Exhibit No.: 403
Issues: Negative Impacts to Farming
And Ranching Operations
Witness: Charles E. Kruse
Sponsoring Party: Show-Me Concerned Land Owners
Type of Exhibit: Rebuttal Testimony
Case No.: EA-2014-0207
Date Testimony Prepared: September 15, 2014

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of the Application of Grain Belt Express Clean Line LLC for a Certificate of Convenience and Necessity Authorizing it to Construct, Own, Operate, Control, Manage, and Maintain a High Voltage, Direct Current Transmission Line and an Associated Converter Station Providing an interconnection on the Maywood-Montgomery 345 kV Transmission Line	)	Case No. EA-2014-0207

REBUTTAL TESTIMONY OF
CHARLES E. KRUSE
ON BEHALF OF THE
SHOW ME CONCERNED LANDOWNERS

SEPTEMBER 15, 2014

BEFORE THE PUBLIC SERVICE COMMISSION
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REBUTTAL TESTIMONY OF
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ON BEHALF OF THE
SHOW ME CONCERNED LANDOWNERS
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I. INTRODUCTION AND PURPOSE OF TESTIMONY

Q 1: Please state your name, position and address.

A: My name is Charles E. Kruse. My wife Pam and I are the owner/operators of Charles Kruse Farms, Inc., started in 1976. My address is 1007 Woodland Drive, Dexter, MO 63841.

Q 2: Please describe your experience and qualifications.

A: I am a fourth generation farmer, farming land that my great-grandfather, grandfather, and father farmed before me. I received a BS in Agronomy from Arkansas State University in 1967, and an MS in Agronomy with an emphasis in plant genetics from the University of Missouri in 1974. I served as a Research Agronomist for the University of Missouri Delta Research Center, doing research on soybeans and small grains. I was a Technical Representative for BASF Ag , a world-wide company, providing product information and advice to farmers. I was elected by my peers and served on the Missouri Soybean Merchandising Council. I was appointed by Governor John Ashcroft and served as Director of Agriculture for the State of Missouri. I was recruited and served as the CEO of the North American Equipment Dealers Association, made up of agriculture and construction equipment dealers in the US and Canada. I was elected for 9 two-year terms by the membership of Missouri Farm Bureau to serve as State President, retiring in December, 2010. During that time I served on both the American Farm Bureau Board of Directors and the American Farm Bureau Executive Committee. I received the Distinguished Alumni Award from both Arkansas State University and the University of Missouri. I also received the Outstanding Service to Agriculture Award from the

Missouri Farm Bureau, and the Distinguished Service Award from the American Farm Bureau.

Q 3: On whose behalf are you appearing in this proceeding?

A: I am appearing on behalf of the Show Me Concerned Landowners.

Q 4: Please describe the scope and purpose of your testimony.

A: This proceeding addresses the application of Grain Belt Express Clean Line LLC (Grain Belt) for a certificate of convenience and necessity authorizing it to construct, own, operate, control, manage, and maintain a high voltage, direct current (DC) transmission line and an associated converter station providing an interconnection on the Maywood—Montgomery 345 kV transmission line. For purposes of this proceeding, I will rebut Grain Belt witness Anthony Galli's testimony regarding how the Grain Belt Express project could impact farming operations as well as discuss other issues regarding the negative impacts to farming and land as a result of large transmission projects like the Grain Belt project. Specifically I will address the following negative impacts: (A) Compaction of Soil; (B) Irrigation Equipment Interference; (C) Difficulty in Aerial Applications to Crops and Pastures; (D) Possible GPS Interference; (E) Problems Maneuvering Large Farm Equipment around Towers; (F) Precision Farming Problems; (G) Concerns about Storm Recovery; and (H) Eminent Domain.

II. Issues Regarding The Negative Impacts To Farming and Ranching Operations

A. Introduction

Q 5: Did you review any materials about the Grain Belt project for your testimony?

Yes. I reviewed information from Grain Belt's website at http://www.grainbeltexpresscleanline.com/site/home . Attached as Schedule CEK-1 are some

pages from the website concerning the overview of the project, the Missouri proposed route, and transmission line structures. In addition, I viewed a video of the Rock Island Clean Line Construction Simulation at http://www.cleanlineenergy.com/video/video/rock-island-clean-line-construction-simulation . Attached as Schedule CEK-2 are some screen shots of that video showing the types of construction equipment and transmission towers that will be used for the project.

Q 6: What are some of the negative impacts to farming and land as a result of the placement of transmission line structures?

A: A study done by the Public Service Commission of Wisconsin in July, 2013, entitled, "Environmental Impacts of Transmission Lines,"[1] stated that the placement of transmission structures can cause the following agricultural and non-agricultural impacts:

- Aesthetics
- Agricultural Lands
- Airports and Airstrips
- Archeological and Historical Resources
- Cultural Concerns
- Electric and Magnetic Fields (EMF)
- Endangered/Threatened and Protected Species
- Implantable Medical Devices and Pacemakers
- Invasive Species

[1] See Schedule CEK-3, page 1.

- Noise and Light Impacts
- Property Owner issues
- Recreation Areas
- Safety
- Stray Voltage
- Water Resources
- Wetlands
- Woodlands

Under the Agricultural Lands section of the report, it lists the following negative impacts:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields;
- Create opportunities for weed and other pest encroachment;
- Compact soils and damage drain tiles;
- Result in safety hazards due to pole and guy wire placement;
- Hinder or prevent aerial spraying or seeding activities by planes and helicopters;
- Interfere with moving irrigation equipment;

- Hinder future consolidation of farm fields or subdividing land for residential development.[2]

From my experience, all of the issues cited by the Wisconsin Commission report are valid, although the report does not identify all of the negative impacts associated with transmission structures. My testimony will address the issues I identified in my answer to question 4 above, many of which are referenced in the Wisconsin Commission report.

B. Compaction of Soil

Q 7: What is compaction of soil?

A: Soil compaction is the physical consolidation of the soil by an applied force that destroys structure, reduces porosity, limits water and air infiltration, increases resistance to root penetration, and often results in reduced crop yields.

Q 8: Why is soil compaction a problem for farming and land?

A: Compaction effects on crop yields can be a significant factor in today's farm economy and is a very serious problem in Agriculture today. Farmers and Ranchers spend a lot of time and money to prevent soil compaction from adversely affecting their crops and pastures. Soil compaction can result in stunted growth of plants; impede the uptake of plant nutrients, and have an adverse effect on plant growth and development.

Q 9: What causes soil compaction?

A: Heavy machines and equipment are the main cause of soil compaction. Soil compaction is made much worse by heavy equipment moving over the land, and when the equipment is used during wet conditions, the compaction issues become much worse.

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[2] See Schedule CEK-3, attached, page 8.

Q 10: Will the Grain Belt Project cause compaction of soil?

A: Yes, it will. Due to the size of the structures, Grain Belt will have to use very large and very heavy equipment to construct and maintian the towers and infrastructure. In the Rock Island Clean Line construction simulation video that I viewed on Clean Line's website, the construction equipment mentioned were Augers, Excavators, Cranes, and Material and Concrete Hauling Trucks. The video also shows smaller trucks, vehicles and wire stringing equipment. Grain Belt will have to pour tons and tons of concrete to set its transmission towers in a farmer's field. If a concrete truck is carrying 10 cubic yards, then the weight of the concrete is 40,000 pounds. The truck will weigh approximately 26,000 pounds for a total weight of 66,000 pounds.[3] It can be reasonably expected that it would take several concrete trucks per tower to supply all the concrete needed for one tower.

Without question, if this project were to move ahead, there would be very significant soil compaction, both due to the heavy equipment moving over the land, and the disregard for wet soil conditions that would make soil compaction much worse. Following is an example of damage to land during power line work during wet conditions:[4]

[3] See Schedule CEK-4, attached, page 2.
[4] See Schedule CEK-3, attached, page 9.

The Wisconsin report states the following on soil compaction:

"Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW [Right of Way]. Significant rutting can occur when soils become saturated or in areas of sensitive soils (see Figure 3). This may impact agricultural lands by increasing the mixing of soils, eroding topsoils during rain events, and compacting soils. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways.

Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed."[5] (emphasis added).

In some areas, the compaction problems for landowners could last for years, and in some areas, the damage may be permanent.

C. Irrigation Equipment Interference

Q 11: What is irrigation?

A: Irrigation is the artificial application of water to the land or soil. It is used to assist in the growing of agricultural crops, maintenance of landscapes, and revegetation of disturbed soils in dry areas and during periods of inadequate rainfall.

Q 12: Is irrigation of farm land used extensively in Missouri?

A: Irrigation, out of necessity, has become much more prevalent over the past several years. In Missouri, the two most prevalent types of irrigation are flood irrigation and center pivot irrigation. With flood irrigation, the land is shaped so there is a slight grade, and the irrigation water is then run between the rows of crop. With center pivot irrigation, a large structure moves in a circle around the field, distributing water on the crop as it moves.

Q 13: What kind of irrigation is used for the land along the proposed transmission route?

A: The proposed route for Grain Belt has land that, because of topography, is much more conducive to center pivot irrigation. The structures that are being proposed by Grain Belt

[5] *Id.* at page 8.

would make it an impossibility to irrigate the fields impacted by Grain Belt structures. In my opinion, timely moisture is the greatest variable to maximizing crop production. The inability to irrigate as a result of the Grain Belt structures would dramatically reduce the potential for this land, thereby reducing the land value significantly, as a result of the diminished productivity potential.

D. Difficulty In Aerial Applications To Crops And Pastures

Q 14: What are aerial applications?

A: Aerial application is often the most efficient and most economical way to apply crop protection products, fertilizer and even seed to grow and protect crops such as corn, soybeans and wheat. Aerial applications in agriculture are increasing every year. Herbicides, fungicides, insecticides, and other materials are applied aerially to a greater extent than ever before.

Q 15: What effects to aerial application can be expected from Grain Belt's structures?

A: While the Grain Belt structures would create obvious hazards for low-level flying, the structures would also create serious impediments to being able to uniformly apply the product, and some areas of the field simply would not be treated. This would adversely impact the potential profit picture for these fields. In the case of severe insect infestations, the untreated areas would allow the insects to thrive, creating the necessity for repeated applications of insecticides as the insects spread over large areas of the fields. As a result, costs would be greater and at the same time, profit potential would be diminished.

E. Possible GPS Interference

Q 16: What is GPS?

A: The Global Positioning System (GPS) is a space-based satellite navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites.

Q 17: How is GPS used in farming?

A: Farmers use GPS receivers to record location. This information helps determine how much fertilizer, weed control, and water is needed in various locations of the field. Additional soil analysis combined with market information about predicted crop prices helps farmers decide what is the best crop rotation.

Q 18: How prevalent is the use of GPS in farming operations?

A: Farmers and Ranchers are utilizing GPS at a greater level than ever. GPS is used to guide equipment so that rows are straight and uniform, herbicides are not overlapped, fertilizer applications are uniform with no double-applications or skipped spots. GPS is very important for both row–crop and pasture land.

Q 19: Can there be negative impacts to using GPS for farm operations from structures like Grain Belt will be building on farm and pasture land?

A: Yes it is possible. Whether or not transmission lines interfere with GPS is not completely settled. In 2009, the Wisconsin Department of Agriculture, Trade and Consumer Protection prepared an Agricultural Impact Statement on American Transmission Company, LLC's proposed Rockdale to West Middleton 345 kV transmission line project. GPS was one on the issues studied. On page 54, the report stated:

"The question of whether transmission lines may have an effect on increasingly sophisticated agriculture equipment, including the GPS component of precision agriculture systems, has come up frequently in recent years. Some experts in the field have indicated that they believe that there were no effects of transmission lines on GPS,

but that the issue deserves further investigation. A technician at John Deere stated that his experience suggested that transmission lines do interfere with the GPS signal, as well as stating that this issue should be formally studied and that he would support such a study."[6] (emphasis added).

Later on the study quotes the expert witness testimony by J. Michael Silva for Montana Alberta Tie Ltd., who had done both extensive measurement and theoretical analysis to determine the possibility of transmission line impacts on GPS signals:

"Silva's testimony does leave room for two possible remaining ways that transmission lines could conceivably act to affect GPS-guided equipment. The first case would be if the power line tower physically blocked the line-of-sight between a fixed base station used to provide differential correction to satellite information and a mobile piece of farm equipment, just as a building or a tree might similarly block a satellite signal "depending on the relative instantaneous satellite and user positions." (Silva, 2007, 12) He sees this as highly unlikely.[7] (emphasis added).

And:

"The other method by which GPS might be affected, while speculative, remains worthy of further investigation. This would be through the transmission line being a media for conveyance of higher frequency harmonics of electromagnetic energy that are near to GPS frequencies. 'Performance of GPS can be degraded due to unintentional electromagnetic energy from a variety of sources, especially those that produce higher frequency harmonics near to the GPS frequencies.' (Silva, 2007, 13). Silva sees it as unlikely that harmonics of the

[6] See Schedule CEK-5, attached, page 54.
[7] *Id.* at page 55.

60 Hz. frequency of power lines would be a source of GPS interference. 'A harmonic is an integer multiple of the basic frequency at which a device is designed to operate and it is usually much lower in intensity than the primary frequency. High voltage transmission lines have very little harmonics and would not be a source of interference to GPS.' (Silva, 2007, 13)."[8] (emphasis added).

The report concludes on this issue:

"However, it is documented that radio frequency electric currents are present on transmission lines. These are used for communications and remote control by electric utilities. In addition, there are many high frequency transients present on power lines originating due to switching derived from sources along the line that affect power quality. Where power line carrier (PLC) techniques are used on power lines for telemetry, protective relaying or supervisory control, some studies demonstrate the potential for the field generated 'to degrade navigation signal receiver performance.' (Silva and Whitney, 2002)."[9] (emphasis added).

To be fair, the study did indicate that major interference was unlikely, but importantly that further study was warranted.[10] The fact that fact that some experts indicate that further studies are necessary on the impacts to GPS on large transmission lines demonstrates that Grain Belt cannot conclusively confirm that their structures and DC high voltage line will not interfere with GPS. Given that Grain Belt is asking for eminent domain powers to force landowners against their will to have these structures placed on their land, Grain Belt should be held to a very high standard in demonstrating

[8] *Id.* at page 56.
[9] *Id.*
[10] *Id.*

conclusively that GPS for farming operations will not be adversely affected by their project.

Q 20: On page 25, line 4 of Grain Belt witness Anthony Galli's testimony, he states that "It is extremely unlikely" that the Grain Belt project will interfere with GPS signals. Do you agree?

A: Not necessarily. First, Dr. Galli did not say unequivocally that that Grain Belt's structures would not interfere with GPS signals used by farmers. Second, the fact that there is anecdotal evidence of interference (the John Deere representative cited in the Wisconsin Department of Agriculture, Trade and Consumer Protection report) and that report's conclusion that further studies are warranted show that the science is not settled on this issue. If the studies showing GPS interference is "highly unlikely" are flawed in any way, it can translate into major problems for farmers who actually have to use GPS to make a living. I believe that is why the Wisconsin Department of Agriculture, Trade and Consumer Protection report concluded that more studies are needed on this important topic for farmers.

F. Problems Maneuvering Large Farm Equipment Around Transmission Towers

Q 21: Why is it a problem to maneuver large farm equipment around transmission towers?

A: By necessity, farm equipment continues to get larger. Fifty years ago, a four-row planter was considered large. Today, it is not uncommon for farmers to have 24-row planters or larger. Spray booms can be 120 feet wide. It is not unusual for tillage equipment to be 25-40 feet wide. Combine grain headers can be 45 feet wide. With all the large farming equipment used today, it is a nightmare to try to maneuver around obstacles such as the

ones that Grain Belt is proposing. Looking at the proposed route,[11] a very high percentage of these obstacles would traverse farmland at an angle, which makes the maneuverability problem even worse.

Q 22: What are the effects of the maneuverability problems associated with transmission towers?

A: Farmers will have to take more time and use more fuel to maneuver around these obstacles. This means more expenses, which cuts into the amount of income a farmer can earn.

G. Precision Farming Problems

Q 23: What is precision farming?

A: Precision farming is simply utilizing technology, especially GPS, to apply optimum amounts of fertilizer to small areas of fields based on intensive soil testing instead of applying the same rate of fertilizer to the entire field. Precision farming has become very popular in recent years.

Q 24: Why is precision farming becoming so popular?

A: Precision farming is not only more cost-effective, it also eliminates the practice of over-fertilizing some areas of fields.

Q 25: What effects could the Grain Belt project have on precision farming?

A: A transmission project like the Grain Belt project could make it much more difficult to utilize precision farming practices, due maneuverability problems around the large Grain Belt structures and due to potential interference with GPS.[12] Again, the fact that the

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[11] See Schedule CEK-1, attached, page 3.

[12] See Schedule CEK-5, attached, pages 53-56, and my testimony under II. E. above.

Grain Belt structures would traverse fields at an angle would make precision farming extremely difficult.

H. Storm Recovery Concerns

Q 26: Do you have concerns about how Grain Belt's storm recovery efforts may affect the land?

A: Yes, I do. As much as we would hope that our state never has storms that damage property, that has not, and will not be the case. In the event of a storm that topples some of the Grain Belt structures, agriculture would experience substantial damage. Whether livestock or crops, the potential for significant losses would be high. The immediate loss of crops and livestock would be bad enough, but the moving of large equipment across fields and pastures to recover the structures and lines would cause much greater damage. There is a very high probability that the ground will be very wet and that will, of course, cause many problems—great damage to crops and pastures, severe rutting and soil compaction.

III. Final Comments and Conclusion

Q 27: The studies and documents you have attached as schedules to your testimony indicate that mitigation, remediation, and payments to landowners for damages can compensate the landowner for negative impacts to the land. Do you agree?

A: Yes, but only to a certain extent. Even if Grain Belt will be required to compensate landowners for negative impacts to the land, it has been my experience as a farmer, and as Missouri Farm Bureau President, that in practice such compensation can never be completely adequate. This project will have a permanent negative impact on farming and ranching operations in Missouri for which Grain Belt can never adequately mitigate, remediate, or compensate affected landowners. Furthermore, my understanding is that the Grain Belt project will be so much larger than traditional alternate current (AC)

transmission projects like we have currently in Missouri, both in the size of the structures and the amount of power flowing on the lines. Accordingly, the impacts could be more severe than those that have ever been experienced before in Missouri.

Q 28: Do you have any other comments?

A: Yes. During the time I served as Missouri Farm Bureau President, we saw a lot of abuses of eminent domain. We, as an organization, decided to try to pass stronger eminent domain legislation, which we were successful in doing. One of the aspects of this legislation was that eminent domain could not be used solely for economic development purposes. That part of the law, in my opinion, makes the Grain Belt effort a non-starter. Additionally, eminent domain is supposed to be used in Missouri to further the public good of our citizens. In my opinion, Grain Belt's plan provides at best only a minimal public good that is far outweighed by the negative impacts of this project on the citizens of Missouri. Furthermore, as I understand the project, there are so many unknowns, uncertainties and blanks to be filled in. In the best interests of the people of the State of Missouri, the PSC should deny this permit request. To approve this massive amount of eminent domain for a project like this is unwarranted and unjust.

Q 29: Does this conclude your testimony?

A: Yes, it does.

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AFFIDAVIT OF CHARLES E. KRUSE

STATE OF MISSOURI)
) ss
COUNTY OF Stoddard)

Charles E. Kruse, being first duly sworn on his oath, states:

1. My name is Charles E. Kruse. My wife Pam and I are the owners/operators of Charles Kruse Farms, Inc. My address is 1007 Woodland Drive, Dexter, MO 63841.

2. Attached hereto and made a part hereof for all purposes is my Rebuttal Testimony on behalf of Show Me Concerned Landowners, consisting of 16 pages, all of which have been prepared in written form for introduction into evidence in the above-referenced docket.

3. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded are true and accurate to the best of my knowledge, information and belief.

Charles E. Kruse

Charles E. Kruse

Subscribed and sworn to before me this 8 day of September, 2014.

Robyn M. Shaffer

Notary Public

My commission expires: 1-5-2018

NOTARY PUBLIC NOTARY SEAL STATE OF MISSOURI

ROBYN M. SHAFFER
My Commission Expires
January 5, 2018
Stoddard County
Commission #14440084

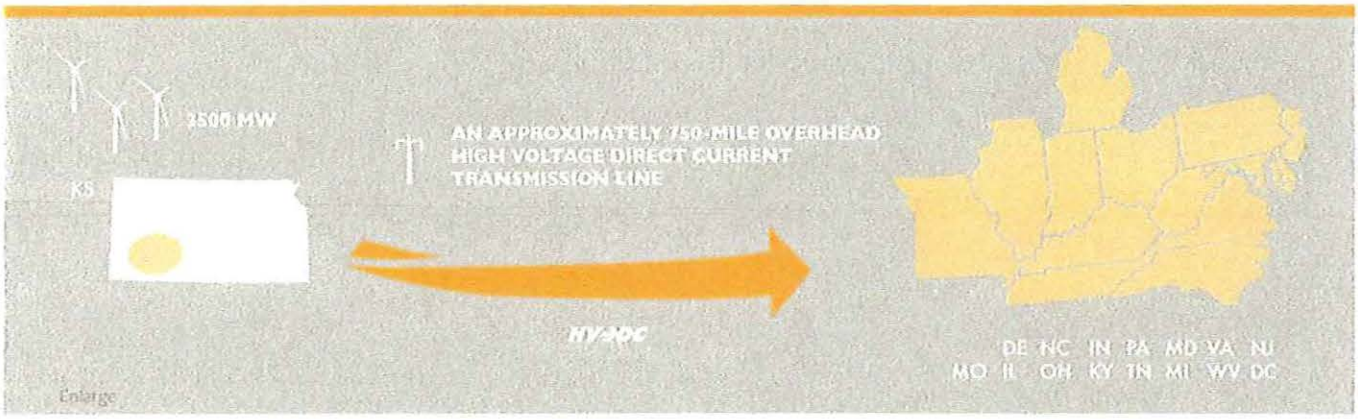
CLEAN LINE ENERGY PARTNERS

GRAIN BELT EXPRESS CLEAN LINE

OVERVIEW

The Grain Belt Express Clean Line is an approximately 750-mile overhead, direct current transmission line that will deliver wind energy from western Kansas to utilities and customers in Missouri, Illinois, Indiana and states farther east.

Similar to the trains that carry grain harvested in the Midwest to market, the Grain Belt Express Clean Line will move wind energy from its source in the grain belt of the country to markets with a strong demand for low-cost, clean power.



GRAIN BELT EXPRESS CLEAN LINE QUICK FACTS

- The Grain Belt Express Clean Line will deliver up to 3,500 megawatts of low-cost, renewable power and enough clean energy for approximately 1.4 million homes per year.
- The Grain Belt Express Clean Line will create thousands of construction jobs and hundreds of permanent jobs to maintain and operate the wind farms and transmission line.
- The development and construction of the Grain Belt Express Clean Line is an estimated $2 billion investment that will enable approximately $7 billion of new, renewable energy projects to be built. The transmission line will also provide a long-term source of income for rural communities that host the line.
- The Grain Belt Express Clean Line is a participant-funded, merchant model project. Its construction will be paid for by the renewable energy generators and load serving entities that purchase transmission capacity on the line.

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SCHEDULE CEK-1

1001 McKinney Street, Suite 700, Houston, TX 77002 • T (855) 885-3436 • F (832) 319-6311

CLEAN LINE ENERGY PARTNERS

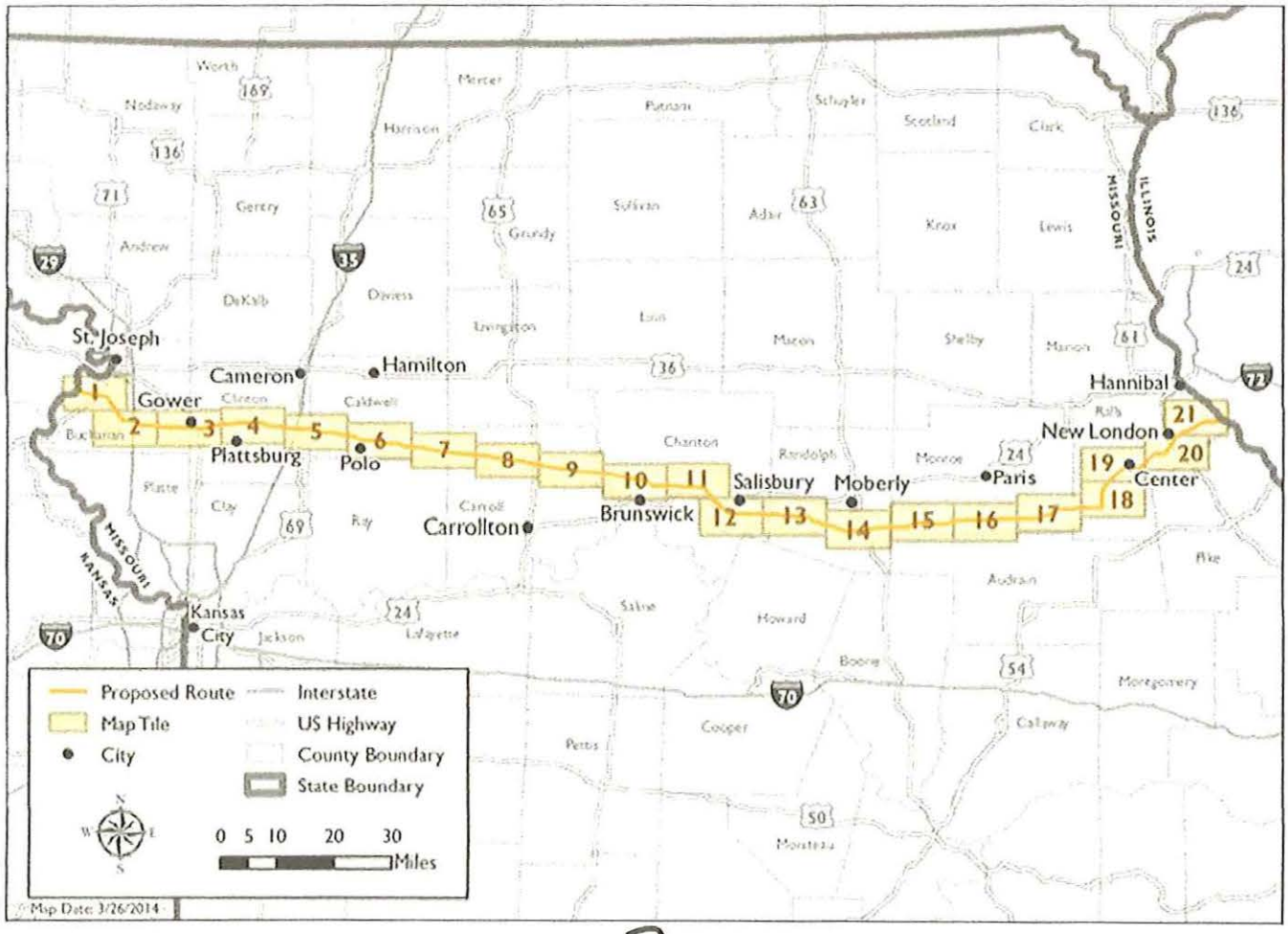
GRAIN BELT EXPRESS CLEAN LINE

MISSOURI PROPOSED ROUTE

An approximately 206-mile proposed route has been identified for the Grain Belt Express Clean Line in Missouri. The proposed route is the result of an extensive public involvement and routing process, during which Clean Line met with landowners, tenants, conservation and agricultural organizations, elected officials, community leaders, government agencies, and others, recognizing that these stakeholders have valuable insight that should be considered in the routing process. We continue to work closely with landowners to minimize impacts to their property and compensate them fairly.

Landowners and other interested community members can find additional information here.

The overview map on this page depicts the route of the Grain Belt Express Clean Line in Missouri. Please click one of the light-yellow shaded boxes below to zoom in.



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4

CLEAN LINE ENERGY PARTNERS

GRAIN BELT EXPRESS CLEAN LINE

TRANSMISSION LINE STRUCTURES

There are many different types of transmission structures used to deliver power. Clean Line Energy is evaluating the use of steel lattice and steel monopole DC transmission structures to move large amounts of renewable power over long distances to market.

A typical steel monopole transmission structure requires around 35,000 – 40,000 pounds of steel per structure and a typical steel lattice transmission structure requires an average of 32,000 pounds of steel per structure.

The images below show average specifications for a typical steel monopole, typical steel lattice mast, and a typical steel lattice transmission structure.

