed Action on soils and vegetation was evaluated using an air quality model that estimated pollutant concentrations and deposition of pollutants onto soils and vegetation. The modeling showed that the estimated maximum concentrations of air pollutants would be less than secondary ambient air quality standards (standards set for the protection of materials, vegetation, and other effects that are not directly health related.

The analysis showed that emissions of SO_2 and NO_X related to the Proposed Action would be highly unlikely to cause adverse effects. (AECI, 2006). Based on these findings, the Proposed Action would not have significant adverse effects on soils and vegetation.

Mercury Emissions

The mercury emissions from the proposed coal-fired power plant could pose a potentially unacceptable risk to local populations by entering the human food chain. Inorganic mercury released in power plant emissions can be converted to a toxic organic form, methylmercury, once it enters water bodies via deposition and runoff. Methylmercury is highly bioaccumulative in fish, and anglers who catch and consume fish can be at risk if too much mercury enters a watershed, therefore a health risk assessment was performed.

The health risk evaluation addresses the emissions from the Proposed Action. The health risk posed by the cumulative impact of emissions from all power plants in the Midwest and all other sources of mercury deposition were not specifically evaluated, although the evaluation did include an element to determine whether the existing fish advisory issued by the Missouri Department of Health and Senior Services (MDHSS) would be made more severe in consideration of the mercury emissions from the Proposed Action.

A number of assumptions are made throughout the evaluation process to ensure that risks are more likely to be overestimated than underestimated. The evaluation is performed using the multi-step process listed below:

1. Obtain and evaluate fish advisories issued by the MDHSS. Also obtain from the MDNR mercury concentrations in fish fillets and whole fish tissue from streams within a 50 mile radius.
2. Estimate mercury emissions from the proposed power plant based upon coal data, control technology efficiencies, and speciated mercury stack test data from other power plants.
3. Perform air modeling to predict mercury air concentrations from the proposed power plant and subsequent deposition to the surrounding vicinity.
4. Identify watersheds in the area with highest potential to be impacted by mercury deposition.
5. Calculate the total deposition of mercury for the most-impacted watersheds.
6. Calculate representative (e.g., worst-case) surface water concentrations of methylmercury in the most affected watersheds.
7. Use the BAF for methylmercury to calculate fish tissue concentrations.
8. Use fish tissue concentrations to evaluate the incremental impact on fish samples obtained from MDNR in step 1.

9. Calculate hazard indices for anglers who catch and consume fish from the most affected watersheds.

A hazard index is a number that is calculated to determine if a combination of non-carcinogenic pollutants and/or exposure pathways create a potential health risk. Each pollutant/exposure pathway is evaluated individually. The estimated exposure is then divided by a health effects threshold value for the pollutant and/or pathway to create a ratio for each condition that was evaluated. The hazard index is the sum of the ratios calculated for each pollutant and pathway. A hazard index greater than one indicates a potential health risk.

A number of assumptions were made for this analysis which are likely to overestimate the potential impacts. In particular, the following conservative assumptions were made:

- Predicted mercury deposition rates were calculated based on worst-case historical meteorological data for the years 2001-2005 (i.e., 2005 data, which produced the highest predicted mercury deposition rates).

- Assumption that all mercury deposited in a watershed ends up in surface water. In reality, much of the mercury would be either lost from the watershed from subsequent volatilization, leach to the subsurface, or be sequestered in soils and sediments, where it would not be available for bio-uptake into fish.

- The ingestion rates used in the risk calculations are based on the assumption that an adult eats an average of 5.4 fish meals per week, and that all of that fish originates from the impacted watershed (i.e., individuals do not eat fish from any other source). Likewise, the assumption is made that a very young child, aged 0-6, eats an average of 0.8 fish meals per week from the impacted watershed. In reality, most anglers consume fish that originate from a variety of sources.

- The bioaccumulation factor used to estimate representative methylmercury concentrations in fish was based on species with the highest bioaccumulation potential, Trophic Level 4 fish (i.e., it was assumed that only large individuals of top predator species such as large mouth bass were consumed). This is a worst-case scenario, as most anglers could be expected to eat a variety of fish from different trophic levels, with a lower overall methylmercury concentration.

- The reference dose used in the risk calculations includes a 10X uncertainty factor (similar in concept to a safety factor) to ensure that the hazard index is not underestimated.

In combination, these assumptions undoubtedly resulted in a substantial overestimation of the potential health impacts from mercury emissions. Even with the use of these conservative assumptions, the predicted hazard indices were well below the threshold value of 1.0, indicating that mercury emissions from the proposed power plant should not pose any health threat to the surrounding community.

This evaluation considered the current mercury levels in fish samples taken by the MDNR, Missouri Department of Conservation (MDC), and EPA within 50 miles of the proposed plant and the incremental effect the mercury released by the proposed plant would have on mercury levels in those fish. Based on this evaluation, there would be no change in limits on recommended fish consumption due to the incremental increase in mercury in the fish.

The mercury health risk analysis is described in more detail in *Appendix D, Mercury Risk Evaluation*.

GHG Emissions

The primary GHG related emission from the Proposed Action is carbon dioxide Carbon dioxide emissions can be estimated using the type and amount of coal being fired and an emission factor. Emissions (in tons) of CO_2 are estimated by the formula:

% carbon in the coal[36] X 72.6 X amount of coal used in tons / 2000 (EPA, 2006q)

(49.72) X (72.6) X 3,762,420 tons coal per year / 2000 = 6.8 million tons

This compares to total US power plant emissions of CO_2 in 2005 of 2,474 millions tons and total US emissions of 5,912 million tons in 2004 (EIA, 2006m).

[36] This analysis used the design coal for the plant.

Total worldwide emissions in 2004 were 24,528 million tons. The proposed project's CO_2 emissions would be 0.1% of total US emissions and 0.03% of worldwide CO_2 emissions. As the term global warming suggests, an appropriate measure of the impact of the proposed project's emissions is the ratio of those emissions to global emissions. On that basis, the proposed project would not have a significant impact on global warming.

Acid Rain Related Emissions

The federal CAA requires control of power plant emissions of SO_2 and NO_X in order to address potential acid rain impacts. The EPA recently issued final rules (the Clean Air Interstate Rule) that list limits for total SO_2 and NO_X emissions for each state. The limits for total power plant emissions in Missouri in 2015 are shown in Table 3-10 below together with the estimates of emissions from the Proposed Action.

Table 3-10. Acid Rain Related Emissions

	SO_2 Emissions	**NO_X Emissions**
Missouri Total	245,000	58,000
Proposed Action[37]	3,100	2,500

Potential Ammonia and Chlorine Releases

Both ammonia and chlorine would be stored and used in accordance with DNR and EPA requirements that are intended to prevent the accidental escape of these gases.

No Action Alternative

If the Proposed Action were not constructed, there would likely still be air quality impacts since the Proposed Action is intended to meet electricity demand that will exist whether or not the Proposed Action is built. The air quality impacts of the no action alternative will vary depending on the alterative source of the electricity. *Section 2, Alternatives Including the Proposed Action*, outlines alternative sources of electricity. Those that would have no air quality impact, such as hydro, are generally not suitable to

[37] From AECI Air Quality Permit Application, 2006. Basis of the estimate is maximum allowable emissions.

provide for the base load needs that the Proposed Action is intended to meet. Therefore, it is likely that the no action alternative would result in similar air quality impacts that would affect a different geographical area.

Big Lake Alternate Site

The air quality impacts and their significance at the Big Lake Alternate Site would be similar to those at the proposed Norborne site. If the project were developed at the Big Lake Site, it would be subject to all of the same regulatory requirements as at the Norborne site.

Integrated Gasification Combined Cycle (IGCC) Alternative

The IGCC alternative has the potential of having somewhat different impacts than the Proposed Action.

- Emissions of pollutants for which there are NAAQS would be similar to those from the Proposed Action, though SO_2 emissions could be somewhat lower[38].
- As with the Proposed Action, ambient air quality impacts would not cause or significantly contribute to a violation of the NAAQS.
- Emissions of SO_2 could be as low as one third of those from the Proposed Action, lessening any potential impact on acid rain. However, it should be noted that the EPA's Clean Air Interstate Rule is designed to reduce nationwide SO_2 emissions to below levels required under the CAA acid rain program.
- Emissions of CO_2 could be ten to twenty percent lower than from the Proposed Action[39].
- Emissions of mercury and mercury deposition would be similar to that related to the Proposed Action.

3.1.2.4.2 Mitigation and Residual Impacts

The Proposed Action as planned does not present any significant air quality impacts. Also, the Proposed Action already incorporates Best Management

[38] "Multipollutant Emission Control Technology Options for Coal-fired Power Plants", EPA-600/R-05/034, March 2005. The range of SO_2 emission rates is from about 1/3 of that of the Proposed Action to a rate equal to that of the proposed action.
[39] "Multipollutant Emission Control Technology Options for Coal-fired Power Plants", EPA-600/R-05/034, March 2005.

Practices (BMPs) such as use of dust control measures during construction. While achievement of mercury emissions limits is a requirement and is therefore part of the Proposed Action, the specific means of achievement have not been identified. AECI is considering injection of activated carbon to control mercury emissions.

3.2 GEOLOGY AND SOILS

This section describes the affected environment and environmental consequences as they apply to geological and soil resources.

3.2.1 Affected Environment

The following sections describe the current geological and soil environment. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

3.2.1.1 Region of Influence

The region of influence for assessing impacts on geological and soil resources includes the proposed power plant site and alternate, proposed well field and water line site, railroad corridors, rights-of-way where ground-disturbing activities could occur, proposed transmission lines, and the adjacent parcels of land. For the transmission lines, soil disturbance would occur only at locations of line support structures and substation structures.

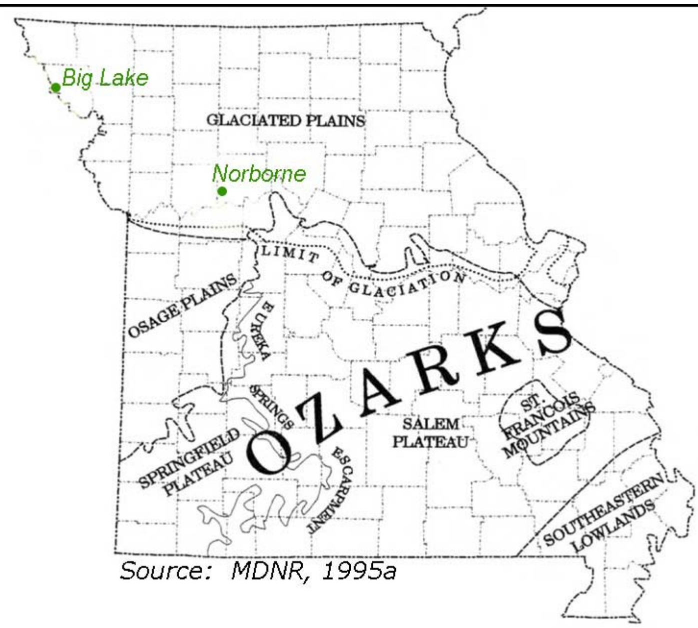
3.2.1.2 Existing Conditions

3.2.1.2.1 Regional Setting

Missouri Natural Sections

All parts of the project and alternate site are located within the Glaciated Plains Natural Section, except for part of the Norborne to Sedalia/Mt. Hulda transmission line, which is located partly in the Osage Plains and partly along the edge of the Ozarks (Figure 3-17).

Continental glaciers were present in the glaciated plain area tens of thousands of years ago. The glaciers smoothed out the landscape and, when they melted, left thick deposits of unsorted clay, silt, sand and gravel, called glacial till. The present course of the Missouri River within Missouri was determined by glaciation. Flowing from the west, the Missouri River encountered the western edge of these great ice sheets and the course of the river was deflected southward. The southern extent of these ice sheets in Missouri was near Kansas City and at that point the river was able to turn and continue flowing eastward (MDNR, undated1). This ancient Missouri River was a larger stream of glacial meltwater that scoured and eroded the bedrock river channel, then left thick deposits of sand, gravel and cobbles. Later, after the glaciers had melted, the calmer Missouri River deposited finer-grained sand, silt, and clay. These river deposits are called alluvium. Silt that was later blown in from drier western regions tended to deposit along river channels where vegetation was more dense, forming thick beds of what is termed loess. Thus all of Missouri north and east of the Missouri River was subject to glaciation and has been covered with deposits of glacial till. The glacial till is tens of feet thick, and locally, where ancient bedrock river valleys were filled, it may be up to 200 feet thick.



Source: MDNR, 1995a

Figure 3-17. Natural Sections of Missouri

In west central Missouri, an area of unglaciated flat land referred to as the Osage Plains (Figure 3-17) lies between Kansas City on the north and Joplin on the south and stretches eastward to Osceola, Warsaw and Sedalia. In this area, thin deposits of loess overlie bedrock (MDNR, undated1).

Both the Norborne and the Big Lake plant sites are located within the Missouri River Alluvial Plains Natural Subsection (Figure 3-18), as is the rail corridor for the Big Lake Site, and the southern rail corridor for the Norborne Site, the proposed well field, and the proposed water line for the Norborne site. The alluvial plains are the broad, relatively flat floodplain lands along major rivers. As shown in Figure 3-18, the alluvial plains are especially wide at both Big Lake and Norborne.

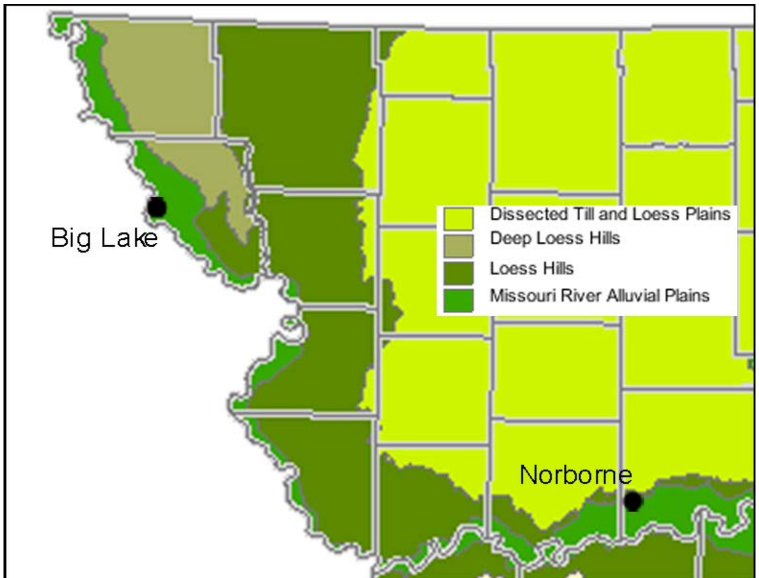


Figure 3-18. Natural Subsections
Source: cares.missouri.edu

The northern rail corridor for Norborne crosses the Loess Hills Natural Subsection, which at the Norborne site forms a narrow border at the north edge of the alluvial plain along the Missouri River bluff. Much thicker and broader loess deposits lie to the east and north of the Big Lake site. These deposits, the thickest in the state, are up to 100 feet thick and form prominent bluffs. These Deep Loess Hills extend north along the east side of the Missouri River, through Iowa and into Nebraska. A part of the Deep Loess Hills in Iowa has been designated by the National Park Service as a National Natural Landmark for the unique geology and associated native vegetation. There is only one other place on earth where loess deposits of comparable thickness have been formed: along the Yellow River in China (NPS, 2004a). In Missouri, a 112-acre portion of the Jamerson C. McCormack Conservation Area (CA) has been designated as the McCormack Loess Mound Natural Area (NA). It is located near the southern end of Squaw Creek National Wildlife Refuge (NWR), east of the Big Lake Site. The McCormack NA preserves the unique geology and associated native vegetation of a small part of the Deep Loess Hills. The goal of the natural areas system "is to designate, manage and restore high quality examples of every extant natural community in each of Missouri's natural sections" (MDC, 1996). Natural Areas are designated by the Missouri Natural Areas Committee and they are permanently protected and managed for the purpose of preserving their natural qualities. The McCormack Loess Mound NA is jointly owned by the MDC and The Nature Conservancy. The Squaw Creek NWR also protects a part of the Deep Loess Hills (USFWS, 2006a).

Bedrock Geology

Figure 3-19 shows the general bedrock underlying the surface deposits of till, loess, or, in the case of the limestone/dolomite bedrock south of the Missouri River, underlying the residual soil formed from the bedrock. Most of the bedrock in the project area is Pennsylvanian in age (about 300 million years old) and consists of cyclic deposits of shale, sandstone, and limestone, with some coal.

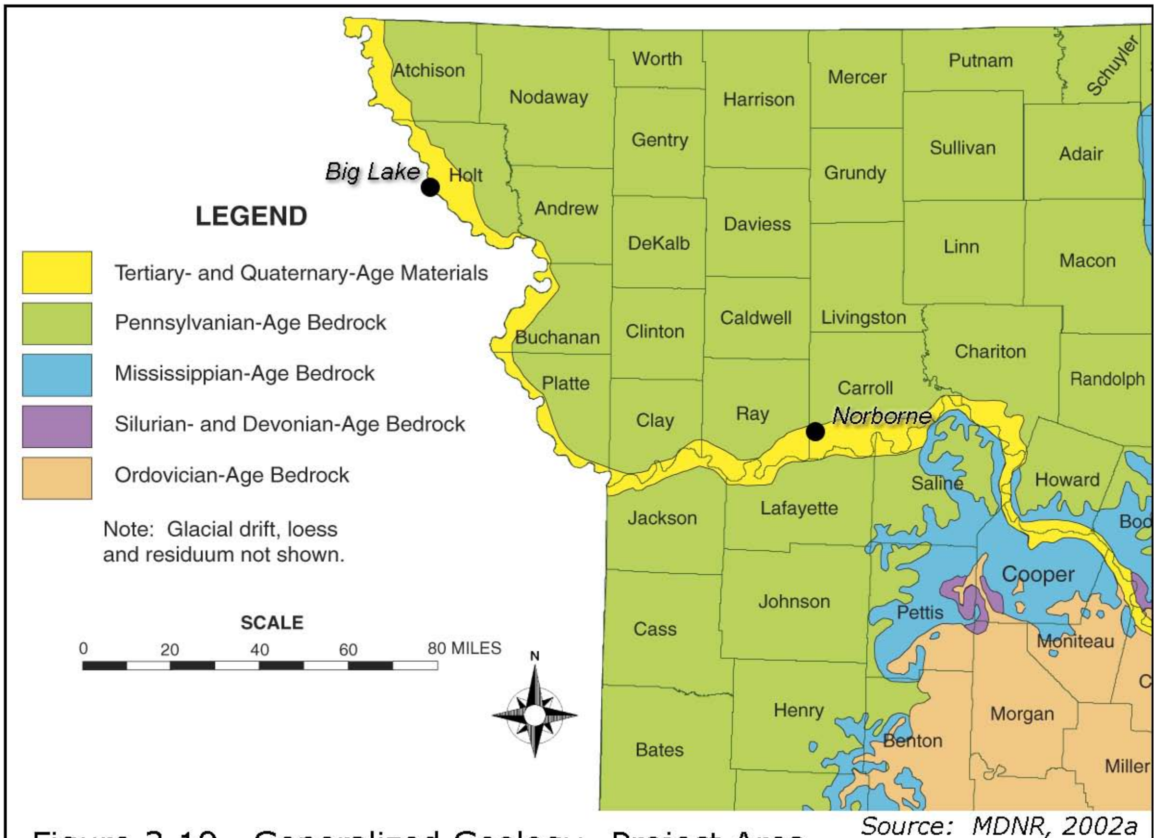
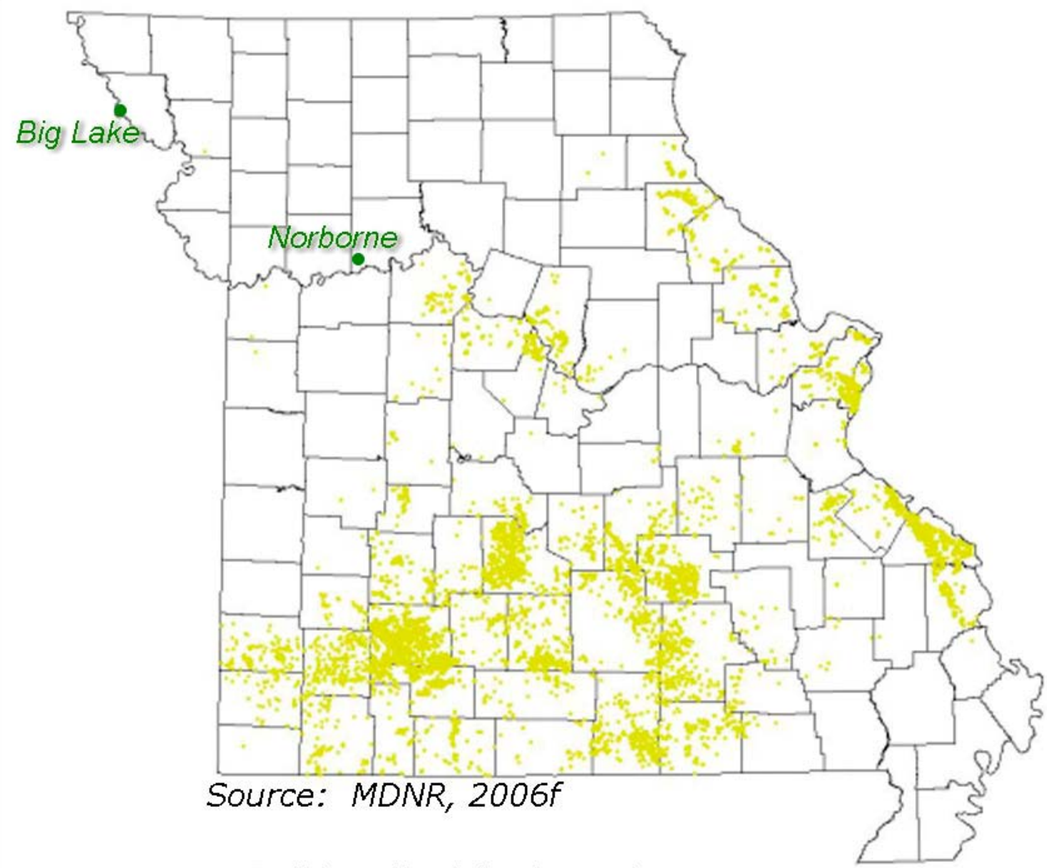


Figure 3-19. Generalized Geology--Project Area.

The Mississippian-, Silurian-, Devonian-, and Ordovician-Age (300 to 500 million years ago) bedrock shown in the figure consists mainly of limestone and dolomite. Limestone and dolomite are subject to dissolution by slightly acidic rainwater, and areas underlain by limestone and dolomite tend to develop karst features from dissolution of the bedrock along joints and other cracks: cave, sinkholes, losing streams and springs.

Figure 3-20 shows sinkholes in Missouri, which occur in areas of massive limestone/dolomite bedrock, but not in the Pennsylvanian deposits of northwest, north central and west central Missouri, where the limestone is in thin layers between other rock types. Caves occur in the same geologic environment as sinkholes, as do springs (Figure 3-21). There are some springs outside the limestone/dolomite bedrock areas, but these springs are generally small and do not flow year-round. Losing streams, which have special protection in Missouri[40], are another characteristic feature of karst areas. Generally stream flow increases downstream, as tributaries feed into a main stream. A losing stream loses flow over some stretches, when all or part of the stream flow moves to an underground conduit. Sometimes the flow reappears further down the channel. There are many losing streams in the karst areas of Missouri, but none within the project area.



Source: MDNR, 2006f

Figure 3-20. Sinkholes of Missouri

[40] 10 CSR 20-7.031

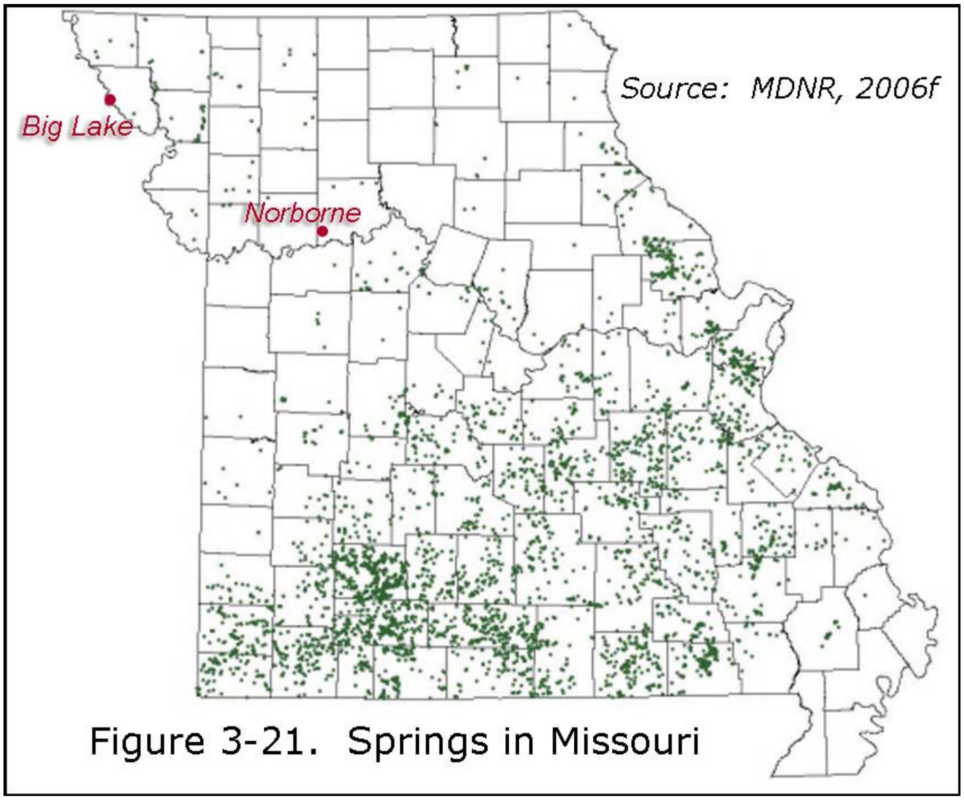


Figure 3-21. Springs in Missouri

3.2.1.2.2 Norborne Site

The Norborne site is located at the edge of, and almost entirely within, the Missouri River alluvial floodplain. Only the proposed landfill is outside the floodplain. The extent of the Missouri River alluvial deposits are evident on the topographic maps, contrasting with the bluffs that rise to either side.

A subsurface investigation at the site (AECI, 2005c) found the following general stratigraphy below the alluvial floodplain part of the site (Table 3-11).

Table 3-11. Generalized Subsurface Stratigraphy, Norborne Site

Depth BGS, Feet	Average Elevation, Feet MSL	Description
0-2	684-682	Organic clay (topsoil)
2-25	682-659	Soft to medium stiff, high plasticity clay
25-76	659-608	Loose to medium dense, poorly graded, fine to medium sand
76+	Below 608	Limestone and sandstone, fresh, hard

Because the site is several miles from the present-day river channel, the more recent deposits (the clay to a depth of 25 feet) have occurred in a backwater environment—well away from the flowing channel, in fairly still water at the edges of large floods. The deeper sand was probably deposited during glacial times. The bedrock limestone and sandstone are the cyclic Pennsylvanian deposits.

Three borings were installed in the loess bluff part of the site, where the landfill would be located. Two of these borings extended to 25 feet, and encountered 18 inches of topsoil, then a silty clay typical of loess to the bottom of the borings. A third boring was extended to 30 feet; the upper 25 feet encountered the same material as the other two borings. The bottom five feet of the boring was in sand, from approximately elevation 664 to 659 feet MSL. This sand is probably part of the glacial river deposits from the ancestral Missouri River.

Figures 3-22 and 3-23 show highly erodible soils in the area of the Norborne Plant and the proposed rail corridor north of the plant (referred to as Alternative 2 in the alternatives evaluation). The erodible soils map is based on Natural Resource Conservation Service (NRCS) soil association maps and erodibility classifications. Essentially, the alluvial soils are not considered erodible, the loess soil is considered highly erodible, and till soils are considered potentially highly erodible. As shown, most of the plant site is not in soil classified as highly erodible. The proposed well field and water line, located to the south of the proposed plant site (not shown in the figures) are located entirely in alluvial soil, which is not classified as highly erodible. Part of the rail corridor is in highly erodible soil, and the cut that would be needed to get from the plant to the Wakenda Creek Valley would be in highly erodible soil.

Locations of transmission lines are not shown in the figure. These are also located mostly in soils classified as highly erodible, except for the areas around drainages where alluvial soils and some till occur.

3.2.1.2.3 Big Lake Site

The Big Lake Site is located in a large bend in the Missouri River, where the flow direction locally changes from south to east (Figure 3-24). At the location of the bend, the Missouri River floodplain is contiguous with the floodplain of the Big Nemaha River, which flows into the Missouri River from

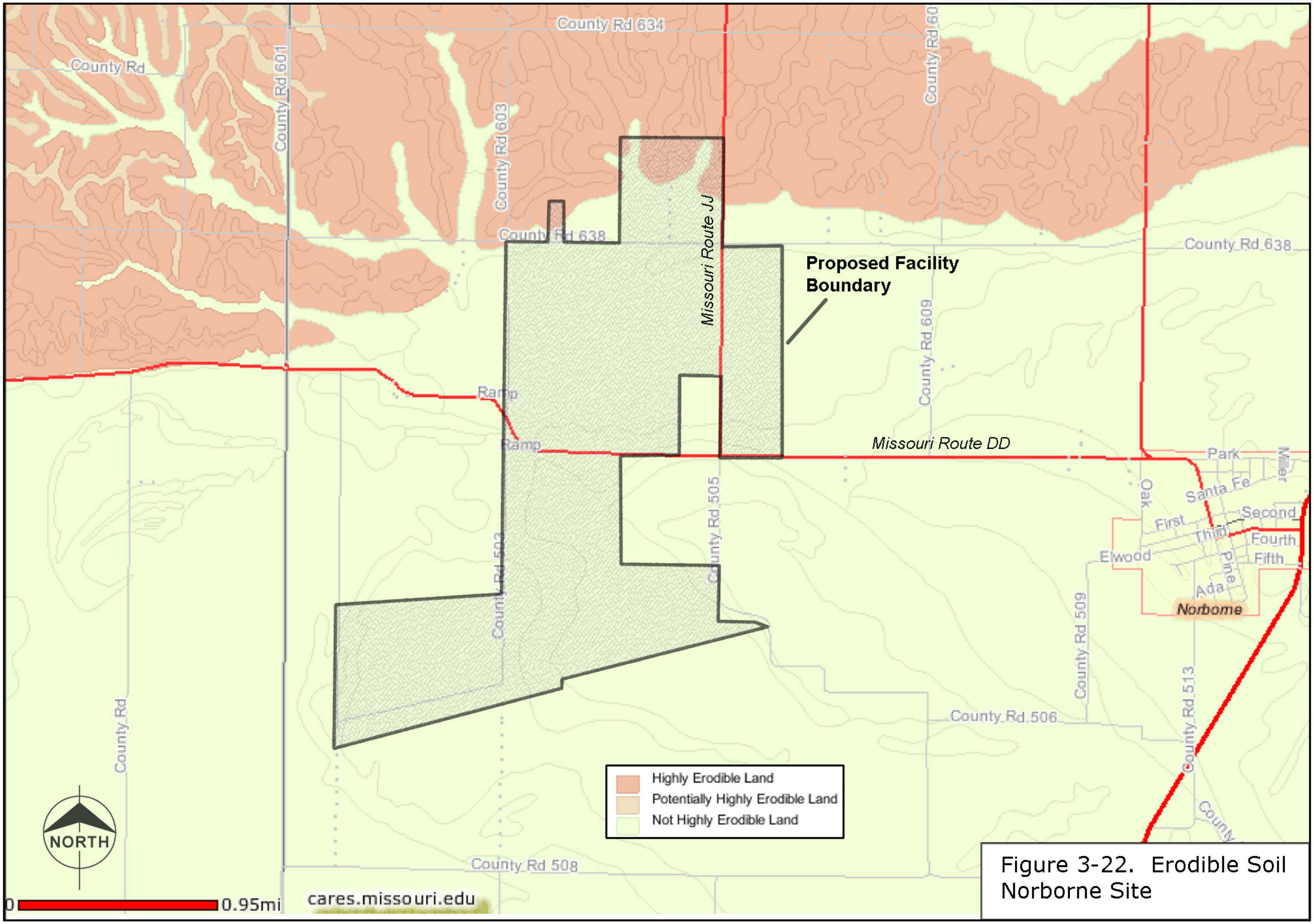


Figure 3-22. Erodible Soil Norborne Site

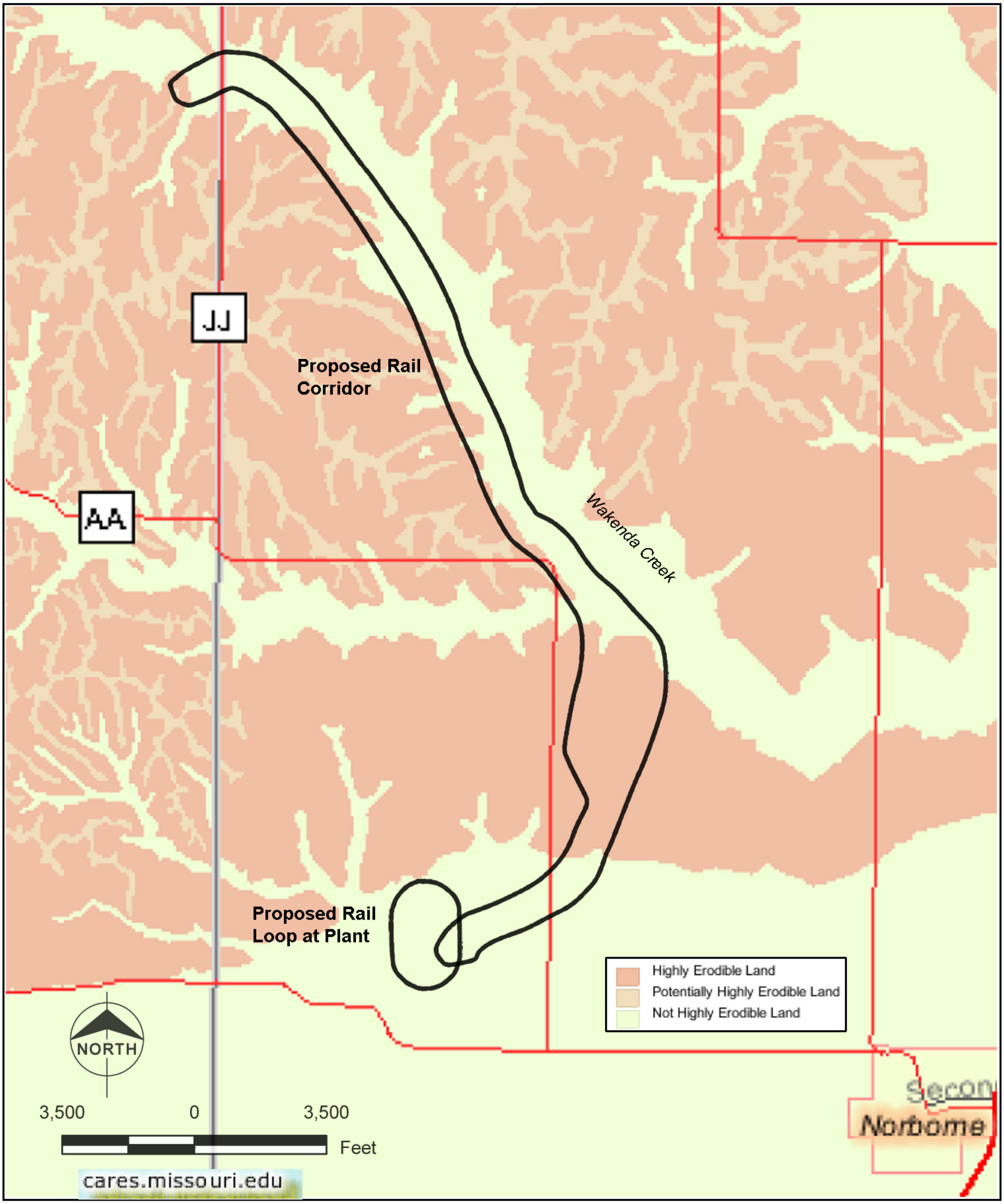


Figure 3-23 Erodible Soil
Norborne North Rail Corridor

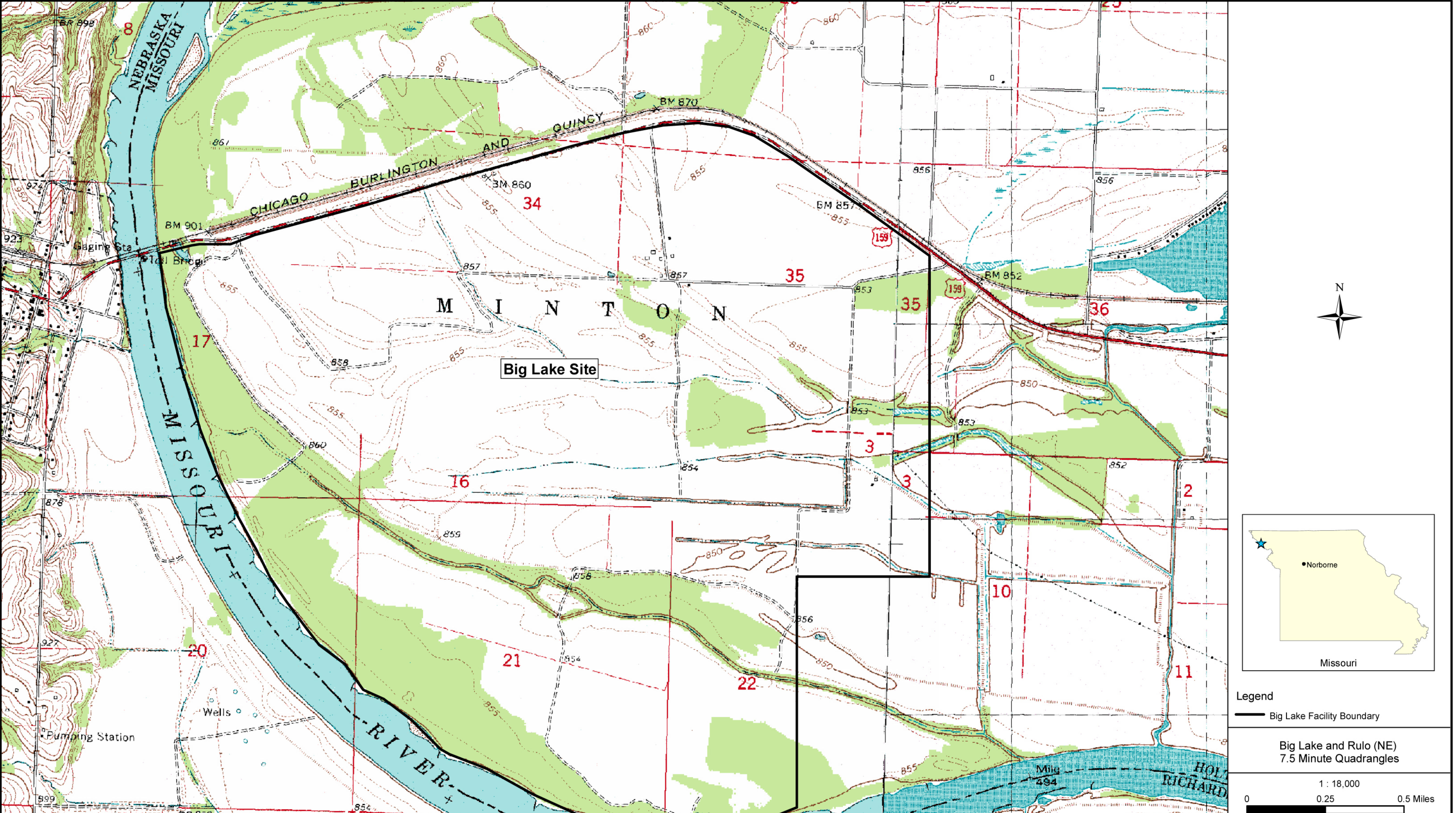


Figure 3-24.
Big Lake Site

Source(s): Missouri Spatial Data Information Service, U.S. Geological Survey, and URS Corporation

Nebraska just south of the site. The Big Lake Site is underlain by alluvial deposits overlying Pennsylvanian bedrock, the same as the Norborne Site.

The Big Lake Site is several miles from any soil classified as highly erodible. As with the Norborne Site, the alluvial soils are not classified as highly erodible, but the bluffs to the east are.