Key Terms

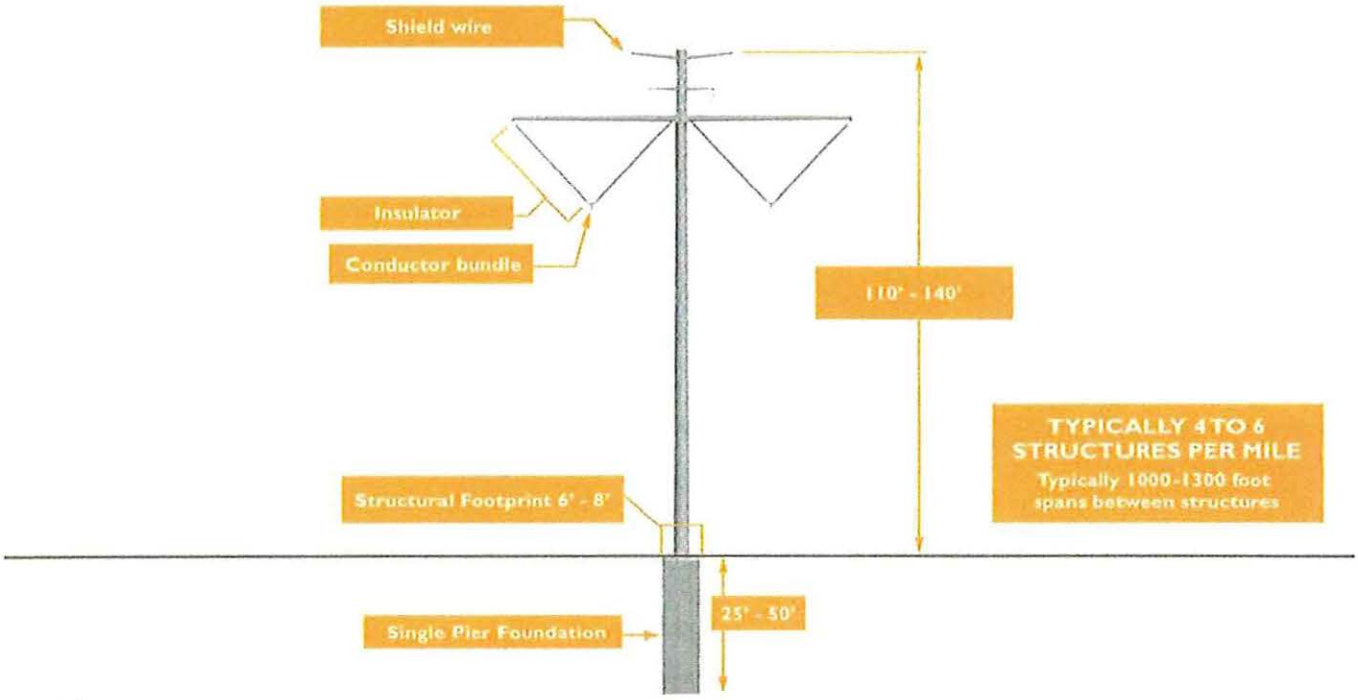
Shield Wire:
Protects the line from lightning strike to prevent power outages.

Insulator:
Prevents the electricity from short-circuiting from wire to structure.

Conductor:
Carries electricity

5

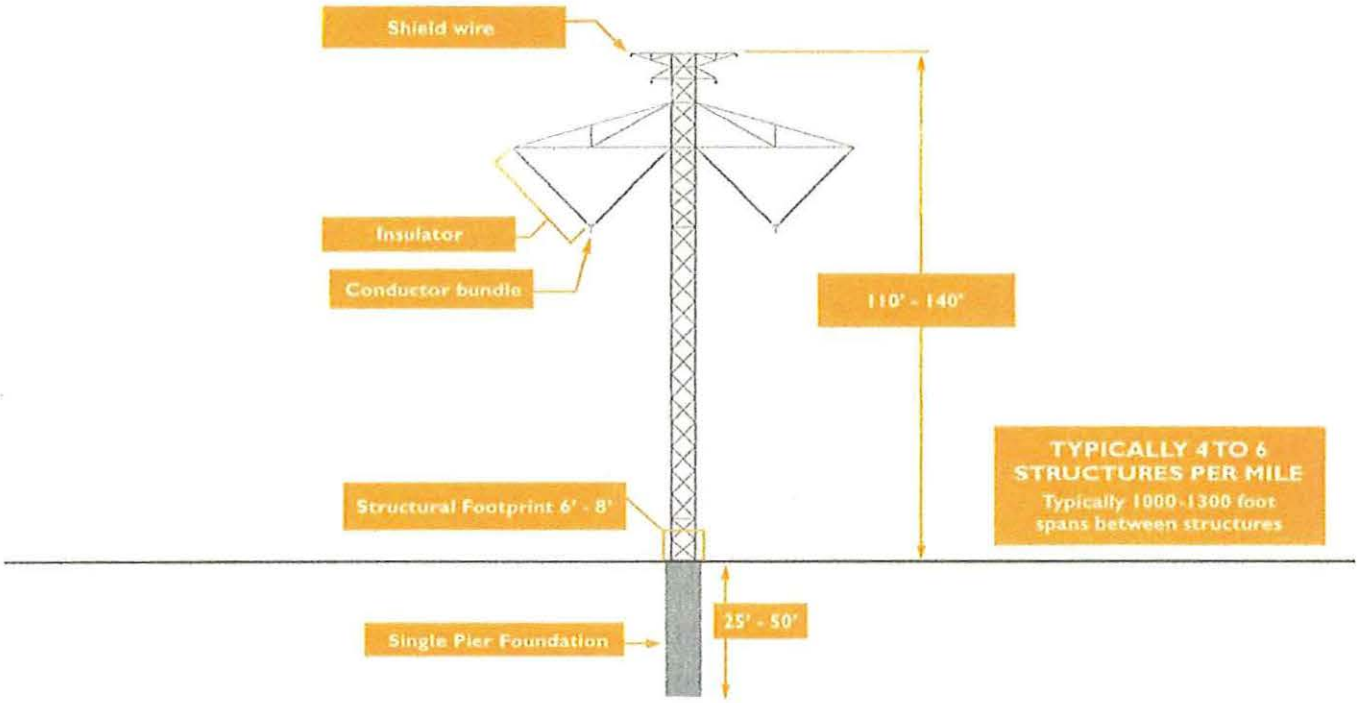
TYPICAL MONOPOLE STRUCTURE: 110 - 140 FEET



Enlarge

6

TYPICAL LATTICE MAST STRUCTURE: 110 - 140 FEET



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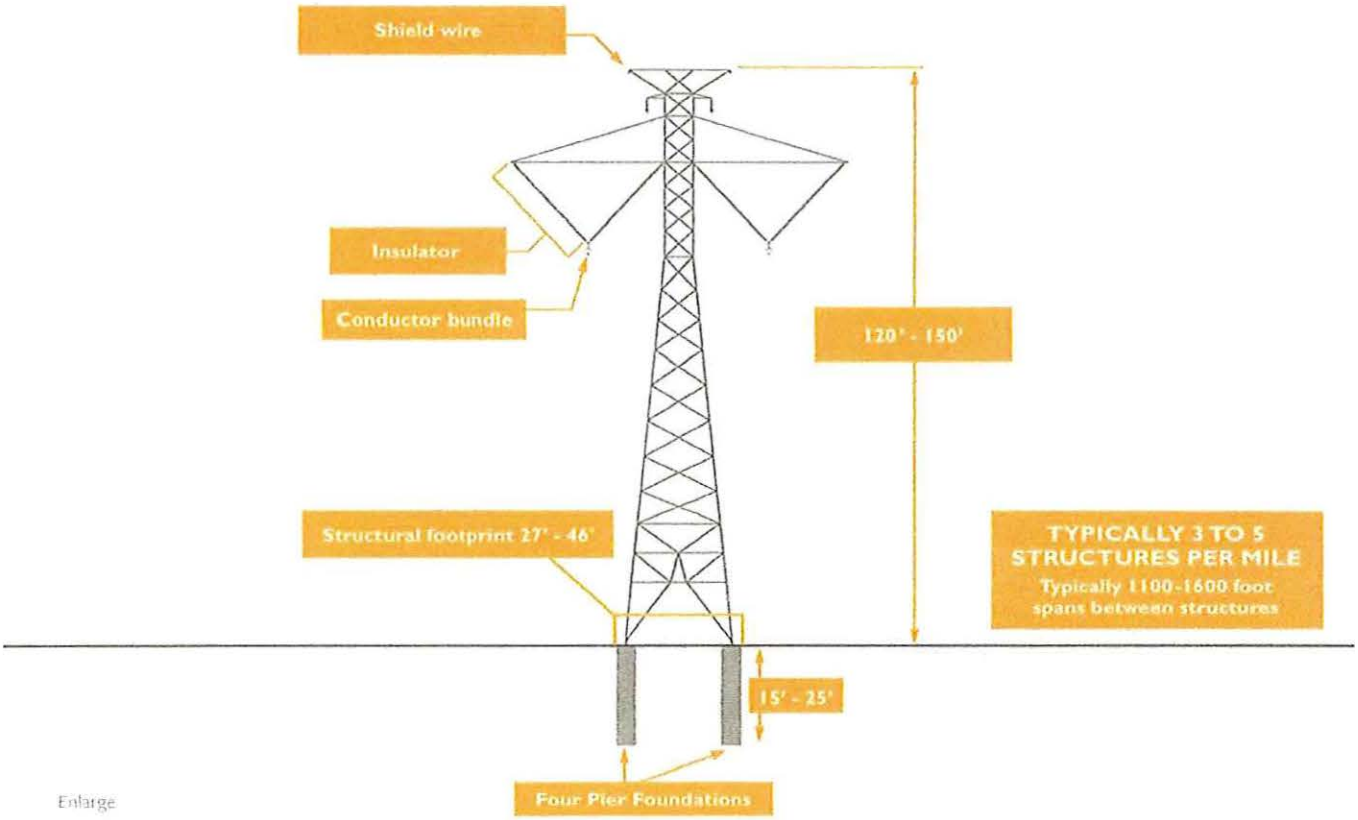
TYPICAL LATTICE STRUCTURE: 120 - 150 FEET



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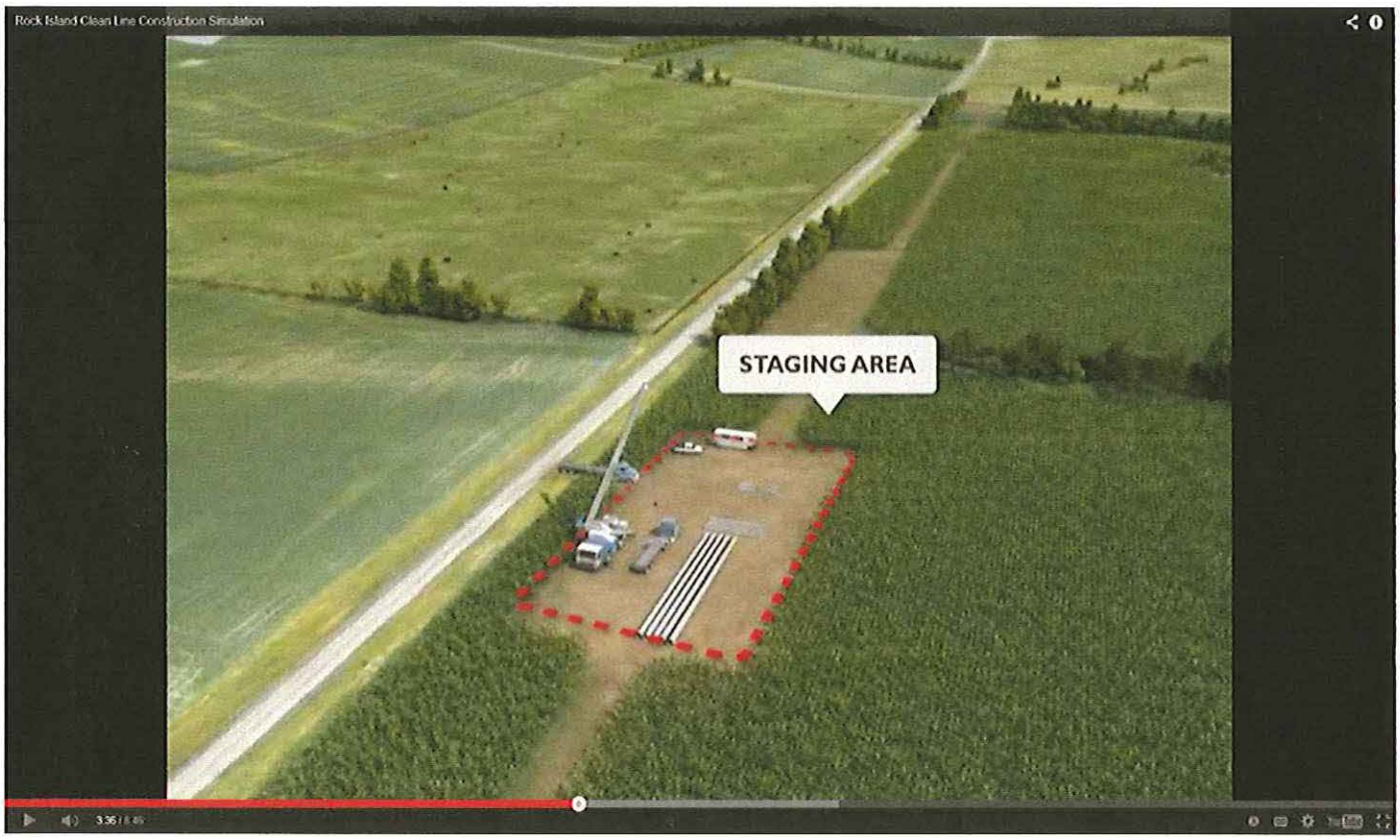
Screen shots from the video "Rock Island Clean Line Construction Simulation" at
http://www.cleanlineenergy.com/video/video/rock-island-clean-line-construction-simulation
Showing types of heavy construction equipment used. Video mentioned Augers, Excavators, Cranes, and Material and Concrete Hauling Trucks.

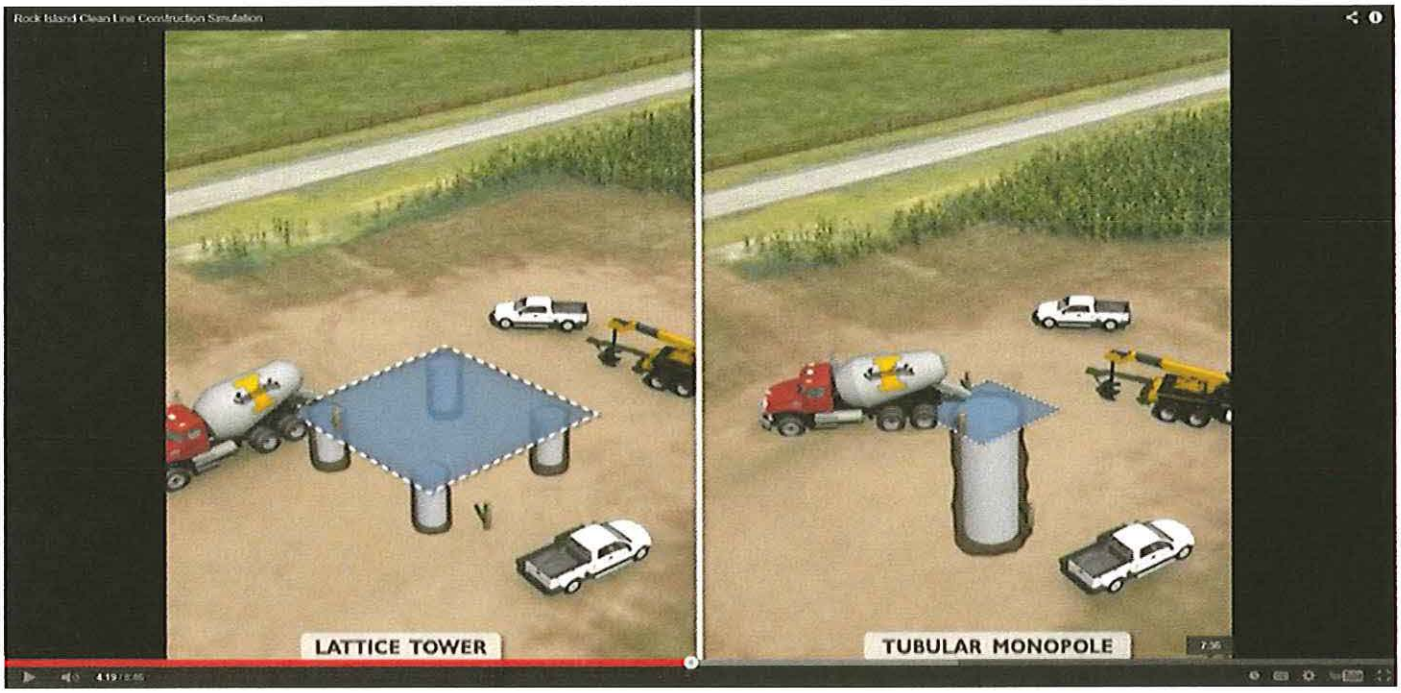
SCHEDULE CEK-2

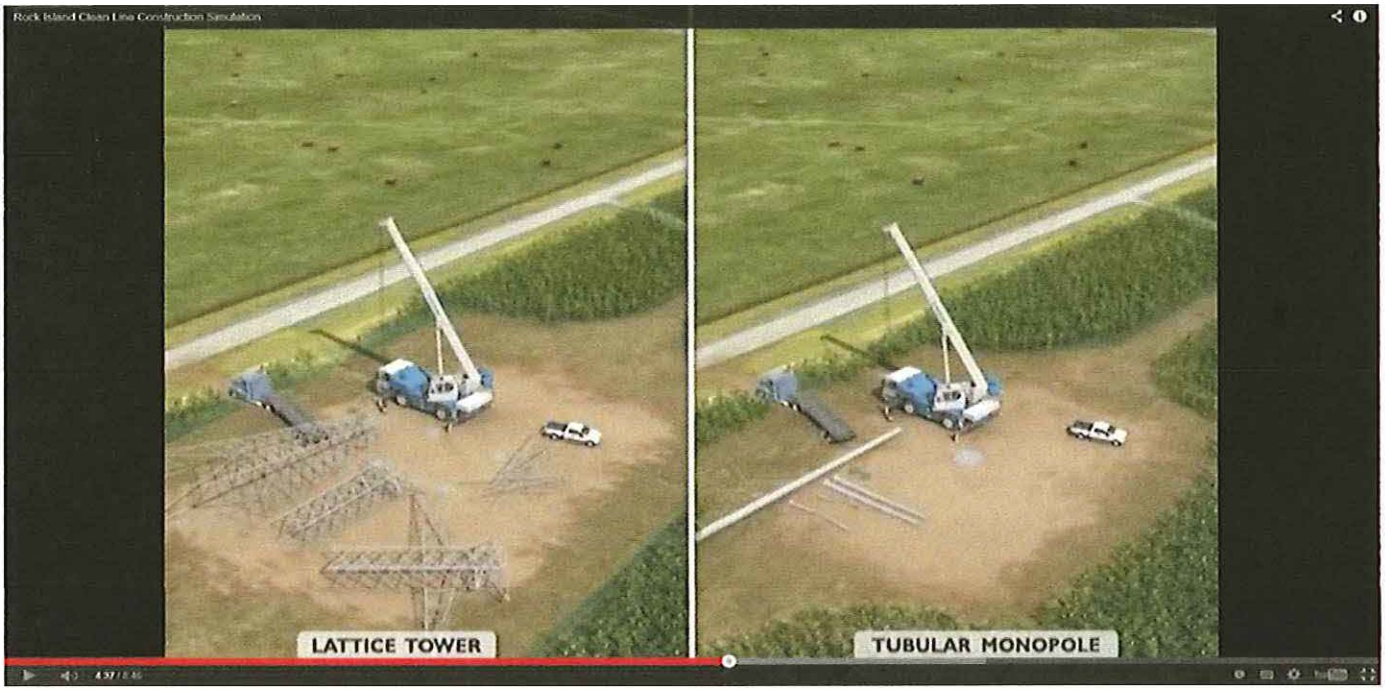

Rock Island Clean Line Construction Simulation
STAGING AREA

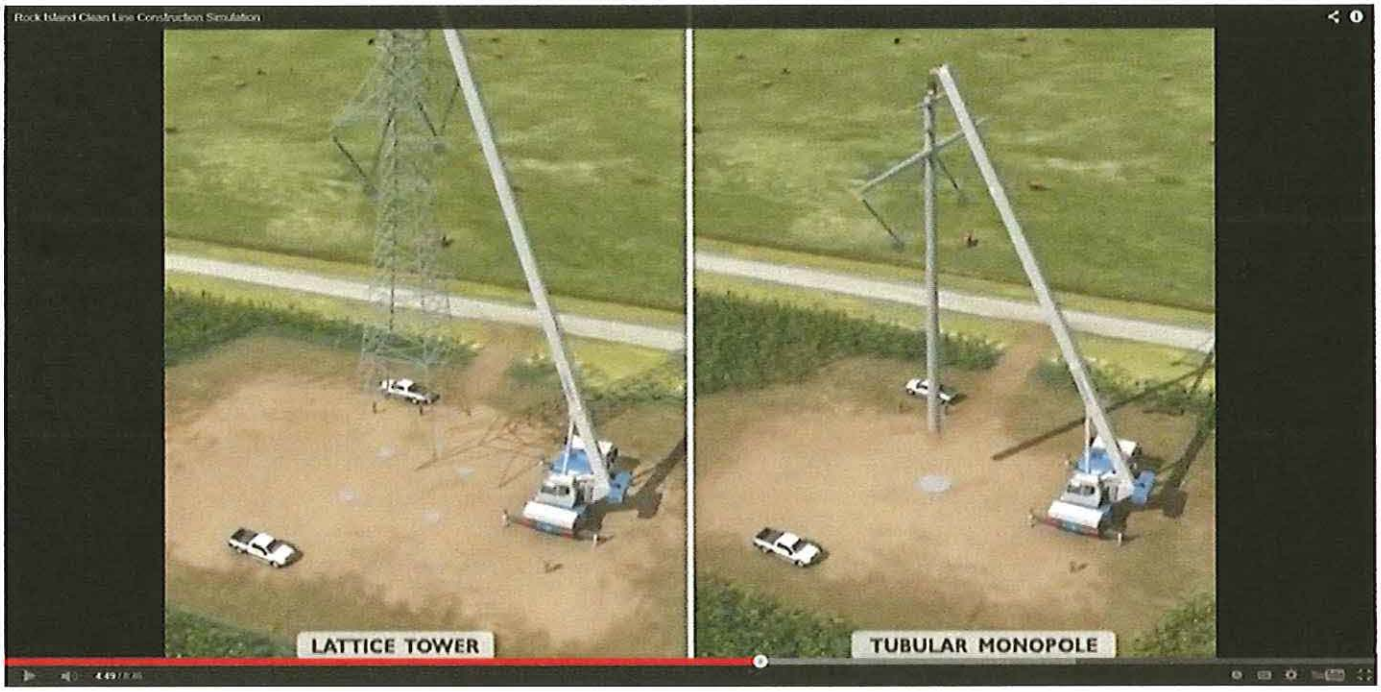

Rock Island Clean Line Construction Simulation

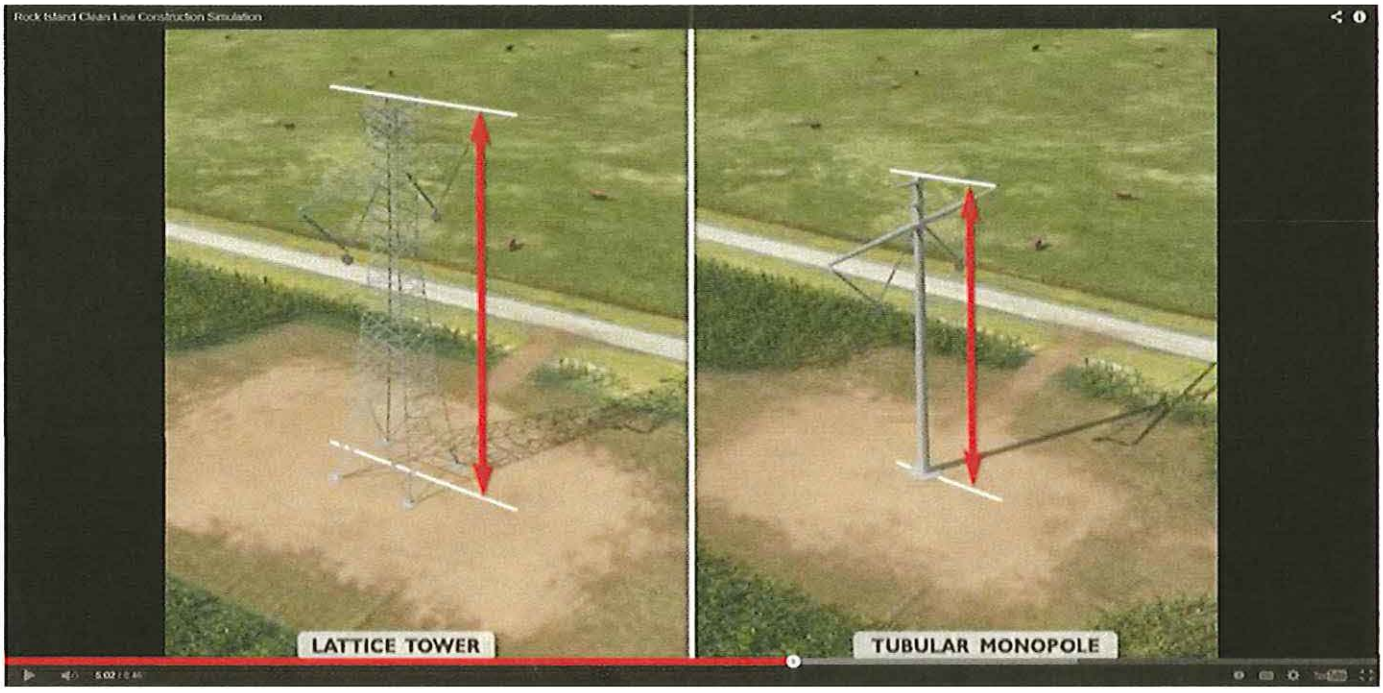

Rock Island Clean Line Construction Simulation


Rock Island Clean Line Construction Simulation
LATTICE TOWER
TUBULAR MONOPOLE


Rock Island Clean Line Construction Simulation
LATTICE TOWER
TUBULAR MONOPOLE


Rock Island Clean Line Construction Simulation
LATTICE TOWER
TUBULAR MONOPOLE


Rock Island Clean Line Construction Simulation
LATTICE TOWER
TUBULAR MONOPOLE


Rock Island Clean Line Construction Simulation
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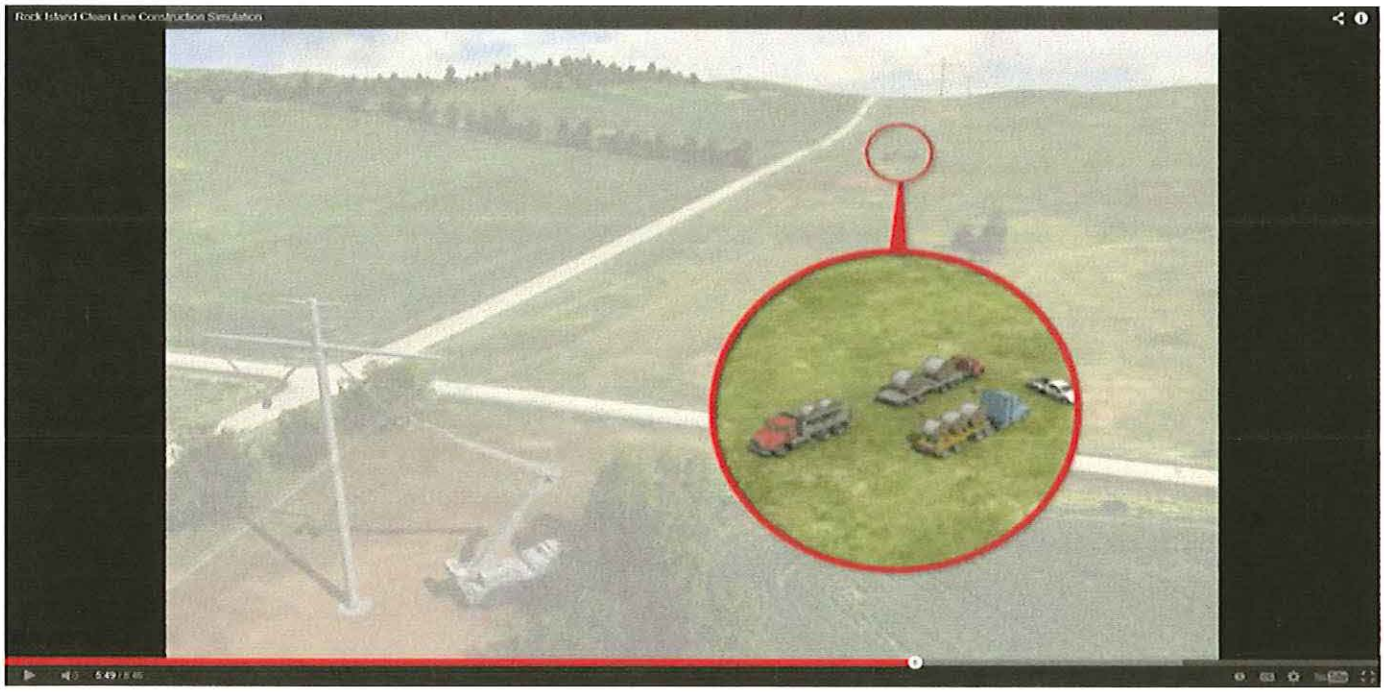
Rock Island Clean Line Construction Simulation

Environmental Impacts of Transmission Lines

Introduction

This publication reviews the environmental issues and concerns raised by the construction and operation of electric transmission facilities. The first part provides a general summary of the types of analysis and the means to measure and identify environmental impacts.