3.2.2 Environmental Consequences

3.2.2.1 Identification of Issues

The following is a list of issues that were identified as relating to geology and soils; these issues form the basis for the assessment of potential impacts:

- potential impacts on areas of regional geological importance
- source of fill; concerns about fill being taken from Loess Hills (Big Lake Site)
- potential for creation of sinkholes caused by pumping groundwater (addressed in *Section 3.3, Groundwater*)
- potential for soil erosion

3.2.2.2 Significance Criteria

Listed below are the significance criteria established for the identified issues. Impacts would be considered significant if they would result in the following:

- destruction of areas of regional geological importance
- activities that would result in creation of sinkholes that would be safety hazards and/or cause property damage
- soil erosion sufficient to cause damage to soil resources outside the areas directly impacted by construction

3.2.2.3 Impact Assessment Methods

In order to assess potential impacts on geological and soil resources within the region of influence, available information was compiled related to geology, soils and geologic hazards. All relevant reports prepared by AECI and its consultants were reviewed to independently evaluate and verify the accuracy and comprehensiveness of the information provided by AECI, and, where necessary, supplement this information.

After data were compiled and reviewed, and the information provided was verified, potential direct and indirect impacts on geological and soil resources were assessed. Particular consideration was given to the identified issues, and the significance criteria described above were used to assess whether significant impacts potentially could occur.

3.2.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts on geological resources:

- Both permanent and temporary erosion control measures (silt fences, straw bale checks, riprap, revegetation)

3.2.2.4.1 Impact Assessment

The assessment of impacts on geological and soil resources is described below in terms of the criteria outlined in *Section 3.2.2.2, Significance Criteria*.

Proposed Action

Geologic Resources

There are no areas of geological importance within the region of influence of the Proposed Action. Therefore, no areas of geological importance would be destroyed by the Proposed Action.

Soil Resources

There are areas of highly erodible soil within the region of influence. Construction of the landfill would occur partly within highly erodible soils, and this material would be re-used for fill at the plant site. The cuts for the north rail connector would be made in highly erodible soils. Implementation of erosion control measures during construction and operation as incorporated into the Proposed Action as required by Missouri regulation would prevent significant adverse impacts to soil resources.

Big Lake Alternate Site

The McCormack Loess Mound CA and any comparable areas in the Deep Loess Hills Natural Subsection that have been geologically and biologically preserved but are unprotected would be considered areas of regional geologic importance. Using such areas for fill sources or constructing within such areas could result in significant impacts. The McCormack Loess Mound CA and the Deep Loess Hills Natural Subsection in which it is located are a few miles east of the Big Lake Site. The landfill and borrow areas for the Big Lake Site have not been determined; if this site is selected, care would need to be taken in identifying locations for borrow and for the landfill so as not to impact the McCormack Loess Mound CA and any comparable resources that may be present in the Deep Loess Hills east of the site.

IGCC Alternative

Impacts would be the same for the IGCC alternative as for the Proposed Action.

No Action Alternative

Under the No Action Alternative, the Project would not be constructed and there would be no change or disturbance of geological or soil resources within the project area.

3.2.2.4.2 Mitigation and Residual Impacts

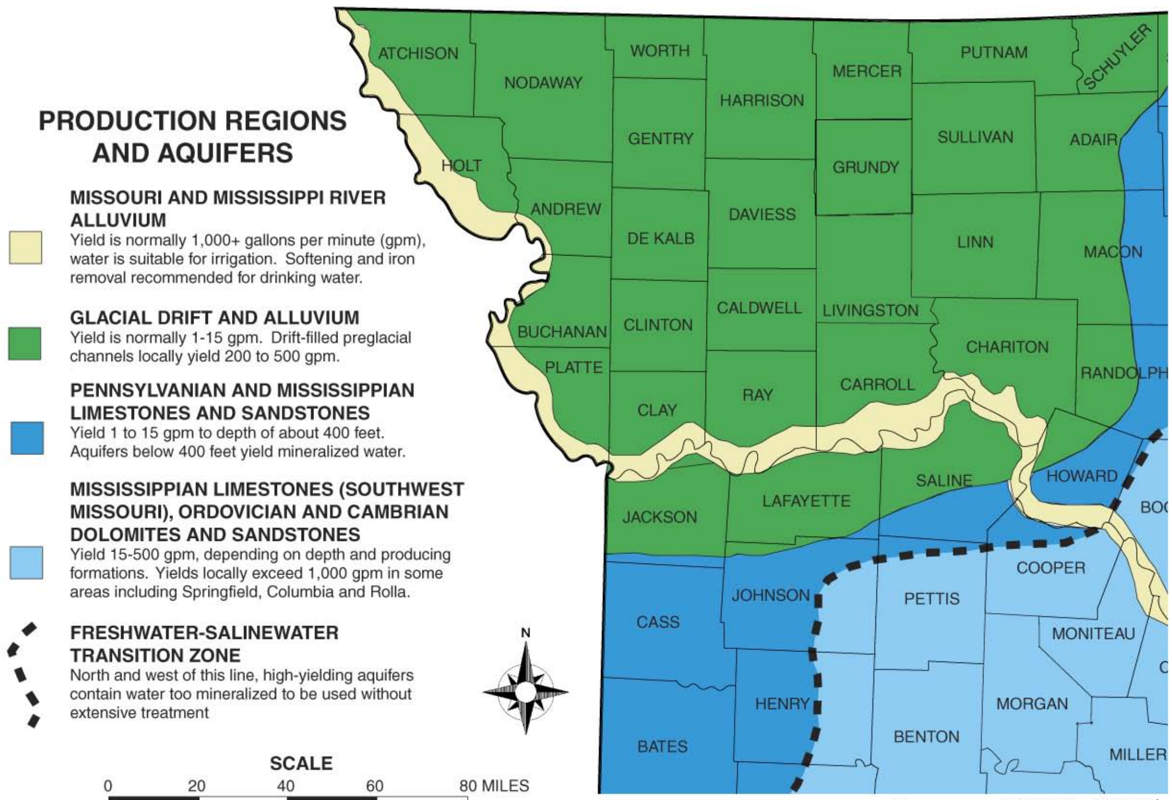
No mitigation measures have been identified because impacts are not anticipated.

3.3 GROUNDWATER

3.3.1 Affected Environment

3.3.1.1 Regional Setting

The general groundwater conditions within the overall project area are shown in Figure 3-25.



Source: MDNR, 2002b

Figure 3-25. Groundwater--Project Area.

The major groundwater source in the general project area is the Missouri River Alluvium. The Pennsylvanian bedrock that underlies most of this area is not considered an aquifer for water supply. The glacial deposits generally have low yields, but with some localized buried channels with higher yields. The limestones and dolomites that further south and east yield large quantities of usable groundwater are deep underground in the project area, but the water is highly mineralized. North and west of the dashed line shown in the figure, these bedrock aquifers are too highly mineralized to be used for drinking water sources (MDNR, 2005a).

3.3.1.2 Region of Influence

The two main potential types of impacts on groundwater that could result from the project are impacts on aquifers due to withdrawal of water for plant use, and impacts due to migration of contaminants through the soil to the groundwater. There also may be temporary construction impacts due to the need to dewater the excavation for the hopper for the rotary car unloading system at the coal unloading area.

The region of influence for potential impacts from withdrawal of groundwater is the region over which groundwater levels may fall as a result of pumping water for the plant, and for construction, as a result of the temporary dewatering of the hopper excavation.

The region of influence for the potential contaminant impacts to groundwater is the general area where potential contaminants are stored or disposed of. This would primarily be the proposed waste disposal facility at the Norborne Site; a similar facility would be constructed at the Big Lake Site if it were selected. In either case, the general plant area would also be of some concern because of the storage of chemicals and fuels that, if released, could impact groundwater.

Construction and operation of the water line, discharge line, rail connections, and transmission lines are not expected to impact groundwater.

3.3.1.3 Existing Conditions

As shown in Figure 3-26, a generalized cross section at the location of the proposed well field, the depth to bedrock is about 75 feet (elevation 610 feet MSL), and the high-water-yielding sand and gravel layer is present in about a 30-foot layer above the bedrock. Finer grained sand, silt and clay material overlies the coarse-grained deposits. While the overall alluvial profile is similar to that described above for the plant site in that the thickness is similar and the material becomes coarser with depth, the deposits near the river are overall coarser grained. As described above, the waste storage facility is located in silty clay loess deposits overlying alluvial sand.

No borings were made at the Big Lake Site, but conditions would be expected to be similar.

Existing water supply wells in the vicinity of the proposed well field for the Norborne Plant are summarized in Table 3-12.

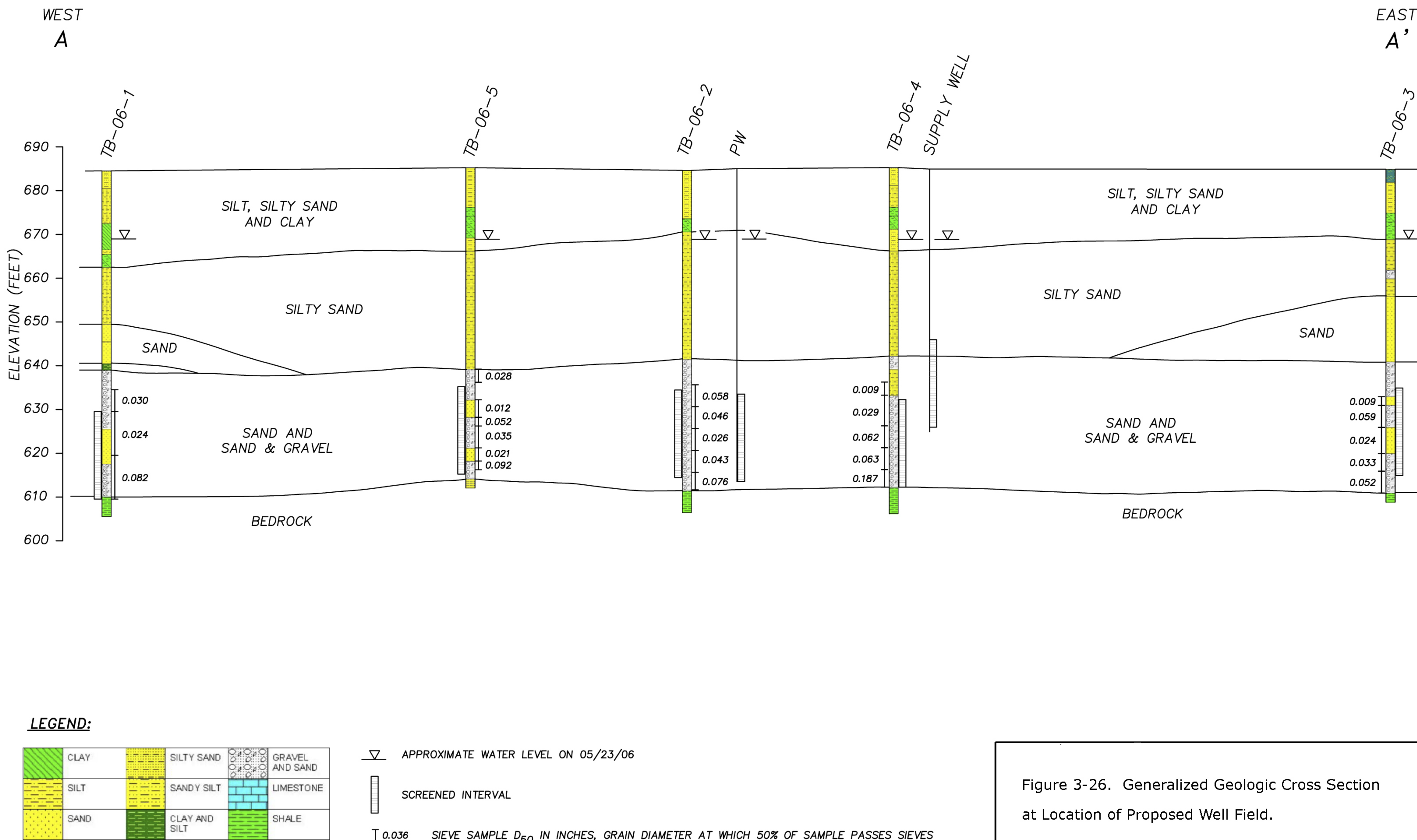


Figure 3-26. Generalized Geologic Cross Section at Location of Proposed Well Field.

Source: AECI, 2006j

Table 3-12. Summary of Existing Wells in Vicinity of Proposed Well Field

MDNR Reference No.	Owner	Usage	Depth, feet	Location	Yield, gallons per minute (gpm)
00069983	Beckemeier	Unknown	70	Sec7,T51N,R25W	50
00336666	Don Heil Farms	Domestic	50	NW¼SE¼NE¼ Sec7,T51N,R25W	10
00343852	Don Heil Farms	Domestic	22	NW¼SE¼NE¼ Sec7,T51N,R25W	2
00232272	Peters Orchard	Irrigation	61	SW¼NW¼SW¼ Sec11,T51N,R25W	500
00336665	Durham	Domestic	70	NW¼NW¼NW¼ Sec11,T51N,R25W	15
00083852	Elis	Unknown	60	NW¼NE¼NS¼ Sec11,T51N,R26W	Not reported
00008548	Edmond	Irrigation	80	SW¼NE¼NE¼ Sec12,T51N,R25W	600
00099436	Elis	Irrigation	61	NW¼SE¼, Sec11,T51N,R26W	Not reported
00255556	Lester	Irrigation	72	NE¼NE¼SW¼ Sec12,T51N,R26W	1,500

Source: MDNR, 2006b

3.3.2 Environmental Consequences

3.3.2.1 Identification of Issues

The major issues identified during scoping were potential impacts from large withdrawals of groundwater and potential for groundwater contamination, especially from the landfill. Other issues were concern about development of sinkholes from overpumping, drainage of wetlands from pumping, and poor water quality.

Potential long-term groundwater impact is associated primarily with plant operation. There would be short-term construction impacts associated with the dewatering of the coal unloading hopper. There is also potential for fuel spills associated with construction activities. Proper containment as required by law results in minimal potential for groundwater impacts from spills during construction.

Groundwater Withdrawal

The water level in any well that is pumped will drop in response to pumping. This "drawdown" of the water table is greatest at the well and decreases away from the well. All else being equal, the higher the pumping rates the greater the drawdown will be and the more widespread its effects will be. Large groundwater withdrawals can potentially affect other users by lowering the overall groundwater level. There are no state laws, regulations or policies that specify the quantity of water that any groundwater diverter may use. Missouri is a riparian water law state, which means that all landowners touching or lying above water sources have a right to a reasonable use of those water resources. Recent case law has established the reasonable use criteria that the State Supreme Court has been following. Reasonable use requires that other users and landowners not be overly adversely impacted (MDNR, 2006a).

Potential Contamination of Groundwater

Chemicals and fuels that have the potential to impact groundwater would be used at the plant; and waste ash, if not properly disposed of, has the potential to impact groundwater. Chemicals and fuels can cause contamination by spillage that then migrates downward through soil to groundwater, or is carried by surface water that then infiltrates through soil to groundwater. Current laws and regulations governing storage of chemicals and fuels that can harm groundwater, and required action for spills of those materials, are intended to prevent groundwater impact from storage and use of those chemicals and fuels. As described in *Section 2.4, Description of the Proposed Action*, surface water runoff from potentially contaminated areas would be treated prior to discharge. Because of the higher potential for landfills to result in groundwater contamination, long-term monitoring is required by state regulations.

3.3.2.2 Significance Criteria

Impacts would be considered significant for the groundwater pumping if other users would be overly adversely impacted. Impacts would be considered significant for contamination if impacts from the waste disposal facility occurred that resulted in exceedances of groundwater protection standards that would be established as part of the waste disposal facility permitting.

Impacts would be considered significant for contamination if chemical or fuel spills resulted in exceedances of groundwater protection standards.

3.3.2.3 Impact Assessment Methods

Groundwater Withdrawal-Well Field

In April and May 2006, AECI conducted detailed aquifer tests at the proposed well site for the purpose of assessing whether adequate water could be produced, and what the impacts would be (*Appendix E, Hydrogeologic Investigation Report of Findings*). Task 1 of the work included installing three test borings to bedrock, collecting samples for characterization testing, and conducting a hydraulic interval test in one of the borings. The purpose of the hydraulic interval testing was to determine the hydraulic conductivity of the selected intervals and evaluate groundwater quality.

Task 2 included the installation of a test well capable of pumping at least 1,000 gpm and four additional observation wells, and conducting aquifer testing. The Task 2 aquifer testing included the following:

- A four-hour multiple rate step drawdown test
- A recovery/background period
- A 72-hour constant-rate aquifer test.
- A recovery monitoring period.

Task 3 included compilation of the data collected to determine the feasibility and preliminary design of the collector wells (AECI, 2006j). The generalized profile shown in Figure 3-26 is based on the data collected. The boring and well locations are shown in Figure 3-27. “PW” indicates the location of the production well used for aquifer testing in Task 2. The approximately 30-foot sand and gravel layer between depths of about 45 and 75 feet is the aquifer from which the groundwater would be extracted for the plant. The hydraulic conductivity of this layer was estimated at 3,000 gallons per day per square foot (gpd/ft^2), based on the hydraulic interval testing.

Projecting the aquifer response to pumping at this site is complicated by fluctuating levels of the Missouri River, which impact the groundwater levels. Well yields would be less under low river flow conditions, and water demand would be highest during summer.

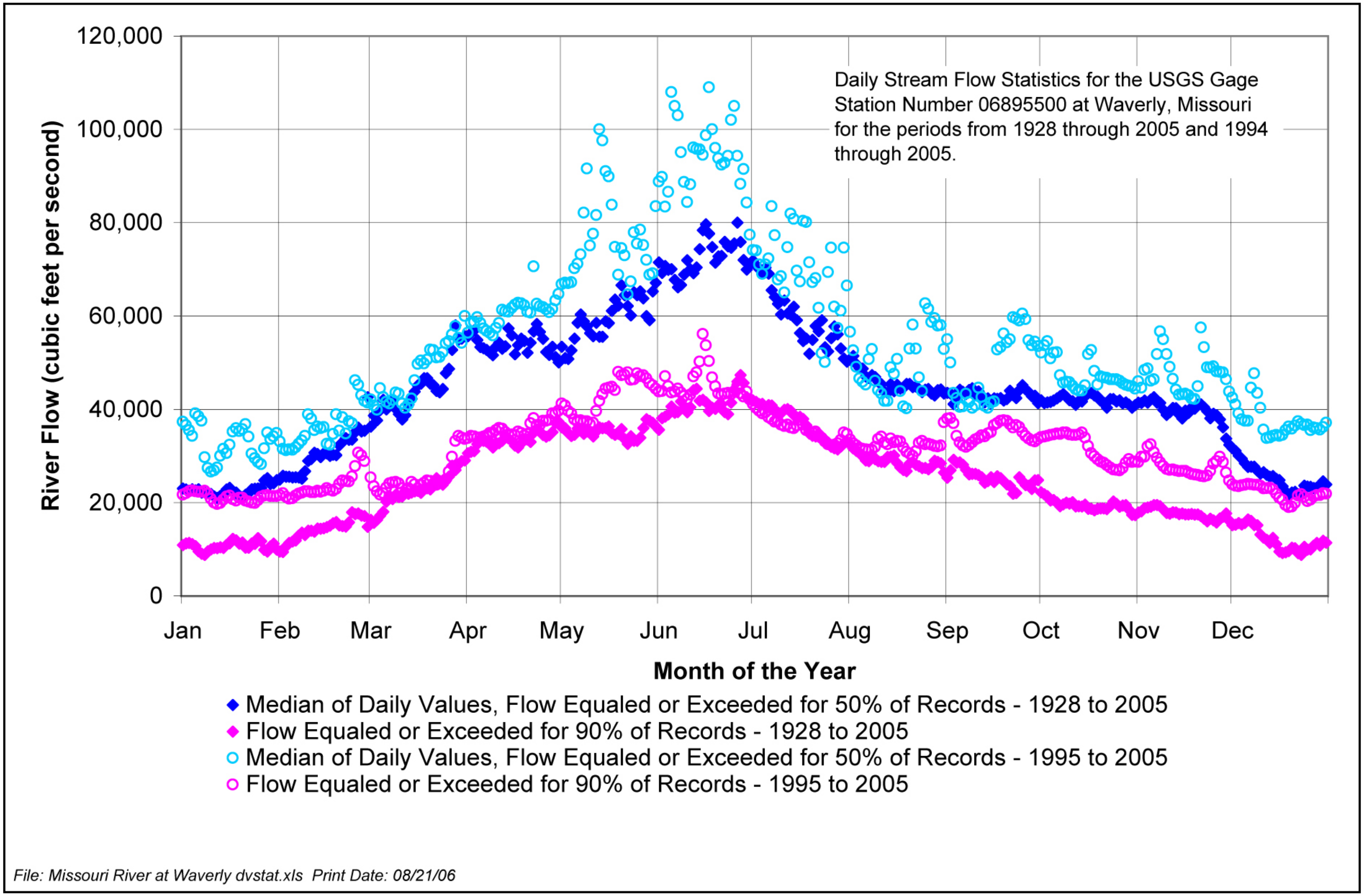
Source: AECI, 2006j

Figure 3-27. Boring and Well Locations for Aquifer Testing

Selected daily stream flow statistics from a U.S. Geological Survey gage at Waverly, Missouri, about 12 miles east of the site (Figure 3-28) were used to estimate low flow and median summer flow conditions. Shown in the figure are the median daily flow values, i.e. the flow that is equaled or exceeded for 50% of the records for a given day of the year, and also shown are the flow values that are equaled or exceeded for 90% of the records for a given day of the year. These records indicate that the lowest stream flows on this stretch of the Missouri River typically occur during the winter months. For the purposes of estimating the potential collector well yield, the winter low flow conditions were assumed to be represented by the daily flows during the months of December and January that are equaled or exceeded for 90% of the records at the Waverly gage. For the purposes of estimating the potential collector well yield, the average late summer flow conditions were assumed to be represented by the median daily flows during the months of August and September at the Waverly gage (AECI, 2006j).