The second part is an alphabetic list of potential impacts and the available methods to minimize or mitigate the impacts. This general information can be found on the following pages.

In the final section of this pamphlet, community involvement and the role of the Public Service Commission (PSCW or Commission) are discussed. The PSCW regulates transmission line construction so that costs to consumers are minimized, Wisconsin has a safe and reliable electric supply, and environmental and social impacts are limited.

Measuring and Identifying Environmental Impacts

Quantifying Potential Impacts

The impact from the construction of a transmission line can be measured in several different ways. Useful measurements of impacts may be area (acreage), distance (miles or feet), or the number of transmission structures.

The effect of a new transmission line on an area may depend on the topography, land cover, and existing land uses. In forested areas for example, the entire right-of-way (ROW) width is cleared and maintained free of tall-growing trees for the life of the transmission line. The result is a permanent change to the ROW land cover. In agricultural areas, heavy construction vehicles traverse the ROW and temporarily suspend the use of the land for crop production. After construction ends and the fields are properly restored however, the land beneath the line can be cropped or pastured. For this reason, the area permanently affected by the line is usually much smaller than the area temporarily affected during construction. Where transmission lines are routed through areas that are valued for their scenic qualities, the visual impacts of the line (the area affected) may extend well beyond the ROW.

Determining the Degree of Potential Impacts

In general the degree of impact of a proposed transmission line is determined by the quality or uniqueness of the existing environment along the proposed route. The quality of the existing environment is influenced by several factors:

- **The degree of disturbance that already exists**
  The significance of prior disturbance can be evaluated by determining how close the place resembles pre-settlement conditions. Many areas have been substantially altered by logging, the installation of drain tiles, residential and commercial developments, or conversion to cropland.
- **The uniqueness of the resources**
  Proposed transmission routes are reviewed for species or community types that are uncommon or in decline in the region or state. The environmental review evaluates whether the resource possesses a feature that would make it unique, such as its size, species diversity, or whether the resource plays a special role in the surrounding landscape.
- **The threat of future disturbance**
  The resource is compared to surrounding land uses that may affect the quality of the resource over time. Considerations include whether the current and likely future land uses may threaten some aspect of the resource or whether the resource is valued by the adjacent community and therefore, likely to be preserved.

Identifying the Duration of Potential Impacts

The construction of a transmission line involves both long-term and temporary impacts. Long-term impacts can exist as long as the line is in place and include land use restrictions, loss of woodland, and aesthetic impacts. Temporary impacts occur during construction or at infrequent intervals such as during line repair or ROW maintenance. They can include noise or crop damage during construction. Short-term impacts can become long-term impacts if not properly managed or mitigated.

Mitigating Potential Impacts

It may be possible to lessen or mitigate potential environmental, landowner, and community impacts by adjusting the proposed route, choosing a different type of pole structure, using different construction methods, or implementing any number of post-construction practices. The Commission can require the project applicants to incorporate specific mitigation methods into the project design, construction process, and/or maintenance procedures. Examples of common mitigation techniques are shown in the table below.

Table 1 Examples of Mitigation Strategies

Project Phase	Feature	Examples of Mitigation Methods
Design Phase	Route	Using corridor-sharing to minimize ROW requirements.
	Transmission Structure	Choosing a different transmission pole with different construction requirements and aesthetic appeal. • H-frame structures have longer span widths which make it easier to cross rivers, wetlands, or other resources with fewer impacts (see Figure 1). • The darker color of oxidized steel structures may blend in better with forested backgrounds. • Low profile poles can be used near airports to avoid interference with flight approaches.
	Pole Placement	Making minor adjustments in pole locations to avoid archeological sites or minimize effects on agricultural operations.
	Add-ons	Adding flight diverters to conductors to minimize bird collisions with the wires.
Construction Phase	Timing	Constructing when the ground is frozen and vegetation is dormant to minimize impacts to wetland habitat. Delaying construction in agricultural areas until after harvest to minimize crop damage.
	Specific Construction Equipment	Using wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas.
	Erosion Control	Installing and maintaining proper erosion controls during construction to minimize run-off of top soil and disturbances to natural areas.
Post-Construction Phase	Invasive Species Management	Annual surveying for new populations of invasive species (*e.g.* purple loosestrife) caused by construction disturbances. Early detection of invasive species increases the likelihood of successful outcomes.
	Restoration	De-compacting agricultural soils so that impacts to crop yields are minimized (see Figure 2). Re-vegetate ROWs in natural areas with WDNR-approved seed mixes.

Replacing or Upgrading Existing Lines

One method to mitigate impacts during project design is replacing or double-circuiting an existing line rather than building a new line. The environmental advantages of double-circuiting an existing line are:

- Little or no additional ROW clearing, if the new line can be placed in the center of an existing ROW;
- Land use patterns may have already adapted to the existing ROW;
- Magnetic fields may be reduced because new structure designs place line conductors closer together resulting in lower fields.

There could also be disadvantages. Upgrading an existing transmission line from single-circuit to double-circuit can increase the cost by 130 percent or more, depending on the choice of structures and the size of the line. Using an existing transmission line ROW may also not be the best choice when:

- The existing ROW is in a poor location;
- New residential areas have been built around the existing line;
- Electricity use has grown more in other areas, so using the existing ROW reduces the efficiency of the new line and increases costs;
- A wider ROW is needed because the size of the new line is much greater than the existing line.

Figure 1 Typical Two-Pole, H-frame Structure

Figure 2 Typical Single-Pole, Double-Circuit Structure

Corridor Sharing

It is the policy of the state (Wis. Stat. § 1.12(6)) to site new transmission lines, to the greatest extent feasible that is consistent with economic and engineering considerations, reliability of electric system, and protection of the existing environment, utilizing corridors in the following order of priority: (a) existing utility corridors, (b) highway and railroad corridors, (c) recreational trails with limitations, and (d) new corridors. When properly evaluated as part of routing decisions, corridor sharing can be a useful method in mitigating environmental, property, and community impacts of a new transmission line. Transmission line ROWs can be shared in all or part with other electric transmission lines, roads or highways, gas or oil pipelines, and railroad corridors. ROW-sharing with some of these types of corridors has more advantages than others. The more the ROW overlaps an

existing ROW, the more benefits are possible. Side by side placement of ROWs with no overlap has fewer benefits than true corridor sharing. Some types of corridor sharing, like building a high-voltage transmission line over a distribution line right-of-way may not as beneficial in reducing impacts, and may create additional impacts.

Sharing corridors with existing facilities may minimize impacts by:

- Reducing the amount of new ROW required;
- Concentrating linear land uses and reducing the number of new corridors that fragment the landscape;
- Creating an incremental, rather than a new impact.

Often, the most preferred type of corridor sharing is with an existing transmission line. An existing line may be double-circuited with a new transmission line and therefore require little or no expansion of the existing ROW. However, in some situations corridor sharing has drawbacks. Some examples of these disadvantages are described in Table 2.

Table 2 Examples of Possible Disadvantages of Corridor Sharing

Existing ROW	Examples of Corridor Sharing Drawbacks
Railroads	• Some railroad ROWs have long distances between road crossings and additional access roads would be needed for the construction of a transmission line. • Railroad corridors that pass through wetlands are generally berms that are too narrow to support transmission structures, resulting in additional impacts to wetlands. • Some railroad companies require corridor-sharing transmission to be located at the edge or outside of the railroad ROW. Some railroad ROWs are very wide and constructing at its edge might create a new corridor and significantly widening the environmental impacts.
Gas Pipelines	• Pipeline ROWs often run cross-country with little or no visual or agricultural effects. However, transmission lines constructed cross-country can interfere with farm operations and produce a negative visual impact. • For reasons of safety, gas pipelines often require a transmission line ROW to parallel the pipeline ROW with no or very minimal overlap. This minimizes any potential benefits of corridor sharing.
Rural Roads	• Along local roads, large trees may form a scenic canopy over the road. The construction of a transmission line ROW that overlaps the road ROW would require the clear cutting of these trees and negatively impact aesthetic views. • Where wind-blown soil is a problem, a transmission ROW requiring clear cutting of windbreak trees could lead to soil loss and traffic hazards from "brown-outs." • Rural roads typically do not have sufficient ROW available, so additional ROW must be obtained from adjacent landowners, with associated impacts.
Existing Transmission Lines	• Locating a new transmission line ROW parallel with an existing line on separate structures can increase impacts to agricultural operations. • New double-circuited structures may be taller than the existing transmission structure and create increased hazards for bird or airport flyways. • Increasing the width of an existing corridor can increase edge effects and barriers to wildlife.

Corridor-sharing with an existing utility may require some modification to the proposed transmission structures resulting in additional costs to the project. For example, corridor sharing with a railroad may require the installation of underground communication circuits for the railroad. Sharing a corridor with a gas pipeline may require the installation of cathodic protection to prevent

pipeline corrosion caused by induced currents. Transmission structures located within a highway ROW must be moved at the ratepayers' expense, if the highway is modified.

One additional drawback to corridor sharing is that landowners who have agreed to an easement for one facility may be unfairly burdened by the addition of more facilities. Additional utility easements may further limit their rights and the use of their property. The property owner would then be responsible for negotiating a new easement contract in order to receive proper compensation from the utility.

Underground Electric Transmission Lines

It is a common practice in residential areas to place low-voltage distribution lines underground. However, placing high-voltage transmission lines underground is less common and can cost two to ten times more than building an overhead line. While this practice may reduce aesthetic and other impacts, it may increase others. High-voltage transmission lines differ from lower voltage lines in that significant aboveground facilities are necessary to support the underground cable. The PSCW offers a separate publication with more detailed information about underground transmission lines called *"Underground Electric Transmission Lines"*.

Underground transmission lines can be a reasonable alternative:

- In urban areas where an overhead line cannot be installed with appropriate clearances;
- When it allows for a significantly shorter route than overhead;
- When aesthetic impacts would be significant.

Underground transmission lines can have the following disadvantages:

- An increase in the area of environmental disturbance;
- The complete removal of small trees and brush along the transmission ROW;
- Increased construction and repair costs;
- Increased operation and maintenance costs.

Types of Impacts Associated with Transmission Lines

The following pages describe many of the usual environmental, landowner, and community impacts related to the construction and operation of transmission lines. The issues are listed in alphabetical order. This section is meant to provide general background information and not an all-encompassing list applicable to all construction projects.

Aesthetics

Potential Aesthetic Impacts

The overall aesthetic effect of a transmission line is likely to be negative to most people, especially where proposed lines would cross natural landscapes and private properties. New tall steel or wide H-frame structures may seem out of proportion and not compatible with agricultural landscapes or residential neighborhoods. Landowners who have chosen to bury their electric distribution lines on their property may find transmission lines bordering their property particularly disruptive to scenic views.

Some people however, do not notice transmission lines or do not find them objectionable from an aesthetic perspective. To some, the lines or other utilities may be viewed as part of the infrastructure necessary to sustain everyday lives and activities.

Aesthetic impacts depend on:

- The physical relationship of the viewer and the transmission line (distance and sight line);
- The activity of the viewer (*e.g.*, living in the area, driving through, or sightseeing);
- The contrast between the transmission structures and the surrounding environment, such as whether the line stands out or blends in.

A transmission line can affect aesthetics by:

- Removing a resource, such as clearing fencerows;
- Degrading the surrounding environment (*e.g.*, intruding on the view of a landscape);
- Changing the context of the view shed (*e.g.*, evoking an image of development in a previously rural area).

Mitigation of Aesthetic Impacts

Electric transmission lines may be routed to avoid areas considered scenic. Routes can be chosen that pass through commercial/industrial areas or along land use boundaries.

The form, color, or texture of a line can be modified to somewhat minimize aesthetic impacts. There are some choices available in transmission structure color and/or construction material. Structures constructed of wood or of rust brown oxidized steel may blend better with wooded landscapes. Stronger conductors can minimize line sag and provide a sleeker profile.

ROW management can also mitigate visual impacts of transmission lines. Some of these techniques include planting vegetative screens to block views of the line, leaving the ROW in a natural state at road crossings, and placing or piling brush from the cleared ROW so that it provides wildlife habitat. The Wisconsin Public Trust Doctrine identifies natural scenic beauty as viewed from a waterway. Wisconsin Statute Chapter 30 allows for the analysis of impact to natural scenic beauty as viewed from a navigable waterway.

In the end, aesthetics are to great extent based on individual perceptions. Siting, design, construction materials, and ROW management can mitigate some of the adverse aesthetic effects of a line. It is in the interest of the applicant and the affected landowners to discuss these measures early in the planning and design process. Public comments made during the review process of a construction application can help decision-makers understand local concerns about the existing landscape and potential aesthetic impacts.

Agricultural Lands

Potential Impacts to Agricultural Lands

Transmission lines can affect farm operations and increase costs for the farm operator. Potential impacts depend on the transmission line design and the type of farming. Transmission lines can affect field operations, irrigation, aerial spraying, wind breaks, and future land uses. For new transmission lines 100 kV or greater and longer than one mile, state law requires the utility to repair much of the damage that can occur during construction and/or provide monetary compensation (Wis. Stat. §§ 182.017(7)(c) to 182.017(7)(h)). The PSCW offers a separate publication with more detailed information about landowner rights called *"Right-of-Ways and Easements for Electric Facility Construction"*.

The placement of transmission structures can cause the following agricultural impacts:

- Create problems for turning field machinery and maintaining efficient fieldwork patterns;
- Increase soil erosion by requiring the removal of windbreaks that were planted along field edges or between fields;
- Create opportunities for weed and other pest encroachment;
- Compact soils and damage drain tiles;
- Result in safety hazards due to pole and guy wire placement;
- Hinder or prevent aerial spraying or seeding activities by planes or helicopters;
- Interfere with moving irrigation equipment;
- Hinder future consolidation of farm fields or subdividing land for residential development.

Windbreaks consist of rows of trees that can help reduce wind erosion by providing a barrier on the windward side of a field. Depending on soil conditions and supporting practices, a single row of trees protects for a distance downwind of approximately 10 to 12 times (or more) the height of the windbreak. The removal of windbreaks because of transmission lien construction, especially in agricultural soils highly susceptible to wind erosion, could result in reduced crop productivity due to permanent loss of top soil.

In recent years there has been discussion about the potential for construction projects to spread farm pests and diseases or to otherwise affect the health of farming operations. Concerns have been raised about Johne's disease, soybean cyst nematode, the spreading of ginseng diseases to plots reserved for future ginseng production, and pesticide contamination of soils on organic farms. Issues of biosecurity can be a concern to many farm operators.

Soil mixing, erosion, rutting, and compaction are interrelated impacts commonly associated with transmission construction and can greatly affect future crop yields. Soils may be mixed during the excavation of pole foundations or during the undergrounding of electrical lines. The excavation depth for transmission structure foundations can vary greatly, but in some projects may be more than 50 feet deep. Excavated parent material or subsoils should not be mixed with topsoils and spread on the surface of the ROW. Significant rutting can occur when soils become saturated or in areas of sensitive soils (see Figure 3). This may impact agricultural lands by increasing the mixing of soils, eroding topsoils during rain events, and compacting soils. The degree to which soils are compacted by heavy construction equipment again depends on the type of soil and its saturation level. Ineffective erosion controls may wash valuable topsoils downhill and impact wetlands and waterways. Agricultural soils that have been improperly protected or mitigated may suffer decreased yields for several years after the construction of the transmission line is completed.

Figure 3 Rutting in Agricultural Lands

Agricultural Impact Statement (AIS)

An AIS is required when the builders of a public construction project have the power to condemn property (eminent domain) and will acquire more than five acres of land from any farm operation. Wis. Stat. § 32.035 specifies what the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) is required to include in an AIS. The AIS is prepared to help farmers determine appropriate compensation for their losses. Easement agreements should include a discussion of anticipated damages and mutually agreed-upon reparation.

Mitigation of Agricultural Impacts

The utility should work with agricultural landowners as early in the design process as is appropriate to help identify potential impacts, well in advance of construction. Landowners and utilities may work out solutions that include minor changes to pole heights, specific pole locations, construction timing, and other significant land use concerns. By incorporating these solutions in written agreements, agricultural impacts can be prevented or minimized. A utility working with landowners can:

- Avoid or minimize construction through sensitive farmland;
- Identify, address, and document concerns before construction begins;
- Find resolutions for anticipated impacts (*e.g.*, payments to temporarily suspend farming activities or the installation of a temporary fence).

Problems with pole placement can be mitigated to some extent if the utility works with farmers to determine optimal pole locations. The following approaches might be useful:

- Using single-pole structures instead of H-frame or other multiple-pole structures so that there is less interference with farm machinery, less land impacted, and weed encroachment issues;
- Locating the line along fence lines, field lines, or adjacent to roads so as to minimize field impacts;
- Using transmission structures with longer spans to clear fields;

- Orienting the structures with the plowing pattern to make farm equipment less difficult to use;
- Minimizing the use of guy wires but where necessary, keeping the guy wires out of crop and hay lands and placing highly visible shield guards on the guy wires;
- Minimizing pole heights and installing markers on the shield wires above the conductors in areas where aerial spraying and seeding are common;
- Locating new transmission lines along existing transmission line corridors;
- Using special transmission designs to span existing irrigation systems or if necessary, reconfiguring the irrigation system at the utilities expense.

Problems with the spread of farm pests or diseases and contamination of soils can be reduced by:

- Having the farmer avoid spreading manure or pasturing livestock in the transmission line ROW prior to construction. (This is the most cost-effective method to prevent the spread of animal disease.);
- Avoiding access through, or construction in, areas that may contain manure;
- Learning about individual farm field activities, such as planting, tillage, and crop rotations so that construction methods and timing can be adapted to the timing of crop work;
- Installing exclusion fencing to keep livestock away from construction activities, or markers to identify where construction is occurring, in consultation with the farmer, so that field activities and construction do not overlap;
- Putting barriers between equipment and manure or disease-contaminated soil;
- Physically removing manure or contaminated soil from equipment in compliance with existing farm disease control efforts.

Protection of organic farm certifications requires critical communication with the farmer and a thorough understanding of the farmer's operations along the ROW.[1]

Mitigation of farm impacts includes prevention of mixing topsoils with sub soils and the underlying parent material. Wis. Stat. § 182.017(7)(c) requires utilities that construct transmission lines that are 100 kV or larger and longer than one mile to ensure that topsoil is stripped, piled, and replaced upon completion of the construction operation.

If construction activity occurs during wet conditions and soils are rutted, repairing the ruts as soon as possible can reduce the potential for impacts. However, if improperly timed, mitigation work on rutted soil could compound the damage already present. Allowing a short time for the soil to begin drying and then using a bulldozer to smooth and fill in the ruts is a common mitigation approach (see Figure 4). The Atterberg field test should be used to determine when the soil is friable enough to allow rutting to be remediated safely.

[1] An organic farmer is also protected during ROW maintenance by the requirements in Wis. Stat. § 182.017(7)(c) through (h), particularly those related to soil management and pesticide use.

Figure 4 Smoothing Out Ruts by Backblading with a Dozer

To minimize soil compaction during construction in low-lying areas, saturated soils, and/or sensitive soils, low-impact machinery with wide tracks can be used. DATCP has recommended that such machinery and tires also be used across agricultural land if it must be worked during wet conditions.

When construction of the line is complete, the soil in the ROW in fields that were accessed by heavy construction traffic should be checked for compaction with a soil penetrometer and compared to penetrometer readings on soils outside of the ROW. If compaction within the ROW is detected, appropriate equipment should be used to restore the soil tilth. A soil with good tilth has large pore spaces for adequate air infiltration and water movement. (Roots only grow where the soil tilth allows for adequate levels of soil oxygen.) DATCP can provide guidance on the best methods or equipment to be used.

Problems with potential damage to soil productivity due to soil mixing, soil compaction, and soil erosion can be lessened by:

- Identifying site-specific soil characteristics and concerns from the landowner and farm operator before construction begins;
- Avoiding areas where impacts might occur by altering access routes to the construction sites;
- Using existing roads or lanes utilized by the landowner;
- Using construction mats, ice roads, or low ground pressure or tracked equipment to minimize compaction, soil mixing, rutting, or damage to drainage systems;
- Segregating top soils or soil horizons during excavation and construction to minimize soil mixing;
- De-compacting soils following construction with appropriate equipment until the degree of soil compaction on the ROW is similar to soils off the ROW;
- Avoiding construction and maintenance activities during times when soils are saturated;
- Avoiding the removal of critical windbreaks and replanting windbreaks with lower growing woody species, to minimize soil erosion due to wind.

Wisconsin Statute § 182.017(7)(c)

This statute describes a number of restoration practices that the utility must employ when building a high-voltage transmission line on private property. This statute includes requirements, such as: removing rock and all construction debris; restoring all disturbed slopes, terraces, and waterways to their original condition; repairing drainage tile lines and fences damaged by construction; and paying for crop damage. Unless landowners waive their rights in an easement agreement, the utility is required to implement these mitigation practices. If a route passes through primarily agricultural land, DATCP has recommended that, to aid enforcement of the statute requirements, detailed Best Management Practices (BMP) should be incorporated into the project construction plans and agricultural specialists should be available to consult with the environmental monitors employed to oversee the contractors and ensure that these protections are implemented.

USDA Conservation Reserve Program Lands

There are farmlands in Wisconsin are enrolled in USDA Farm Service Agency (FSA) programs established to preserve wetlands, grasslands, and farmland. Federal easements on these lands may have restrictive land uses not consistent with the construction of a transmission line. For example, a finding of incompatibility by the FSA could affect Conservation reserve Program (CRP) payments to the landowner.

Airports and Airstrips

Transmission lines are a potential hazard to aircraft during takeoff and landing. To ensure safety, local ordinances and Federal Aviation Administration (FAA) guidelines limit the height of objects in the vicinity of the runways. Utilities can route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the conductors.

Large brightly colored balls or markers may be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated.

Archeological and Historical Resources

Archeological and historical sites are protected resources. They are important and increasingly rare tools for learning about the past. They may also have religious significance. Transmission line construction and maintenance can damage sites by digging, crushing artifacts with heavy equipment, uprooting trees, exposing sites to erosion or the elements, or by making the sites more accessible to vandals. Impacts can occur wherever soils will be disturbed, at pole locations, or where heavy equipment is used.

The Wisconsin Historical Society (WHS) has the primary responsibility for protecting archeological/historical resources. WHS manages a database that contains the records of all known sites and is updated as new information becomes available. The database is searched for any sites that might be located along any of the proposed transmission routes.

The PSCW is required to notify the WHS, if the construction of a transmission line has the potential for encountering any archeological resource. Archeological surveys might be required in these areas with the results of the surveys reported to the WHS. WHS then makes recommendations for avoiding and minimizing impacts to the sites. It is the responsibility of the PSCW to ensure that the

construction practices follow all WHS recommendations. Route changes are seldom necessary. Judicious transmission pole placement can often be used to span resources and avoid impacts to the sites.

If during construction an archeological site is encountered, construction at the site is stopped and the WHS and PSCW must be notified by the utility. The WHS then makes recommendations on how construction should proceed so that impacts to the resource are managed or minimizing.

Cultural Concerns

Protection of archeological and historic resources is often discussed in terms of "cultural resource" impacts. However, there are other cultural factors that occasionally surface during a transmission project review. A cultural concern can occur when an identifiable group or community has practices or values that may conflict with the presence of a new transmission line.

An example of a cultural concern that has been addressed in past transmission line cases is the routing of a proposed transmission line through an Amish community. Because the Amish do not use electric service, wish to remain non-confrontational, and tend not to become involved in government processes, a concerted effort was made to avoid impacts on this community.

Cultural impacts may also be related to property impacts and general social concerns such as fairness. These issues are discussed in the section titled, Property Owner Issues.

Electric and Magnetic Fields (EMF)

Sources of Fields

Electric and magnetic fields (EMF) occur whenever and wherever electricity is used. A magnetic field is created when electric current flows through any line or wire including the electrical wiring in a home. Sources of magnetic fields include electrical appliances such as power tools, vacuum cleaners, microwaves, computers, electric blankets, fluorescent lights, and electric baseboard heat. Because there are so many common sources of EMF, everyone is exposed to a wide range of magnetic fields every day.

Results of EMF Research

Starting in the late 1970s, researchers began to investigate the possibility that exposure to magnetic fields might have an adverse effect on human health. Since then, scientists have conducted many studies designed to determine whether or not exposure to EMF affects human health. Scientists have uncovered only weak and inconsistent epidemiological associations between exposure to transmission line magnetic fields and adverse health effects. Several epidemiological studies have shown a weak statistical association with the risk of childhood leukemia. Cellular studies and studies exposing test animals to magnetic fields have shown no link between magnetic fields and disease. Taken as a whole, the biological studies conducted to-date have not been able to establish a cause-and-effect relationship between exposure to magnetic fields and human disease, nor have scientists been able to identify any plausible biological mechanism by which exposure to magnetic field exposure might cause human disease. There is a growing consensus within the scientific community that exposure to magnetic fields is not responsible for human disease. The PSCW offers a separate publication which discusses in more detail about electric and magnetic fields called, "*EMF, Electric & Magnetic Fields*".

Reducing Magnetic Field from Transmission Lines

A common method to reduce magnetic fields is to bring the lines (conductors) closer together. The magnetic fields interfere with one another, producing a lower field. The conductors can be brought closer together by using different types of structures or double-circuiting two lines on the same structures. However, there are electrical safety limits to how close together conductors can be placed. Conductors must be far enough apart so that arcing cannot occur and so that utility employees can safely work around them. Additionally, the closer conductors are to one another, the closer together poles must be constructed. Increasing the number of poles per mile increases private property land impacts and costs.

Burying transmission lines can also reduce the generated magnetic fields. The reduction occurs because the underground lines can be installed closer together than overhead lines. Overhead lines need to be further apart because air is used as an insulator, whereas underground cables use rubber, plastic or oil for insulation. Underground transmission lines are typically three to five feet below ground; as such magnetic fields can be quite high directly over the line. Magnetic fields on either side of an underground line decreases more rapidly with increased distance than the magnetic field generated from an overhead line.

Endangered/Threatened and Protected Species

Potential Impacts to Protected Species

The state's Endangered Species Law, Wis. Stat. § 29.604 makes it illegal to take, transport, possess, process, or sell any wild animal that is included on the Wisconsin Endangered and Threatened Species List. In addition it is illegal to remove, transport, carry away, cut root up, sever, injure or destroy a wild plant on the Wisconsin Endangered and Threatened Species List on public lands. Forestry, agricultural, and utility practices are exempted from the taking prohibitions of listed plant species.

The Wisconsin Endangered Species law allows WDNR to authorize the taking of a threatened or endangered species if the taking is not for the purpose of, but will be only incidental to, the carrying out of an otherwise lawful activity and the taking meets the requirements outlined in Wis. Stat. § 29.604. Authorization generally occurs through an Incidental Take Permit. If the activity is conducted by WDNR itself or if another state agency conducts, funds, or approves the activity, authorizations would occur through an Incidental Take Authorization.

Endangered species are species whose continued existence is in jeopardy. Threatened species are likely to become endangered. Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of the Special Concern category is to focus attention on certain species before they become threatened or endangered. Special Concern species are not covered by the Wisconsin's Endangered Species Law, but may be protected by other state and federal laws.

The WDNR Bureau of Endangered Resources (BER) manages the Natural Heritage Inventory (NHI) database which lists current and historical occurrences of rare plants, animals, and natural communities. The database includes the location and status of these resources. However, most areas of the state have not been surveyed extensively or recently, so the NHI database should not be relied upon as a sole information source for rare species.

Construction and maintenance of transmission lines might destroy individual plants and animals or might alter their habitat so that it becomes unsuitable for them. For example, trees used by rare

birds for nesting might be cut down or soil erosion may degrade rivers and wetlands that provide required habitat.

Mitigation of Impacts to Rare Species and Their Habitats

If preliminary research and field assessments indicate that rare species or natural communities may be present in the project area, the utility should conduct WDNR-approved surveys prior to construction. If a threatened or endangered species is likely to be in the project area, impacts can usually be avoided or minimized by modifying the route, changing the design of the transmission line, reducing the workspace at a particular location, employing special construction techniques, or limiting construction activities to specific seasons. The PSCW has the authority to order transmission construction applicants to conduct surveys, require an expert be present during construction activities, and implement mitigation measures.

In some limited cases, transmission line ROWs can be managed to provide or improve habitat for some rare species or communities. For example, some ROWs in Wisconsin are being actively managed to provide habitat for the Karner blue butterfly, a federally-listed species. Close cooperation between the utility and WDNR is necessary to protect listed species and their habitat.

Implantable Medical Devices and Pacemakers

Potential Impacts to Implantable Medical Devices

Implantable medical devices are becoming increasingly common. Two such devices, pacemakers and implantable cardioverter defibrillators (ICDs), have been associated with problems arising from interference caused by EMF. This is called electromagnetic interference or EMI.

EMI can cause inappropriate triggering of a device or inhibit the device from responding appropriately. Documented sources of EMI include radio-controlled model cars, slot machines, car engines, cell phones, anti-theft security systems, radiation therapy, and high voltage electrical systems. It has been estimated that up to 20 percent of all firings of ICDs are inappropriate, but only a very small percentage of those are caused by external EMI.

ICD Manufacturers' recommended threshold for modulated magnetic fields is 1 gauss. One gauss is five to ten times greater than the magnetic field likely to be produced by a high-voltage transmission line. Research shows a wide range of responses for the threshold at which ICDs and pacemakers responded to an external EMI source. The results for each unit depended on the make and model of the device, the patient height, build, and physical orientation with respect to the generated field.

Mitigation of EMI

Transmission lines are only one of a number of external EMI sources. Exposure to magnetic fields produced by transmission lines generally will not affect pacemakers and implantable defibrillators. All pacemaker and ICD patients are informed of potential problems associated with exposure to EMI and must adjust their behavior accordingly. Moving away from a source is a standard response to the effects of exposure to EMI. Patients can shield themselves from EMI with a car, a building, or the enclosed cab of a truck. Individuals concerned with potential issues associated with their implantable medical device should consult with their physician.

Invasive Species

Potential Impacts by Invasive Species

Non-native plants, animals, and microorganisms found outside of their natural range can become invasive. Many non-native species are harmless because they do not reproduce or spread abundantly in their new surroundings. Some non-native species have been introduced intentionally such as the Norway maple for landscaping and the ring-necked pheasants for hunting. However, a small percentage of non-native species are able to become quickly established, are highly tolerant of a wide range of conditions, and are easily dispersed. The diseases, predators, and parasites that kept their populations in check in their native range may not be present in their new locations. Over time, non-native, invasive species can overwhelm and eliminate native species, reducing biodiversity and negatively affecting both ecological communities and wildlife habitats.

Human actions are the primary means of invasive species introductions. Transmission line construction causes disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially "seed" invasive species wherever the vehicle travels. Infestation of invasive species can also occur during periodic transmission ROW maintenance activities especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

Best Management Practices

To control invasive species, Wis. Admin. Code ch. NR 40 establishes a classification system for invasive species and prohibits activities that result in the spread of invasive species in certain categories. It also establishes preventive measures to help minimize their spread. Using the practices consistent with the BMP manual will assist utilities in complying with "reasonable precaution" requirements under Wis. Admin. Code ch. NR 40.

The BMP manual identifies many methods that can be used to limit the introduction and spread of invasives species during and post-construction. These measures include marking and avoidance of invasives, timing construction activities during periods that would minimize their spread, proper cleaning of equipment, and proper disposal of woody material removed from the ROW.

Because construction measures may not be completely effective in controlling the introduction and spread of invasives, post-construction activities are required. Sensitive areas such as wetlands and high quality forests and prairies should be surveyed for invasive species following construction and site re-vegetation. If new infestations are discovered, then measures should be taken to control the infestation. Each exotic or invasive species requires its own protocol for control or elimination. Techniques to control exotic/invasive species include the use of pesticides, biological agents, hand pulling, controlled burning, and cutting or mowing. WDNR should be consulted to determine the best methods for control of encountered invasive species.

Noise and Light Impacts

During Construction

During each phase of construction of the transmission line, noise will be generated by the construction equipment and activities. Initially, vegetation in the ROW is mowed or cut using mowers, whole tree processors, and/or chainsaws. Wood brush and logs may be chipped or burned in the ROW. Trucks are used to haul away material that can't be stockpiled or disposed on-site and

to bring in necessary construction materials. Typical construction vehicles include bucket trucks, cranes or digger derricks, backhoes, pulling machines, pole trailers, or dumpsters. Transmission structures are constructed by first using a standard drill rig to bore a hole to the required depth. If water is encountered, pumps will be used to move the water to either adjacent upland areas or to waiting tanker trucks for proper disposal. When bedrock is close to the surface or when subsoils primarily consist of large boulders and large cobbles, blasting may be required. Concrete trucks carry concrete to the boreholes to construct the foundations of the transmission structures. Cranes then erect the towers on the foundations. Finally the wire is strung between the towers using large pulleys. After the construction is completed, the ROW is graded, agricultural soils are de-compacted, and the ROW cleaned up.

All of these operations produce noise that may impact adjacent landowners. However, normal work schedules and local ordinances usually restrict noise producing activities to daytime hours.

During Operation

Vibration or humming noise can be noticeable and is most often associated with older transmission lines. It is usually the result of conductor mounting hardware that has loosened slightly over the years and can be easily repaired by the utility. This is a maintenance issue that can be identified and repaired.

The other types of sounds that are caused by transmission lines are sizzles, crackles, or hissing noises that occur during periods of high humidity. These are usually associated with high-voltage transmission lines and are very weather dependent. They are caused by the ionization of electricity in the moist air near the wires. Though this noise is audible to those very close to the transmission lines, it quickly dissipates with distance and is easily drowned out by typical background noises.

Ionization in foggy conditions can also cause a corona, which is a luminous blue discharge of light usually where the wires connect to the insulators.

Residential properties located in close proximity to a substation could be impacted by the noise and light associated with the operation of a new or enlarged substation.

Property Owner Issues

ROW Easements

Property owner issues are often raised by individuals or communities along proposed transmission line routes. One concern relates to how some property owners bear the burden so that everyone else can use the electricity, pitting property owner rights versus public good. Another concern relates to who should be considered as affected by the new line.

There is often a feeling of unfairness between those that use electricity and those that bear the impacts of the facilities required to support that use. The money paid to landowners for ROW easements is meant to compensate them for having a transmission line cross their property. These easement payments are negotiated between the landowner and the utility. Some landowners do not regard the payments as sufficient to truly compensate for the aesthetic impacts and the loss of full rights to their own land. This is especially true if the landowner is not compensated for the "highest and best use" of the affected parcel.

The policy of corridor sharing favors the placement of new transmission lines within or next to existing infrastructure, causing some landowners to be burdened by multiple easements. The individual hardships must be balanced against the additional environmental or social impacts caused by the development of new transmission corridors.

Property owners, who live near the line, but not on the ROW, might be affected but are not compensated. Subsequent owners of a property in a transmission ROW are usually not compensated because the easement payment is most often a one-time payment paid to the owner at the time of easement acquisition.

The PSCW offers a separate publication with more detailed information about landowner rights called *"Right-of-Ways and Easements for Electric Facility Construction"*.

Compensation is paid to towns, municipalities, and counties through which a 345 kV or greater transmission line (high-voltage) is constructed via payment of one-time environmental and/or annual impact fees (Wis. Stat. § 196.491 (3g)(a)). The amount can be considerable and is proportional to the percentage of the line constructed within a specific political subdivision and the cost of the project. No portion of it, however, is paid directly to affected property owners.

Property Value Studies

The potential change in property values due to the proximity to a new transmission line has been studied since the 1950s by appraisers, utility consultants, and academic researchers. Data from these studies is often inconclusive and has not been able to provide a basis for specific predictions in other locations for other projects.

While the data from many of the studies reviewed are often inconclusive, some general conclusions among the studies have been made. In 2003, the Electric Power Research Institute (EPRI) conducted an assessment of the researched relationship between electric transmission facilities and property values.[2] Their conclusions do not differ substantially from previous analyses.

- The potential reduction in sale price for single-family homes in the U.S. may range from 0 to 14 percent. For states within the Midwest (Minnesota, Wisconsin, and the Upper Peninsula of Michigan), the average decrease appears to be between 4 and 7 percent. EPRI reported a potential overall decrease of 0 to 6.3 percent.
- Higher-end properties are more likely to experience a reduction in selling price than lower-end properties.
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
- Amenities such as proximity to schools or jobs, lot size, square footage of a house, and neighborhood characteristics tend to have a much greater effect on sale price than the presence of a power line.
- The degree of opposition to a transmission upgrade project may affect the size and duration of the sales-price effects. Furthermore, adverse effects on price and value appear to be greatest immediately after a new transmission line is built and appear to diminish over time and generations of property owners.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from a line. Homes not directly adjacent to the ROW or beyond 200 feet from the ROW, however, were affected to a much lesser degree than those abutting the line or ROW.[3] [4]

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[2] Goodrich-Mahoney, J. Transmission Line and Property Values: State of the Science. EPRI, November 2003.

[3] Kung, H. and C. Seagle, "Impact of Power Transmission Lines on Property Values: A Case Study," Appraisal Journal, July 1992.

- Setback distance, ROW landscaping, shielding of visual and aural effects, and integration of the ROW into the neighborhood can significantly reduce or eliminate the impact of transmission structures on sales price.
- Properties located near a transmission line may sometimes take a longer time to sell than comparable properties in the area.
- The value of agricultural property is likely to decrease if the power line structures are placed in an area that inhibits farm operations.

Radio and Television Reception

Transmission lines do not usually interfere with normal television and radio reception. In some cases, interference is possible at a location close to the ROW due to weak broadcast signals or poor receiving equipment. When significant interference is found to be due to a transmission facility, the utility should take reasonable measures to mitigate the interference (Wis. Admin. Code § PSC 113.0707).

Recreation Areas

Recreation areas include parks, trails, lakes, or other areas where recreational activities occur. Transmission lines can affect these areas by:

- Limiting the location of buildings;
- Discouraging potential users of recreational areas whose activities depend on the aesthetics of natural surroundings (*e.g.*, backpackers, canoers, hikers);
- Altering the types of wildlife found in an area by creating more edge habitat or additional mortality risks to birds;
- Providing paths or better access to previously inaccessible areas for those who snowmobile, ski, bike, hike, or hunt;
- Posing potential safety risks by locating new poles or wires in the path of recreational vehicles such as snowmobiles and ATVs without adequate signage.

Some of these effects can be mitigated by locating lines along property edges, using pole designs that blend into the background and reduce aesthetic impacts, or designing recreation facilities to take advantage of cleared ROWs.

Safety

Safety Standards

Transmission lines must meet the requirements of the Wisconsin State Electrical Code.[5] The code establishes design and operating standards, and sets minimum distances between wires, poles, the ground, and buildings. While the code represents the minimum standards for safety, the electric utility industry's construction standards are generally more stringent than the Wisconsin State Electrical Code requirements. Wis. Admin. Code § PSC 114.234A4 prohibits the construction of

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[4] Hamilton, S. and G. Schwann. 1995. Electric Transmission Lines and Property Value. Land Economics 71(4):436-444.

[5] Wisconsin adopts the most recent edition of the National Electrical Safety Code with certain changes, deletions, and additions. Volume 1 of the Wisconsin Electrical Code is found in Wis. Admin. Code Ch. PSC 114. It is administered primarily by the Commission.

high-voltage electric transmission lines over occupied residential dwellings or residential dwellings intended to be occupied. Although they may not be prohibited by code, building other structures within a transmission line ROW is strongly discouraged.

Contact with Transmission Lines

The most significant risk of injury from any power line is the danger of electrical contact between an object on the ground and an energized conductor. Generally, there is less risk of contact with higher voltage lines as opposed to low-voltage lines due to the height of the conductors. When working near transmission lines, electrical contact can occur, even if direct physical contact is not made, because electricity can arc across an air gap. As a general precaution, no one should be on an object or in contact with an object that is taller than 15 to 17 feet while under a high-voltage electric line. Individuals with specific concerns about whether it is safe to operate vehicles or farm equipment near transmission lines should contact their electric provider.

Fallen Lines

Transmission lines are designed to automatically trip out-of-service (become de-energized) if they fall or contact trees. This is not necessarily true of distribution lines. However, transmission lines are not likely to fall unless hit by a tornado or a vehicle.

Lightning

New transmission lines are built with a grounded shield wire placed along the top of the poles, above the conductors. Typically, the shield wire is bonded to ground at each transmission structure. This protects the transmission line from lightning. Transmission poles, like trees or other tall objects are more likely to intercept lightning strikes, but do not attract lightening. Lightning is not more likely to strike houses or cars near the transmission line. Shorter objects under or very near a line may actually receive some protection from lightning strikes.

Induced Voltage

People or animals can receive a shock by touching a metal object located near a transmission line. The shock is similar to that received by touching a television after walking across a carpet. The magnitude and the strength of the charge will be related to the mass of the ungrounded metal object and its orientation to the transmission line.

Induced current can be prevented or corrected by grounding metal objects near the transmission line. Grounding chains can be installed on tractors. Metal fences can be connected to a simple ground rod with an insulated lead and wire clamp. Electric fences with proper grounding should continue functioning properly even when subject to induced voltage.

Refueling vehicles directly under a high-voltage transmission line is not a good practice. A spark from a discharging metal structure with induced voltages to earth could ignite the fuel. The risk of such ignition is higher with gasoline-powered vehicles than for diesel-powered vehicles.

DATCP staff can provide more information regarding safety issues when farming near transmission lines. Other source of information include the online publication from the Bonneville Power Administration, *"Living and Working Safely around High-Voltage Power Lines"* (www.bpa.gov/corporate/pubs/public_service/livingandworking.pdf) and the Midwest Rural Energy Council's, *"Installation and Operation of Electric Fences, Cow Trainers and Crowd Gates"* (http://www.mrec.org/pubs.html).

Stray Voltage

Causes of Stray Voltage

Stray voltage and its impacts on livestock and other confined animals have been studied in detail by state and federal agencies, universities, electric utilities, and numerous scientists since the late 1970s. The PSCW has opened investigations, encouraged the upgrade of rural distribution systems, established measurement protocols, and compiled a stray voltage database to track investigations, all in order to develop successful strategies for minimizing stray voltage in farm operations (http://psc.wi.gov/utilityInfo/electric/strayVoltage.htm). Over the decades, significant resources have been allocated to understand this issue.

Electrical systems, including farm systems and utility distribution systems, are grounded to the earth to ensure safety and reliability, as required by the National Electrical Safety Code and the National Electrical Code. Because of this, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When NEV is measured between two objects that are simultaneously contacted by an animal, a current will flow through the animal and it is considered stray voltage. Animals may then receive a mild electrical shock that can cause a behavioral response. At low voltages, an animal may flinch with no other noticeable effect. At higher levels, avoidance or other negative behaviors may result. Stray voltage may not be noticeable to humans.

Low levels of alternating current (AC) voltage on the grounded conductors of a farm wiring system are a normal and unavoidable consequence of operating electrical farm equipment. In other words some levels of stray voltage will always be found on a farm. For example, a dairy cow may feel a small electric shock when it makes contact with an energized water trough. The issue of concern is stray voltage that occurs at a level that negatively affects an animal's behavior, health, and more specifically, milk production.

Stray voltage can be caused by a combination of on-farm and off-farm causes. One off-farm contributor to stray voltage is the operation of transmission lines in close proximity and parallel to a distribution line. As a means to minimize new transmission line impacts, new lines are often co-located near a distribution ROW or the distribution line is underbuilt on the new transmission poles. This configuration can contribute to stray voltage issues. To minimize the likelihood of stray voltage occurrences, utilities sometimes propose to relocate these paralleling distribution lines further away from the transmission line and/or burying the distribution line underground. Additionally, the PSCW may require the utility to conduct pre-construction and post-construction testing of potentially impacted farms and lines.

Potential Impacts of Stray Voltage

Herd problems can be difficult to diagnose. There are many factors to consider such as the herd's environment, diet, and health. Dairy cow behaviors that may indicate the presence of stray voltage include nervousness at milking time, increased milking time, decreased milk production, increased Somatic Cell Count, increased defecation or urination during milking, hesitation in approaching waterers or feeders, a reluctance to enter the barn or milking parlor, or an eagerness to leave the barn. Some of these symptoms are interrelated. For example, a dairy cow that does not drink sufficient water due to shocks may have decreased milk production. However, these same symptoms can be caused by other factors that are unrelated to stray voltage such as increased mastitis or milk-withholding problems for farms with milking parlors or in barns with milk pipelines. If stray voltage is suspected to be the cause of herd problems, the farm should be tested.

In 1996, the PSCW established a stray voltage "level of concern" of 2 milliamps (PSCW docket 05-EI-115). The level of concern is not intended as a "damage" level but as a very conservative, below-the-injury level, below the point where moderate avoidance behavior is likely to occur, and well below where a cow's behavior or milk production would be affected. The PSCW and DATCP consider that at this level of current, some form of mitigative action should be taken on the farmer's behalf.

The level of concern is further defined with respect to how it should be reduced. If a utility distribution system contributes one milliamp or more to stray voltage on a farm, the utility must take corrective action to reduce its contribution to below the one milliamp level. If the farm electrical system contributes more than one milliamp, the farmer may want to consider taking corrective measures to reduce the level below one milliamp.

Mitigation of Stray Voltage

When stray voltage is a concern, electrical measurement in confined livestock areas should be done using the established PSCW-approved testing procedures with appropriate equipment. These testing protocols have been developed to collect a reasonable set of data useful in the analysis of the quantity and quality of stray voltage that may be present under a variety of conditions, and the source (including on-farm versus off-farm sources) of such stray voltage.

Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane.

Farm operators may receive additional technical assistance from the Wisconsin Rural Electric Power Services (REPS) program (as defined and authorized by Wis. Stat. §§ 93.41 and 196.857). The REPS program is jointly managed by the PSCW and DATCP. DATCP (http://datcp.wi.gov/Farms/Wisconsin_Farm_Center/Farm_Rewiring/Stray_Voltage/index.aspx) provides an ombudsman, veterinarian, an energy technical advisor, and a program assistant to the REPS program. REPS staff provides information about stray voltage and power quality issues; work to answer regulatory questions; conduct on-farm and distribution system investigations that can assist farmers in working with the utility or electrician to resolve a power quality concern; provide a format for dispute resolution; and continue to research electrical issues. REPS staff also works with farmers, their veterinarians and nutritionists to resolve herd health and production problems.

Water Resources

Potential Impacts to Surface Waters

Waterways in the form of creeks, streams, rivers, and lakes are abundant throughout Wisconsin. Many of these waters have been designated as special resources that have state, regional, or national significance. Construction and operation of a transmission line across these resources may have both short-term and long-term effects. The type and significance of the impact is dependent on the characteristics of the water resource and the transmission line design. Waterway use, physical features such as channel width, herbaceous plant cover, and water quality, recreational use, and the scenic quality of the river and its surrounding landscape are important factors in assessing potential impacts.

The WDNR is responsible for regulating public waters, including any crossings of these waters. For certain protected areas the Army Corps of Engineers and/or the US Fish and Wildlife Service (USFWS) might require additional permits and approvals.

Water quality can be impacted not only by work within a waterway but also by nearby vegetation clearing and construction activities. The removal of adjacent vegetation can cause water temperatures to rise and negatively affect aquatic habitats. It can also increase erosion of adjacent soils causing sediment to be deposited into the waterbody, especially during rain events. Construction often requires the building of temporary bridges that, if improperly installed may damage banks and cause erosion or be overtopped or dislodged, and back up water. Overhead transmission lines across major rivers, streams, or lakes may have a visual impact for river users and pose a potential collision hazard for waterfowl and other large birds, especially when located in a migratory corridor. Recreational use such as sight-seeing, boating, fishing, or bird watching could be adversely affected.

Areas of Special Natural Resource Interest

Certain waters of the state that possess significant scientific value are identified as Areas of Special Natural Resource Interest (ASNRI) for their protection (Wis. Admin. Code § NR 1.05). ANSRI-identified waters include:

- State natural areas (Wis. Stat. §§ 23.27 through 23.29);
- Trout streams (Wis. Admin. Code § NR 1.02(7));
- Outstanding resource waters (ORW) or exceptional resource waters (ERW) (Wis. Stat. § 281.15);
- Waters or portions of waters inhabited by an endangered, threatened, special concern species or unique ecological communities identified in the Natural Heritage Inventory;
- Wild rice waters as identified by the WDNR and the Great Lakes Indian Fish and Wildlife Commission;
- Waters in areas identified as special area management plan or special wetland inventory study (Wis. Admin. Code § NR 103.04);
- Waters in ecological significant coastal wetlands along lakes Michigan and Superior as identified in the coastal Wetlands of Wisconsin;
- Federal or state waters designated as wild or scenic rivers (Wis. Stat. §§ 30.26 and 30.27);

There are more than 10,000 miles of trout streams in Wisconsin categorized as Class 1, 2, or 3. High-quality trout streams (Class 1) have sufficient natural reproduction to sustain populations of wild trout, at or near carrying capacity. These streams are often small and may contain small or slow-growing trout, especially in the headwaters. Approximately 40 percent of the trout streams are Class 1 trout streams. Degradation of trout habitat is caused by siltation from erosion, decreased groundwater flow from irrigation, drained wetlands, and poor watershed management. High oxygen demand from organic pollution, channelization, cattle grazing, and increased temperatures from both man-made (*i.e.* stormwater discharges) and natural sources are other common causes of trout habitat deterioration. State laws protect trout streams from pollution and other harmful effects.

Outstanding resource waters (ORW) and exceptional resource waters (ERW) are characterized as being valuable or unique for various features including fisheries, hydrology, geology, and recreation. Regulations require that these shall not be lowered in quality without good justification. By assigning these classifications to specific streams and lakes, high quality waters receive additional protection from point source pollution. Of the some 42,000 stream/river miles in the state, over

3,000 stream miles or approximately 8 percent have been designated as ORW and more than 4,500 stream miles or approximately 11 percent have been designated as ERW. Of Wisconsin's 15,000 lakes and impoundments, 103 are designated as ORW.

Mitigation of Impacts to Surface Waters

Techniques for minimizing adverse effects of constructing transmission lines in river and stream environments, especially in ASNRI-designated waters include avoiding impacts, minimizing impacts, and/or effective remediation of the impacts. Impacts to waterways can be avoided by rerouting the line away from the waterway, adjusting pole placements to span the resource overhead, constructing the line under the resource, or constructing temporary bridge structures across the resource. Methods to minimize impacts include avoiding pole placements adjacent to the resource, using WDNR-approved erosion control methods, using alternative construction methods such as helicopter construction, landscaping to screen the poles from the view of river users, and maintaining shaded stream cover. After construction, some impacts can be remediated.

There are several methods and cable types for constructing a transmission line under a resource. Lower voltage and distribution lines are commonly directionally bored under the waterway. High voltage lines are rarely constructed underground due to the substantial engineering, costs, and operational hurdles that would need to be overcome for it to be a feasible alternative to overhead construction. Directionally boring a line underground will minimize construction and aesthetic impacts to the resource; however it does require potentially large construction entrance and exit pits on either side of the resource. There are also concerns about the potential for frac-outs which can release drilling fluids into the waterbody and subsurface environment.

The use of properly designed temporary bridge structures avoids the necessity of driving construction equipment through streams (Figure 5). Temporary bridges generally consist of timber mats that can allow heavy construction traffic to cross streams, creeks, and other drainage features without damaging the banks or increasing the potential for soil erosion. Temporary bridges should be located to avoid unique or sensitive portions of these waterways, i.e., bends, riffles, pools, spawning beds, etc. They span from top-of-bank to top-of-bank and rarely require a support structure under the bridge, placed on the bed of the waterway, to support heavy vehicle use.

Figure 5 Temporary Bridge Structure Spanning a Waterway

Proper WDNR-approved erosion control is necessary for all construction activities, especially those that may affect water resources. WDNR Best Management Practices (BMP) should be employed before, during, and immediately after construction of the project to reduce the risk of excess siltation into streams. Erosion controls must be regularly inspected and maintained throughout the construction phase of a project until exposed soil has been stabilized.

Woodlands and shrub/scrub areas along streams are a valuable buffer between adjacent land uses such as farm fields and corridors of natural habitats. The vegetation protects water quality, maintains soil moisture levels in stream banks, helps stabilize the banks, filters nutrient-laden sediments and other runoff, maintains cooler water temperatures, and encourages a diversity of vegetation and wildlife habitats. The removal of vegetative buffers from ASNRI-designated shoreland zones could raise the temperature of the water temperature. Cool water temperatures are necessary for good trout stream habitat. Existing vegetative buffers should be left undisturbed or minimally disturbed, whenever possible. For areas where construction impacts cannot be avoided, low-growing native tree and shrub buffers along these streams should be allowed to regrow and/or should be replanted so as to maintain the pre-construction water quality in the streams (Figure 6).

Figure 6 Restored River Bank Following Construction

Wetlands

Potential Impacts to Wetlands

Wetlands occur in many different forms and serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing habitat for aquatic species and wildlife. The construction and maintenance of transmission lines can damage wetlands in several ways including the following:

- Heavy machinery can crush wetland vegetation;
- Wetland soils, especially very peaty soils can be easily compacted, increasing runoff, blocking flows, and greatly reducing the wetland's water holding capacity;

- The construction of access roads can change the quantity or direction of water flow, causing permanent damage to wetland soils and vegetation;
- Construction and maintenance equipment that crosses wetlands can stir up sediments and endanger fish and other aquatic life;
- Transmission lines can be collision obstacles for sandhill cranes, waterfowl and other large water birds;
- Clearing forested wetlands changes the habitat type for decades, and can expose the wetland to invasive and shrubby plants, thus removing habitat for species in the forest interior;
- Vehicles and construction equipment can introduce exotic plant species such as purple loosestrife. With few natural controls, these species may out-compete high-quality native vegetation, destroying valuable wildlife habitat.

Any of these and other activities can impair or limit wetland functions. Organic soils consist of layers of decomposed plant material that formed very slowly. Disturbed wetland soils are not easily repaired. Severe soil disturbances may permanently alter wetland hydrology. A secondary effect of disturbance is the opportunistic spread of invasive weedy species such as Phragmites. These invasive species provide little food and habitat for wildlife.

Local, state, and federal laws regulate certain activities in wetlands. When fill material is proposed to be placed in a wetland, a permit is routinely required from the U. S. Army Corps of Engineers (USACE) under the Clean Water Act (CWA), Section 404. WDNR must determine if the proposed activity is in compliance with applicable state water quality standards (Wis. Admin. Code chs. NR 103 and 299). If the proposal is found to be in compliance with state standards, WDNR issues a wetland permit and a water quality certification to the applicant. If the project would result in impacts to wetlands associated with waters of the state, then WDNR may have primary authority under Wis Stat. ch. 30.

Minimization of Impacts to Wetlands

To reduce the potential impacts to wetlands, the utility can:

- Avoid placing transmission lines through wetlands;
- Adjust pole placements to span wetlands or limit equipment access in wetlands, wherever possible;
- Limit construction to winter months when soil and water are more likely to be frozen and vegetation is dormant;
- Use mats (Figures 7 and 8) and wide-track vehicles to spread the distribution of equipment weight when crossing wetlands during the growing season or when wetlands are not frozen;
- Use alternative construction equipment such as helicopters or marsh buggies for construction within wetlands;
- Clean construction equipment after working in areas infested by purple loosestrife or other known invasive, exotic species;
- Place markers on the top (shield) wire to make the lines more visible to birds if the collision potential is high.

USDA Wetland Reserve Program Lands

Some properties in Wisconsin are enrolled in the Wetlands Reserve Program (WRP), a voluntary program overseen by the National Resource Conservation Service (NRCS) of the USDA. Farmers are provided the opportunity to retire marginal agricultural lands, and reap the economic and social benefits of having wetlands on their property. The program offers a landowner payment for restoring, protecting, or enhancing wetlands on the property in consultation with NRCS, USFWS, WNDR, and local conservation districts.

WRP easements or cost-share agreements do not necessarily prohibit the construction of a transmission line across a wetland. A biologist or the central NRCS office in Washington would likely decide if a proposed line or access road were a "compatible" use. Landowners can make "compatible use" requests throughout the life of the easement or agreement.

Figure 7 Mats Used in a Wet Meadow

Figure 8 Mats Used in a Wooded Wetland

Woodlands

Potential Impacts to Woodlands

Wisconsin forests provide recreational opportunities, wildlife and plant habitats, and timber. Building a transmission line through woodlands requires that all trees and brush be cleared from the ROW. One mile of 100-foot ROW through a forest results in the loss of approximately 12 acres of trees. Transmission construction impacts can include forest fragmentation and the loss and degradation of wooded habitat, aesthetic enjoyment of the resource, and/or the loss of income.

Different machines and techniques are used to remove trees from the transmission ROW depending on whether the woodlands consist of mature trees, have large quantities of understory trees, or are considered a sensitive environment, such as a wooded wetland. The clearing techniques can range from large whole tree processors which can cause rutting and compaction of the forest floor to hand clearing with chainsaws in more sensitive environments. These activities are shown in Figures 9 and 10.