The observed river water level at the project site was approximately 668.4 feet at the end of the constant-rate test pumping period. Assuming that the river levels at the project site vary similarly with changes in flow as do the river levels at the Waverly gage, it is estimated that the river level during the assumed winter low flow conditions would be approximately 8 feet lower at the site than the river level was at the time of the aquifer test. Consequently, the static water level representing winter low flow conditions at the site was assumed to be at elevation 660.4 feet. Also, based on the information from the USGS gage station, it was estimated that the median summer river elevation at the site is approximately 1 foot higher than the conditions observed during the testing period. Consequently, under average late summer stream flow conditions, it is estimated that the river would be at an elevation of approximately 669.4 feet (AECI, 2006j)

Due to the increase in water viscosity with decreasing temperature, a lower groundwater temperature than observed during the testing would result in a lower hydraulic conductivity for the aquifer, and a higher groundwater temperature would result in a higher hydraulic conductivity for the aquifer. Based on information from other sites along the Missouri River, it was estimated that the river water temperature varies from just above freezing in the winter to over 80 degrees F in the summer.



Source: AECI, 2006j

Figure 3-28. Missouri River Daily Stream Flow Statistics for the US Geological Survey Gage Station at Waverly, Missouri

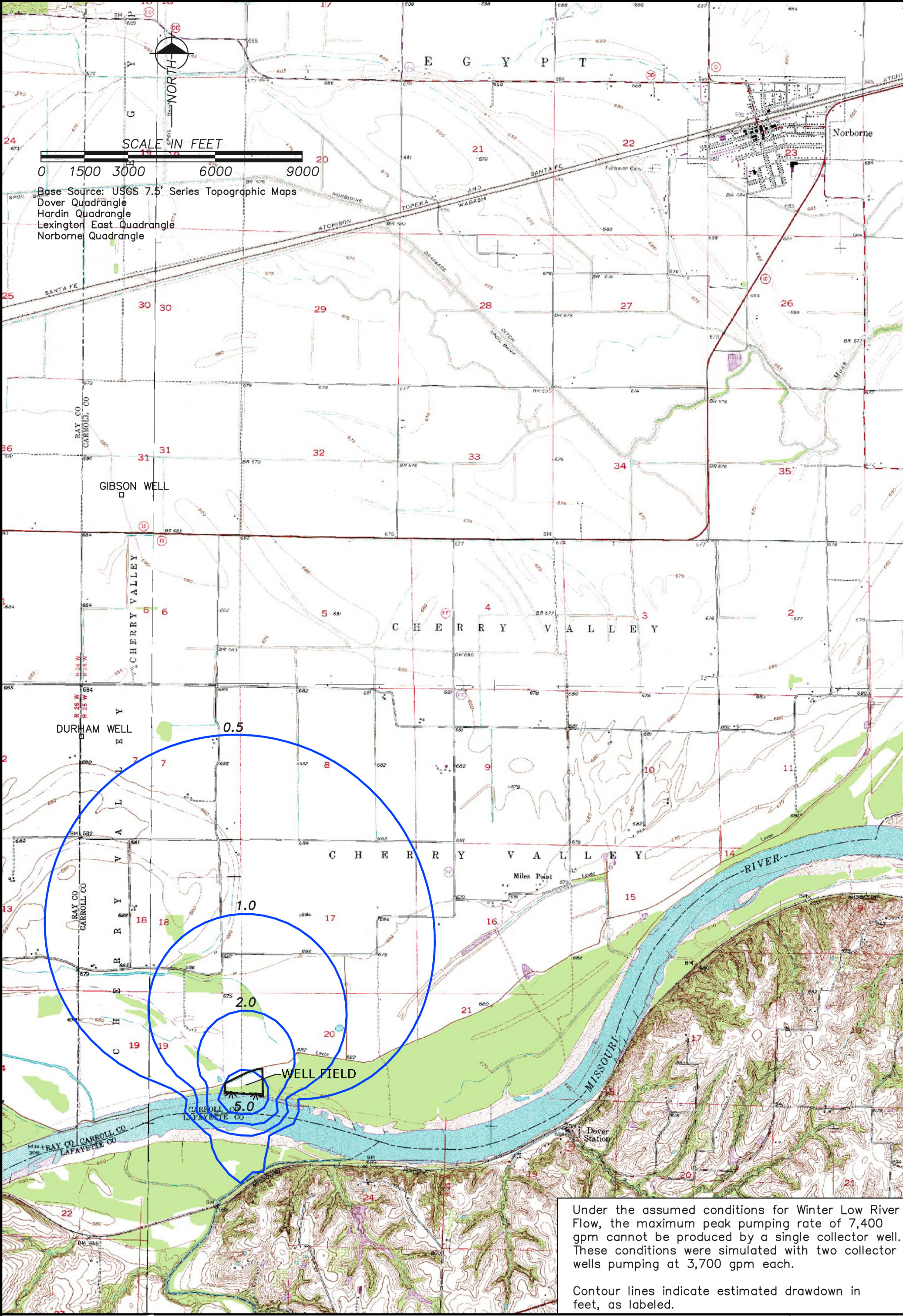
Under the influence of induced filtration of river water, the groundwater temperature near the proposed collector well could range from a low temperature of approximately 45 degrees F to a high temperature of about 70 degrees F. The groundwater temperature of 58 degrees during the constant-rate test is probably close to average conditions. The least favorable water supply conditions would occur if extreme low river levels coincide with low winter water temperatures. Based on the recent river data from the site and from the USGS gage at Waverly, it was estimated that the river level at the project site will rarely drop below an elevation of approximately 663 feet. At this river level a collector well at the PW site would be capable of yielding up to 6,300 gpm (10.3 million gallons per day (mgd)) with the groundwater temperature at 58 degrees F (AECI, 2006j).

An analytic element groundwater flow model was used to estimate the effects on the aquifer when pumping the desired yield. A model simulation was run with two collector wells with each pumping 3,700 gpm for a total of 7,400 gpm under assumed winter low river conditions. This simulation shows that there would be approximately 5 feet or more drawdown extending nearly to the property boundaries of the project site, and an area that would have a projected drawdown of approximately 0.5 feet or more extending to approximately 2.2 miles north of the project site (Figure 3-29). An additional simulation was run with low river levels during the summer (Figure 3-30) This simulation showed that summer impacts would be less than winter. Projected drawdown would be less at higher river levels.

Groundwater Withdrawal—Construction Dewatering

Construction of the proposed power plant would require deep excavations for construction of coal unloading and coal handling equipment. The deepest excavation required would be for the rotary coal car unloading system which would require an excavation approximately 80 feet deep. The bottom of the excavation would be well below the water table elevation in the Missouri River alluvial aquifer.

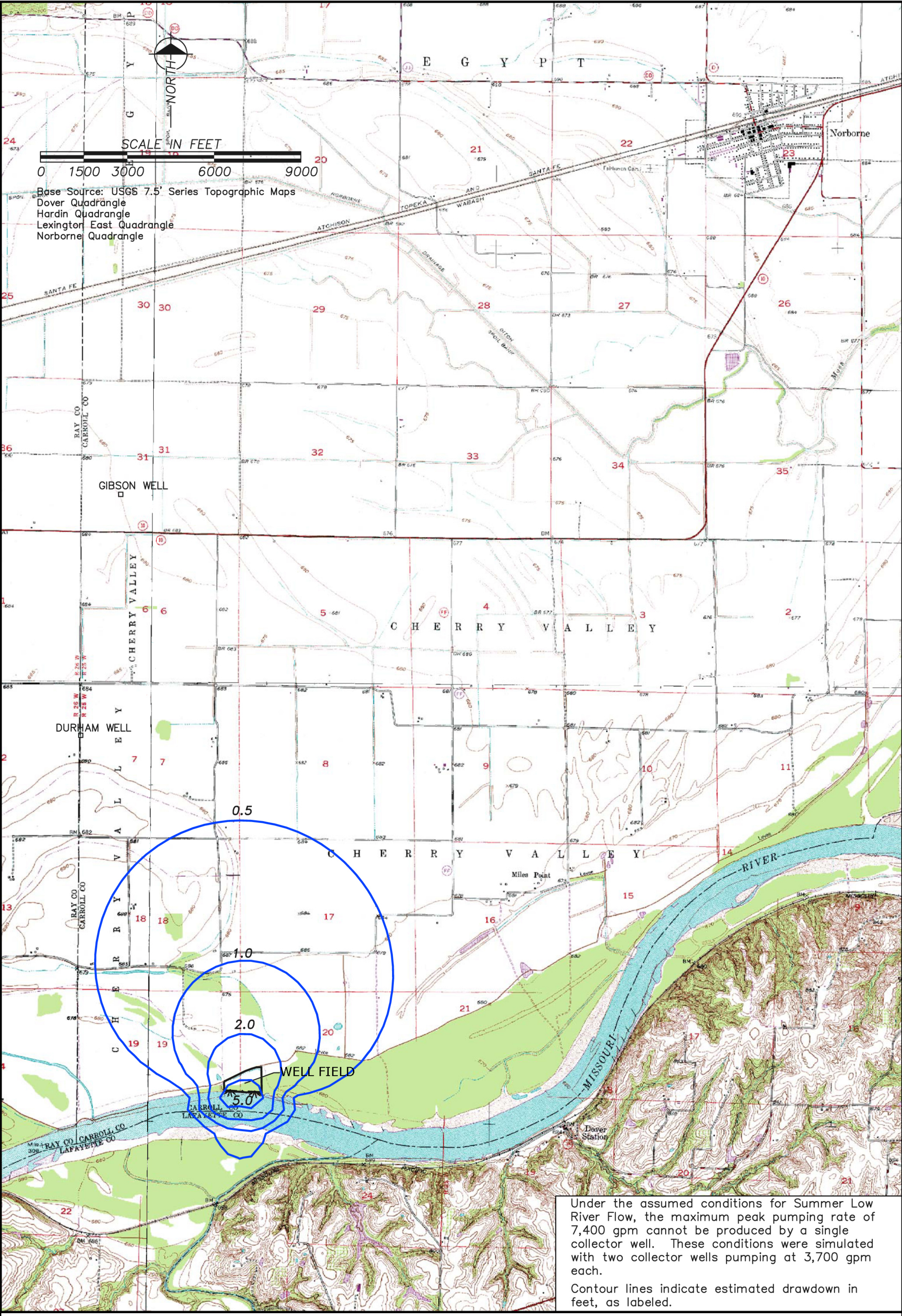
In order to safely and economically construct the facility, the groundwater level would have to be lowered, a process known as dewatering, to enable construction to be performed in a dry condition. Depending on the methods employed for constructing these facilities below the groundwater table, there may be some short term (4 to 6 months), impact on the local groundwater



Scale: 1" = 3000'

Figure 3-29. Model Estimated Drawdown for Two Collector Wells Pumping 3,700 gpm Each, Winter Low River Conditions

Source: AECI, 2006j



Under the assumed conditions for Summer Low River Flow, the maximum peak pumping rate of 7,400 gpm cannot be produced by a single collector well. These conditions were simulated with two collector wells pumping at 3,700 gpm each.

Contour lines indicate estimated drawdown in feet, as labeled.

Scale: 1" = 3000'

Figure 3-30. Model Estimated Drawdown for Two Collector Wells Pumping 3,700 gpm Each, Summer Low River Conditions

Source: AECI, 2006j

system and potentially some short term impacts to adjacent groundwater users.

Dewatering methods employed would be determined by the contractor to match his planned construction procedures. Typically, methods include deep wells, well points, water flow barriers (sheet piles) and pumping from sumps within the excavation.

Depending on the contractor's method of construction and dewatering, impacts of ½ foot or more could be experienced by up to 6 nearby wells constructed in the alluvial aquifer. Four more domestic wells are located in a transition area that may be connected to the alluvial aquifer. Actual well location and elevation, as well as construction dewatering methods, would determine if they would be impacted by the dewatering operation. Additionally, 11 wells are located in the uplands north of the plant site within 1.75 miles of the coal unloader excavation. These wells are constructed in geologic materials that are at a higher elevation than the alluvial aquifer and would not be impacted by the dewatering system operation.

Impacts to neighboring groundwater users can be addressed through a number of options including replacement water by a tanker, bottled water, connection to rural water system or redrilling a well or well point. Impacts may also be reduced through construction methodology requirements such as using techniques that limit drawdown and installation of recharge wells to maintain groundwater levels near neighboring wells. Impacts would be assessed through testing at the site to determine actual aquifer parameters, and in consideration of the contractor's selection of construction methodology.

Potential Contamination of Groundwater

Missouri regulations for utility landfills require characterization of the soil, geology, and groundwater at the site so that the landfill can be designed to prevent impact to groundwater. Groundwater monitoring systems are included to detect impacts to any aquifer from the landfill.

3.3.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse environmental impacts on groundwater water:

Groundwater Withdrawal

- Construction of the wells at a location and pumping rate such that the expected impacts on other existing wells are negligible.

- If additional testing and assessment indicate that other wells may be overly adversely impacted by construction dewatering, AECI would contact the owners prior to initiating construction dewatering activities and would work with them to arrive at appropriate solutions that AECI would implement.

Potential Contamination of Groundwater

- The fuel oil unloading, piping, and storage system would be provided with containment and leak detection as required by 40 CFR 112, Oil Pollution Prevention.

- The utility waste landfill leachate collection pond would be sized to retain the flow from a 50-year, 24-hour rainfall over the largest open active area of the landfill expected during the lifetime of the landfill. The pond would have a double liner system with a leak detection and removal system.

- The plant would have a coal pile runoff treatment area with concrete-lined ditches and a concrete-lined basin and a wetland treatment area with a low permeability liner, as describe in *Section 2.4.6.2, Coal Yard Area*.

- An oily water system would be provided for potentially oily runoff, as described in *Section 2.4.6.3, Oil Areas*.

- A Spill Prevention, Control, and Countermeasure (SPCC) Plan would be provided as required for containment and control of liquids that have the potential to contaminate groundwater.

- Water from chemical cleaning would be collected and treated as described in *Section 2.4.6.4, Chemical Cleaning*.

- All runoff water that may be contaminated would be collected and treated as described in *Section 2.4.6, Wastewater Collection and Treatment*.

- A two-foot layer of clay would be provided beneath the coal piles to prevent leaching into the ground.

- Ash and FGD waste would be disposed of in a facility designed and permitted to prevent contamination of groundwater. The facility would be lined and would have a leachate collection system. The landfill would be divided into 20 to 25 cells, only two of which would be operated initially.

- Cells would be closed as they are filled to prevent infiltration of storm water. A final cover for the landfill would have a geomembrane liner, soil and a vegetative cover. A groundwater monitoring system would be included.

3.3.2.4.1 Impact Assessment

Proposed Action

Groundwater Withdrawal

Pumping from the collector wells would be expected to impact the groundwater surface as shown in Figures 3-29 and 3-30. Drawdown between wells is additive, so that the net drawdown due to more than one well pumping would be the direct sum of the drawdown caused by the individual wells pumping alone. Consequently, the simulated drawdown values predicted by the groundwater flow model represent the amount of additional drawdown that would occur in an offsite well located within the radius of influence of the proposed collector well(s). For example, a well located in the area between the 1 foot and 2 foot drawdown contours lines depicted in Figures 3-29 and 3-30 would be expected to have 1 to 2 feet of drawdown in addition to the drawdown caused by its own pumping. The amount of impact to off-site wells resulting from pumping of collector wells at the project site would be dependent on the depth, construction, groundwater levels, pumping equipment and capacity of the off-site wells. Several feet of additional drawdown could be detrimental to a shallow well equipped with a suction pump that is operating near the limits of its capacity. Conversely, several feet of additional drawdown might go unnoticed in a deep high capacity well equipped with a submersible pump (AECI, 2006j).

The aquifer conditions in the vicinity of the project site are generally favorable, and it is likely that the aquifer properties improve to the north of the project site. Domestic wells in the area probably have low amounts of drawdown under normal use. The natural variation in the groundwater levels seasonally and with changes in the river level and recharge are likely to be larger than the amount of drawdown resulting from pumping of collector wells at the project site, except in the area less than a half-mile from the proposed collector wells.

At this site, all the wells identified from MDNR's database are more than a half-mile away, and outside the projected maximum extent of drawdown at the 0.5 feet contour line (Figure 3-29). As such, the existing wells in the vicinity of the project site have probably experienced larger changes in water level under normal conditions, than would be caused by the proposed collector wells (AECI, 2006j).

At this site, all the wells identified from MDNR's data base are outside the projected maximum extent of drawdown at the 0.5 feet contour line (Figure 3-29) (MDNR, 2006b). In general, if there were off-site wells located in the areas depicted in Figures 3-29 and 3-30 as having an estimated drawdown from the collector wells of 0.5 to 1.0 feet these wells would probably have negligible impact from the collector well pumping. If there were wells in the areas depicted in Figures 3-29 and 3-30 as having an estimated drawdown from the collector wells of 1.0 to 2.0 feet these wells would probably have slight decreases in capacity due to the collector well pumping. If there were wells in the areas depicted in Figures 3-29 and 3-30 as having an estimated drawdown from the collector wells in excess of 2.0 feet these wells would probably have some decrease in yield due to the collector well pumping, and shallow low capacity wells would have the potential for the most impact. Decreases in yield would generally not be substantial in areas that did not have at least 3 feet of additional drawdown due to the pumping of the proposed collector wells.

At present, there are no houses or existing off-site wells in the areas where the groundwater models predict 2 feet or more of drawdown from the proposed collector well. Since all known wells are outside the estimated drawdown contour of 0.5 feet, impact, if any, is expected to be negligible.

Other Issues Related to Groundwater Withdrawal

Potential adverse impacts. If other users were overly adversely impacted, AECI would either have to reduce pumping rates, provide water to the affected party, or compensate for damages.

Development of sinkholes from pumping. The pumping from the Missouri River aquifer that AECI proposes would not cause sinkholes to develop. For surface collapse to occur, subsurface materials would need to be removed. Proper design of the collection system, including the well screen, would prevent removal of subsurface materials in excess of the small amount of suspended solids that are always present in groundwater.

Draining wetlands by lowering the groundwater level. As noted above, natural groundwater fluctuations from changing river levels are expected to be greater than the changes resulting from drawdown. Therefore, pumping would not be expected to impact a wetland by lowering the groundwater any more than a lower river level would in the absence of pumping. In addition, the top of the aquifer is about 45 feet deep. Effects would occur within the aquifer; impacts to water in a surface wetland are not expected.

Groundwater quality. Groundwater is typically more mineralized than river water. Chemical testing of groundwater was done as part of the aquifer testing. Additional testing would be done during design to determine specific treatment requirements.

Potential Contamination of Groundwater

With implementation of measures described above and included in the Proposed Action, contaminant impacts to groundwater are not anticipated.

IGCC Alternative

Impacts would be the same for the IGCC alternative as for the Proposed Action.

No Action Alternative

Under the No Action Alternative, the Project would not be constructed and there would be no change or disturbance of groundwater or aquifer resources within the project area.

3.3.2.4.2 Mitigation and Residual Impacts

No mitigation measures have been identified because impacts are not anticipated. However, AECI is committed to mitigate any serious adverse impact if it occurs.

3.4 SURFACE WATER

3.4.1 Affected Environment

3.4.1.1 Regional Setting

Both the proposed Norborne Site and the alternate Big Lake Site are located within the Missouri River floodplain. All parts of the Proposed Action and the alternative actions associated with the Big Lake Site are within the Missouri River watershed. At the Waverly Station on the Missouri River, about 12 miles east of the Norborne Site, the average Missouri River flow is 51,580 cubic feet per second (cfs), and the drainage area is almost a half-million square miles. The highest recorded flow at the station was nearly twice the average (in 1993) and the lowest was less than half the average (in 1934) (MDNR, 1995a).