Figure 9 Whole Tree Processor Clearing

Figure 10 Hand Clearing Channel

Wisconsin statutes (Wis. Stat. § 182.017(7)(e)) state that all timber removed for construction of a high-voltage transmission line remains the property of the landowner. Thus, the landowner should discuss with the ROW agent at the time of easement negotiations the disposition of all timber to be cut. Larger timber might be stacked on the edge of the ROW for the owner. Smaller diameter limbs and branches are often chipped or burned. According to the landowner's wishes, wood chips may be spread on the ROW, piled to allow transport by the landowner to specific locations, or chipped directly into a truck and hauled off the ROW.

Forest Fragmentation

A transmission line ROW can fragment a larger forest block into smaller tracts. Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species, and catastrophic events. The continued fragmentation of a forest can cause a permanent reduction in species diversity and suitable habitat.

This loss of forested habitat increases the number of common (edge) plants and animals that can encroach into what was the forest interior. This encroachment can have impacts on the number, health, and survival of interior forest species, many of which are rare. Examples of edge species that can encroach into forest interiors via transmission ROWs include raccoons, cowbirds, crows, deer, and box elder trees. Interior forest species include songbirds, wolves, and hemlock trees.

Invasive Plants

The activities associated with tree clearing and constructing a transmission line through or along the edge of forested areas can destroy and degrade forest habitat. Seeds and other propagating parts of non-native plants may be carried into a forest inadvertently by construction equipment. Disturbance caused by construction can then encourage aggressive growth of these invasive species. Habitat providing food and cover for local wildlife may be altered or lost if these invasive species out-compete existing native plants, resulting in a loss of plant and animal diversity. Examples of problematic invasive species are buckthorn, honeysuckle, and garlic mustard.

Disease

Trimming and clearing oak trees at certain times of the year can also contribute to the spread of oak wilt disease. Red oak (*Quercus rubra*), black oak (*Quercus velutina*), and northern pin oak (*Quercus ellipsoidalis*) are especially susceptible to the disease and will often die within one year of infection. The cause of the disease is a fungus that is carried by sap-feeding beetles or spread through common

root systems. In the upper Midwest, pruning or removal of oaks should be avoided from late spring to midsummer, when the fungus most commonly produces spores.

Other Impacts

A cleared ROW increases access into a forest which may lead to trespassing and vandalism. It can also provide recreation opportunities such as access for hunting, hiking, and snowmobiling.

Mitigation of Impacts to Woodlands

Impacts to woodlands can be minimized by a variety of methods. Example methods include:

- Avoiding routes that fragment major forest blocks;
- Adjusting pole placement and span length to minimize the need for tree removal and trimming along forest edges;
- Allowing tree and shrub species that reach heights of 12 to 15 feet to grow within the ROW;
- Following the WDNR guidelines for preventing the spread of exotic invasive plant species and diseases such as oak wilt.

Community Planning

In prior decades, electric transmission lines were constructed from point A to point B in the most direct manner possible without too much regard for communities, crops, natural resources, or private property issues. As these older lines require improvements, they may now be rerouted to share corridors with roads, and to reduce or even avoid, where possible, community and natural resource impacts. At the same time, continued growth in energy usage will require new electric substations and transmission lines to be sited and constructed. New and upgraded electric facilities will impact many communities and many property owners.

To meet future growth, communities often draft plans for sewers, roads, and development districts, but few cities, towns, or counties include transmission lines in their plans. Transmission lines are costly to build and difficult to site. Cities, towns, and counties can help reduce land use conflicts by:

- Dedicating a strip of land along existing transmission corridors for potential future ROW expansions;
- Identifying future potential transmission corridors and substation sites in new developments;
- Defining set-backs or lot sizes for properties adjacent to transmission lines so that buildings don't constrain future use of the ROW.

Being an active participant in the decision-making process will improve the ability of communities to manage future growth and protect their resources.

The Role of the Public Service Commission

The PSCW regulates Wisconsin's utilities. A three-member board (the Commission) is appointed by the governor to make decisions for the agency based on analyses by a technical staff with a wide range of specialties.

The PSCW staff analyzes transmission line applications to see if the transmission lines, if the applicant's cost estimates are accurate, and to determine their potential social and natural resource impacts. The size and complexity of the proposed project determines the PSCW review process. The PSCW considers alternative sources of supply and alternative locations or routes, as well as the need, engineering, economics, safety, reliability, potential for individual hardships, and environmental factors when reviewing a transmission project.

An applicant must receive a Certificate of Pubic Convenience and Necessity (CPCN) from the Commission for transmission line projects that are either:

- 345 kV or greater; or,
- Less than 345 kV but greater than or equal to 100 kV, over one mile in length, and needing some new ROW.

The CPCN review process includes a public hearing in the affected project area.

Projects less than 100 kV and/or less than one mile long must receive from the Commission a Certificate of Authority (CA) if the project's cost is above a certain percent of the utility's annual revenue. The CA review process does not automatically include a public hearing. For those cases in which hearings are held, members of the public are encouraged to testify to their views and concerns about the project. Public comments are also solicited for new lower voltage transmission projects that do not require a public hearing.

The Commission is responsible for making the final decisions about proposed transmission lines. The Commission decides whether the line will be built, how it is to be designed, and where it will be located. If there is a hearing, the Commission reviews all hearing testimony from PSCW staff, the applicant, WDNR staff, full parties, and members of the public. The three Commissioners meet regularly in "open meetings" to decide cases before them. The public can observe any open meeting. At these open meetings, the Commission approves, denies, or modifies the proposed project. The Commission has the authority to order environmental protections or mitigation measures as a condition of construction.

The Public Service Commission of Wisconsin is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide natural gas, electricity, heat, steam, water and telecommunication services.

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What is concrete?

Concrete is a material made from cement, aggregates (rock and sand), water, and admixtures (chemicals that enhance or modify the properties of concrete). Concrete is one of the most widely used and versatile building products known to man.

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What is cement?

Cement, or Portland cement, is a dry powder made from limestone and other materials. It is burned in a kiln and then ground finely. Cement reacts chemically with water to cause concrete to harden. There are several different types of Portland cement, designated as Type I, Type II, etc.

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What is ready mix?

Ready mix, also known as ready mixed concrete, is a type of concrete that is delivered in trucks that agitate and/or mix the concrete on the way to the job or at the job site. The concrete is delivered in a plastic, unhardened state. The truck-mounted, revolving drum mixer was invented by Stephen Stepanian. Stepanian filed the first truck mixer patent application in 1916.

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SCHEDULE CEK-4

What is the difference between cement and concrete?

Cement is an ingredient in concrete. It is the ingredient that forms a paste with the water, sand, and admixtures and fills the space between the coarse aggregates (rock) and binds the rocks together. The term "cement" is commonly misused to refer to concrete.

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What is flyash?

Flyash is a byproduct of coal-burning power plants. When used properly in concrete, it improves the quality of the mix and saves money. Concrete with flyash will typically have a higher ultimate strength, although early strength will be lower than with straight cement. Sometimes users will complain about "too much flyash in the mix." That is rarely the problem. More often the problem is not enough cement in the mix.

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What do you do when concrete hardens in the truck?

First of all, you do everything you can to prevent that from happening. If it happens anyway, then you get inside the mixer drum with an air hammer and break it out. It is a difficult job and nobody likes to do it.

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How much does concrete weigh?

Normal weight concrete weighs about 4000 lb. per cubic yard. Lightweight concrete weighs about 3000 lb. per cubic yard.

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How much does a concrete truck weigh?

If a truck is carrying 10 cubic yards, then the weight of the concrete is 40,000 lb. The truck will weigh approximately 26,000 lb. for a total of 66,000 lb.

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What is finishing?

Finishing is the process used to create the surface texture of the completed concrete pour. Finishing involves several different steps. Depending on the type of surface desired, it can involve striking off, floating, edging, jointing, troweling, texturing, and curing.

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When is it too cold to place concrete?

It depends. Concrete will not set when the concrete temperature is below about 35F. Many times specifications will say something like "Concrete may not be poured when the temperature is 37F and falling." With heated water and aggregates, accelerating admixtures, and other methods, jobs can be poured below freezing, but it is more expensive. In most southern states there are so few freezing days that it is not worth it to try to pour when the temperature is below freezing.

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When is it too hot to place concrete?

It depends. High temperatures (90F and above) cause concrete to set faster. High temperatures also reduce the strength of concrete. Strong winds and low humidity can also cause problems with plastic shrinkage and drying shrinkage cracks, even at moderate temperatures. To avoid these problems, planning, timing of the finishing operations, proper use of retarding admixtures, and proper curing are necessary. More...

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Is there really a cement shortage?

Supplies of cement, the key ingredient in concrete, are sometimes very tight. Several factors are involved.

First, strong construction markets cause increased demand. If winter weather is good, there may be little opportunity to prepare a large inventory for spring construction activity.

Another factor is the availability of imported cement. The booming Asian economies are straining worldwide cement capacity and shipping availability. These conditions make imports of cement more expensive and difficult to acquire.

Regulations and a "build it anywhere not anywhere near anything" attitude have restricted increases in domestic production. Domestic plants have not kept up with the increased demand. In Texas, demand is much greater than the amount of cement produced in Texas.

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Where do your raw materials come from?

The cement comes from plants in Midlothian, Texas. The natural river sand we use comes from the Trinity River bottoms southeast of Dallas. Crushed limestone, the primary coarse aggregate we use, comes from quarries near Bridgeport, Texas.

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Why does my concrete job cost so much?

Concrete is the most versatile and economical building material in the world, but there are costs involved in doing the job properly. The cost of the concrete itself is a relatively small percentage of the overall job. Insurance, labor, benefits, materials, excavation, hauling, disposal, supervision, taxes, tools, and equipment are some of the expenses a contractor faces. If you receive a "cheap quote" it is probably because the contractor is not including all of these things. For example, they may not have insurance, which can be more expensive than the cost of the concrete. However, if they don't have insurance, the job could end up costing you many times the original quote.

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When can I drive on my new driveway?

It depends on many variables, two of which are mix design and temperature. If you need your driveway quickly, ask your supplier to provide a high early strength mix. Normal concrete will reach 1/3 of its ultimate strength in 3 days, 2/3 in 7 days. Ideally, you should wait 7 days, however that is not always possible. Some high early strength concrete mixes can be driven on in 24 hours or less.

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Does concrete hurt the environment?

Actually, concrete construction is environmentally friendly. Concrete is energy efficient. Concrete contains recycled materials. Concrete reduces urban heat islands. Concrete is manufactured locally. Concrete structures are durable. Concrete pavements can be recycled. The raw materials used in concrete come from the most abundant minerals on earth.

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What are those orange spots on my sidewalk?

It may be fertilizer. Some fertilizer includes iron, and when the granules get wet on the concrete they leave rust spots. Fortunately, the effect is temporary.

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Can I put a topping on my concrete floor?

It depends. Keep in mind that any cracks in the underlying surface will probably be reflected in the new surface. For thin overlays up to 2 inches, polymer-based overlay cement products should be used. One product is good for applications in the 0- to 1/8-inch category, another for up to 1/2 inch, and another for 2-inch-thick applications. Polymer cement products have good flexural and tensile strength ratings and are much more crack-resistant. They also have much higher compressive strengths than regular concrete.

For toppings of 2 or more inches, a very rough profile on the existing floor is needed. Shotblasting or chipping will give the new floor a surface to bond to. The day before you place concrete, wet down the surface and keep it wet until you place concrete but don't have any standing water on the slab during placement. For bonding, use a 50% mix of portland cement and sand slurry. You can use a 50% mix of water and latex bonding agent (like Acryl 60) to make the slurry. Squeegee or sweep with a stiff broom the slurry into the existing floor just ahead of concrete placement. The slurry must not dry before concrete is placed over it. Consult your ready mix supplier for the proper concrete mix to use for topping.
Source: *Concrete Construction,* February 2003

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AGRICULTURAL IMPACT STATEMENT

American Transmission Company, LLC
Rockdale – West Middleton Transmission Line
Dane County

Wisconsin Department of Agriculture,
Trade and Consumer Protection
DATCP #3487

Publication Date: March 2009

Agricultural Impact Statement

Wisconsin Department of Agriculture,
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Agricultural Impact Statement

American Transmission Company, LLC
Rockdale to West Middleton 345 kV Transmission Line
Dane County
PSC Docket # 137-CE-147

INTRODUCTION

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) has prepared this agricultural impact statement (AIS) in accordance with §32.035, *Wisconsin Statutes*. The AIS is an informational and advisory document that describes and analyzes the potential effects of the project on farm operations and agricultural resources, but cannot stop a project.

The DATCP is required to prepare an AIS when the actual or potential exercise of eminent domain powers involves an acquisition of interest in more than 5 acres of land from any farm operation[1]. The DATCP may choose to prepare an AIS if an acquisition of 5 or fewer acres will have a significant impact on a farm operation. Significant impacts could include the acquisition of buildings, the acquisition of land used to grow high-value crops, or the severance of land. The DATCP should be notified of such projects regardless of whether the proposing agency intends to use its condemnation authority in the acquisition of project lands. The proposing agency may not negotiate with or make a jurisdictional offer to a landowner until 30 days after the AIS is published.

The DATCP is not involved in determining whether or not eminent domain powers will be used or the amount of compensation to be paid for the acquisition of any property. The AIS reflects the general objectives of the DATCP in its recognition of the importance of conserving important agricultural resources and maintaining a healthy rural economy.

Sources of information used to prepare this statement include the *Wisconsin 2007 Agricultural Statistics* and other yearly issues; the *2002 and 1997 Census of Agriculture*; the *Dane County Farmland Preservation Plan*; the *Soil Survey of Dane County*; the *Joint Application for Certificate of Public Convenience and Necessity and Utility Permit Application: Rockdale to West Middleton 345 kV Transmission Line Project, October, 2007;*. The *Draft Environmental Statement Rockdale to West Middleton Transmission Project*; the Public Service Commission of Wisconsin, the Dane County Land Conservation Department; the American Transmission Company, and selected farmland owners potentially affected under each route.

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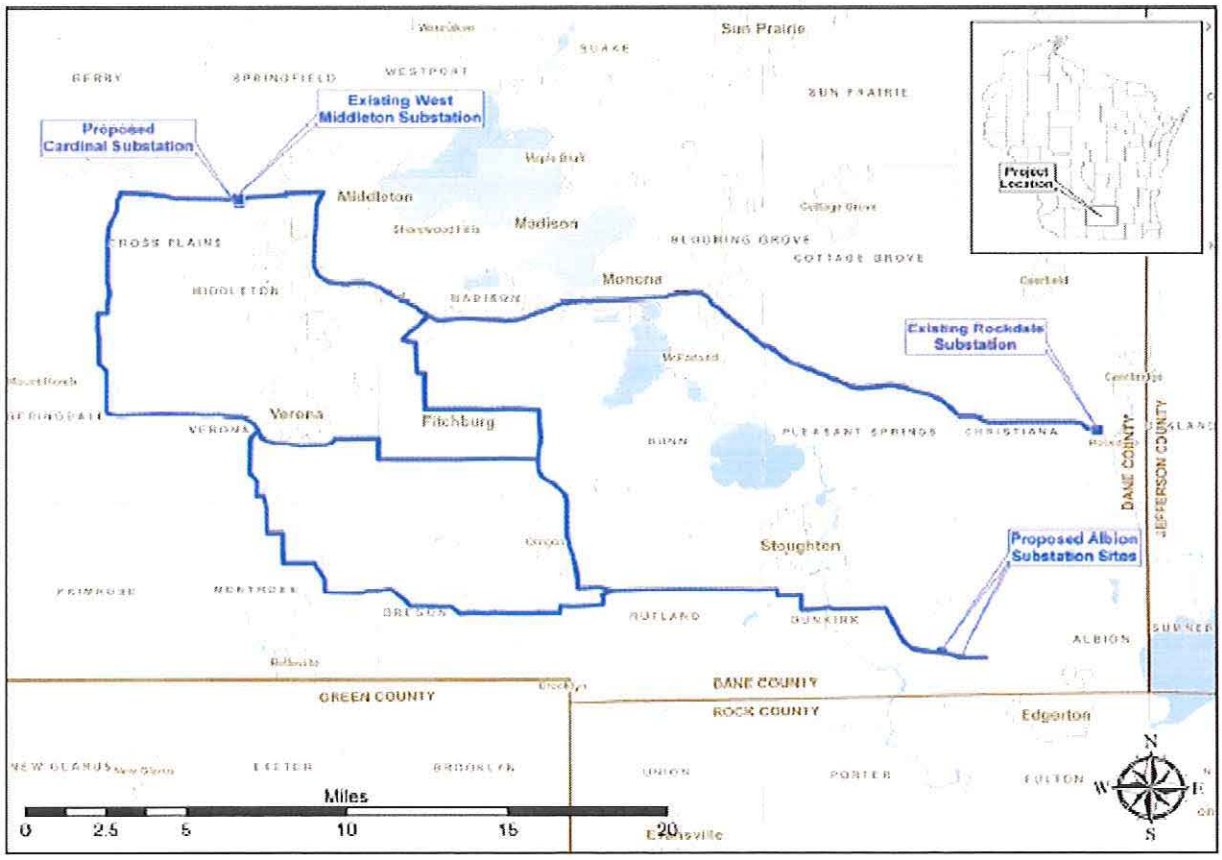
[1]The term *farm operation* includes all owned and rented parcels of land; buildings and equipment; livestock; and personnel used by an individual, partnership, or corporation under single management to produce agricultural commodities.

Project Location Map

(Source: Public Service Commission)



PROJECT DESCRIPTION

The American Transmission Company (ATC) proposes to construct a new 345 kilovolt (kV) transmission line connecting northwest and southeast Dane County. The new line would run between a proposed new Cardinal Substation in the town of Middleton and either an existing Rockdale Substation in the town of Christiana or a new Albion Substation to be located either in the town of Albion or the town of Dunkirk. Depending on the route and the southeast terminus chosen, the length of the new 345 kV line would be from 32 to 55 miles.

The Public Service Commission of Wisconsin (PSC) is evaluating four main routes for the proposed transmission line:

- The Rockdale-Beltline Route (Segments A, B, H, O)
- The Albion-Southwestern Route (Segments Q, E2, G, N)
- The Albion- Fitchwestern Route (Segments Q, E2, F, M, N)
- The Albion-Fitchbeltline Route (Segments Q, E2, F, P, K2, L, O)

OVERVIEW OF PROPOSED PROJECT SEGMENTS

The **Rockdale to Beltline** route goes through the town of Middleton, city of Middleton, city of Madison, town of Madison, city of Monona, town of Blooming Grove, town of Cottage Grove, town of Pleasant Springs, and town of Christiana. It runs from the Cardinal substation site parallel to and south of an existing double-circuit 69 kV line nearly to Pinehurst Drive and then crosses to the north side of U.S. Highway (USH) 14, following it east to its intersection with the Beltline. It continues on the south or west side of the Beltline highway east to its intersection with Verona Road, where it follows the south side of the Beltline east until the intersection with Interstate Highway (IH) 39/90. From there it follows the interstate southeast until it intersects an existing double-circuit 138 kV line, which it then parallels until it reaches the Rockdale substation. The route length is about 32.1 miles.

The **Albion - Southwestern** route goes through the towns of Middleton, Cross Plains, Springdale, and Verona; the city of Verona; and the towns of Montrose, Oregon, Rutland, Dunkirk, and Albion. It runs west from the proposed Cardinal Substation into the town of Cross Plains, paralleling an existing 69 kV line to a point about 600 feet west of Cleveland Road, where it then parallels the railroad for awhile, then running cross country to a point 1400 feet west of North Birch Trail.

Then it follows Stagecoach Road and an existing 69 kV line (#6927) before turning south prior to Dahmen Pass and roughly paralleling CTH "P" into the town of Springdale until it connects with USH 18, where it follows an existing 69kV line (#Y136) along the highway east to Military Ridge Trail and the Chicago and Northwestern RR in the town of Verona. It then runs cross-country southeast, re-crossing Military Ridge Trail, and heading cross country south into the town of Montrose, running along a section of Paoli Road, heading south again, then running east again along a section of Gaffney Road until it intersects an existing 69 kV line, where it heads south paralleling that line.

At the intersection with State Trunk Highway (STH) 59, it turns east cross-country into the town of Oregon, paralleling Tipperary Road, then heading southeast and then straight east into the town of Rutland, where it heads northeast, and then east, cross country into the town of Dunkirk. Upon intersecting the Wisconsin and Southern railroad in the town of Dunkirk, it follows the railroad right-of-way and an existing 69 kV line southeast until it reaches the Albion substation site. The route is about 47.4 miles long.

The **Albion – Fitchbeltline** route runs through the town of Middleton, city of Middleton, city of Madison, town of Madison, city of Fitchburg, town and village of Oregon, town of Rutland, town of Dunkirk, and the town of Albion. It utilizes the USH 14-Beltline Connector. It runs from the Cardinal substation site parallel to and south of an existing double-circuit 69 kV line nearly to Pinehurst Drive and then crosses to the north side of USH 14, following it east to its intersection with the Beltline.

It continues on the south or west side of the Beltline highway east to its intersection with Verona Road, where it heads south following Verona Rd. to Williamsburg Way. There it goes east until it reaches an existing 69 kV line and south following existing utility lines to Fitchburg substation. From there is follows an existing double-circuit line until it connects with USH 14 and follows it south near the western boundary of the town of Dunn into the town of Rutland

until it intersects the Wisconsin and Southern railroad. From there it follows the railroad and existing 69 kV line southeast until it reaches the Albion substation. This route is about 37.9 miles long.

The **Albion-Fitchwestern** route goes through the towns of Middleton, Cross Plains, Springdale, and Verona; the cities of Verona and Fitchburg; the town and village of Oregon; and the towns of Rutland, Dunkirk, and Albion. It runs west from the proposed Cardinal Substation into the town of Cross Plains, paralleling an existing 69 kV line to a point about 600 feet west of Cleveland Road, where it then parallels the railroad for awhile, then running cross country to a point 1400 feet west of North Birch trail. Then it follows Stagecoach Road and an existing 69 kV line before turning south prior to Dahmen Pass and roughly paralleling CTH "P" into the town of Springdale until it connects with USH 18, where it follows an existing 69kV line along the highway east to Military Ridge Trail and the Chicago and Northwestern RR in the town of Verona.

Where the Chicago and Northwestern RR intersects USH 18, it follows US 18 to the intersection with STH 69. From there, it runs east along USH 18/151 to a point ¼ mile south of Whalen Rd. where it turns east and continues cross-country to Fitchrona Road. There it continues south to an existing 69 kV line, which it follows east along Adams Rd. to the intersection with USH 14. It continues south along US 14 and the existing 69 kV line to just south of Oak Hill Road. From there, it turns east and goes cross country into the towns of Albion and Dunkirk where it intersects the Wisconsin and Southern Railroad and then follows the railroad and existing 69 kV line southeast until it reaches the Albion substation. This route is about 45.8 miles long.

CURRENT AND PLANNED TRANSMISSION STRUCTURES AND LINES

Rockdale to Beltline Route (Segments A, B, H, O)

The new 345 kV transmission line would utilize mainly single-circuit, single pole structures. Exceptions include 0.19 miles of triple-circuit structures needed near Mineral Point Road and 0.34 miles of double-circuit structures needed near the IH 39/90 interchange with USH 12/18 to accommodate existing structures. These exceptions are in Segment O.

Table 1 - Rockdale-Beltline Route Distribution and Transmission Line Structures

Segment # (length in miles)	Current and Planned Structures	Current Lines	Proposed Lines
A (4.51miles)	Replace 8 double-circuit towers with single-pole steel structures; 1 existing tower will be relocated; relocate 1000 ft. of distribution line underground on south side of Koshkonong Rd.	138 kV line X59 & Line G-13HR21	345 kV line
B (9.28 miles)	Replace 1,800 feet of 138 kV line #X83 with four double circuit structures south of I-39/90 and USH 12/18; relocate 3,100 ft. of distribution line underground on west side of I-90 from CTH "AB" to Skiggelkow Rd.	138 kV line #X83	345 kV line
H (8.99 miles)	Relocate 1,800 ft. of distribution line underground on south side of Beltline highway on west side of interchange with USH 14, and 300 ft. on south side of Beltline east of John Nolan Drive interchange		345 kV line
O (9.36 miles)	One span of 69 kV line (#6963) would be undergrounded; three double circuit 69 kV structures would be replaced with triple-circuit structures for 1,000 ft. south of Mineral Point Rd.; 1000 ft. of distribution line along the north side of USH 14 from Deming Way to Eagle Drive would be relocated underground; 5000 ft. of distribution line on west side of US 12/14 from Mineral Point Rd. north to W. Old Sauk Rd. would be relocated underground; 1000 ft. of distribution line on west side of USH 12/14 south of Mineral Point Rd. would be placed underground	Three 69 kV lines: #6963, #6997, and #6998	345 k1V line

Source: ATC Application, October 2007, pp.23-31; pp.48-49

Albion Southwestern Route (Segments N, G, E2, Q)

The new 345 kV line would involve mainly single-circuit single-pole structures. However, to accommodate existing lines, about 43 double-circuit structures would be needed along Segment N, about seven double circuit structures along Segment G, and about 19 triple circuit structures along Segment Q.

Table 2 - Albion Southwestern Route Distribution and Transmission Line Structures

Segment # (length in miles)	Current and Planned Structures	Current Lines	Proposed Lines
N (16.98 miles)	Replace 6.3 miles of existing lines on 43 common double-circuit structures; relocate 6,400 ft. of distribution line underground on north side of US 18 from CTH "J" to where 345 kV lines turn north; relocate 4200 ft. distribution line underground on north side of Stage Coach Rd.; relocate 1,400 ft. of distribution line underground on south side of US 14 east of Rocky Dell Rd.	69 kV lines #6927 and Y136	345 kV line
G (17.44 miles)	Replace one mile of 69 kV line #Y42 with about 7 common double-circuit structure; relocate 2,800 ft. of distribution line underground on south side of Gaffney Rd.; relocate 300 ft. of distribution line underground on west side of STH 69; relocate 1,800 ft. of distribution line underground on west side of US 14.	69 kV line #Y42	345 kV line
E2 (9.28 miles)			345 kV line
Q (3.96 miles)	Replace 3.1 miles of existing line with 19 or more common double-circuit steel structures	69 kV line #Y12	345 kV line

Source: ATC Application; October 2007; pp.23-31; pp. 48-49

Albion-Fitchwestern Route (Segments N, M, F, E2, Q)

The new 345 kV line would involve mainly single-circuit single-pole structures. However, to accommodate existing lines, about 43 double-circuit structures would be needed along Segment N, about 7 double circuit structures along Segment G, and about 19 triple circuit structures along Segment Q. Some H-frames would be needed near Verona Airport due to height restrictions.

Table 3 - Fitchwestern Route Distribution and Transmission Line Structures

Segment # (length in miles)	Current and Planned Structures	Current Lines	Proposed Lines
N (16.98 miles)	Replace 6.3 miles of existing lines on 43 common double circuit structures; relocate 6,600 ft. of distribution line underground on north side of US 18 from CTH "J" to where 345 kV lines turn north; relocate 4200 ft. distribution line underground on north side of Stage Coach Rd.; relocate 1,400 ft. of distribution line underground on south side of US 14 east of Rocky Dell Rd.	69 kV lines #6927 and Y136	345 kV line
M (9.79 miles)	Replace 69 kV lines Y136 and Y119 with about 25 double-circuit steel pole; replace 69 kV line Y119 and kV line X91 with about 17 triple-circuit steel poles; relocate 3,900 ft. of distribution line underground on east side of Fitchrona Rd.; relocate 3,300 ft. of distribution line underground on south side of US 18 near Verona substation west; relocate 1.9 miles of distribution line underground on south side of Adams Rd. Some H-frames would be used near Verona Airport due to height restrictions.	69 kV lines Y136 and Y119; 138 kV line X91	345 kV line
F (5.83 miles)	Replace 69 kV lines #Y119 and Y127 with 21 common double-circuit structures and 3 triple-circuit structures; relocate 3 miles of distribution line underbuild underground from existing line Y119; relocate 2,500 ft. of distribution line underground on east side of US 14 from intersection of STH 138 north	69 kV lines #Y119 and #Y127	345 kV line
E2 (9.28 miles)			345 kV line
Q (3.96 miles)	Replace 3.1 miles of existing line with at least 19 common double-circuit steel structures	69 kV line #Y12	345 kV line

Source: ATC Application, October 2007, pp.23-31; pp.48-49

Albion – Fitchbeltline Route (Segments O, L, K2, P, F, E2, Q)

The new 345 kV transmission line would utilize mainly single-circuit, single pole structures. Exceptions include .19 miles of triple-circuit structures needed near Mineral Point Rd. and .34 miles of double-circuit structures needed near the I-39/90 interchange with US 12/18 to accommodate existing structures. These exceptions are in Segment O. About 19 triple-circuit structures would be needed in Segment Q.

Table 4 - Albion - Fitchbeltline Route Distribution and Transmission Line Structures

Segment # (length in miles)	Current and Planned Structures	Current Lines	Proposed Lines
O (9.36 miles)	One span of 69 kV line (#6963) would be undergrounded; three double circuit 69 kV structures would be replaced with triple-circuit structures for 1,000 ft. south of Mineral Point Rd. ; 1000 ft. of distribution line along the north side of US 14 from Deming Was to Eagle Drive would be relocated underground; 5000 ft. of distribution line on west side of US 12/14 from Mineral Point Rd. north to W. Old Sauk Rd. would be relocated underground; 1000 ft. of distribution line on west side of US 12/14 south of Mineral Point Rd. would be placed underground	Three 69 kV lines: #6963, #6997, and #6998	345 kV line
L (2.17 miles)	Replace line #6956 structures with common double circuit structures north of Fitchburg substation; relocate 3,400 ft. of distribution line underground on west side of Verona Rd. between Williamsburg Way and the north side of Raymond Rd.; relocate 2,700 ft. of distribution line underground from McKee Rd. along existing 69 kV corridor	69 kV line #6956 on north	345 kV line
K2 (5.5 miles)	Relocate existing double circuit lines #13857 and #13858; a new single pole single-circuit structure will be used for new 345 kV line	138 kV lines #13857/13858	345 kV line
P (1.77 miles)			345 kV line
F (5.83 miles)	Replace 69 kV lines #Y119 and Y127 with 21 common double-circuit structures and 3 triple-circuit structures; relocate 3 miles of distribution line underbuild underground from existing line Y119; relocate 2,500 ft. of distribution line underground on east side of US 14 from intersection of STH 138 north	69 kV lines #Y119 and #Y127	345 kV line
E2 (9.28 miles)			345 kV line
Q (3.96 miles)	Replace 3.1 miles of existing line with at least 19 common double-circuit steel structures	69 kV line #Y12	345 kV line
Source: ATC Application, October 2007, pp.23-31; pp.48-49			

PROJECT NEED

ATC is seeking approval from the PSC to construct the Rockdale to West Middleton transmission line to address projected reliability risks posed by the existing system. These risks, according to ATC, are due predominantly to three factors:

- Growing demand for electricity in Dane County
- A shortage of electrical generation capacity in Dane County; and
- Limitations to the existing transmission system to import electricity to Dane County

ATC demand estimates are based on projections provided by the local utilities they serve and electric demand forecasts made by Clearspring Energy Advisors. Both sources indicated that projected demand justifies the need for the project.

In its Application to the Public Service Commission of Wisconsin for the Rockdale to West Middleton Project, ATC indicates that the project is needed to assure reliable transmission service to local distribution company customers in Dane County, given "higher than average electric load growth in Dane County." (p.2)

> "Load growth in the area is higher than ATC system average load growth due primarily to suburban expansion in the Madison metropolitan area. Load in Dane County is projected to continue to increase rapidly. Based on an independent forecast of peak demand growth performed by Clearspring Energy Advisors, ATC determined that an annual growth rate range of 2% to 3.6% is reasonable for planning purposes through 2020. Due to these factors several transmission facilities in the area are expected to experience periods of overloads, low voltages and voltage collapse conditions under certain contingency situations."
>
> "In recent years, power imports into Dane County have been in the range of 40% to 100%. In other words, less than half of the power consumed in Dane County is generated in the county. There is a significant mismatch between load at peak and Dane County generation (currently, approximately 1,100 to 1,200 MW vs. 878 MW). This mismatch will increase by 2020 (approximately 1,689 to 1,869 MW vs. 788 MW). In addition, there is no new generation planned in the Dane County area, and Madison Gas and Electric Company (MGE) has publicly announced plans to stop burning coal and to retire three units at its Blount facility in 2011. This would result in the reduction of 90 MW in generation capacity at Blount. Recently completed ATC transmission system improvements, along with the West campus cogeneration project, are projected to support the delivery of reliable transmission service only to 2011 before problems begin to develop." (Ibid.)

ATC notes that despite Dane County's heavy reliance on imported power, there are currently only two major paths for such importing which leaves the transmission line system vulnerable to common mode failures (i.e. the loss of a single structure which holds two or more high-capacity lines). The area's 138 kV transmission system is now supplied from only two 345 kV sources, the Rockdale and North Madison substations. The proposed project would add a new

interconnection point in West Middleton for the existing 138 kV transmission system to access ATC's 345 kV system.

Project critics have argued that the need for the proposed transmission line should be reassessed based more recent demand forecasts; that the data used to estimate future demand may be overstated when viewed of in the light of current economic conditions. Projections based on historical trends may be flawed due to major shifts in current and future trends. Such shifts could include onset of peak oil, the significant loss of asset values due to the mortgage loan crisis, the devaluation of the dollar, the unfavorable U.S. balance of trade, declining consumer demand, and possible deepening to a global recession.

In response to this criticism, ATC updated its load forecasts and provided additional information about electrical imports to the County. Based on this January 9, 2009 information, the PSC concluded that effects of the recession are unclear and may be short term, peak demand is highly weather dependent, and statewide economic trends may not represent Dane County conditions.

The Final Environmental Impact Statement (FEIS) for the projects states, "Given the strong analysis on the primary household and population growth that is driving energy and demand growth Dane County, the overall analysis is directionally sound." For a more detailed discussion of this issue, see *Rockdale to West Middleton Transmission Line FEIS*, Section 2.8.1 (pg. 32).

FARMLAND OWNER COMMENTS

DATCP surveyed a sample of farmland owners on each segment to assess their concerns regarding the possible impacts the proposed transmission line could have their farm operation. This section summarizes their comments.

Segment A

Duane and Dorothy Skaar:

The proposed line would parallel an existing 138 kV line as well as an existing gas pipeline. The Skaars grow corn and soybeans and the land that would be affected by the transmission line is mostly cropland. Currently, there are no drainage tiles on this land, but Mr. Skaar has been considering putting some in. He doesn't have any formal plans for installing tiling at this time. He indicated that the existing transmission line does not generally interfere with the working of this land. He was disappointed with the large number of rocks that were left after the gas pipeline was installed several years ago. Pipeline company representatives promised that they would be removed, but instead, they were driven further into the ground. It took several years to get them all picked. One concern Mr. Skaar has about the proposed power line is its potential to lower the value of his land. He does not have any livestock except a few horses and they are not located near the line. In addition, manure is not spread on his cropland.

DATCP Comment:

The wet soils on the property are the Sable silty clay loam (SaA) with the water table at 0 – 1 foot below the soil surface and the Elburn silt loam, gravelly substratum (EgA) with the water table at 1 – 3 feet below the soil surface. Both soils respond very well to installation of tile drainage systems. The Sable soil, when drained, becomes one of Dane County's best producing soils. The outlet for the drainage system is a ditch (channel) going to the northeast. Higher land between the wet areas and the channel may require a pumping plant or a deep trench for the tile outlet.

The rock problem as a result of the pipeline construction can reoccur if the spoil / parent material removed during the construction of the caisson is not hauled away. The Plano soil has a gravelly substratum with large fragments. There is no need for this problem to happen.

Vasby Farms, Inc. (Lowell Vasby):

Vasby Farms, Inc. is a cash crop operation that grows corn and soybeans. Lowell Vasby indicated that all of the land that would be affected by the new power line is cropland. This land has drainage tiling and one grassed waterway that might be affected by the project. Mr. Vasby indicated that there are two lattice towers supporting the existing 138 kV transmission line. He said that ATC is considering removing the existing towers and replacing them with single-pole structures. He indicated that these would be easier to work around and he would prefer them. This farm does not have any livestock and no manure is spread on the land that would be affected by the project. This farm has a grain elevator, but it is not located near the proposed transmission line. In general, he would prefer not to have the new or existing lines because they interfere with field work, but he feels the power is needed.

DATCP Comment:

The wet soils are the Elburn silt loam (EfB) with a water table at 1-3 feet below the soil surface and the Sable silty clay loam with a water table at 0-1 feet below the soil surface. Both soils respond very well to installation of tile drainage systems. The Sable soil, when drained, becomes one of Dane County's best producing soils. The outlet for the drainage system is a ditch (channel) going to the northeast. The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

The cross-section and profile (slope) of the waterway can be repaired. If a tile line has been placed along the waterway to provide firm soil for crossing the waterway with equipment, it will need to be checked for damage by construction equipment.

Segment B

David Smithback:

The Smithback farm is a cash crop operation that produces corn, soybeans, wheat, and tobacco. The proposed line would affect cropland, wetland, wildlife habitat, and a small amount of woodland. The project would also pass about 90 feet from Mr. Smithback's house near where Segments A and B meet. ATC told him that the line might be moved closer to Highway "W" to move it further away from his house. There is tiling on the affected cropland. This farm does not have any livestock and no manure is spread on the cropland.

Segment B will affect land that is enrolwled in the Conservation Reserve Program (CRP) and Mr. Smithback is concerned that he may be responsible for the repayment of money he has received from the program or that the power line may change the eligibility of the remaining land for the program. Mr. Smithback would be required to report to the NRCS any poles that would be located on property enrolled in CRP. CRP contracts would need to be revised to reflect the area occupied by the pole. This area would need to be removed from the contract. A minimum of one-tenth of an acre for each pole would need to be removed. All moneys received on that area would need to be repaid. Repayments would include annual rental payments, cost-share payments, signing incentives, practice incentives, CR 23, and liquidated damages.

He indicated that the Fish and Wildlife Service helped him establish two wildlife scrapes on his property and they may be adversely affected by this project. There is also a cell phone tower on his land that is owned by SBA Towers. He is concerned that if the transmission line interferes with reception, he may be left with an abandoned tower that will not generate any rent and that he will be responsible for demolishing. The line may also affect a small parcel of woodland where a historic oxen trail is still visible. Mr. Smithback said that ATC has indicated that they would like to construct the line where the existing Interstate Highway fence runs now. This will have the least impact on his cropland, but he is concerned that this may not accommodate the expansion of the interstate to six lanes. He said that the project would affect wetland on his property and he is willing to allow ATC to reroute the line on his land to avoid this wetland. The owner of a billboard on the Smithback property already removed the sign in anticipation of the highway expansion and construction of the new power line.

DATCP Comment:

The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

Roger Juvi:

Mr. and Mrs. Juvi alternate between growing hay and corn on their farm. The proposed project would affect cropland as well as land that used to be used for hay, but is now left fallow. This fallow land is on a steep hill. Periodically, the Juvi's raise beef cattle. The affected land is not

tiled and no manure is spread on it. Mr. Juvi did not express any concerns about the project or its impacts on his land.

Segment E2

Jeffrey Alme

Mr. Alme grows corn, soybeans, and tobacco. All of the land that would be affected by the proposed project is cropland. He no longer raises any livestock and no manure is spread on his cropland. The line may be close to an existing grassed waterway, but it would not affect any fencing. Mr. Alme is very concerned about the line being close to his house and farm buildings. He indicated that the project would be about 15 feet from one building and 30 feet from another. He also indicated that his silos would be about 40 feet from the project and they are 60 to 65 feet tall. Mr. Alme is concerned about the safety of being so close to a transmission line. He doesn't have any cattle now, but he is concerned that having the line so close to his buildings would cause health problems for cattle if he ever decided to raise any in the future. He indicated that his cousins David and John Alme own the land on the opposite side of the proposed line from him. Their buildings would be further away from the line, but they currently raise cattle. Mr. Alme does not want the line on his land.

Gunder Hjortland, Jr.

Mr. Hjortland grows corn and soybeans on his land and he doesn't raise any livestock. His land is just north of his brother Sydney's land, which may also be affected. Gunder Hjortland indicated that the line would only affect cropland on his farm and that it would pass through the middle of his fields. No manure is spread on this land. Mr. Hjortland does not want the line on his land.

Scott Klongland:

Mr. Klongland grows corn and does not raise any livestock on his farm. The proposed line would affect cropland and a wooded fence line. Because of changes that ATC keeps making in the location of the route, Mr. Klongland isn't sure if he would have to have 60 feet of right-of-way or all 120 feet of right-of-way on his property. The line would not affect tiling or waterways and no manure is spread on this land. There is an old barbed wire fence in the fence line. Mr. Klongland does not want this line on his land and he thinks it should follow existing corridors as the state statute recommends. Mr. Klongland is concerned that the line would detract from future plans for his property.

The wooded fence line will probably be cleared of all woody vegetation.

Doris Gallagher:

Mr. and Mrs. Gallagher rent their land to a farmer who grows corn and soybeans. All of the land that would be affected by the project is cropland. The affected land is tiled and manure is not spread on this land. The line would pass through the middle of the Gallagher's' fields and Doris

Gallagher is concerned that the line might be close to the buildings. It appear that four poles would be located the Gallagher parcels. All of the affected property is in enrolled in the Farmland Preservation Program. Ms. Gallagher stated that she does not want the transmission line on her land.

DATCP Comment:

Wet soils are the Sable silty clay loam (SaA) with a water table at 0-1 foot below the soil surface, Virgil silt loam (VwA) with a water table at 1-3 feet, and Wacousta silty clay loam (Wa) with a water table at 0-1 feet. These soils respond very well to the installation of a tile drainage system. The Sable soil, when drained, becomes one of Dane County's best producing soils. The outlet for the system is the Oregon Branch (ditch) connected to the Badfish Creek. This farm may be in the Dane County Badfish Creek Drainage District which is legal special use district (Ch. 88, Wisc. Stats)

The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

Furseth Farms, Inc. (Daniel Furseth):

Daniel Furseth farms with his brothers as Furseth Farms, Inc. This operation supports five families. They grow corn, soybeans, and alfalfa, and they run a 200-cow dairy operation. Mr. Furseth indicated that the proposed line would cross about 1.5 miles of the land he farms and rents. This land is all cropland. It has drainage tiling and manure is spread on it. Mr. Furseth does not want the line on his land, but if it is constructed there he would prefer to have it run along the fence line rather than go through the middle of fields. The Furseths previously bought some adjacent Halverson property on Lake Kegonza Road so that they could remove the fence line and farm a larger parcel. This project would interfere with those plans. Daniel Furseth said that it is becoming more and more difficult to expand in this area. He is also concerned that the line would increase the risk of cancer for people living and working near it. He indicated that he and his brothers want to continue farming, but if they have to sell land for development, the best parcel for houses would be on Lake Kegonza Road right where the line is proposed to go. He doesn't believe anyone would want to buy land or live next to the line.

DATCP Comment:

Wet soils are the Sable silty clay loam (SaA) with a water table at 0-1 foot below the soil surface, and Radford silt loam (RaA) with a water table at 1-3 feet below the soil surface. These soils respond very well to the installation of a tile drainage system. The Sable soil, when drained, becomes one of Dane County's best producing soils. The outlet for the system is into the Badfish Creek. This farm may be in the Dane County Badfish Creek Drainage District which is legal special use district (Ch. 88, Wisc. Stats)

The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

Segment F

Michael U'ren:

Mr. U'ren indicated that most of the land that would be affected by the project is cropland. Some woodland and wetland would also be affected. He rents his cropland to a neighbor who grows corn, soybeans, and wheat in rotation. The ditches along Highway 14 act as waterways for the cropland. Mr. U'ren indicated that there is an existing power line on his property that travels in an east/west direction across his land. It is on single poles. He is not aware of any problems the renter has maneuvering around these structures. The only concern that Mr. U'ren identified for this project is the possibility of stray voltage. He said that a representative from a cellular phone company called him about constructing a tower on his land. He told the representative about the potential power line project and he hasn't had any follow-up from the company, so he doesn't know if the power line would interfere with the operation of a cell phone tower. Mr. U'ren's property may also be affected by Segment P.

Stanley Mabie:

Stanley's father did not want to comment on the project. He said that Stanley is a truck driver and difficult to get in touch with.

Elmer Fosso, Jr.:

Mr. Fosso owns 79 acres of land that includes 72 acres of cropland that he rents out. The Fosso land is currently for sale. The project will affect cropland along the southern boundary of the Fosso land. There is a fence along this boundary, but the affected cropland does not have any drainage tiling and the renter does not spread manure on it. The renter grows corn and soybeans. Mr. Fosso is concerned that the project might affect the value of his property and make it more difficult to sell than it already is. The existing zoning would allow him to split this land with a possibility of constructing three houses.

Segment G

Erwin Sholts:

Mr. Sholts owns 100 acres of land that is mostly cropland with some pasture. He rents the cropland to a neighbor who grows corn, soybeans, wheat, and alfalfa. The western part of his cropland has grassed waterways and manure is spread on the cropland. He said that where the line will cross his property it will affect about 1,980 feet of old fencing. If the line has to be built on his land, Mr. Sholts would prefer to see it about 400 feet south of its proposed location. This would put it on his poorer quality land and it would move the line away from houses west of his property.

The old fence line has grown up to woody vegetation (tree / brush) that will be cleared. Walnut trees are probably not an issue because there is no mention of livestock.

Helmut and Ruth Jeschke:

The proposed project will affect only cropland on the Jeschke farm. They grow soybeans, corn, oats, and alfalfa, and they raise steers. The project may affect a waterway and the owners spread manure on their cropland. It would also affect fencing, but the fencing is not used except for the line fencing between the Jeschke's and their neighbor's land. Ruth Jeschke indicated that the project would go through the middle of their land and they would rather not have it.

Robert Stuessy Trust (Sally Stuessy):

Robert passed away in 2007 and his wife Sally and their two sons run the farm, which has been in the family over 100 years. The original route that was proposed to cross the Stuessy land would have come very close to the farm buildings. ATC developed a revised route that moved the line further away from the buildings, which Sally Stuessy likes better. The project would affect mostly cropland and manure is spread on this land. The Stuessys grow corn, soybeans, wheat, and alfalfa. They also have a 105-cow stanchion dairy barn that is not completely full at the moment and they raise steers and hogs. Mrs. Stuessy is very concerned that the project would make it very difficult to move large farm machinery around the poles and under the wires. She has heard that during hot summer months, the wires could sag as much as 40 feet, which would add to the safety concerns of working around the transmission lines with large equipment. She is concerned that the support structures and wires might also be an insurance liability for the farm in terms of the workers that are hired.

The project would also pass near the barn, grain bins, and other farm buildings. The cropland is not irrigated now, but that is an option that they are considering and the proposed line might interfere with the use of irrigation equipment. The line passes diagonally through the middle of the farm. There is a grassed waterway in back of the yard behind the barn. Manure is spread on the cropland. They use farm lanes on their land to avoid driving on public roads and Mrs. Stuessy is concerned that the line might interfere with the use of these lanes and force them to drive on local roads. The Stuessys want to continue farming and they have never sold any of their land for development. Mrs. Stuessy is very concerned that the proposed project might put their farm out of business. She would rather not have the line on her land, but she does not wish it on anyone else either.

Thomas Duerst:

Most of the Duerst property that would be affected by the project is cropland. Mr. Duerst grows winter wheat, corn, soybeans, alfalfa, and pasture grass for hay. He also runs a dairy operation. The affected land has both tiling and grassed waterways, and it is spread with manure. Mr. Duerst indicated that the project might affect fencing and it might affect access to his land depending on the final location of the line and poles. He is most concerned about the potential loss in value of his property and the potential for the line to inhibit expansion of his operation.

He would rather see the line constructed along the Beltline route, but he expects that the southern route will be selected because fewer people will be affected; therefore, there is less opposition from residents along the southern route.

David Dunn:

Mr. Dunn runs a dairy operation and he grows corn, oats, and alfalfa as well as some wheat and soybeans. He indicated that if the project follows the proposed route through his property, it would go right through the middle of his cropland. If it must be built on his land, he would prefer to see it follow one of the property lines. Manure is spread on this cropland, but there are no grassed waterways or drainage tiles.

Segment K2

Mr. and Mrs. Herbert Haas:
The proposed project would affect cropland, woodland, and pasture on the Haas property. They rent the land to their son who grows corn, soybeans, and wheat. It would affect fencing and there is a waterway on the affected cropland. They spread manure on the cropland. Mr. and Mrs. Haas are opposed to the project. They have had people coming onto their land without permission.

Robert Mandt:

About ¾ of the Mandt property that would be crossed by the line is cropland and the rest is woodland. Mr. Mandt grows corn and soybeans. There are no grassed waterways or tiles, and he does not spread manure on his cropland. He has not had livestock for several years. Mr. Mandt said that he knows some people are concerned about EMF from the power lines, but he has worked around power lines for 20 or 30 years and he hasn't had any trouble with them. He thinks the Beltline route would be a better place for the line than the route crossing his land, but if it's for the public good, he doesn't have strong objections to it. He remembers the days before electricity and he thinks that the Rural Electrification Administration was a good program. The Mandt property may also be affected by Segment P.

Gerald Dunn:

Mr. Dunn grows corn, soybeans, and alfalfa. All of the affected land is cropland. There are no drainage tiles or grassed waterways on this land, but there is a low spot that is sometimes wet. He doesn't have any livestock, so no manure is spread on this land. Mr. Dunn indicated that he has worked around the existing line for 45 years. He would rather not have it on his land, but he could adjust to it if he needed to and he thinks the power is needed. He is not planning to sell his land, but if he needed to sell it in the future, he is concerned that the line might affect the value of the property.
Segment M

Clifford Hageman:

All of the Hageman land that would be affected by the proposed project is cropland. Mr. Hageman rents additional land in the area that will also be affected by the project including the Mischler property. There are no grassed waterways or drainage tiling on the affected Hageman land, but there is a gas pipeline. It was put in about twelve years ago. Manure is spread on the affected cropland. Mr. Hageman grows alfalfa, oats, corn, soybeans, and wheat, and he runs a dairy operation and raises hogs. The project will affect some fencing.

He is concerned that the project will affect the valuation of his property. He has no plans to sell and would like to continue farming, but if circumstances change or his children need to sell land in the future, he is concerned that the line would lessen the value of his land. His barn burned last July and he has had difficulty with the DNR and Dane County in finding an acceptable site to rebuild. He has an open building that provides some shelter for his cows, but if the DNR decides that this is unacceptable, he may be forced to quit dairying. His original barn site was near a ravine with a narrow waterway and he has been told that construction must be at least 300 feet from that waterway. The line generally follows his property lines and roads. He mentioned that there were power line poles on his father's farm and it was very inconvenient to have to work around them. He wants people to consider the cost of putting this line through farmland, not just the cost of putting it through the Arboretum. This would be another utility right-of-way on his land in addition to existing power lines and a gas pipeline.

Doerfer Brothers, Inc.:

The Doerfers are planning to construct a 600-cow dairy barn on the parcel south of Whalen Road and west of Fitchrona Road. The proposed power line would run through the middle of this parcel and through the new dairy barn site. The Doerfers chose this site so the barns would be near their existing five million gallon concrete manure pit. In addition to dairy cattle, the Doerfers also feed out beef cattle. They grow corn, soybeans, wheat, and alfalfa. Except for the proposed building site, all of the Doerfer land that would be affected by the proposed project is cropland and manure is spread on the cropland.

The Doerfers would like to suggest an alternative route to Segment M. From east to west it would follow the same route as Segment M until it reached Fitchrona Road. At this point, it would head angle to the southwest, follow the property line between Glenn Fisher and the Hageman Trust, and continue west until it reached the section line between sections 25 and 26. It would then head north for ¼ of a mile along the section line, turn west and follow the quarter section line for ½ of a mile, and then head north to intersect with the proposed Segment M. This route would pass through the industrial park and would put the line near cell phone and radio towers, but it would not be close to any homes.

Heinz Mischler:

The power line would run along the southern property line of Mr. Mischler's property. All of this land is cropland that is rented to Clifford Hageman. Mr. Mischler indicated that as long as the line is constructed on the edge of his fields rather than through the middle of them, he does not believe it will have much of an impact on his land.

Segment N

Theresa Wagner:

Theresa Wagner is deceased. An aerial photo showing where the project would affect the Wagner property was sent to Jerome Wagner and he may return comments about the project.

Jerome and Mary Esser:

Mr. and Mrs. Esser have the distinction of having the largest amount of land affected by the proposed transmission line of any farmland owners. ATC would acquire 21.4 acres of new easement on 15 Esser tax parcels. Mr. Esser is strongly opposed to the construction of the line on his land. He and his wife, one son and his wife, and their three children work full time on the farm. Twenty two other family members work part-time or occasionally on the farm. This farm has been in the Esser family for 114 years. The Essers grow corn, soybeans, and alfalfa, and they run a dairy operation. Most of the land that would be affected by the proposed transmission line is cropland, but some pasture would also be affected.

The cropland has drainage tiling and grassed waterways, and the project would also affect fencing. Manure is spread on the cropland. Mr. Esser said that if the route through his land is selected, he wants ATC to buy his herd because he will quit milking. He is very concerned about the potential impacts of stray voltage from the line affecting his cattle. He cited the case of Roger Rebout in Rock County as an example of ATC causing stray voltage on a dairy farm. He is opposed to this route because it does not follow the list of priorities identified in the statutes. This portion of Segment N follows new right of way that is not adjacent to any existing right-of-way. He also indicated that he has rezoned some of his land that could be used for future development and he is concerned that if the line is built on his land, he will have trouble selling those parcels.

Krantz Farms, Inc. (Jerry Krantz):

Krantz Farms includes a dairy operation and they grow corn, soybeans, alfalfa, and oats. The land that would be affected by the project is ¼ to 1/3 wetland, ¼ to 1/3 highly erodible land, and the remainder is prime farmland. There are grassed waterways and tiling on the cropland, and manure is sometimes spread on the cropland. Mr. Krantz hopes that the line does not follow this route. He feels that the line should be buried on the Beltline, which is where most of the power would be used. He is also concerned about the project's potential effects on the health of near by residents.

DATCP Comment:

The wet soils are the Elburn silt loam (EgA) and Radford silt loam (RaA) with a water table at 1-3 feet below the soil surface and the and Otter silt loam (Ot) with a water table at 0-1 feet below the soil surface. All the wet soils respond very well to installation of tile drainage systems. The outlet for the drainage system is a ditch (channel) going to the southwest. The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line

will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

If a tile line has been placed along a waterway to provide firm soil for crossing the waterway with equipment, it will need to be checked for damage by construction equipment.

Shawn and Maureen Connors:

The proposed line would go through the middle of the Connors land. All of the affected land is cropland. The Connors will be installing drainage tiling on their land in the spring of 2009. They grow corn, soybeans, and alfalfa, and they run a dairy operation. No manure is spread on the cropland that would be affected by the proposed project. Mr. Connors indicated that he does not want the line and that it would make more sense to build it along the Beltline.

DATCP Comment:

The wet soils are the Virgil silt loam (VwA) with a water table at 1-3 feet below the soil surface and the Otter silt loam (Ot) with a water table at 0-1 feet below the soil surface. Both the wet soils respond very well to installation of tile drainage systems. The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line.

If a tile line has been placed along a waterway to provide firm soil for crossing the waterway with equipment, it will need to be checked for damage by construction equipment.

Segment O

Twin Valley Farms:

The proposed project would follow an existing 69 kV line adjacent to this property. The existing line is on railroad right-of-way. The land that would be affected includes cropland, woodland, and wetland. Some of the affected land has recently come out of the Conservation Reserve program. The affected cropland has no drainage tiling and manure is not spread on it. The owner is concerned that the line might limit the uses of this land either for farming or for development. It would also require him to work with ATC if he wanted to construct buildings or roads near the transmission lines. However, since the land is adjacent to an existing transmission line corridor, he understands that this makes it a much higher likelihood that other lines would be constructed here.

In addition, one of the potential routes for the West Middle to Rockdale project that was previously dropped would have had more significant negative impacts to other property that he owns. Of the two segments that could have affected his land, Segment O is much less damaging to his property. The poles for the existing line are not currently a hindrance to farming because they are in the railroad right-of-way, but new poles could be an obstacle for farming depending how far they are placed into the fields. The only problem he has had with the current line is

when crews have come onto his land for brush clearing and line maintenance, and they have not been as careful as they could have been in avoiding damage to crops and property.

Segment P

Michael U'ren:

Mr. U'ren indicated that most of the land that would be affected by the project is cropland. Some woodland and wetland would also be affected. He rents his cropland to a neighbor who grows corn, soybeans, and wheat in rotation. The ditches along Highway 14 act as waterways for the cropland. Mr. U'ren indicated that there is an existing power line on his property that travels in an east/west direction across his land. It is on single poles. He is not aware of any problems the renter has maneuvering around these structures. The only concern that Mr. U'ren identified for this project is the possibility of stray voltage. He said that a representative from a cellular phone company called him about constructing a tower on his land. He told the representative about the potential power line project and he hasn't had any follow-up from the company, so he doesn't know if the power line would be a problem for operating a cell phone tower. Mr. U'ren's property may also be affected by Segment F.

Robert Mandt:

About ¾ of the Mandt property that would be crossed by the line is cropland and the rest is woodland. Mr. Mandt grows corn and soybeans. There are no grassed waterways or tiles, and he does not spread manure on his cropland. He has not had livestock for several years. Mr. Mandt said that he knows some people are concerned about EMF from the power lines, but he has worked around power lines for 20 or 30 years and he hasn't had any trouble. He thinks the Beltline route would be a better place for the line than the route crossing his land, but if it's for the public good, he doesn't have strong objections to it. He remembers the days before electricity and he thinks that the Rural Electrification Administration was a good program. The Mandt property may also be affected by Segment K2.

Segment Q

John Sweeney:

All of the affected Sweeney land is cropland. John Sweeney grows corn and soybeans, and does not raise any livestock. There is at least one drainage tile on this land that he knows of. No manure is spread on this land. Mr. Sweeney's primary concern about this project is the loss of productive acreage.