MDNR assesses water resources by the 19 major watersheds shown in Figure 3-31. Ten of these watersheds (shaded yellow in the figure) drain to the Missouri River and the other nine drain to the Mississippi River, which runs along the east side of the state. In Missouri, one major river, the Grand, flows into the Missouri from the dissected till plains in the north, and two, the Osage and Gasconade, flow into the Missouri from the Osage Plains, Ozark border area, and Ozarks in the south.

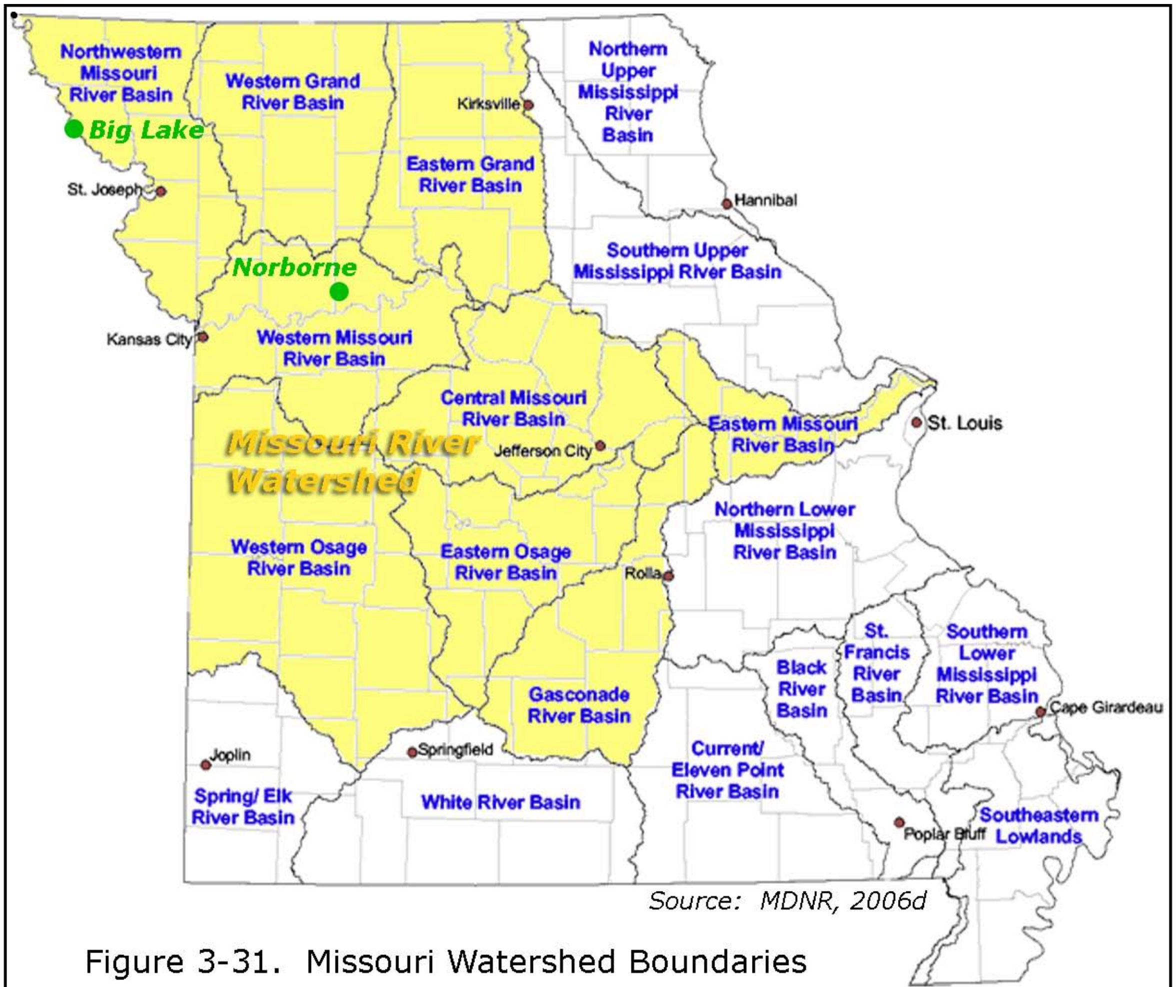


Figure 3-31. Missouri Watershed Boundaries

3.4.1.1.1 Prairie Streams

Most streams in Missouri north of the Missouri River are considered prairie type streams, as are the streams in west central Missouri, and have certain typical characteristics as a result of the geologic setting and land use.

Both the glacial till of the northern till plains and the Pennsylvanian bedrock in the Osage Plains greatly retard the infiltration of rainfall to the subsurface. As a result, almost all water falling in this area of the state quickly flows over the surface of the land and into the surface stream network. This results in very large flows in these streams during wet weather and very little or no flow in streams during dry periods. In contrast, the streams of the Ozark Plateau, which comprise most of the southeast and south central portions of the state, have somewhat smaller high flows and considerably greater flows during dry weather than prairie streams. This is because the soils and bedrock of the Ozarks are more porous and allow more infiltration of water through the soils and into the groundwater system. This groundwater moves more slowly than surface waters. It eventually re-emerges to the surface water system as seeps or springs and acts to sustain flow in streams during dry weather. Figure 3-32 shows flow characteristics for two Missouri streams, the Grand River at Gallatin, a prairie stream, and the Current River at Doniphan, an Ozark Plateau stream. These two sites have almost identically sized watersheds and maximum flows, but the Current River, during dry weather, maintains 40-400 times more flow than the Grand (MDNR, undated).

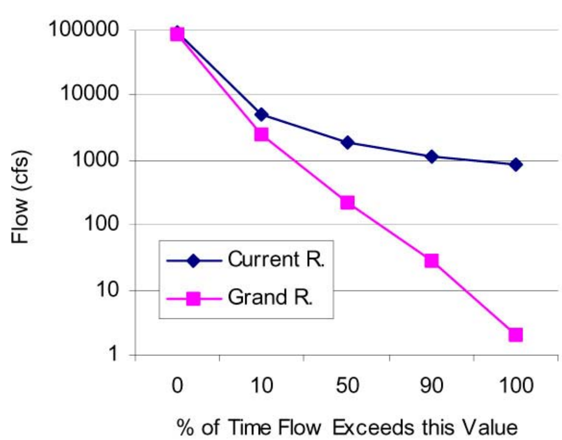


Figure 3-32. Comparison of Flows on A Prairie and an Ozark Stream

Source: MDNR, undated1

Water quality in streams reflects the geology and land use of the watershed. Missouri prairie streams flow through predominantly agricultural land. Within the general project area, row crop agriculture occupies the greatest percent of watersheds in northwestern Missouri and progressively smaller percentages of land in more eastern watersheds through the Chariton River basin. The amount of row crop land in a watershed tends to correlate well with the amount of nitrate nitrogen (NO_3N), total suspended solids (TSS), and total phosphorus (TP) in streams. This observation is consistent with the assumption that greater amounts of row crops in a watershed result in more soil erosion and in greater amounts of fertilizer application. Fecal Coliform bacteria (FC) indicates the degree of contamination of the water by the fecal material of warm-blooded animals and also seems to be related to the intensity of agricultural land use. Other water quality constituents such as total dissolved solids (TDS), sulfate (SO_4) and chloride (Cl) are more related to the age of the geologic materials over and through which these streams flow. The younger glacial till of northern Missouri yields much more dissolvable minerals than the very old and weathered soils, subsoils and rock of the Ozark Plateau. Dissolved oxygen (DO) is needed for almost all fish and other aquatic life. Average DO levels appear to have little correlation with land use and are not of concern in prairie streams. However, during summer low flow conditions DO levels can be very low in small prairie streams and can result in conditions harmful to aquatic life (MDNR, undated1).

3.4.1.2 Region of Influence

The region of influence for surface water impacts are surface waters located downstream of activities associated with the Proposed Action, or with the Alternate Site.

3.4.1.3 Existing Conditions

3.4.1.3.1 Missouri River

From Montana to the South Dakota-Nebraska border, the U.S. Army Corps of Engineers (USACE) operates six large dams that are the centerpiece of the Missouri River water storage system, the largest in North America. The USACE's water-release schedule for the dams enhances navigation for barges by maintaining a nine-foot-deep channel from Sioux City, Iowa, downstream to St. Louis (NAS, 2002). Except for periods of extreme flood and drought, the flow of the Missouri River through Missouri is now largely dependent on the discharge from last of the six dams, Gavins Point Dam on the South Dakota-Nebraska border. The construction of these dams and others in the Missouri River basin, the channelization of the lower 735 miles of the river, the building of levees, conversion of riparian corridors to cropland, and other human activities over the past century have led to significant reductions in the natural habitat and abundance of native species along the Missouri River (NAS, 2002). For example, of the 67 fish species native to the river, 51 are now listed as rare, uncommon, or decreasing in numbers, and one is an endangered species. (NAS, 2002). The U.S. Fish and Wildlife Service (USFWS) has suggested decreased flow during the summer to more closely simulate natural conditions for the benefit of fish and wildlife. However, lower summer flows on the Missouri could curtail commercial navigation or cause water temperatures to rise above Missouri's temperature standard (MDNR, 2006e).

3.4.1.3.2 Norborne Area

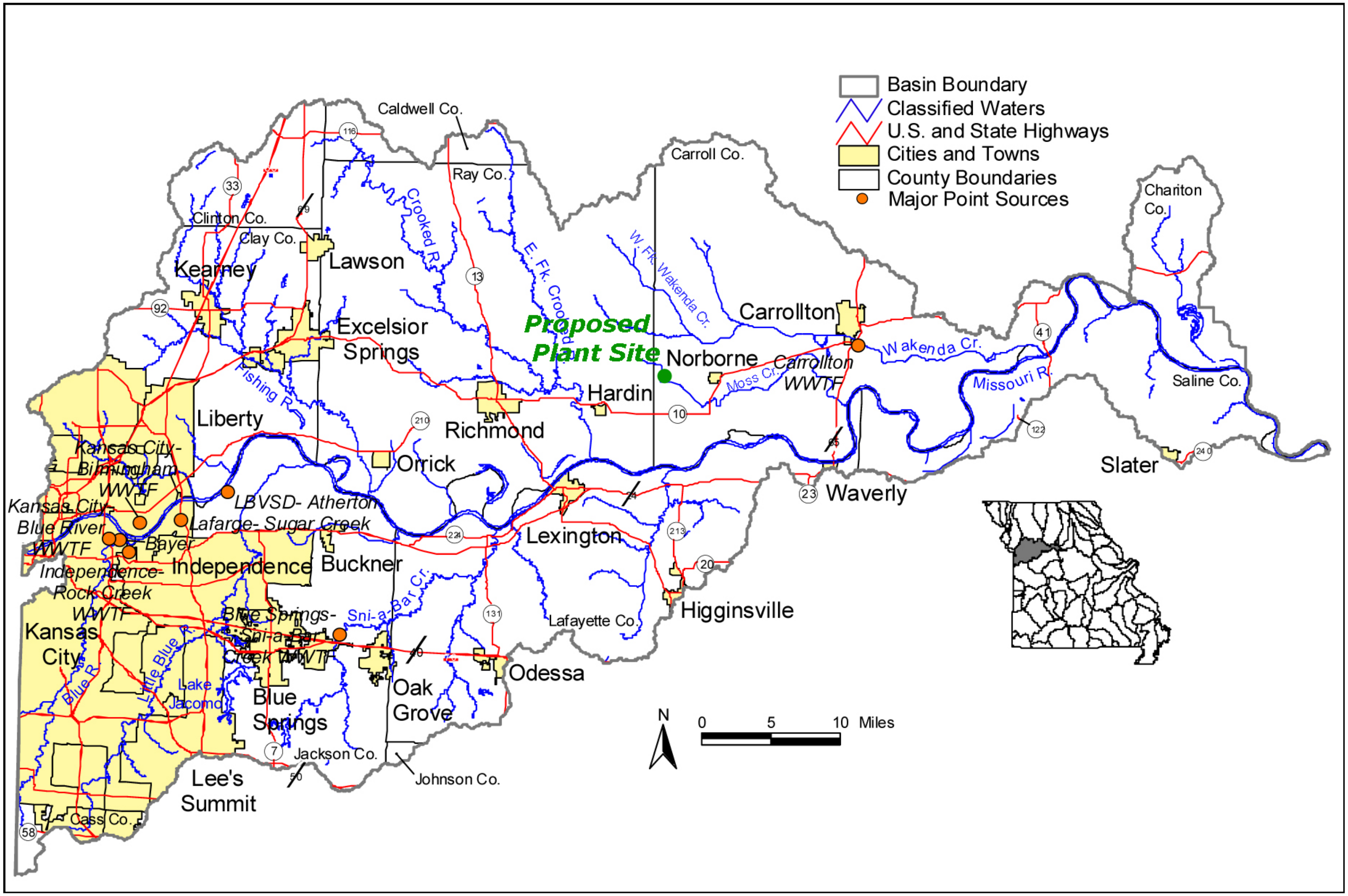
The Western Missouri River Basin (Figure 3-33) is made up of the Missouri River mainstem and the Blackriver and Lamine River watersheds to the south. The Missouri River mainstem watershed in which the proposed Norborne Site lies is shown in Figure 3-33. The Norborne Site lies at the edge of the floodplain, and includes part of the Norborne Drainage Ditch, a drainage channel in the floodplain that flows to Moss Creek. The classified waters shown in the figure are streams and water bodies for which MDNR has identified uses and corresponding water quality standards. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life.

To the north of the plant site lies the Wakenda Creek Watershed, where the proposed coal supply rail connector would be located. The proposed transmission line to Thomas Hill would cross Wakenda Creek and the proposed line to Sedalia would cross the Missouri River south of the site.

This basin is underlain by clayey glacial till and Pennsylvanian shales that allow very little infiltration of water to the subsurface. Therefore, most water movement in the basin is through the surface stream network and baseflows to streams are very low during dry periods. There are no notable springs in the basin, but several northern tributaries of the Missouri flow for significant distances within the sand and gravel aquifer of the Missouri floodplain. Therefore, even during dry weather, these streams would often hold substantial amounts of water if the alluvial aquifer is high enough to intercept the streambeds (MDNR, 2006e).

There are 758 miles of classified streams in the basin, about 5 miles of which have water quality impairments from point sources, meaning they do not meet their applicable Missouri water quality standards.[41] Most of the impairments from point sources are due to discharges from small wastewater treatment facilities in the Kansas City area (MDNR, 2006e).

[41] 10 CSR 20-7.031



Source: MDNR, 2006e

Figure 3-33._Watershed: Missouri River Mainstem-Kansas City to Glasgow

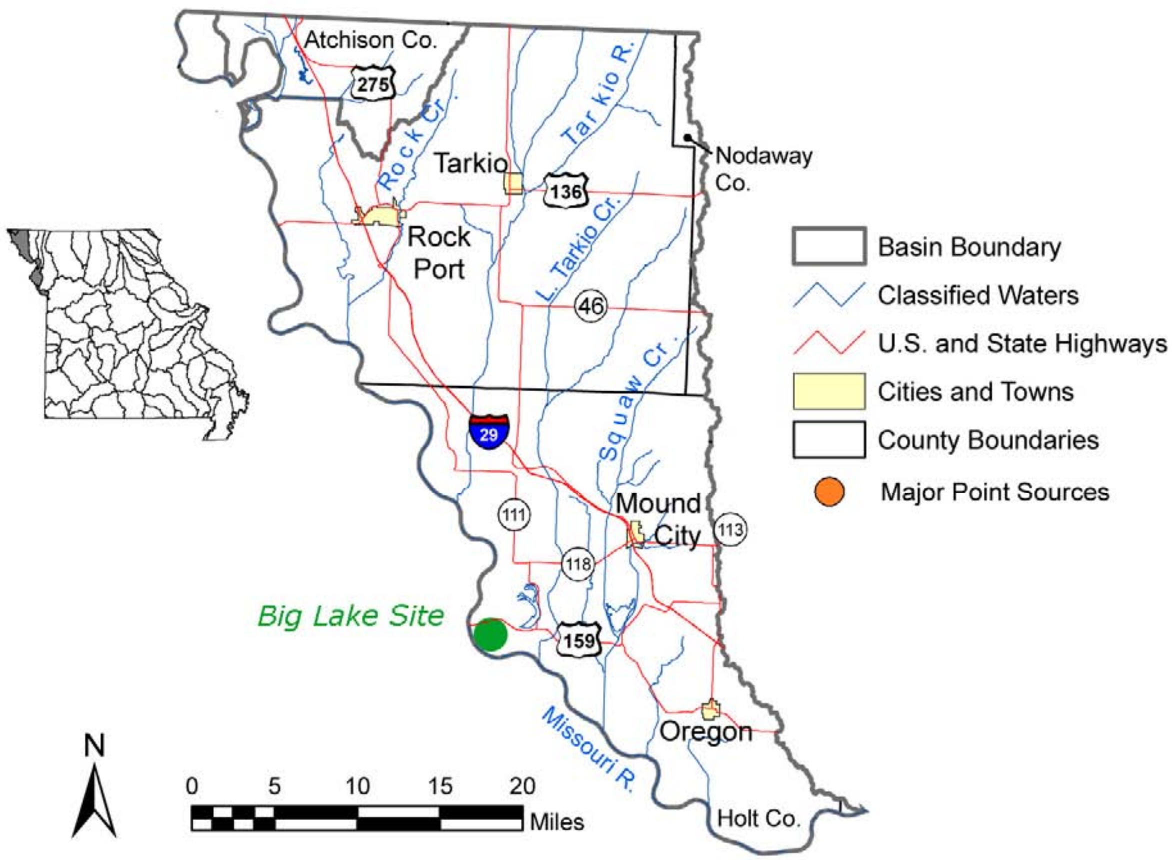
Nonpoint source pollution occurs when pollutants enter bodies of water at many locations over a wide area rather than at specific, well-defined points. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control. In prairie streams such as the Missouri River and its tributaries in the basin, some of the major nonpoint source issues are the degradation of aquatic habitat from channelization, other streambank alterations, and loss of riparian corridors. Soil erosion, subsequent instream sediment deposition, and runoff of fertilizers, pesticides, and animal wastes are also concerns (MDNR, 2006e).

Habitat impairment is a serious concern in this basin. Of the 758 classified stream miles in the basin, 736 miles, or 97 percent, are considered by MDNR to be impaired habitat for aquatic life. Causes of this impairment may include channelization, excessive sedimentation (usually as a result of channelization), loss of aquatic vegetation or associated wetlands, and impoundment. Channelization is the process of straightening a stream or river by removing natural meanders. A channelized stream has steeper slopes, faster streamflow, higher peak flows and lower base flows, resulting in increased erosion and sediment transport when flow is high, and reduced habitat when flow is low. Twenty-seven percent of the rivers and streams in the basin have been channelized. These channelized miles may represent only 50-70 percent of the miles that were originally present. The Missouri River itself has undergone extensive modification such as narrowing and deepening for the purpose of aiding navigation. These alterations have resulted in the loss of most of the still, shallow backwaters and side channels. The population and diversity of fish and other aquatic life in the Missouri have dropped substantially due to this loss of habitat (MDNR, 2006e).

3.4.1.3.3 Big Lake Area

The Northwestern Missouri River Basin, in which the Big Lake Alternate Site is located, is made up of the Missouri River mainstem, in which the Big Lake Site is located, and the Nodaway and Platte River watersheds to the east. The part of the Missouri River mainstem in which the Big Lake Site is located is shown in Figure 3-34.

The Big Lake Alternative Site is located on a very wide part of the Missouri floodplain, close to the river. Across the Missouri River in Nebraska is the



Source: MDNR, 2006e

Figure 3-34. Watershed: Missouri River Mainstem Northwest

floodplain of the Big Nemaha River, which flows into the Missouri just south of the Big Lake Site. Big Lake, at 625 acres the largest oxbow lake in Missouri, is visible in Figure 3-34, in the floodplain to the east of the Big Lake Site. An oxbow is a former river meander that was cut off when the river found a shorter course. There are several other oxbow lakes in the Missouri River floodplain within this basin. The main pool at Squaw Creek NWR, located east of Big Lake on Squaw Creek, is 615 acres in size, but is a shallow manmade impoundment that sometimes contains very little water (MDNR, 2006e). There are three small springs of note in the basin. None of the springs sustain flow during dry weather. Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods (MDNR, 2006e).

There are no major point sources within the subwatershed shown in Figure 3-34, but 79 percent of the classified streams in the basin are considered by MDNR to have degraded aquatic habitat from non-point sources. The prevalence of highly erosive loess soils and the large amount of row crop agriculture in the basin result in some of the highest soil erosion rates in Missouri and high levels of sediment deposition in streams (MDNR, 2006e). Surface water resources at the Squaw Creek NWR, east of the Big Lake Site, are heavily impacted by sediment deposition (USFWS, 2006a).

There are important natural surface water resources in the area east of the Big Lake Site. Big Lake Marsh, a 150-acre marsh in Big Lake State Park, is one of only three marshes in Missouri that have been designated as Outstanding State Resource Waters[42]. It is the largest of the three. The Squaw Creek NWR, east of Big Lake State Park, protects a portion of a vast historic wetland basin that contained large marshes with meandering creeks that have since been straightened for agricultural drainage (USFWS, 2006a).

3.4.1.3.4 Currently Impacted Waters

Under the Clean Water Act (CWA) requirements, the MDNR prepares periodic reports of Water Quality in Missouri (Section 305(b) reporting) and of waters that are considered impaired because of failure to meet applicable regulatory water quality standards (Section 303(d) list). Not all impaired waters are included in the 303(d) list, only those that do not meet the specific water quality standards (MDNR, 2006g). Other impairments not related to water quality standards are addressed in the Section 305(b) report.

Section 305(b) Report

According to MDNR's 305(b) report (MDNR, 2006g), 76 percent of Missouri's classified streams are impaired. The two major sources of pollution causing impairment are crop production (causing impairment to 34 percent of Missouri stream miles) and channelization (causing impairment to 17 percent of Missouri stream miles). Other sources are atmospheric deposition (4 percent), mining tailings (one percent), and natural sources (one percent). Other sources such as municipal discharges, urban runoff, industrial point source discharges account for less than one percent each.

[42] 10 CSR 20-7.031

Section 303(d) List

Section 303(d) of the federal CWA requires that each state identify waters that are not meeting water quality standards. These waters, because of degraded water quality, do not sustain all of its beneficial uses under state regulation. Water quality standards protect beneficial uses of water such as whole body contact for swimming, maintaining fish and other aquatic life and providing drinking water for people, livestock and wildlife. These waters need to be further addressed by a Total Maximum Daily Load (TMDL) study or requirements for pollution controls to characterize the nature and causes of the impairment. Each state must compile a list biennially and submit it to the EPA for approval and proceed with further attention to correct the impairment. Not all impaired waters are included in the 303(d) list (MDNR, 2006g).

Because of regulatory changes that occurred during 2003 and 2004, a 2004 list was not issued, and the 2002 list is still in effect. Impaired waters from the 2002 list in the general project area are shown in Figure 3-35.

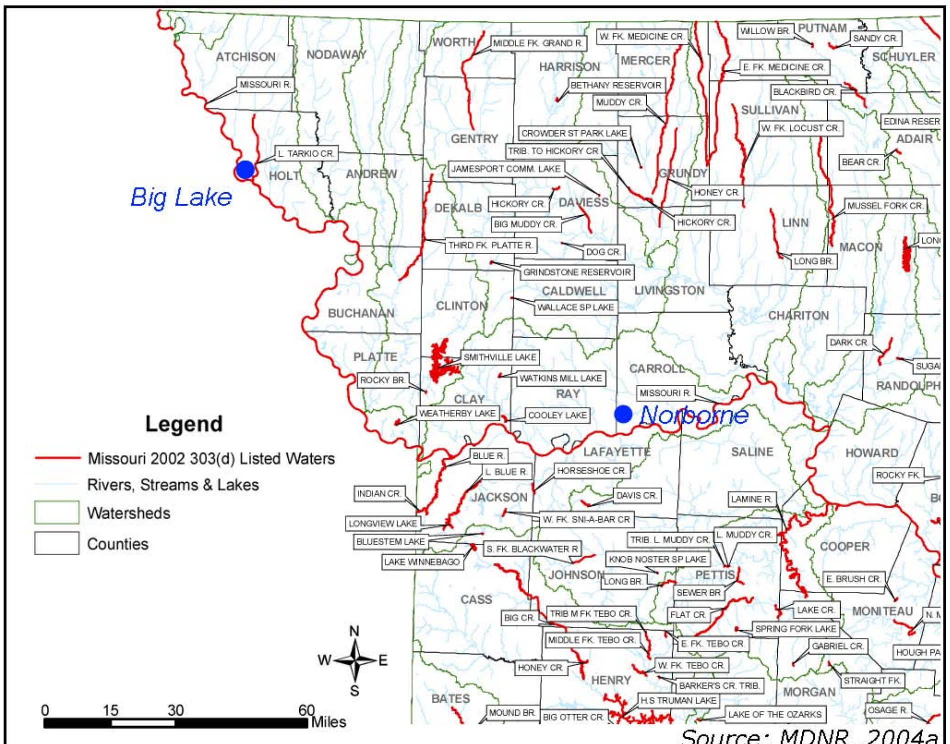


Figure 3-35. Missouri 2002 Section 303(d) Listed Waters

In October 2006 MDNR published a draft 2004/2006 list for review. In the draft 2004/2006 list, many streams were deleted and some were added. Most deletions occurred either because the stream quality improved or because the standards for listing were more rigorous, or changed. For example, the Little Tarkio Creek near Big Lake is proposed for delisting for sediment impairment because there were no data to support the classification, not because the stream quality improved. The Missouri River, on the other hand, is proposed for delisting because it now meets the water quality standards for chlordane and polychlorinated biphenyls (PCBs). There are no streams within the subwatersheds for either the Big Lake Site or the Norborne Site currently on the proposed Section 303(d) list. There are streams on the draft list within the transmission corridors, shown in Table 3-13. The segments of the Grand and Chariton Rivers and their tributaries shown on the list are all crossed by the proposed Norborne to Thomas Hill transmission route corridor.

3.4.2 Environmental Consequences

3.4.2.1 Identification of Issues

As with groundwater, most surface water related issues fall into the two broad categories. With surface water these are 1) potential adverse impacts on surface water quality from discharges associated with construction and operation and 2) potential changes in the hydrology from water withdrawal or diversion. The following specific issues were identified during the scoping process and the EIS development process:

- Need for special attention to areas subject to soil erosion caused by rain and water flow
- Potential effects on river biota from heated discharge water
- Potential impacts of National Pollutant Discharge Elimination System (NPDES) discharges; where are the locations, what are the monitoring requirements
- Concern about water from Big Lake being used for water supply (Big Lake Site)

Table 3-13. Streams in Region on 2004/2006 Proposed Missouri Section 303(d) List

Waterbody Name	WBID	First Year on 303(d)	Length/Area of Impaired Segment	Pollutant	Source	Impaired Uses*	Other Designated Uses*	Upstream Endpoint of Impaired Segment		Downstream Endpoint of Impaired Segment		Primary County
								Latitude	Longitude	Latitude	Longitude	
Chariton River	640	2006	20.0 mi.	Bacteria	Unknown	WBC	FC, AQL, LWW, SCR, IRR	39.6819	-92.6928	39.4428	-92.8784	Chariton
East Fork Chariton River	682	2006	48.5 mi.	Sulfate	Multiple AMLs	AQL	FC, LWW, WBC, DWS, IRR	39.7509	-92.5158	39.3403	-92.8445	Randolph
East Fork Grand River	457	2006	25.0 mi.	Bacteria	Unknown	WBC	FC, AQL, LWW, DWS, IRR	40.4943	-94.3123	40.1977	-94.3620	Gentry
Grand River	593	2006	60.0 mi.	Bacteria	Unknown	WBC	AQL, FC, LWW, SCR, DWS, IRR	39.7410	-93.5352	39.3844	-93.1071	Chariton
Little Muddy Creek, Tributary to	3490	1998	0.4 mi.	Color, Chloride	Tyson Foods	AQL, GC**	FC, LWW, WBC	38.7680	-93.3021	38.7731	-93.2912	Pettis
Middle Fork Grand River	468	2006	25.0 mi.	Bacteria	Unknown	WBC	AQL, FC, LWW, SCR, IRR	40.5418	-94.3513	40.2186	-94.3944	Gentry
Muddy Creek	853	2006	1.0 mi.	Color	Tyson Foods	GC**	AQL, FC, LWW, WBC	38.7718	-93.2748	38.7675	-93.2582	Pettis

*Designated Use Codes: AQL-Protection of Aquatic Life (Warm, Cool, or Cold Water); FC-Fish Consumption; WBC-Whole Body Contact Recreation; SCR-Secondary Contact Recreation; DWS-Drinking Water Supply; IRR-Irrigation; LWW-Livestock & Wildlife Watering; IND-Industrial; AML-Abandoned Mine Land

**General Criteria: Although no specific designated uses have been impaired, the general water quality criteria which apply to all waters of the state [10 CSR 20-7.031 (3)] have been violated, so the water is considered impaired and eligible for the 303(d) list. In the case of unclassified waters, this includes acute toxicity.

Source: MDNR, 2006c

- Potential hydrologic impacts to local community, hunt clubs, Mallard Marsh, Big Lake State Park, and area wetlands

- Control of runoff during construction

- Control of runoff during plant operation

- Effects on Missouri River level due to water withdrawal

3.4.2.2 Significance Criteria

Impacts would be considered significant if either of the following occurred:

- Surface water quality is substantively impacted during construction or operation by runoff water or discharges that fail to meet standards established by the state.

- Surface water bodies or streams are substantively impacted by water withdrawals or by diversion of storm water runoff.

3.4.2.3 Impact Assessment Methods

3.4.2.3.1 Storm Water Runoff During Construction

Construction activities have the potential to impact surface water primarily by exposing soil which then may be eroded and deposited into streams and other water bodies. During construction at this site much of Section 17 (one square mile) would be disturbed for plant construction and much of the southwest quarter of Section 8 would be disturbed for landfill construction. The disturbed areas for other features would be much smaller. The railroad corridor right-of-way (about 150 to 200 feet wide) (AECI, 2006i) would be disturbed, plus areas for access roads, and wider areas at locations of cuts. There would be little ground disturbance for the transmission line except at support locations, access roads, and substations. All ground disturbance areas associated with the project construction would be subject to the state storm water pollution prevention requirements. Those parts of the site within loess soils (essentially all parts not in the floodplains) would require more attention because of the highly erodible nature of this soil.

Missouri requires a storm water permit for any construction activity that disturbs more than one acre.[43] Special permits are required for activities near water resources with special protection such as outstanding resource waters or losing streams. The permit requires development of a storm water pollution prevention plan (SWPPP), which is intended to reduce the amount of sediment and other pollutants in storm water and to ensure compliance with Missouri Water Quality Standards (MDNR, 2004b). Among the items that must be included in a SWPPP are:

- A description of the BMPs that would be used (e.g., silt fences, straw bales, rock dams, mulching) and where they would be installed

- Locations of sedimentation basins for each drainage area with 10 or more acres disturbed at one time

- Additional site BMPs to be used, such as solid and hazardous waste management, provision of portable toilets, proper storage of construction materials, installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers (MDNR, 2004b).

3.4.2.3.2 Operation Discharges

MDNR achieves water quality ,management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters. As described in *Section 2.4.6, Wastewater Collection and Treatment*, all potentially contaminated surface and process water from the plant would be treated prior to discharge at a single NPDES-permitted location. The discharge would be to the Missouri River at a location to be determined and included in the NPDES permit.

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[43] 10CSR20-6.200

To protect the landfill from flooding by surface water runoff during operation, the active cells of the landfill would have internal dikes and external ditches. The external ditches would be sized to convey the flow from a 50-year rainfall, which AECI defined as 3.2 inches of rain in a one-hour period (AECI, 2005f).

Monitoring Requirements

Monitoring requirements would be established in the NPDES permit that would be issued for the site, based on regulatory standards and site-specific conditions. For point sources such as this facility that discharge more than one million gpd to the Missouri River, Missouri regulations require collection of a minimum of 20 samples per year to be analyzed for effluent standards, unless the applicant can show that the wastewater has a consistent quality, such as once-through cooling water, then the permit may require less frequent monitoring.[44]

Water Quality Standards

Discharges may not impact streams above water quality standards established by the state, except that in larger streams such as the Missouri River, a mixing zone is allowed.[45] For the Missouri River, the mixing zone is ¼ mile in length and ¼ the stream width, cross sectional area or volume of flow. Permit-specific modifications for lengths of thermal plumes in mixing zones may be made. Different water quality standards may be applicable for different streams, depending on the stream use. Missouri has established water quality standards for each of the following uses: irrigation, livestock and wildlife watering, protection of warm-water aquatic life and human-health fish consumption, cool-water fishery, cold-water fishery, whole-body contact recreation, secondary contact recreation, drinking water supply, and industrial. Missouri streams are classified according to these uses, and water quality standards are established for each use.[46] All use categories apply to the Missouri River except cool-water and cold-water fishery.

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[44] 10 CSR 20-7.015(2)(D)1B.

[45] 10CSR20-7.031

[46] 10CSR20-7.031, Tables A and H

Thermal Effects

Standards for temperature are included in the water quality criteria for protection of aquatic life and warm-water fisheries, which are applicable to the Missouri River. Outside the mixing zone, the discharge cannot raise or lower the temperature more than five degrees Fahrenheit, or increase the temperature over 90 degrees.[47] Under Section 316(a) of the CWA, this thermal standard can be appealed if it can be demonstrated that the standards can be less stringent and still "assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on that body of water". AECI does not plan to appeal and plans to comply with the standards Missouri has established for protection of aquatic life. To ensure that river water temperatures would not be increased over 90 degrees, AECI plans to limit the temperature to 90 degrees at the point of discharge.

Potential Hydrologic Effects on Streams and Other Water Bodies

With both the Norborne Site and the Alternate Big Lake Site, AECI would obtain water for the plant from a well field located near the Missouri River. Obtaining water from surface sources is not being considered. Discharge would be to the Missouri River in either case. Therefore, no surface streams or other water bodies other than the Missouri River would potentially be impacted by water withdrawals or discharges. Pumping water from the Missouri River aquifer would not impact surface water levels in the river. The drawdown curves shown in the figures in *Section 3.3, Groundwater*, show drawdown within the aquifer. The lines cross the river, but the effect would be in the aquifer beneath the river, not in the river water itself. The average Missouri River flow is about 52,000 cfs and the lowest flow measured was about half that amount. The proposed wells would be pumping at a maximum rate of 7,400 gpm, which is about 16 cfs, less than $1/1000^{th}$ of the lowest measured flow of the river.

[47] 10CSR20-7.031(4)(D)

3.4.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

Potential Hydrologic Impacts

- Use of groundwater at the Missouri River would prevent impacts from surface water withdrawals.

Potential Contamination of Surface Water

- A SWPPP would be implemented to prevent impacts to stream and other water bodies from storm water runoff during construction.

- The fuel oil unloading, piping, and storage system would be provided with containment and leak detection as required by 40 CFR 112, Oil Pollution Prevention.

- The utility waste landfill leachate collection pond would be sized to retain the flow from a 50-year, 24-hour rainfall over the largest open active area of the landfill expected during the lifetime of the landfill.

- The plant would have a coal pile runoff treatment area.

- An oily water system would be provided for potentially oily runoff.

- Discharge water temperature would be at or below the maximum allowable at the plant site, before it is discharged.

- An SPCC Plan would be provided as required for containment and control of liquids that have the potential to contaminate surface water.

- Water from chemical cleaning would be collected and treated as described in *Section 2.4.6.4, Chemical Cleaning*.

- All runoff water that may be contaminated would be collected and treated as described in *Section 2.4.6, Wastewater Collection and Treatment*.

3.4.2.4.1 Impact Assessment

Proposed Action

The large area of disturbed soil that would be exposed during construction and the use of fuels and chemicals during operation of the plant indicate the potential for surface water impacts. However, with implementation of the environmental regulatory requirements outlined in this section, no significant impacts to surface water would be anticipated.

The only streams on Missouri's proposed 2004/2006 Section 303(d) in the area of the Proposed Action are within the proposed transmission line route corridors (Table 3-13). Identified pollutants causing impairment of these streams are bacteria (from unknown sources), sulfate (from abandoned mine lands), and color/chloride (from a food processing facility). The activities associated with construction of a transmission line in the vicinity of these streams would not be expected to contribute any of the identified pollutants, and would not be expected to contribute to further impairment of these streams.

Big Lake Alternate Site

The assessment outline above for the Norborne Site would also be applicable for the Big Lake Site. No hydrologic impacts to Big Lake, the local community, hunt clubs, Mallard Marsh, Big Lake State Park, or area wetlands would be expected.

IGCC Alternative

Water requirements and other relevant features for the IGCC alternative would be similar to requirements for the Proposed Action (Amick et al, 2002). Therefore, the impacts on surface water would be expected to be similar.

No Action Alternative

The Proposed Action would not be constructed under the No Action Alternative. There would be no impacts on surface water.

3.4.2.4.2 Mitigation and Residual Impacts

If adopted, the following would contribute to reductions in impacts from the Proposed Action:

- Implementing Missouri's guidance for BMPs for erosion, sediment, and storm water (MDNR, 1999).

- Requiring the top elevation of all berms for wastewater storage ponds be above the 100-year flood elevation.

3.5 FLOODPLAINS

3.5.1 Affected Environment

The following sections describe the current floodplain conditions. The description of current conditions represents the baseline for the assessment of impacts and environmental consequences.

Areas of potential flooding (100-year and 500-year floodplains as determined by the Federal Emergency Management Agency (FEMA)) have been identified in the vicinity of the Proposed Action and are presented on Figure 3-36.

The proposed power plant site, which is located mainly in Section 17, T7N, R25W, is situated at the edge of the 100-year floodplain. The proposed landfill site is not in the 100-year floodplain (Figure 3-36).

3.5.1.1 National Flood Insurance Program

FEMA, through the National Flood Insurance Program (NFIP), has primary responsibility for developing and implementing regulations and procedures to control development in areas subject to flooding. The U.S. Congress established the NFIP with the passage of the National Flood Insurance Act of 1968. FEMA describes the NFIP as follows:

> The NFIP is a federal program enabling property owners in participating communities to purchase insurance as a protection against flood losses in exchange for state and community floodplain management regulations that reduce future flood damages. Participation in the NFIP is based on an agreement

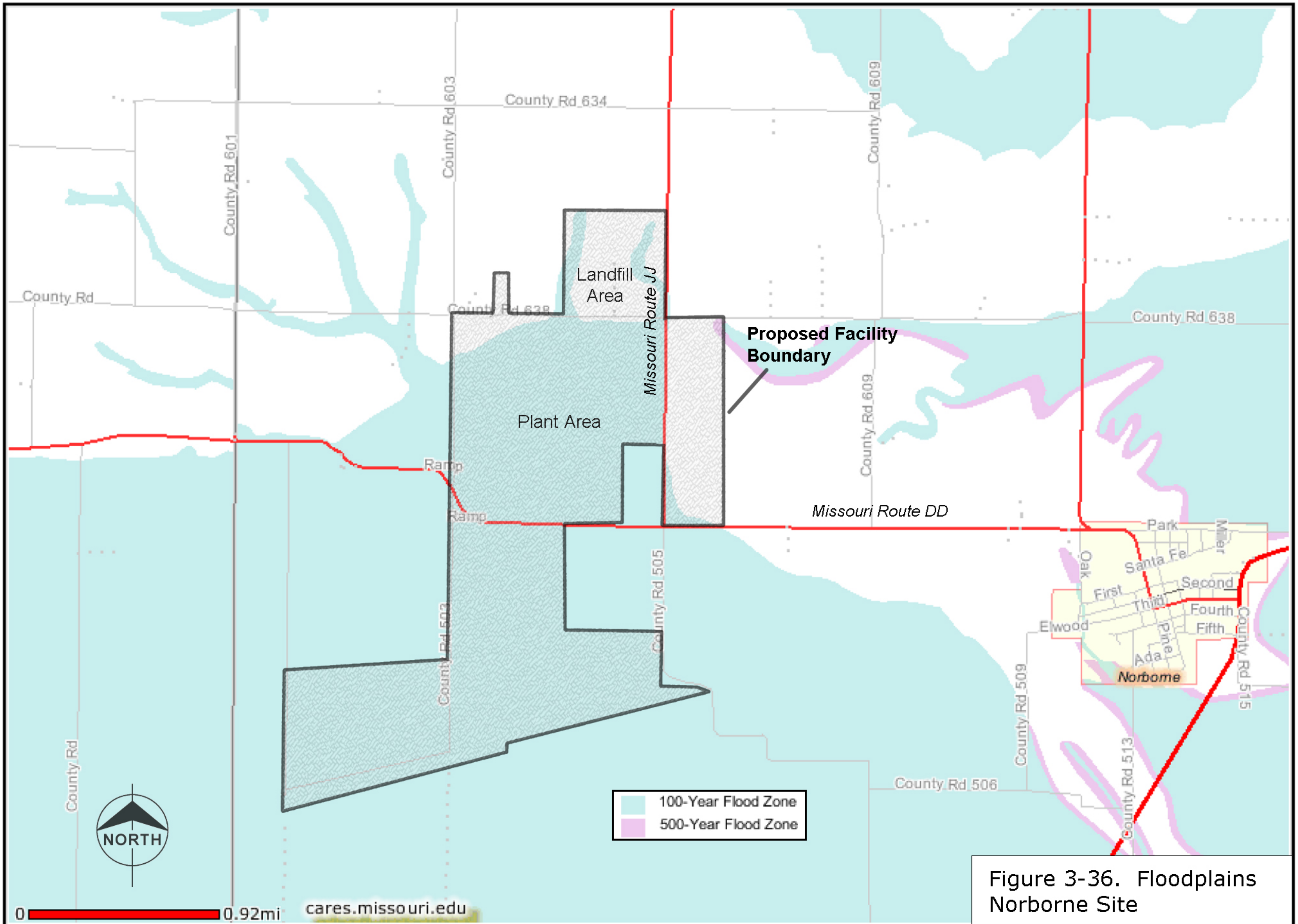

Figure 3-36. Floodplains Norborne Site

> between communities and the federal government. If a community adopts and enforces a floodplain management ordinance to reduce future flood risk to new construction in floodplains, the federal government would make flood insurance available within the community as a financial protection against flood losses (FEMA, 2002).