DATCP Comment:

The land may be in Dane County Drainage District no. 16. The wet soils are the Virgil silt loam (VwA) with a water table at 1-3 feet below the soil surface and the Sable silty clay loam (SaA) with a water table at 0-1 feet below the soil surface. Both the wet soils respond very well to installation of tile drainage systems. The construction equipment may crush or displace tile when they cross tile lines. Placing a caisson on a tile line will require rerouting the tile which

could cause a flat spot in the line. Flow will be slowed and sediment may be deposited in that portion of the tile line. If a tile line has been placed along a waterway to provide firm soil for crossing the waterway with equipment, it will need to be checked for damage by construction equipment.

Merle and Virginia Skjolaas:

The proposed project would follow an existing power line and railroad corridor. The Skjolaases do not farm the land that is immediately adjacent to the existing line, so working around the poles is not a problem. Much of the land that would be affected by the proposed project is wetland and wildlife habitat. This includes land enrolled in the Wetland Reserve program. As long as the new line is constructed along the existing transmission line and railroad corridors, the owners do not have strong objections to the project. However, they do not want the line any closer to their house and buildings than it is now. They had been told in the past that if more power was needed, the existing line would be beefed up.

CONSTRUCTION PROCESS

OVERHEAD TRANSMISSION LINES CONSTRUCTION PROCESS

ATC will contract with a construction company to build the transmission line and proposed substation. This contractor will subcontract some of the construction activities to another company or companies to complete the surveying and clearing of the right-of-way, for example. It is important that the contractor and subcontractors are made aware of the requirements in ATC's Agricultural Construction Mitigation Plan and any requirements included in the PSC's Final Oder. This will require pre-construction training for all employees that will be involved in the construction process.

The following is a general description of the transmission line construction process. Additional information about this process can be found in Chapter 4 of the *Environmental Impact Statement for the Rockdale to West Middleton Transmission Line Project.*

Surveying and Staking the Right-of-way: Crews will survey the centerline and stake the right-of-way limits. It will include existing right-of-way and newly acquired easements. Typically, the right-of-way width required will be a total of 80 to 175 feet wide if the Beltline to Rockdale Route is chosen, 120 to 150 feet if the Rockdale Southwest Route is chosen, and 120 feet if the Albion Southwest Route is chosen. The Beltline-Rockdale Alternate Route and the Beltline-Albion Alternate Route would require widths of 75 to 175 feet. The Rockdale-Verona Alternate Route would require 120 to 150 feet of ROW width, while the Albion-Verona Alternate Route would require 120 feet of ROW width. These figures include both existing right-of-way and newly acquired easements. (Source: ATC Application; October, 2007; p. 77)

Development of Right-of-way Access: Vehicle tracking pads, silt fences, and other applicable erosion control measures will be installed as right-of-way access is gained. Because disturbance of the access path will be intermittent, seeding and mulching of the access path will be

performed if the anticipated time between disturbance-causing activities is expected to be extended

Temporary Staging and Materials Storage Areas: Silt fences will be placed on the down-slope sides of staging and storage areas where the soil is disturbed. If access to the storage area is from a public road, a vehicle-tracking pad will be placed at the intersection.

Right-of-way Clearing and Preparation: Typically, the easement width is cleared of trees and brush to allow access for construction and maintenance equipment and to eliminate future conductor-to-vegetation contacts. Normally, vegetation is removed to a height of less than 6 inches but no root removal is done. Wisconsin Statutes, §182.017(7)(3), states that landowners shall retain title to all trees cut by the utility.

Brush or trees that are cleared are disposed of in accordance with the property owner's wishes in compliance with regulatory requirements, either by removing the cleared material or storing it on the easement or adjoining land. In upland areas, some vegetative material (cuttings) may be chipped and spread on the right-of-way if permitted by the property owner. Clearing adjacent to waterways requires the preservation of a vegetative buffer of approximately 50 feet. Hand clearing of selected woody species may be required. At new pole locations, access is necessary along with a level working area. Therefore, some grading may be required around new pole locations.

Erosion control measures will be put in place on down slopes of the cleared areas where construction will disturb soils. Areas that will be cleared and further disturbed during the construction of the project will be permanently restored (seeded and mulched or matted) after construction is completed.

Construction during wet conditions can cause soil rutting and erosion. If soil rutting occurs, the ruts should be smoothed when soil conditions are sufficiently dry. Construction should be halted or mats should be used when extremely wet soil conditions exist.

Construction under wet soil conditions can also increase the likelihood of soil compaction. DATCP has reviewed the soils that could be affected by construction and will provide this information to ATC to assist them in avoiding or mitigating problems on these soils.

Matting may also be installed as needed during the clearing process to ensure stable working conditions in wetlands or to provide temporary bridges across waterways. Timber is the most common type of matting material used, but composite plastic mats are also available. In many instances, these mats will be left in place during the entire transmission line construction process. Materials hauled to and from the construction locations will be transported on existing roads or rights-of-way, and/or arranged access locations where roadways are not present.

Where transmission line or distribution line corridors are followed, existing structures may need to be removed prior to installation of the new transmission line structures.

Footing Installation: ATC plans to primarily use concrete caisson footings for transmission structures. The method of installation and the diameter and depth of the excavation will vary depending on the soil capability at each structure location. When constructing concrete caisson foundations, the required hole is excavated, concrete caissons are formed using a rebar and bolt cage that is placed into the excavation, and concrete is poured to cover the cage. The complete caisson is allowed to cure to develop the necessary strength. After the caisson is cured, the pole is mounted on the caisson using the exposed bolts. In general, the excavated holes will range from 6 to 13 feet in diameter and may be 18 to 50 feet deep. This step in the construction process has the greatest potential for compaction of soil. The concrete trucks that cross agricultural land generally have the greatest potential for soil compaction.

Excess soils from excavations in upland areas should be hauled to an offsite disposal location unless the landowner stipulates otherwise. In any areas where conditions may be conducive to erosive losses (erodible soils, slopes, wetlands, or streams adjacent to the site), appropriate erosion control measures as described in the most recent WDNR *Construction Site Best Management Practices* (BMPs) will be installed and maintained until final restoration and revegetation is complete.

The presence of ground water at or near the ground surface can impact the construction procedures used when auguring holes. If groundwater flow into an excavation results in the excavation becoming unsuitable, it is often necessary to install a casing to support the walls of the excavation and/or to dewater the excavation. Depending on site conditions, the extracted groundwater may be de-silted and discharged to a nearby water body or to an upland area where it is allowed to re-infiltrate. In some situations it may be possible to augur the hole and to use casings to maintain the stability of the hole without dewatering the site during excavation. In this situation, the groundwater is removed from the casing as it is displaced by concrete-pushed into the excavation via a special concrete pouring sleeve known as a tremie. This water may contain solids from the auguring process or from contact with the fresh concrete, and is often pumped out of the hole and transported by appropriate tanker truck either to a treatment facility or to an upland site where it can be allowed to settle and re-infiltrate.

In the event that shallow bedrock is encountered, modifications to the standard footing designs by either shortening the footing length and socketing into solid bedrock or anchoring directly into bedrock may be required. Another option would be removing the rock via blasting or special drilling methods to develop the full footing length.

If weak soils are encountered along during construction, footing installation may utilize vibratory methods. This consists of installing a steel caisson up to approximately 60 feet long in areas where soil stability is a concern. At locations where the vibratory techniques are used, the upper four feet of soil is removed by use of a backhoe and transported to an approved upland location for dispersal. The caisson is then advanced using vibratory methods. When the caisson has been fully advanced, the base of the structure is put in place by bolting a platform onto the steel caisson.

A third method footing method is a pile type foundation. This method consists of several smaller concrete foundations joined together with a concrete cap and anchor bolts. This foundation can then be hammered or drilled into place.

Pole Installation: After the base of the structure is in place, the top section(s) of the structure are assembled and put in place using a crane. The insulator strings may already be in place on these structure sections, or they may be installed just prior to conductor installation.

ATC would primarily use a monopole or single shaft pole to support the 345 kV line. H-frame structures would be used in special situations such as near the Verona Airpark where height restrictions must be accommodated. Steel monopoles would range from 100 feet to 175 feet in height. H-frame structures would range 90 to 105 feet in height. The span between transmission line structures ranges from 450 feet to 950 feet, depending on site conditions such as topography. In general, ATC will not reuse existing poles.

Conductor Installation: After blocks are installed at an adequate number of structures, the phase conductors are pulled in place using the pulling lines and blocks. The conductor is then tensioned and clipped to the insulator strings. Helicopters may be used for conductor installation in special situations where access is limited.

Site Access: It is common practice to use a bucket truck to lift workers and the required hardware (insulator strings, pulling dollies, etc.) to their location on each structure to allow the work to be accomplished efficiently. In most areas where bucket trucks can be used to access the construction location, much of the work will be done using this equipment and method. In areas where this type of vehicle access would be difficult, such as in unfrozen wetlands or where access is otherwise limited, alternative methods of construction will be used. The alternative methods still require that workers and the required hardware be able to obtain access to each structure to perform the work. However, the workers may be able to walk in or use lighter equipment (ATVs, tracked equipment, etc.) to access the structure. In these situations, ladders and climbing equipment may be used to gain access to the conductors and perform the work.

When the ground is not frozen, low-impact machinery with wide tracks will be used in unavoidable wetland areas and protective mats will be used in areas where the ground is unstable. To minimize potential impacts, protective mats may also be used as ramps in areas of steep slopes or to cross wetlands or waterways.

Cleanup and Restoration of the Right-of-way: Cleanup and permanent restoration will occur as soon as practicable following completion of the land-disturbing activities. Seed mixes used will be consistent with industry standards and regulatory requirements. Mulching and matting will be used as appropriate. Silt fences will remain in place until adequate vegetation is achieved.

Access to the transmission line right-of-way will be from existing roads, and will follow the transmission line right-of-way or negotiated access from private property owners. ATC and its contractor will strive to arrange for alternate access with landowners utilizing farm lanes and private roads to avoid impacts to sensitive areas.

A construction site is usually active for 4 to 8 weeks and construction is usually done in 2 mile segments. If construction mats are used, they would be left in place for the entire time.

UNDERGROUND TRANSMISSION LINE CONSTRUCTION PROCESS

Segment 3 is the only location where agricultural land is affected by underground transmission line construction. A total of about 14.4 acres of farmland would be affected on this segment. Segment 3a, located in the city of Fitchburg, parallels the above ground transmission line on the south and west. Segment K2 proceeds cross-country from Fish Hatchery Road to Seminole Highway. It then turns north along Seminole Highway and then west along CTH PD.

Segment 3a is approximately 6.2 miles long and would affect about 14 acres of farmland. It would contain 17 paired vault locations. The portion of Segment 3a that crosses agricultural lands starts at the Fish Hatchery Transition Station just east of Fish Hatchery Road. The Fish Hatchery Transition Station would affect about 1.2 acres of farmland. From this point, it crosses the highway and parallels the existing 138 kV transmission line corridor west for about 8,500 feet, north for about 6,500 feet, and west again for a short distance until it reaches Seminole Highway.

The current transmission ROW is 100 feet wide in this area. Construction of this portion of Segment 3A would likely require the width of the transmission easement on private properties to be permanently increased by 15 feet. Additionally, 10 feet of temporary easement (approximately 7 acres, half of which would be within the existing ROW) would be required on either side of the permanent easement for the duration of the construction. Existing land use along this portion of the route is agricultural, though the alignment is mostly located along property boundaries or field edges.

The general construction sequence which could be expected to occur would include survey and staking, clearing and grading, trenching, installation of cable, construction of the concrete duct and vaults, and soil restoration. Restoration would include backfilling the trench, decompaction, rock removal, and topsoil replacement.

Survey and staking

The draft EIS for the Rockdale – West Middleton project repots that on private properties, easements for the underground project would consist of a 50-foot construction easement which would include a 30-foot permanent easement and an additional 20-foot wide temporary easement (10 feet on either side of the permanent easement). The easement is surveyed and staked so the contractor stays within the easement during the construction process.

The major issue is leaving wire surveying flags, equipment, or other debris behind after the work is completed that can pose a hazard to livestock. Livestock ingesting the metal pieces can develop what is known as "hardware disease" which may lead to death of the animal.

Clearing and grading

An underground transmission line constructed in unpaved areas will have all trees and shrubs cleared in the travel path and area to be trenched. The construction area in the vicinity of the trench is leveled so the construction equipment (backhoe, etc.) can operate efficiently.

Before trenching, topsoil will be segregated to avoid mixing with subsoil. The excess subsoil will be removed and taken offsite for disposal.

A hazard to livestock that can occur during ROW clearing or maintenance is the disturbance of black walnut trees. The roots of these trees produce a toxin (juglone) that causes an allergic reaction in horses, and may affect other livestock. Care should be taken when clearing black walnut trees to make sure all roots, wood, bark, leaves, hulls, and sawdust are removed from any area to which livestock may have access. The ash from burned trees may contain the toxin. Relatively small amounts of juglone are also found in Persian (English or Carpathian) walnut trees, and in butternut, pecan, and hickory trees.

Trenching

Trenches for 345 kV underground lines are typically excavated to a depth of 10 to 12 feet, and a width of 4 to 5 feet, except where the concrete vaults are constructed. The depth of the trench will require shoring to keep the trench walls from collapsing on the workers. (1-250) Blasting may be required where bedrock or large boulders are encountered during construction. This would likely be the case where an estimated 1,300 feet of Whalen soils are encountered on Segment 3a.

The expectation is that the trench on agricultural cropland will be about 6.5 feet deep (2. 5 feet of cover over the concrete duct and 4-feet for the concrete duct) except where there are vaults. The volume of the concrete duct will be 16 cubic feet per foot of transmission line length. A volume of spoil (glacial till or sand and gravel) equal to the concrete duct volume (0.6 cubic yards) will need to be removed from the ROW for each foot of transmission line length. An additional 7,200 cubic feet (267 cubic yards) of spoil will need to be removed from each paired vault location. On a 100-foot/day basis, one would need to remove 60 cubic yards of spoil. The actual volume of spoil to be hauled away would be about 67 cubic yards/day because the volume of soil removed in the digging operation "fluffs up' as it is removed.

The construction process is described in the FEIS as:

- Day 1 Dig 100 feet of trench (assume shoring if greater than 5-feet deep).
- Day 2 Dig 100 feet of trench and install 100 feet of concrete duct.
- Day 3 Dig 100 feet of trench; install 100 feet of concrete duct, and backfill the first 100 feet of trench after the concrete has had a day to cure.
- Day 4 Repeat the action of Day 3.

Duct Bank Installation

Underground XLPE cable system can be direct buried or encased in concrete duct banks. Using the concrete duct bank system is the most common method of installation of higher voltage lines even though it more expensive than direct bury. A typical concrete duct for a 345 kV transmission line is 4-feet square, containing 14 conduits holes (ducts). The duct is assembled using polyvinyl (PVC) pipe and spacers. The area around the conduit is then filled with high

strength concrete that is thermally approved. Eight ducts are used for two sets of transmission cables and two spare ducts. The other four ducts house temperature monitoring and ground continuity cables.

Vaults would be constructed within the easement. Preliminary maps show that a majority of the vaults would be constructed near existing transmission structures or along field edges, but some would be constructed within fields. There are 10 vaults (1500 – 1800 feet apart) proposed to be constructed in the section on agricultural lands. This project requires a set of vaults (two) to be constructed at each vault location. Each vault is 10 feet wide, 12 feet deep and 30 feet long. The trench in the vicinity of the vaults would be about 14 feet wide, 14 feet deep and 72 feet long. The concrete floor, walls, and ceiling are approximately 1 foot thick.

Cable Installation

Cable splicing and pulling can take place any time after installation of the duct bank and vaults. A reel of cable, located near a transition station or vault, would be pulled by a winch located at the next vault. Cables are then spliced with the vaults.

Restoration

Restoration would include backfilling the trench, decompaction, rock removal, and topsoil replacement. After the concrete around the duct bank has cured, the trench is backfilled with approved thermal material. Where required, the area over the trench is compacted to avoid settling. In areas over the working right-of-way where soil compaction has occurred, this area would need to be decompacted with the appropriate implement.

Any rocks brought to the surface during construction or soil decompaction should be removed. The top 12 inches of the restored subsoil profile should be free of rocks larger than 2 inches in any dimension. The topsoil can then replaced to it original depth over the construction right-of-way.

The agricultural soils affected by underground transmission line on Segment 3a include:

Plano soils (PoA, PoB), the Dodge – Kidder soils (DoC2), and the Whalen soils (WxC2).

The Plano soils are silt loam soils with a gravelly substratum at about 44-inches below the surface. The soils are on slope segments that are 125 – 200 feet long with 0-2 % (A) slopes and 2-6 % (B) slopes. The gravelly substratum is calcareous sand and gravel.

The Dodge – Kidder soil mapping unit (DoC2) contains both the Dodge silt loam and the Kidder loam. The Dodge soil is silt loam (9 inches) over silty clay loam (13 inches) over silty clay loam with 5 – 10 % coarse fragments (18 inches) over sandy loam at the 40-inch depth containing up to 20% by volume of coarse fragments (stones). The Kidder loam is loam (14 inches) over sandy clay loam (24 inches) over sandy loam at the 38 inch depth with up to 20% coarse fragments by volume. The soils are on 6 – 20 % (C) slopes and are eroded (2/3 of original topsoil lost).

The productivity of the Plano and Dodge – Kidder soils can be maintained by not permitting the sand and gravel (Plano) or sandy loam with up to 20 % coarse fragment (Dodge – Kidder) to mix with silt loam / clay loam subsoil during the trenching operation. Assuming the depth of the trench will be about 6.5 feet, the soil productivity can be maintained by hauling the material (spoil) from the bottom 4-feet of the trench away.

The Whalen soil (WxC2) is silt loam (10 inches) over heavy loam (6 inches) over sandy clay loam (11 inches) over dolomite bedrock. The soils are on 6 – 12 % (C) slopes and are eroded (2/3 of original topsoil lost). There is about 1300 feet of the Whalen soil on the route. Locating a vault before and after crossing the Whalen soil will avoid the large excavation that would be needed in the Dolomite bedrock.

Impacts of Underground Transmission Line Construction

The temporary and long-term impacts on agricultural cropland resulting from the construction of the underground transmission line will be essentially the same as those which occur from the construction of a pipeline. The damage and impacts (soil mixing, compaction, rutting, etc.) on the soil in the easement are potentially very significant.

Much of the ROW will return to crop production. The goal on agricultural cropland during construction and the ensuing restoration process is to restore the productivity of the soils in the construction zone to that present before the project was built.

It is not clear if the proposed 50-foot wide easement is not wide enough to construct the underground transmission line. The proposed construction easement is roughly half of that used for pipeline projects (~ 100 – 125 feet wide). Traffic (concrete and dump trucks, trucks bringing in supplies, etc.) will past down the ROW. The trench will use 5 – 12 feet of ROW width that must be located in the 30-foot wide permanent easement. There may not be room for trucks to meet on the ROW. It is not clear if there will be sufficient room to turn a truck around on the easement without a great deal of jockeying back and forth.

The potential to mix topsoil and subsoil on the construction ROW by the traffic on the ROW can be avoided by stripping the topsoil to a depth of 12-inches over the 50-foot wide easement and storing it separately, prior to and during the clearing and grading, construction, backfilling, decompaction, and re-grading the subsoil. However, there may not be room on the proposed ROW to store the topsoil.

The potential impacts of a construction of an underground transmission lien that trenches across agricultural cropland are mixing topsoil with subsoil, mixing subsoil with the underlying glacial till or sand and gravel, increased stone / rock content of the soil (> 3-inches in diameter), compaction of the working right-of-way (ROW) by the construction equipment, soil erosion, temporary access roads, fencing, damage to surface and/or subsurface drainage systems, creation of seepage zones, and ultimately, a permanent crop yield loss.

Topsoil inversion or mixing topsoil with subsoil

Soil mixing may result from deep rutting (greater than 6 inches) by the construction equipment which mixes topsoil and subsoil. The topsoil has better soil structure and higher organic matter content than the subsoil. The subsoil is higher in clay content than the topsoil. The clay loam subsoil is not as friable as the topsoil, so mixing the subsoil with the topsoil or plow layer makes the resulting mixture more difficult to till. There may be a permanent reduction in yields. The solution to the rutting problem is to delay travel across the land until the soil has dried enough to the equipment. Construction equipment may leave tracks or shallow depression that indicates some compaction. Tracks are not ruts.

Mixing subsoil with the underlying glacial till or sand and gravel

Mixing the subsoil with the parent material (glacial till / sand and gravel) results from the excavating or digging operation. The result of mixing the subsoil with the parent material is less water holding capacity, lower fertility, and lower crop yields over the trench. If the subsoil is removed from and taken off site, this would not be a problem. If not, the subsoil should be segregated from the parent material by a process known as "triple trenching". The result is three piles of soil – topsoil, subsoil, and parent material.

Increased stone / rock content of the soil (> 2-inches in diameter)

Farmers who do not have rocks in their fields before construction do not want rocks in their fields after construction. They also know that rocks with dimensions greater than 2-inches can damage planting and harvesting equipment. Parent material with stones and cobbles brought to the surface during the digging operation and mixed with the subsoil will result in both immediate and longer term rock problems. The solution is to keep the parent material segregated from the subsoil, and to remove all stones greater than 2-inches during the restoration process.

Compaction of the working right-of-way (ROW) by the construction equipment

Compaction of the topsoil and subsoil by the construction equipment can be a major adverse impact. Compaction increases the bulk density of the soil which results in reduced uptake of water and nutrients by the crop, restricts rooting depth, decreases soil temperature, an increased proportion of pore space filled with water at field moisture capacity (poor aeration), and increases surface runoff. Wet soils (somewhat poorly, poorly and very poorly drained) are more prone to compaction forces. The greater the depth at which soil compaction occurs, the more persistent the problem becomes. The plow layer may appear dry, but the subsoil may be saturated (wet) and subject to increased compaction potential during construction.

Soil erosion during the construction process

Soil erosion by surface water runoff occurs because the normal movement of surface water is disrupted by the construction process. A major problem that can occur is the possible rill and / or gully type erosion that by water collecting in the wheel tracks of equipment. Tracks running up/down a slope provide a channel that concentrates the runoff water and greatly increases its

transport capacity. Additional erosion occurs because the piles of topsoil, subsoil, and spoil are open to the rainfall and surface runoff. The solution is the installation of temporary slope breakers (diversion terraces) to redirect the surface runoff off the construction ROW. The runoff should be directed to a stable grass-covered outlet. In crop fields, this goal may be difficult to achieve.

Temporary access roads

Temporary access roads are needed when the distance of travel down the construction ROW becomes excessive. The same problems that can occur on the ROW may happen on the access roads.

Fencing

Fences that confine livestock may be severed by the construction project. The livestock could escape and be injured. Temporary fences may need to be installed to allow livestock to graze or move from pasture to a water supply.

Damage to surface and/or subsurface drainage systems

Agricultural drainage systems are installed to convert somewhat poorly drained to very poorly soils to the equivalent of a well drained soil to the depth equal to root zone of the agricultural crops being grown in the area. The effort reduces flooding and ponding in farm fields, improves soil structure, provides an aerated root zone, lengthens the growing season, and increases both infiltration and permeability rates of the soil so a greater amount of rainfall is absorbed and used by growing crops. Crop yields are increased. Field operations to till, plant, and harvest the crop become more efficient.

Deep or subsurface drainage systems are installed to control the apparent water table at 3 to 4 feet below the soil surface to provide an aerated root zone for the crop. The most extensive systems are rectangular with tile lines (laterals) spaced from 50 to 100 feet apart. The laterals are connected to larger tile lines (sub-mains and mains) sized to carry the collected water to an outlet ditch that is more than 6-feet deep.

Random deep drains are used in narrow low areas or to drain small depressions. Deep drains are often installed on the edge of grass waterways to provide a solid, dry bottom for farm equipment that must cross the channel. The drain also provides a good root zone for the grass.

Creation of seepage zones

The trenching operation can alter the natural stratification of soil horizons and drainage patterns on the ROW and adjoining agricultural lands. Seepage zones or wet areas may be created in farm fields along the trench because water can move down the trench to low areas. Trench plugs may be installed to avoid subsurface channeling of water down the trench prior to completion of backfilling activities in sloped areas and adjacent to wetlands and water bodies.

UNDERGROUND DISTRIBUTION LINE CONSTRUCTION PROCESS

In general, underground construction of distribution lines would take place where existing distribution lines are located along a transmission line route. At these locations, the distribution lines would be moved and, in some cases, buried on the opposite side of a two-lane road to provide distance from the transmission line. If the road is a four-lane roadway, the relocated distribution lines could be placed on poles, rather than buried, because adequate distance may exist between the proposed transmission line and the displaced distribution line.

The local utility, not ATC, would be responsible for relocating the distribution lines. In general, three phase underground distribution lines would be moved to private property adjacent to the roadway in a 10-foot easement. Single phase distribution line could be buried in the road right-of-way. The state code requires the underground wire to have 30-inches of cover. The trench may be 2 feet to 3 feet wide and 3 feet to 3.5 feet deep. Trenching may be done with a wheel trencher or a backhoe. The companies may choose to install the line with directional drilling. Underground construction of distribution lines would have a significantly less impact to farmland than would underground construction of transmission lines.

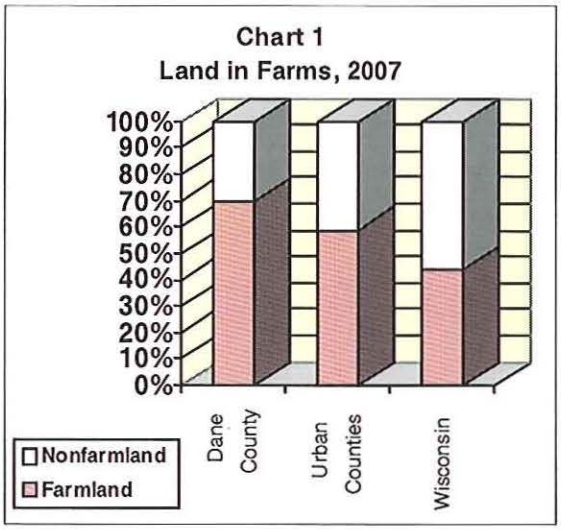
Table 5 shows the areas where relocation of distribution lines could take place on the possible segment alternatives.

Table 5 - Underground Distribution Re-Location Through Farmland

Segment	Location	Approx.Length	Owner	Action
A	Along south side of Koshkonong Road	1,000 ft	WP&L	Relocate Underground
B	Along the west side of I90 from CTH AB to Skiggelkow	3,100 ft	WP&L	Relocate Underground
F	Underbuild on the existing 69 kV Line Y119	3 mi	WP&L	Relocate Underground
F	Along the east side of USH 14 from the intersection of STH 138 north	2,500 ft	WP&L	Relocate Underground
G	Along the south side of Gaffney Road	2,800 ft	WP&L	Relocate Underground
G	Along the west side of STH 69	300 ft	WP&L	Relocate Underground
G	Along the west side of USH 14	1,800 ft	WP&L	Relocate Underground
M	Along the south side of USH 18 near Verona Substation west	3,300 ft	WP&L	Relocate Underground
`	Along the east side of Fitchrona Road	3,900 ft	WP&L	Relocate Underground
`	Along the south side of Adams Road	1.9 mi	MGE	Relocate Underground
N	Along the south side of USH 14 from approximately 300 feet east of Rocky Dell Road to the east	1,400 ft	WP&L	Relocate Underground
N	Along the north side of Stage Coach Road	4,200 ft	MGE	Relocate Underground
N	Along the north side of USH 18 from CTH J to the point where the 345 kV lines turns north cross country	6,600 ft	WP&L	Relocate Underground
N	Along the south side of USH 18 from the Military Ridge Trail to Marshview Road	1,900 ft	WP&L	None Required
O	Along the north side of USH 14 from Pinehurst Drive to east end of Wayside Road	4,200 ft	MGE	None Required
O	Near the Terrace Riser along the south side of USH 14 to near Eagle Drive	2,500 ft	MGE	None Required
O	Along the north side of USH 14 from Deming Way to Eagle Drive	1,000 ft	MGE	Relocate Underground
O	Along west side of USH 12/14 from Mineral Point Road north to the intersection of West Old Sauk Road	5,000 ft	WP&L	Relocate Underground
O	Along west side of USH 12/14 from Mineral Point Road south	1,000 ft	WP&L	Relocate Underground

AGRICULTURAL SETTING

Agriculture's contribution to the Dane County economy[2] is significant according to a report prepared by the University of Wisconsin-Extension and Dane County. Researchers estimated that agriculture provides jobs for 23,739 Dane County residents, which is 6.8 percent of the county's 351,485-member workforce. Agriculture accounts for $3.19 billion in economic activity, 11 percent of the county's total economic activity. Dane County agriculture also pays $102.8 million in taxes not including property taxes for local school districts.