A “community” as defined by FEMA can be a tribe, a state or any political subdivision of a state that has authority to adopt and enforce floodplain management regulations for the areas within its jurisdiction. In all parts of the project area the respective counties are the communities with authority. For example, for the Norborne Site, the NFIP is administered by Carroll County.

3.5.1.1.1 Flood Insurance Rate Maps (FIRMs)

To implement the NFIP, FEMA prepares Flood Insurance Rate Maps (FIRMs) that show special flood hazard areas (SFHAs) where flood insurance is mandatory. The 100-year flood, or base flood, is the flood having a one percent chance of being equaled or exceeded in any given year. The base flood is the national standard used by the NFIP and all federal agencies for the purposes of requiring the purchase of flood insurance and regulating new development. Base flood elevations (BFEs) are typically shown on FIRMs (FEMA, 2006b).

3.5.1.1.2 Regulatory Floodways

In addition to the SFHAs and applicable flood insurance rates, regulatory floodways are intended to be shown on the FIRMs. FEMA defines regulatory floodway as follows[48]:

> A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided BFEs, but no floodway has been designated,

[48] 44CFR59.1

> the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available.

Regulatory floodways have not been identified for all areas; in particular, rural areas are less likely to have regulatory floodways identified. The Carroll County FIRMs do not have regulatory floodways shown, nor do any of the counties through which the proposed Norborne Plant transmission lines pass. Holt County does have designated regulatory floodways, at least in the area of the Alternative Big Lake Site.

3.5.1.1.3 Floodplain Ordinance Requirements

At a minimum, community ordinances must require flood insurance and must issue permits for new construction in SFHAs. They also must require that for new residential construction the lowest floor elevation is above the BFE, and for new non-residential construction, either the lowest floor elevation is above the BFE, or, alternatively, any part of structure below the BFE is floodproofed.[49]

Regarding regulatory floodways, the community's ordinance must also, at a minimum[50]:

> Prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.

If FIRMs with designated flood insurance zones are available, but regulatory floodways have not been designated, the community ordinance must, at a minimum[51]:

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[49] 44CFR60.3
[50] 44CFR 60.3 (d) (3)
[51] 44CFR60.3(c)

> Require until a regulatory floodway is designated, that no new construction, substantial improvements, or other development (including fill) shall be permitted within Zones A1-30 and AE on the community's FIRM, unless it is demonstrated that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, would not increase the water surface elevation of the base flood more than one foot at any point within the community.

Carroll County does not have additional requirements of its own and therefore requires only compliance with the FEMA requirements (Carroll County, 2006a).

3.5.1.2 Executive Order on Floodplains

USDA/RD's regulations require compliance with executive orders, which are issued by the President of the U.S.. An executive order on floodplain management states the following[52]:

> If an agency has determined to, or proposes to, conduct, support, or allow an action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

3.5.1.3 Region of Influence

The region of influence for assessing impacts on floodplains includes all facilities related to the Proposed Action. The Project parcels, well site, transmission lines and rail connectors were evaluated to determine the level of possible floodplain impacts.

[52] Executive Order 11988, May 24, 1977

3.5.1.4 Existing Conditions

3.5.1.4.1 Norborne Site

Proposed Plant Site, Well Field, and Rail Corridors

The proposed power plant site and substation are located within the 100-year flood zone of the Missouri River, as defined by FEMA. The current effective FIRM for Carroll County is dated October 17, 1986[53] (FEMA, 2006a). The Norborne site, south rail alternative, and well field are located within an area with BFEs determined (Zone A7), with a small portion of the site designated as within the 100-year floodplain with no BFEs determined (Zone A). The 100-year and 500-year flood elevations for the proposed Norborne facility are 687.1 feet and 689.5 feet, respectively (AECI, 2005f).

The Wakenda Creek and West Fork Wakenda Creek Floodplains are in Zone A. The north rail connector corridor is partially within the 100-year floodplain of Wakenda Creek (Figure 3-37).

Proposed Transmission Lines

The proposed transmission route would cross several 100-year floodplains. Except for the Missouri River (Zone A7) and the Grand River (Zone AE, a more recent designation, similar to A7), which have BFEs determined, all crossings are designated Zone A (within 100-year flood elevation but with no BFE determined). None of the streams had floodways designated. AECI estimates that floodplains crossings less than about 1,000 feet long can be spanned. Floodplain crossings greater than 1,000 feet are listed in Table 3-14 and shown in Figures 3-38 and 3-39. Note that the crossing length is greater than the floodplain width when the crossing is transverse (not at right angles to the floodplain). Transverse crossings may be necessary to avoid other impacts. Coordination with the respective counties would be needed regarding any requirements for placement of transmission line supports in floodplains without designated floodways.

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[53] Carroll County, Missouri Map Number 29057C0175 B, panel 100 of 225 for the plant site and panel 175 for Wakenda Creek.

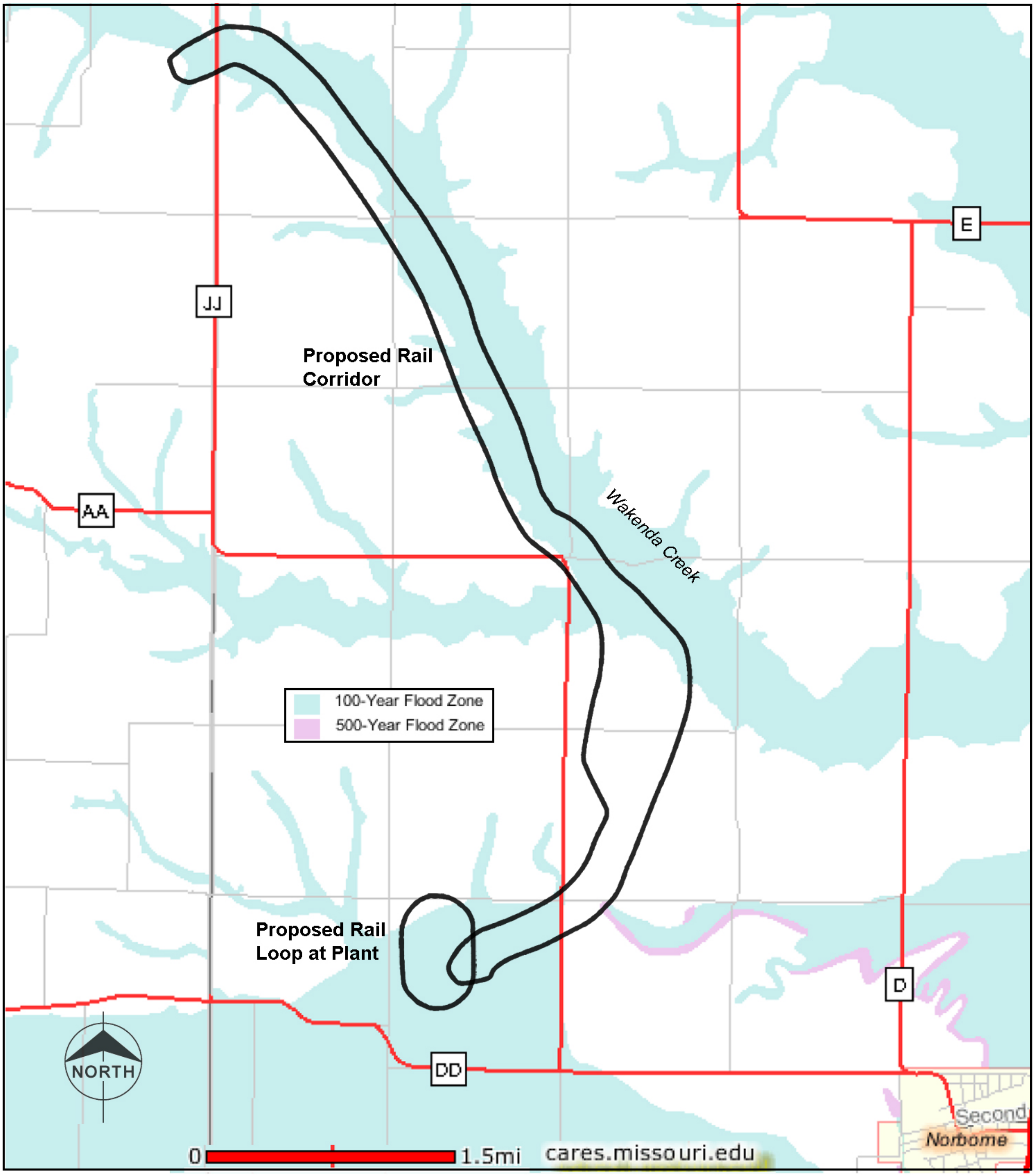

Figure 3-37. Floodplains
Norborne North Rail Corridor

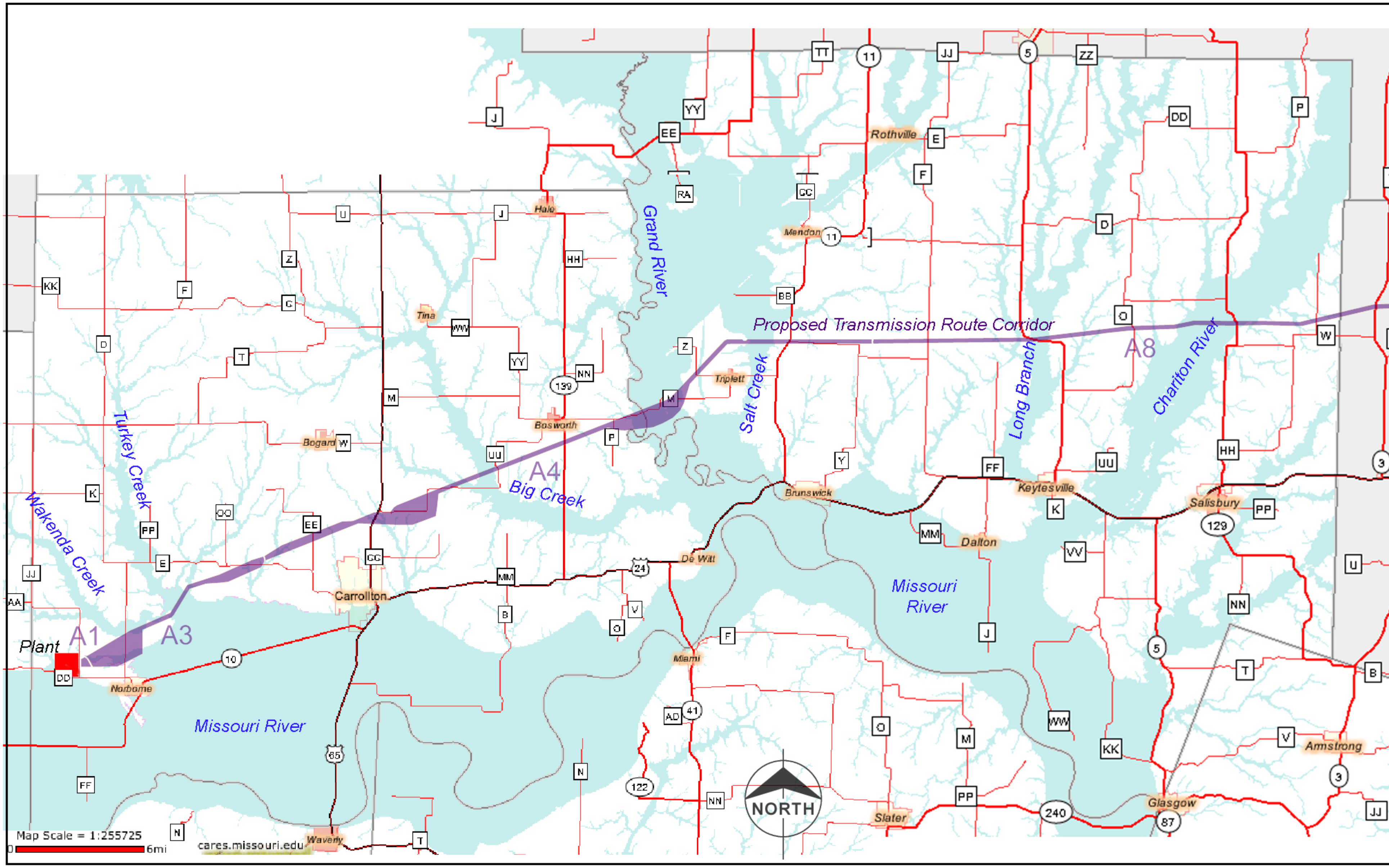

Figure 3-38. Floodplains
Norborne to Thomas Hill
Transmission Route Corridors

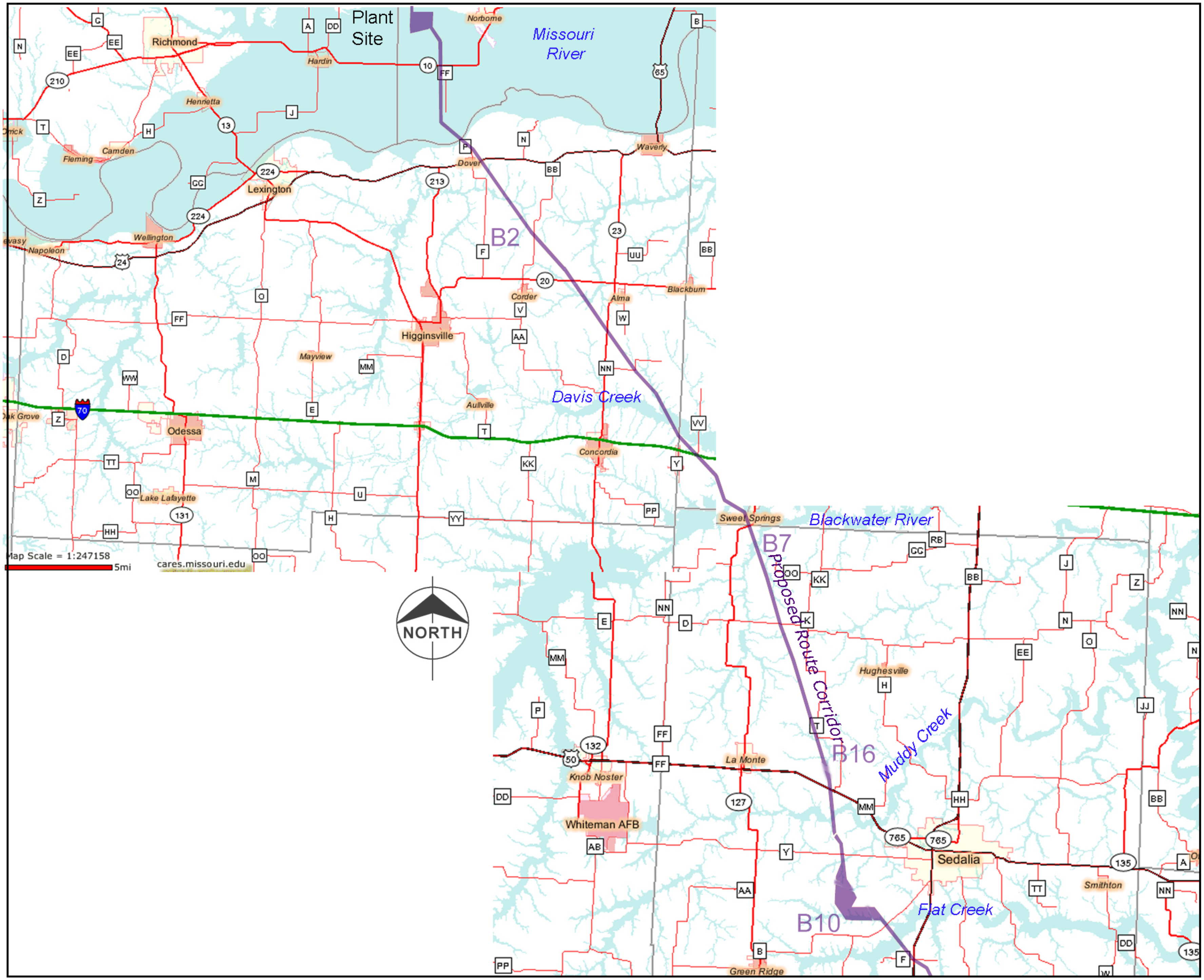

Figure 3-39. Floodplains--Norborne to Sedalia Transmission Route Corridors

Table 3-14. Estimate Lengths of 100-Year Floodplain Crossings

County	Stream	Approximate Length of Crossing, ft.	Figure Reference
Norborne to Thomas Hill			
Carroll	Wakenda Creek	10,000	3-38
Carroll	Turkey Creek	10,000	3-38
Carroll	Big Creek	5,000	3-38
Carroll/Chariton	Grand River	12,000	3-38
Chariton	Salt Creek	6,000	3-38
Chariton	Long Branch	6,000	3-38
Chariton	Chariton River	17,000	3-38
Norborne to Sedalia/Mt. Hulda			
Lafayette	Davis Creek	10,000	3-39
Pettis	Blackwater River	3,000	3-39
Pettis	Muddy Creek	2,000	3-39
Pettis	Flat Creek	2,000	3-39

3.5.1.4.2 Big Lake Site

According to the applicable FIRM, dated January 6, 1988[54], the Big Lake site is located within a 100-year floodplain with approximately 30 percent of the site along the Missouri designated as a regulatory floodway (AECI, 2005a). The site is large enough to accommodate the power plant facilities on fill material that would elevate the power plant out of the floodplain. No power plant facilities would be located in the floodway. Where determined within the site, the BFE line ranges between 858 to 862 feet.

3.5.2 Environmental Consequences

3.5.2.1 Identification of Issues

The following issues were identified during scoping and the EIS development process:

[54] Holt County, Missouri and Incorporated Areas Map Number 29087C0095 B, panel 95 of 190

- Increases in flooding on neighboring farms and other areas from raising of plant elevations in floodplains
- Potential impacts to floodway, use of USACE recalculated flood frequencies
- Compliance with Executive Order 11988 on Floodplain Management
- Loss of floodplain values
- Potential effect on possible plans to restore floodplain functions
- Potential flooding of landfill

3.5.2.2 Significance Criteria

The effects of the Proposed Action and alternatives would be considered significant if the following would occur:

- Encroachment on a floodplain or alteration of a stream, watershed, or river flow that would cause a rise in river or stream flood stage, such that the incremental water level rise caused by encroachment or alteration would cause property damage or threats to human safety that would not otherwise have occurred.
- Encroachment on a floodplain that would cause a violation of FEMA NFIP policy.
- Flooding of the landfill site during operation.

3.5.2.3 Impact Assessment Methods

3.5.2.3.1 Potential for Increased Flooding

As required by FEMA and county ordinances, AECI would conduct a study to assess the cumulative effect of the proposed development, when combined with all other existing and anticipated development, on flood levels within Carroll County and other counties as applicable. This procedure is required even though the plant would be located on the edge of the floodplain and would be expected to have negligible impact on flood levels, because regulatory floodways have not been established in Carroll County or in any of the counties through which the transmission lines would pass.

The work would be done in cooperation with the USACE and would use recalculated USACE flood frequency values as appropriate.

3.5.2.3.2 Compliance with Executive Order 11988

AECI evaluated sites outside the floodplain and has found that costs would be higher primarily because of the increased costs associated with site development in the hilly terrain adjacent to the floodplain. Water delivery costs would also be higher, because of the longer transmission route from the river and the need to pump to higher elevations. AECI estimates that site development costs would be approximately $34 million dollars greater for an upland site compared to the Proposed Action. Annual additional costs for pumping water would be about $750,000 (AECI, 2007a). AECI's contractual obligation to provide power "at the lowest feasible cost" as described in *Section 1, Introduction*, makes an upland site an impracticable alternative.

In addition, assessments of other environmental impacts support the proposed site. An upland plant would create greater intrusion into the visual landscape. AECI has identified a proposed site that has been highly modified in that natural vegetation has been removed and the original hydrology has been altered for drainage and flood protection. Because of the highly modified nature of the proposed site, impacts on the natural environment, except for the impact to high quality prime farmland soils, are low. As discussed in *Section 3.10, Wetlands, Riparian Areas, and Waters of the United States*, wetland impacts are very low and may be completely avoided.

To minimize potential harm to or within the floodplain (Executive Order 11988), the facility would be located at the edge of the floodplain, where flood depths are minimal. The Norborne site was chosen in an area with minimal remaining natural floodplain values: the area is all cropland and the only stream has been channelized; a levee also impacts the natural floodplain value.

The Federal Register notice of availability for this Draft EIS incorporates USDA/RD's required notice under Executive Order 11988. The notice will also be included in the ROD.

3.5.2.3.3 Effects on Potential Restoration Plans

Big Muddy National Fish and Wildlife Refuge

The plan for the Big Muddy National Fish and Wildlife Refuge (NFWR) could include incorporation of any areas in the Missouri River floodplain. The project authorizes the purchase of up to 60,000 acres in 25 to 30 units between Kansas City and St. Louis. The construction of the Norborne Plant would not impact USFWS' opportunity to obtain property for the refuge in the vicinity of the plant.

Wakenda Bottoms Conservation Area Opportunity

The Wakenda Bottoms Conservation Area Opportunity (CAO) is not yet at the plan stage: it is a concept for a CA in the Missouri River floodplain in the vicinity of Wakenda Creek, where the floodplain is very wide. The CAO concept is being developed by a group of agencies and private interests. The general concept area is very large and includes the Norborne Plant site area (MCC, 2005). Several communities, including Carrollton and Norborne, are also within the concept area. The presence of the Norborne Plant would not affect the opportunity for a CA in Wakenda Bottoms, as it is presently conceived.

3.5.2.3.4 Potential Flooding of the Solid Waste Storage Area (Landfill)

The landfill would not be located in the floodplain; it is outside the FIRM SFHA and also above the 500-year flood elevation. AECI is currently planning for the bottom of the landfill liner to be at least five feet above the 100-year flood elevation, and at least five feet above the maximum 100-year groundwater elevation (AECI, 2005f).

3.5.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts on floodplains:

- The plant would be located at the very edge of the floodplain, approximately 6 miles from the river at the nearest point, where flood depths are shallow, which would reduce impacts. Only the necessary features would be raised out of the floodplain, minimizing requirement for fill in the floodplain.

- The proposed site has low natural floodplain values, so these impacts are low: the vegetation is cropland and the hydrology has been modified by a levee and drainage channels.

- In accordance with Missouri regulation, the landfill would not be constructed in a floodplain.

3.5.2.4.1 Impact Assessment

Proposed Action

FEMA FIRM maps were reviewed to assess impacts. The Norborne Plant site would require fill to raise it above the 100-year flood elevation. Current elevations at the proposed plant site are between 685 and 689 feet, compared to the 100-year flood elevation of 687.1 feet. Fill would be added to bring the grade elevation of the power block buildings, the outlying buildings, the access road, rails, and coal pile to three feet above the 100-year flood level (AECI, 2005f). A very simplistic analysis was done to assess the magnitude of the displaced floodwater: the estimated elevated area is about 120 acres, or about 0.2 square miles. If the entire area to be raised is at the lowest elevation (685 feet), two feet of flood storage space would be replaced by fill, over the 0.2 square miles. If this displaced floodwater were spread out over the approximately 21 square miles bordered by the plant, the town of Norborne and the river, it would raise the flood level by 0.2 inches, a negligible amount.

If the south rail connection to the NS line is constructed, it would require fill for an embankment for a bridge over the Burlington Northern Santa Fe (BNSF) line. This embankment would be in the 100-year floodplain of the Missouri River.

The north rail connection would impact the 100-year floodplain of Wakenda Creek.

There would be minor impacts of floodplains from the transmission line, at stream crossings where the floodplain is too wide to span. This would require placing supports in the floodplain.

AECI would prepare a study to assess the impacts of the plant and associated features on flood elevations, as required by Carroll County ordinance. If impacts on flood elevations are in excess of those allowed by county ordinances, AECI would modify its plan to comply with the ordinances. A floodplain development permit application and potentially a No-Rise certification would need to be submitted.

Big Lake Alternate Site

Impacts would be similar for the Big Lake Site, except that the site is much closer to the river. Site elevations range from about 853 to 860 feet, compared with 100-year flood elevations of about 858 to 862 feet. Parts of the site may be up to nine feet below the 100-year flood elevation. The rail connector would also be in the 100-year floodplain. Since the regulatory floodway has been determined at this site and the facility would not impact the floodway, a study to assess impacts would not be needed, nor would a No-Rise certification. A floodplain development permit would be required.

IGCC Alternative

With IGCC, the floodplain impacts would be the same as for the Proposed Action.

No Action Alternative

Under the No Action Alternative, the Project would not be constructed and there would be no change or disturbance of floodplain resources within the project area.

3.5.2.4.2 No Action Alternative

The Proposed Action would not be constructed under the No Action Alternative. There would be no impacts on floodplains.

3.5.2.4.3 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts and there would be no residual significant impacts.

3.6 FARMLAND

3.6.1 Affected Environment

3.6.1.1 Farmland Protection Policy Act

The Federal Farmland Protection Policy Act (FPPA), enacted by Congress in 1984, established criteria for identifying and considering the effects of federal actions on the conversion of farmland to nonagricultural uses. Forms AD-1006 and NRCS-CPA-106 of the NRCS are used for this purpose (*Appendix F, Farmland Conversion Impact Rating*). The fundamental purpose of the Act is to minimize the extent of farmland conversion and impacts and to "assure that federal programs are administered in a manner that, to the extent practicable, would be compatible with state, unit of local government, and private programs and policies to protect farmland."

3.6.1.2 Region of Influence

The region of influence for assessing impacts on farmland includes all facilities related to the Proposed Action. The Project parcels, well site, and rail connectors would all require acquisition of farmland. The transmission lines would have minimal farmland takes, but could have potential impacts on center-pivot irrigation systems.

3.6.1.3 Existing Conditions

The project area is predominantly rural and much of the land is prime farmland, used for crop farming, with corn and soybeans the major crops. In 2005, Carroll County was one of the major producers of both corn and soybeans in Missouri. Table 3-15 shows agricultural and pasture land use for Carroll County and the other two counties nearest to the Proposed Action. According to the 2000 census, 600 people in Carroll County were employed in the category of Agriculture, forestry, fishing and hunting, and mining.

Table 3-15. Agricultural and Pasture Land Use (acres)

County/State	Cropland				Pasture		Land in Farms	
	Harvested		Pastured					
	1992	1997	1992	1997	1992	1997	1997	2002
Carroll	228,553	241,641	45,478	42,417	32,689	28,251	411,158	417,080
Lafayette	231,421	241,084	40,190	34,242	35,762	31,152	362,440	363,186
Ray	152,950	144,291	41,991	36,877	40,266	46,444	293,482	292,067
Missouri*	12,158.8	12,449.0	5,402.3	5,247.6	6,134.4	5,984.6	30,202.7	29,946.0

*Source: MASS, 2006a; *Missouri acres are in thousands*

The Big Lake Alternate Site is also in farmland. Figures 3-40 through 3-42 show prime farmland within the proposed Norborne facility boundaries, the rail connectors, and the Big Lake Alternate Site.

As discussed in *Section 2, Alternatives Including the Proposed Action*, almost all the land in the route corridors is farmland, prime farmland if drained or not flooded, or farmland of statewide importance. The main potential impact of the transmission line on farming would be on center-pivot irrigation systems.

3.6.2 Environmental Consequences

3.6.2.1 Identification of Issues

The following issues were identified during scoping and preparation of this Draft EIS:

- Identification of FPPA impacts
- Loss of farm land and impact on the agricultural economy
- Impacts of relocations of farm families and resulting impacts on business in the area
- Potential impacts of utility poles on center-pivot irrigation systems
- Repair to soil and water conservation practices or structures such as terraces, diversions, drain tiles, grade stabilization structures and grassed waterways.

Figure 3-40.

Prime Farmland

Norborne Site

Source(s): USDA - Natural Resources Conservation Service and URS Corporation.

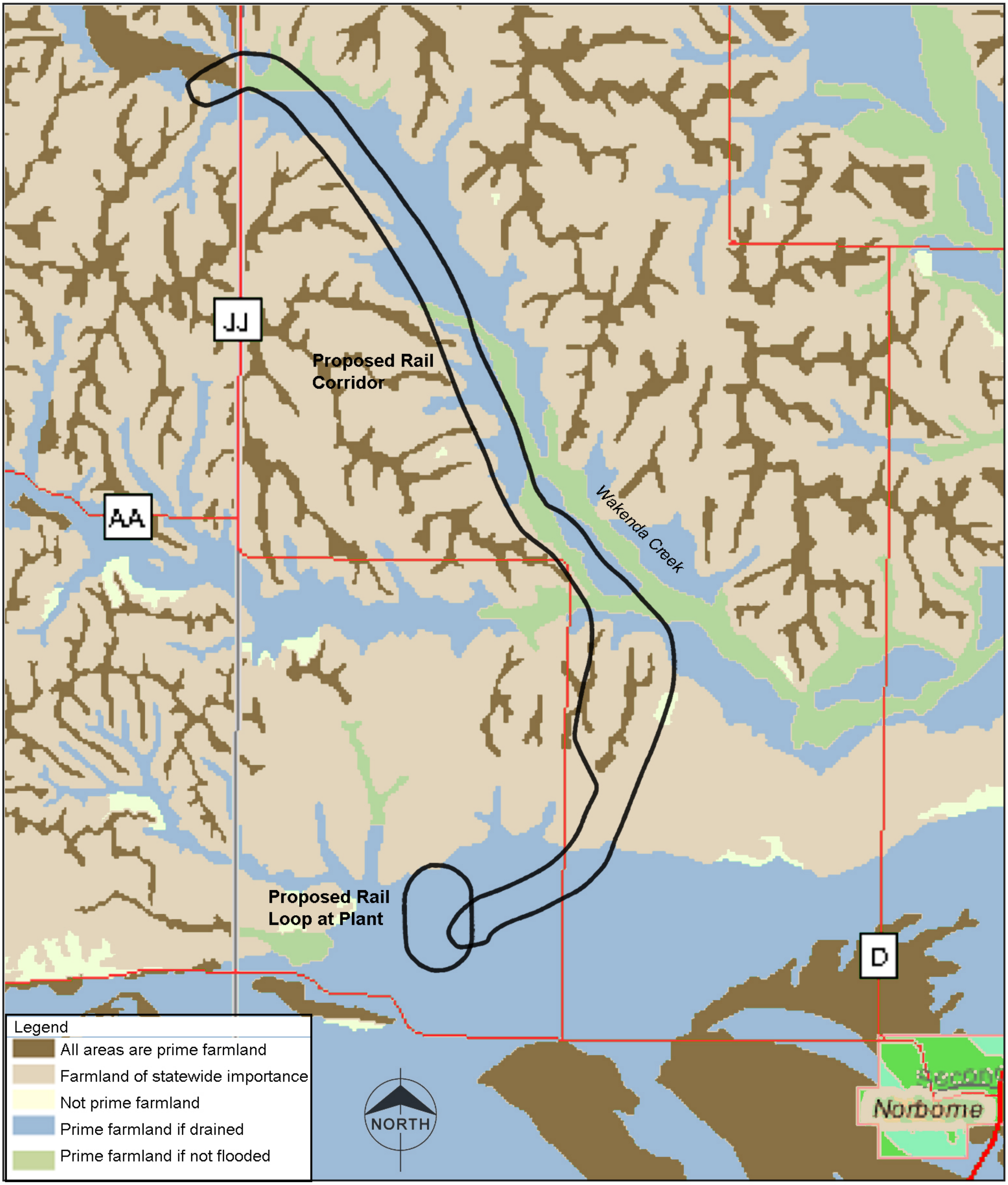

Figure 3-41. Prime Farmland North Rail Corridor

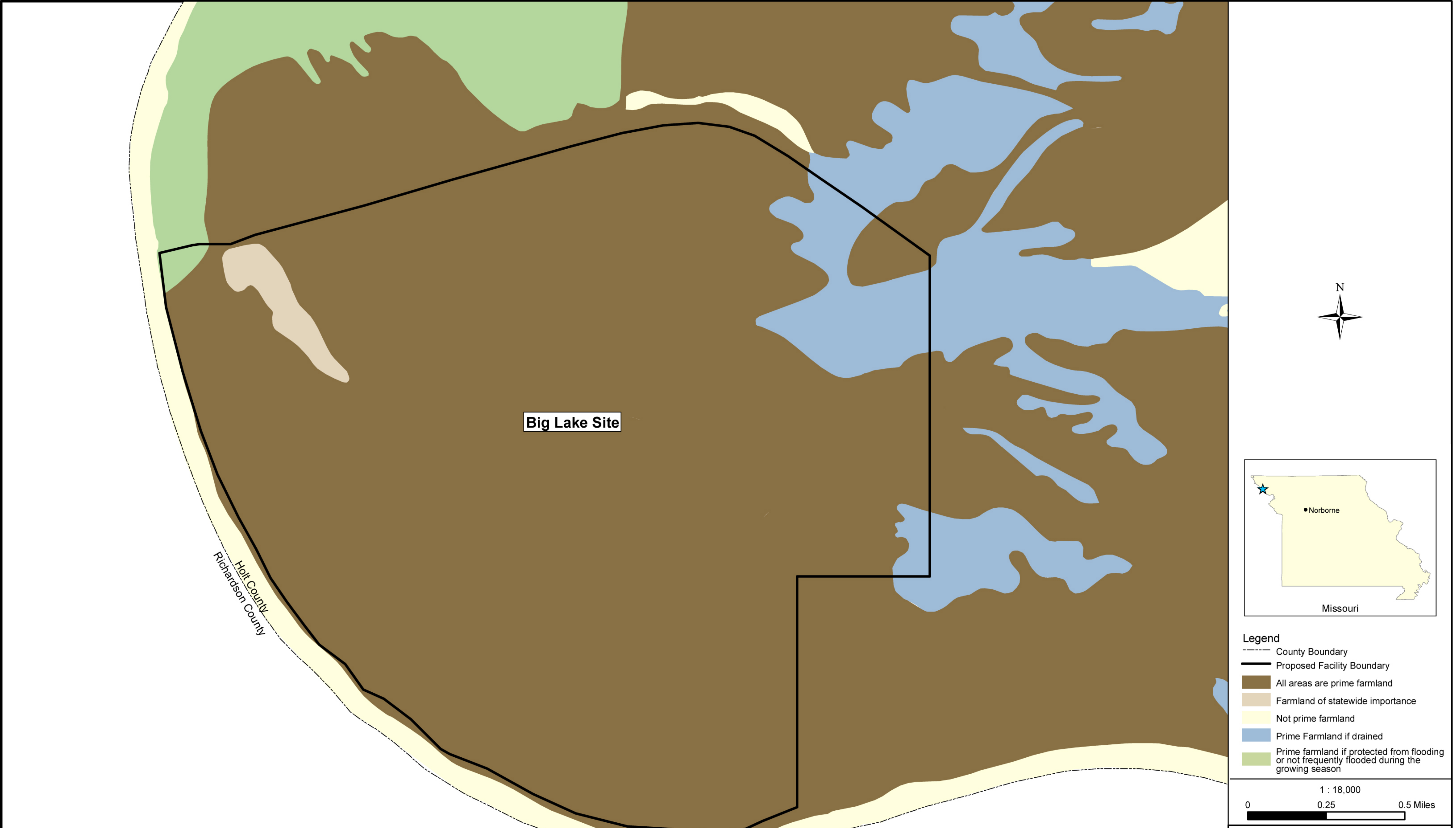

Figure 3-42.

Prime Farmland

Big Lake Site

Source(s): USDA - Natural Resources Conservation Service and URS Corporation.

3.6.2.2 Significance Criteria

Farmland impacts would be considered significant if they presented a hardship to the local economy, if farm losses were not compensated, or if resource losses represented a substantial part of the area resources.

3.6.2.3 Impact Assessment Methods

The plant site would occupy approximately 1,750 acres of farm land in Carroll County. Of that amount, approximately 1,000 acres of prime farmland would be taken out of production, and the other 750 would be leased back for agriculture. In addition, the railroad connection would require roughly 120 acres, all of which would be taken out of production. The new transmission lines to the plant would not require taking land out of production, except for the small amount occupied by the support structures. Since the study area is mainly agricultural, the limited amount of additional space required for new housing would pose minimal impact on agriculture (AECI, 2006n).

Impacts would occur primarily during construction.

Farmland Protection Policy Act

To comply with the FPPA, the NRCS developed the Land Evaluation and Site Assessment (LESA) system. It is a tool for evaluating the relative effect development projects would have on farmland. The impacted farmland is scored in two areas, and the more valuable the farmland, the higher the score. The two parts of the evaluation are the Land Evaluation (LE) section and the Site Assessment (SA) section. The LE section considers both the acreage and the value of the farmland that would displaced. The SA section considers the value of the farmland impacted in the context of the surrounding area. If the impacted farmland has major farm investments (irrigation systems, barns, etc.), is important to the local farm economy, and is in an area that has been developed for farming rather than urban use, it would receive a higher score.

The assessment is done using the Farmland Conversion Impact Rating Forms AD-1006 (for the proposed power plant site) and NRCS-CPA-106 (for the proposed railroad lines and transmission corridors) (*Appendix F, Farmland Conversion Impact Rating*). The higher the rating, the better suited the location is for agriculture and is encouraged to be retained for agricultural uses. LESA scores of 226 and above are in the high protection bracket, a rating between 176 and 225 indicates a moderate need for protection, and a rating below 175 indicates low protection status. For the proposed power plant site, the LE score was 66 and the SA score was 100, for a combined LESA score of 166 points. An assessment for the proposed railroad lines and transmission corridors will be finalized when the alignments are selected; the preliminary forms are included in *Appendix F, Farmland Conversion Impact Rating*.

Loss of Farmland and Impact on Agricultural Economy

In Carroll County in 2002 there were 325,363 acres of crop land and 246,376 acres harvested, leaving 78,987 acres of cropland not in production. The average farm size was 386 acres and the median size was 198 acres. The total market value of all crops sold in Carroll County in 2002 was $47 million, or an average of $190 per acre. For the estimated 1,200 acres that would be put out of production, if all were cropland, the annual market value of the crops would be about $230,000 (in 2002 average dollars) (NASS, 2006b). Market value represents the gross income from crops and does not include the cost of production.

3.6.2.4 Actions Incorporated Into the Proposed Action to Reduce or Prevent Impacts

The Proposed Action includes the following measures to reduce or prevent potential adverse impacts on farmland:

- Transmission line supports would be placed so as not to interfere with center-pivot irrigation systems to the extent practicable. These systems have been identified and transmission route corridors have been expanded in those areas to allow flexibility to make adjustments to avoid interference (see *Section 2, Alternatives Including the Proposed Action*).

- Approximately 750 acres of farmland acquired for the Proposed Action would be leased back for farming.

- Topsoil removed from the plant site would be stockpiled and re-used (AECI, 2005f).

- Drainage and erosion features on adjacent property, if impacted, would be repaired.

3.6.2.4.1 Impact Assessment

Proposed Action

The approximately 1,200 acres of farmland that would be taken out of production, conservatively assuming it is all cropland in production, represents a small part of the total harvested cropland in Carroll County. It is even fairly small compared to the cropland in Carroll County that is not in production (about 79,000 acres). The overall impact on the agricultural economy would be expected to be small, especially considering that the impact could potentially be offset by putting into production some of the cropland that is not currently in production. The impact on the economy overall would be expected to be more than offset by the benefits of the construction and operation employment at the facility.

Alternate Site – Big Lake

Impacts would be similar for the Big Lake Site; site boundaries were not defined, but the acreage requirements would be about the same, and the same kind of farmland would be impacted.

IGCC Alternative

With IGCC, the farmland impacts would be the same as for the Proposed Action.

No Action Alternative

The Proposed Action would not be constructed under the No Action Alternative. There would be no impacts on farmland.

3.6.2.4.2 Mitigation and Residual Impacts

No significant impacts would result from the implementation of the Proposed Action with the actions incorporated to reduce or prevent impacts and there would be no residual significant impacts.