Agricultural Productivity

In 2007, Dane County ranked first out of Wisconsin's 72 counties in the production of corn for silage, second in corn for grain and in soybeans, third in milk, and fourth in forage. In that same year, farmers in the county harvested 163,000 acres of corn for grain, 77,500 acres of forage, 66,500 acres of soybeans, 32,800 acres of corn for silage, and 9,800 acres of winter wheat. They also raised 131,000 head of cattle and calves, and 21,500 hogs and pigs.

Fifteen years earlier, Dane County farmers harvested 202,900 acres of corn for grain, 89,800 acres of forage, 30,600 acres of soybeans, 28,100 acres of corn for silage, and 1,100 acres of winter wheat. They also raised 149,900 head of cattle and calves and 76,300 hogs and pigs.

Land in Farms, Number of Farms, and Average Size of Farms

Dane County is classified as an urban county, which is defined as having an average of 100 or more residents per square mile. According to the *2007 Census of Agriculture*, Dane County has 535,756 acres of land in farms,[3] which represents 69.7 percent of the total land area in the county. The average for urban counties is 196,635 acres of land in farms or 58.7 percent of the total county land area. These can be compared to the average of 213,955 acres or 44.0 percent of

[2] Dane *County Agriculture: Value and Economic Impact*, University of Wisconsin-Extension, Cooperative Extension, Dane County, Wisconsin Farm Bureau Federation, Wisconsin Milk Marketing Board, 2004. http://www.uwex.edu/ces/ag/wisag/

[3] Land in farms consists primarily of agricultural land used for crops, pasture, or grazing. It also includes woodland and wasteland not actually under cultivation or used for pasture or grazing, providing it was part of the farm operator's total operation.

land in farms among all Wisconsin counties. Refer to Chart 1 for a graphic comparison of the percentage of land in farms in Dane County, urban counties, and Wisconsin.

According to the *Census of Agriculture*, Dane County gained 692 farms (a 26.2 percent increase) between 1992 and 2007 as the total number rose from 2,639 to 3,331. Wisconsin as a whole gained 10,504 farms (a 15.5 percent increase) as the total number of farms in the state rose from 67,959 to 78,463. The amount of land in farms decreased from 538,582 to 535,756 acres (a 0.5 percent decline) in Dane County. In Wisconsin as a whole, the amount of land in farms declined from 15.5 to 15.2 million acres (a 1.2 percent loss) during this fifteen-year period. The average size of farms fell from 204 to 161 acres in Dane County and from 228 to 194 acres in Wisconsin as a whole during the same period.

Size Distribution of Farms

Table 6 shows the percentage of farms in each size category for Dane County, urban counties, and all Wisconsin counties.[4] Proportionately, Dane County has more farms that are smaller than 50 acres in size compared to the averages for urban counties and for all Wisconsin counties.

Table 6 - Percent of Farms per Size Category

Acres per Farm	% of Dane County Farms	% of Urban County Farms	% of all Wisconsin Farms
0-49	46.2%	41.0%	31.6%
50-179	31.1%	33.0%	37.9%
180-500	15.9%	18.4%	22.7%
More than 500	6.9%	7.6%	7.8%

Property Taxes and Values

Table 7 lists the average property tax, assessed value, and sale price per acre of agricultural land in Dane County, urban counties, and all Wisconsin counties. The assessed values and property taxes are based on the "use value" of agricultural land. Wisconsin Statutes define agricultural land as "land, exclusive of buildings and improvements that is devoted primarily to agricultural use." In 2006/07, average property taxes[5] on Dane County agricultural land were 14.6 percent higher than the average for urban counties and 22.4 percent higher than the average for all counties.

[4] *2007 Census of Agriculture*, U.S. Department of Agriculture, Wisconsin Agricultural Statistics Service, 2009.

[5] Wisconsin Department of Revenue, Division of Research and Analysis, Bureau of Local Fiscal Policy.

On average, the assessed value[6] of farmland in Dane County was 22.9 percent higher than the average for all urban counties and 40.5 percent higher than the average for all Wisconsin counties.

The average sale price[7] of farmland in Dane County was 10.0 percent higher than the average for urban counties and 69.2 percent higher than the average for all counties. These values do not include land sold for nonfarm purposes.

Table 7 - Farmland Taxes and Values

	2006/2007 Dollars per Acre of Farmland		
	Average Tax	Assessed Value	Sale Value
Dane County	$3.61	$236	$6,603
Urban Counties	3.15	192	5,046
All Counties	2.95	168	3,135

FARMLAND PROTECTION PROGRAMS

Farmland Preservation

The Dane County Farmland Preservation Plan was certified in 1981. The plan identifies farmland preservation areas in the county and provides tax credit eligibility to farmers who wish to participate in the Farmland Preservation program. The purposes of the program are to encourage local governments to develop farmland preservation policies through land use planning and zoning, provide tax relief in the form of tax credits to eligible farmers, and to conserve soil and water resources. The tax credit is provided to owners of farmland protected by a preservation agreement or an exclusive agricultural zoning ordinance.

A portion of the lands along the various transmission line route options are enrolled in the Farmland Preservation Program, i.e. are zoned for exclusive agriculture, or are covered by an individual farmland preservation agreement as described in Chapter 91, preventing development for non-agricultural uses. Lands eligible for a farmland preservation tax credit in 2008 are present on the proposed transmission line routes in the towns of Blooming Grove, Pleasant Springs, Cross Plains, Montrose, Oregon, Rutland, Dunkirk, Albion, Christiana, Verona, Madison and in the city of Fitchburg.

Overall, about nine percent of the Beltline-Rockdale route consists of lands enrolled in the Farmland Preservation Program. For the Rockdale Southwest route the percentage of lands so enrolled is 42 percent, while on the Albion Southwest route the percentage is 36 percent. FPP enrolled lands make up about 20 percent of Segments M and F combined, and 16 percent of Segments L, K2, P and F combined. (See ATC Application, p.105)

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[6] Ibid.

[7] *Wisconsin 2008 Agricultural Statistics*, Wisconsin Agricultural Statistics Service, National Agricultural Statistics Service USDA, Wisconsin Department of Agriculture, Trade and Consumer Protection, August 2008, pp. 10 and 11.

Table 8 below shows the extent that each segment borders exclusive agriculturally zoned land on at least one side of the right-of-way.

Table 8 - Extent of Proposed Route Segments Adjacent to Exclusive Agriculturally Zoned Land

Route Segment Label	Length of Route Segment (miles)	Length of Route Segment Adjacent to Exclusive Ag Zoned Land on Either Side of ROW (miles)	Percent of Route Segment Adjacent to Exclusive Ag Zoned Land on Either Side of ROW
Segment O	9.36	0	0.0
Segment H	8.99	0.24	2.7
Segment B	9.28	8.3	89.4
Segment A	4.51	4.26	94.5
Segment N	16.98	8.0	47.1
Segment G	17.44	15.5	88.9
Segment E2	9.28	9.0	97.0
Segment Q	3.96	3.0	75.8
Segment L	2.17	0	0.0
Segment K2	5.5	4.5	81.8
Segment P	1.77	1.4	79.1
Segment F	5.83	4.9	84.0
Segment M	9.79	6.4	65.4

Source: Route Lengths taken from pp.8-11 of ATC Application; Lengths adjacent to Exclusive Ag Zoned land estimated from measurements using maps in Appendix 8A-8E of ATC Application, Vol.1, Oct. 2007; percentages are calculated from this data.

Table 9 below shows the extent of each route which borders exclusive agriculturally zoned land on at least one side of the right-of-way.

Table 9 - Extent of Proposed Routes Adjacent to Exclusive Ag Zoned Land

Route Label	Length of Route	Length of Route Adjacent to Exclusive Ag Zoned Land	Percent of Route Adjacent to Exclusive Ag Zoned Land
Rockdale to Beltline Route	32.14 miles	12.8 miles	39.8 %
Albion Southwestern Route	47.66 miles	35.5 miles	74.5 %
Albion Fitchwestern	37.87 miles	22.8 miles	60.2 %
Albion Fitchbeltline Route	45.84 miles	31.3 miles	57.3 %

Source: Route Lengths taken from pp.8-11 of ATC Application; Lengths adjacent to Exclusive Ag Zoned land estimated from measurements using maps in Appendix 8A-8E of ATC Application, Vol.1, Oct. 2007; percentages are calculated from this data.

Conservation Reserve Program (CRP)

The Conservation Reserve Program (CRP) is a voluntary federal program that protects highly erodible cropland. In exchange for retiring highly erodible land for a 10-15 year period, the landowner is paid a per-acre annual rent and one-half the cost of establishing a permanent cover.

The Natural Resource Conservation Service (NRCS) awards contracts based on the following factors:

- Water Quality
- Air Quality
- Soil Erosion
- Wildlife Enhancement
- Enduring Benefits

Construction of the proposed transmission line could threaten compliance with a CRP contract if above-listed factors are jeopardized. In addition, CRP contracts would need to be revised to reflect the area occupied by the pole. This area would need to be removed from the contract. A minimum of one-tenth of an acre for each pole would need to be removed. All moneys received on that area would need to be repaid. Repayments would include annual rental payments, cost-share payments, signing incentives, practice incentives, CR 23, and liquidated damages.

According to Dane County data, the Rockdale – Beltline Route would affect about 2 acres of farmland enrolled in the Conservation Reserve Program (CRP). The Albion – Southwestern Route would affect 21.3 acres. The Albion –Fitchbeltline Route would affect 7.2 acres of farmland in the CRP Program. The Albion Fitchwestern Route would affect 12.6 acres.

Conservation Reserve Enhancement Program (CREP)

CREP is an offshoot of the Conservation Reserve Program (CRP) and is very similar to CRP. It is a voluntary land retirement program that helps agricultural producers protect environmentally sensitive land, decrease erosion, restore wildlife habitat, and safeguard ground and surface water. CREP is administered by the NRCS.

Like CRP, CREP contracts require a 10- to 15-year commitment to keep lands out of agricultural production. The program is a partnership among producers; tribal, state, and federal governments; and, in some cases, private groups.

If poles are located farmland with CREP contracts, the contracts would need to be revised to reflect the area occupied by the pole. This area would need to be removed from the contract. A minimum of one-tenth of an acre for each pole would need to be removed. All moneys received on that area would need to be repaid to the NRCS. Additional repayment would need to be made to other partners in the contract.

DATCP has identified in Table 10 the CREP parcels that may be affected by the transmission line project.

Table 10 - Affected CREP Parcels

Landowner	Segment
Scott Schieldt	Q
Merle Skjolaas	Q
Merle Skjolaas	Q
Kenneth Schieldt	Q
Merle Skjolaas	Q
Larry Mahr	G
John Everson	G
Douglas Brown	G
Ronald Neperud	G
William Pauli	G
Catherine Duerst-Schroeder	G
Herbert Haas	K2
David Smithback	B

DANE COUNTY SOILS[8]

This section provides a description of the general features of the major soil groups occurring in agriculturally used soils along the Rockdale to West Middleton transmission line routes listed in descending order by frequency of each soil's occurrence. The distribution of dominant soils differs between routes for the Rockdale to West Middleton project

The **Rockdale to Beltline Route** follows the following major soils in descending order in terms of their frequency along the route:

Ringwood silt loam is the most frequently occurring soil (constituting about 11.2% of farm soils along the route). It consists of deep, well-drained, gently sloping and sloping soil on glaciated uplands. It has high fertility and moderate permeability. Along the route, most of it has a slope of 2 to 6 inches.

Next most frequent, the Elburn silt loam (8.2%) is a deep, somewhat poorly drained, nearly level and gently sloping soils in glaciated stream valleys, underlain by glacial till or sand and gravel outwash. It has high fertility, high available water capacity and moderately slow permeability. The water table is 1 to 3 feet deep in the spring.

St. Charles silt loam (7.0%) is a deep, nearly level to moderately steep, well drained and moderately well drained soil on glaciated uplands. It has high fertility, moderate permeability and high available water capacity. Seasonal high water table is below 3 feet down.

Kegonsa silt loam (6.4%) is a well-drained, nearly level and gently sloping, moderately deep soil on benches on outwash plains, underlain by loose sand and gravel at a depth of 33 inches. It has

[8] *Soil Survey of Dane County*, USDA Soil Conservation Service in cooperation with the Research Division of the College of Agricultural and Life Sciences, University of Wisconsin, January 1978, pp. 2-5.

medium fertility, moderate permeability and medium available water capacity. Water table is below 5 feet down.

Wacousta silty clay loam (6.3%) is a deep, poorly drained, nearly level soil formed under sedges in silt, underlain by silt loam grading to silt and fine sand. It has low fertility, high available water capacity, moderately slow permeability and a water table less than 1 foot down.

Boyer sandy loam (5.2%) with eroded slope of 6-12% is a well-drained, gently sloping to moderately steep soil formed in moderately deep loamy outwash over calcareous sand and gravel outwash. It has low fertility, low water holding capacity and moderately rapid permeability. The water table is below 5 feet down.

Plano silt loam (4.2 %) is deep, well drained and moderately well drained, nearly level to sloping soil on glaciated uplands formed in loess and sandy loam glacial till or sand and gravel outwash. It has high fertility and moderate permeability. The depth to water table may be 3 to 5 feet from the surface. Along the route, the slope is mainly from 2 to 6 %.

Batavia silt loam with gravelly substratum (3.9%) is deep, well-drained, nearly level to sloping soil on high benches formed in deep loess and loamy outwash, with a depth to outwash sand and gravel of 42 inches. It has high fertility and moderate permeability. Along the route, it has a slope of 0 to 6 inches. The depth to water table may be 3 to 5 feet from the surface.

Elburn silt loam (3.6%) is a deep, somewhat poorly drained, nearly level and gently sloping soil in glaciated stream valleys, underlain by glacial till or sand and gravel outwash. It has high fertility, high available water capacity and moderately slow permeability. The water table is 1 to 3 feet deep in the spring.

Sable silty clay loam (3.3%) is deep, nearly level and gently sloping, poorly drained soil on low benches in stream valleys formed in deep silty material more than 4 feet thick, underlain by sandy outwash. The soil has high fertility and moderate permeability. Seasonal high water table is within a foot from the surface. Along the route, the slope is less than 3 %.

The **Albion - Southwestern Route**, the following farm soils are the major ones present in descending order in terms of their frequency along the route:

Kegonsa silt loam (9.1%) is a well-drained, nearly level and gently sloping, moderately deep soil on benches on outwash plains, underlain by loose sand and gravel at a depth of 33 inches. It has medium fertility, moderate permeability and medium available water capacity. Water table is below 5 feet down.

Batavia silt loam with gravelly substratum (5.0%) is deep, well-drained, nearly level to sloping soil on high benches formed in deep loess and loamy outwash, with a depth to outwash sand and gravel of 42 inches. It has high fertility and moderate permeability. Along the route, it has a slope of 0 to 6 inches. The depth to water table may be 3 to 5 feet from the surface.

Elburn silt loam (4.3%) is a deep, somewhat poorly drained, nearly level and gently sloping soil in glaciated stream valleys, underlain by glacial till or sand and gravel outwash. It has high fertility, high available water capacity and moderately slow permeability. The water table is 1 to 3 feet deep in the spring.

Hayfield silt loam (3.7%) is a somewhat poorly drained, nearly level soil on benches of outwash plains over sand. It has medium fertility, medium water capacity, and moderate permeability. The water table is at a depth of 1 to 3 feet.

Troxel silt loam (3.4%) is a deep, gently sloping, well drained and moderately well drained soil below steeper, silty soils formed in moderately deep silty alluvium and buried under prairie grasses. It has high fertility, very high water capacity, and moderate permeability. Water table is below 3 to 5 feet, and frequently flooded.

Dodge silt loam (about 3.3%) is a deep, well-drained, gently sloping and sloping soil on glaciated uplands. It has high fertility and moderate permeability. Along the route, most of it has a slope of 2 to 6 inches.

Dunbarton silt loam, 6-12 inch slope, (3.3%) is a shallow, well-drained, gently sloping to steep soil on uplands with fractured dolomite at a depth of 10 to 20 inches. This soil has low fertility, moderately slow permeability, and low available water capacity. Water table is at a depth of over 5 feet.

Westville silt loam, eroded, 6-12 inch slope, (3%), is a deep, gently sloping to moderately steep, well-drained soil formed in thin loess and weathered loamy glacial till, underlain by sandy loam till. It has medium fertility, high water capacity, and moderate permeability. Water table is below 5 feet down.

Plano silt loam (2.9%) with gravelly substratum, is deep, well drained and moderately well drained, nearly level to sloping soil on glaciated uplands formed in loess and sandy loam glacial till or sand and gravel outwash. It has high fertility and moderate permeability. The depth to water table may be 3 to 5 feet from the surface. Along the route, the slope is mainly from 2 to 6 %.

The **Albion – Fitchbeltline Route**, the following farm soils are the major ones present in descending order in terms of their frequency along the route:

The most frequent soil, Plano silt loam (17.2%) with gravelly substratum, is deep, well drained and moderately well drained, nearly level to sloping soil on glaciated uplands formed in loess and sandy loam glacial till or sand and gravel outwash. It has high fertility and moderate permeability. The depth to water table may be 3 to 5 feet from the surface. Along the route, the slope is mainly from 2 to 6 %.

Next most frequent is Dodge silt loam (about 11.5%), a deep, well-drained, gently sloping and sloping soil on glaciated uplands. It has high fertility and moderate permeability. Along the route, most of it has a slope of 2 to 6 inches.

Batavia silt loam with gravelly substratum (8.5%) is deep, well-drained, nearly level to sloping soil on high benches formed in deep loess and loamy outwash, with a depth to outwash sand and gravel of 42 inches. It has high fertility and moderate permeability. Along the route, it has a slope of 0 to 6 inches. The depth to water table may be 3 to 5 feet from the surface.

Kegonsa silt loam (6.2%) is a well-drained, nearly level and gently sloping, moderately deep soil on benches on outwash plains, underlain by loose sand and gravel at a depth of 33 inches. It has medium fertility, moderate permeability and medium available water capacity. Water table is below 5 feet down.

Ringwood silt loam (5.2) consists of deep, well-drained, gently sloping and sloping soil on glaciated uplands. It has high fertility and moderate permeability. Along the route, most of it has a slope of 2 to 6 inches.

Griswold loam (4.6%) is a deep, well-drained, gently sloping to moderately steep soil on glaciated uplands formed in thick glacial till. Permeability is moderate and fertility is medium with high organic-matter content. The water table is below 5 feet. Most of it along the route has a 6 to 12% slope.

Sable silty clay loam (4.4%) is deep, nearly level and gently sloping, poorly drained soil on low benches in stream valleys formed in deep silty material more than 4 feet thick, underlain by sandy outwash. The soil has high fertility and moderate permeability. Seasonal high water table is within a foot from the surface. Along the route, the slope is less than 3 %.

Virgil silt loam (3.6%) is deep, nearly level and gently sloping, somewhat poorly drained soil on low benches in uplands and stream valleys. It has high fertility and moderately slow permeability. Seasonal high water table is between 1 and 3 feet from the surface. Drainage is needed for maximum crop production. About one fourth of this soil along the route has a gravelly substratum at a depth of 50 to 70 inches.

St. Charles silt loam (3.0%) is a deep, nearly level to moderately steep, well drained and moderately well drained soil on glaciated uplands. It has high fertility, moderate permeability and high available water capacity. Seasonal high water table is below 3 feet down.

The **Albion-Fitchwestern Route** has the following major soils descending order in terms of their frequency along the route:

Most frequently occurring is Dodge silt loam (about 8.4%), a deep, well-drained, gently sloping and sloping soil on glaciated uplands. It has high fertility and moderate permeability. Along the route, most of it has a slope of 2 to 6 inches.

Batavia silt loam with gravelly substratum (8.2%) is deep, well-drained, nearly level to sloping soil on high benches formed in deep loess and loamy outwash, with a depth to outwash sand and gravel of 42 inches. It has high fertility and moderate permeability. Along the route, it has a slope of 0 to 6 inches. The depth to water table may be 3 to 5 feet from the surface.

Plano silt loam (7.0 %) with or without gravelly substratum, is deep, well drained and moderately well drained, nearly level to sloping soil on glaciated uplands formed in loess and sandy loam glacial till or sand and gravel outwash. It has high fertility and moderate permeability. The depth to water table may be 3 to 5 feet from the surface. Along the route, the slope is mainly from 2 to 6 %.

McHenry silt loam (5.2%) is a deep, well-drained, gently sloping to moderately steep soil on glacial uplands underlain by calcareous glacial till at a 24 to 40 inch depth. It has a medium level of fertility, moderate permeability and medium available water capacity. The water table is over 5 feet down.

Sable silty clay loam (4.3%) is deep, nearly level and gently sloping, poorly drained soil on low benches in stream valleys formed in deep silty material more than 4 feet thick, underlain by sandy outwash. The soil has high fertility and moderate permeability. Seasonal high water table is within a foot from the surface. Along the route, the slope is less than 3%.

St. Charles silt loam (4.3%) is a deep, nearly level to moderately steep, well drained and moderately well drained soil on glaciated uplands. It has high fertility, moderate permeability and high available water capacity. Seasonal high water table is below 3 feet down.

Kegonsa silt loam (3.9%) is a well-drained, nearly level and gently sloping, moderately deep soil on benches on outwash plains, underlain by loose sand and gravel at a depth of 33 inches. It has medium fertility, moderate permeability and medium available water capacity. Water table is below 5 feet down.

Troxel silt loam (3.7%) is a deep, gently sloping, well drained and moderately well drained soil below steeper, silty soils formed in moderately deep silty alluvium and buried under prairie grasses. It has high fertility, very high water capacity, and moderate permeability. The water table is below 3 to 5 feet, and the soil is frequently flooded.

Dunbarton silt loam, 6-12 inch slope, (3.4%) is a shallow, well-drained, gently sloping to steep soil on uplands with fractured dolomite at a depth of 10 to 20 inches. This soil has low fertility, moderately slow permeability, and low available water capacity. The water table is at a depth of over 5 feet.

The following table summarizes the amount and percent of prime soils on farmland affected by easements on each route.

Table 11 - Frequency of Prime Soils Along Rockdale to Middleton Transmission Line Routes

Routes	Total Farmland Soil Area in Right-of-Way Along the Route (acres)	Prime Farmland Soil Area, in Acres (Percent of Total Farmland Soil Area)	Prime when Drained Farmland Soil Area, in Acres (Percent of Total Farmland Soil Area)
Rockdale to Beltline Route	97	62 (64%)	11 (11%)
Albion Southwestern Route	423	238 (56%)	54 (13%)
Albion Fitchbeltline	234	153 (65%)	19 (8%)
Albion Fitchwestern Route	346	188 (54%)	37 (11%)

AGRICULTURAL IMACTS

The potential transmission line impacts to farmland is organized and presented as separate sections on impacts: those that are permanent; those that are temporary; and those that should be temporary if effective construction and restoration protocols are followed.

PERMANENT IMPACTS

Impacts Due to Location of Transmission Line Structure

There are several ways to analyze the potential land loss impacts of a transmission line project on farmland. The most obvious measure of farmland lost is the area that the transmission line structure would occupy. Caisson sizes are estimated to range from 6 feet to 13 feet in diameter and up to 50 feet deep. A six-foot diameter caisson and pole would occupy an area of about 28 square feet. The only way to avoid this impact is by limiting the number of poles located in cropland. Locating poles in agricultural areas that are not cultivated cropland is preferable.

Another way is to estimate the total number of acres encumbered by easements. This measurement could include the total number of acres of farmland affected by both existing and new easements. A second measure is the number of acres of new easements that would be acquired. A third metric is the extent to which a transmission line shares a corridor with an existing facility, such as another transmission line, pipeline, or highway. Finally, the impact of a transmission line can be analyzed by estimating the area lost around transmission line structures that are not farmable because of limitations to the maneuverability of modern farm equipment.

Farmland Affected by Easement

Permanent easements restrict certain activities on the easement area or right-of-way. Easements can be viewed as lost opportunities to the farmland owners. Compensation for easements should

take this into consideration. These lost opportunities could include restrictions on building construction, expansion or modification of irrigation systems, and planting of certain types of trees or other vegetation that mature to heights above those compatible with maintaining the transmission line.

The easement is a contract between ATC and the individual landowner. It will identify specifically the kinds of structures that will be placed on a given landowner's property, and the number and location of each. An example of an ATC easement is included in the Appendix.

The following table summarizes the number of acres of farmland affected by easements on each route alternative.

Table 12 - Farmland Affected by Existing and New Easements

	Crop Land		Pasture		Old Field		Specialty (tree nursery)		
Route	Existing ROW Area Shared (acres)	New ROW Area Required (acres)	Existing ROW Area Shared (acres)	New ROW Area Required (acres)	Existing ROW Shared Area (acres)	New ROW Area Required (acres)	Existing ROW Shared Area (acres)	New ROW Area Required (acres)	Totals
Rockdale - Beltline	16.7	68.9	0.0	0.7	0.6	10.2	0.0	0.3	97.3
Albion-Southwestern	36.4	346.0	1.3	10.7	4.8	21.4	0.5	2.7	423.7
Albion-Fitchwestern	47.7	277.7	1.5	3.5	4.3	8.9	0.5	2.6	346.6
Albion-Fitchbeltline	36.5	188.4	0.6	3.4	1.1	2.7	0.0	1.7	234.4

The Albion-Southwest route would the affect the greatest number of acres of farmland in terms of existing and new easements, a total of 423 acres. New easements would total 381 acres or about 90% of the total acres affected.

The Rockdale to Beltline route would affect a total of 97 acres of farmland, the fewest number of acres of the four proposed routes. About 80 acres of this total, or 82%, would be new easements.

The Albion Fitchwestern route would affect an estimated 346 acres of farmland through new and existing easements. New easements would total about 293 acres or about 84% of the total farmland acreage affected by this route.

The Albion-Fitchbeltline route would affect about 232 acres of farmland, which includes new and existing easements. About 196 acres of this total, or about 84%, would be new easements.

Where the new transmission line right-of-way would parallel existing road or pipeline right-of-way, the new transmission line right-of-way will usually overlay a portion of the existing right-

of-way, which would reduce the amount of right-of-way that must be acquired from adjacent landowners.

An easement is a contract between the landowner and ATC. The contract specifies restrictions on both the utility's and the landowner's use of the land and specifies the rights of the utility. It is binding upon the utility, the landowner, and any future owners of the land until the contract is dissolved. In general, buildings and large trees cannot be located on an easement.

An easement acquired for transmission line right-of-way does not open the right-of-way for general public access or use. Both the landowner and the easement owner have property rights in the right-of-way. These rights should be clarified in the easement contract. Landowners should review their easement contracts carefully and should consult an attorney if they are unsure about what they are signing.

The farmland area encumbered by an easement and the area directly impacted by transmission line construction are not necessarily the same. The easement area would restrict certain land uses under the transmission lines. For example, under some conditions the easement could restrict farm expansions. However, most crop-growing activities could continue on most of the easement area not occupied by a transmission line structure. Continued productive farming of the easement area not occupied by the pole structure can only take place only if certain mitigation practices are followed during construction.

Area Lost due to Pole Placement

The area of cropland lost from production when transmission line poles are placed in fields will depend on whether the pole is out in the field, along the field edge, or in the corner of a field. The size of the tillage, planting and harvesting equipment, the effort the farmer makes to get close to the pole and the crop being grown also will affect the amount of area taken out of production. The path taken to travel around a pole is not precisely known. For purposes of this analysis, let us assume the travel path of the machine is parabolic.

The single pole structure that will be used for this project provides much less loss of farmable area than would an H-Frame or a structure with guy wires in the field. The single pole structure that will be used for this project provides much less loss of farmable area than would an H-Frame or a structure with guy wires. The only H-frames that would be used on the current project would occur on routes involving Segment M where a portion of the line would be constrained by height restrictions near Verona Airport.

One study found that "about 70 percent of the costs of towers to farmers was a result of the nonproductive area created by the presence of the tower, and the remaining 30 percent comprised time lost in working around towers, crop damage, and in some cases material waste through double coverage." (Gustafson, et. Al. 1979, 1-2) Another study similarly found that loss associated with the area around the towers that couldn't be farmed made up 70 percent of total tower-induced farm costs. (Scott, 1981, 187) Comprehensive studies of the estimated costs from farming around transmission structures based on Wisconsin-specific farm operations are not available.

However, a number of such estimates have been made based on a model for typical Montana farming operations as part of an environmental impact assessment done for a transmission project there. Although this model was based on different crops from those in Wisconsin, the basic sequence of farm operations involved is likely to be similar to that found here. This sequence included: pesticide use, fertilizer application, planning, in-crop spraying, harvesting, and post-harvest harrowing. The model also included an estimate for labor time and equipment. It also adjusted for the presence of the structure in the field causing "overlap areas" where equipment passes through more than once. Based on 2007 prices, it estimated the annual cost of farming around a regular span mono-pole at the field edge in the range of $13 to $16 dollars per structure; a similar amount for H-frames parallel to the field edge; $40 for H-frames perpendicular to the field edge; $177 for H-frames in the field interior; and $150 for mono-poles in the field interior. (HydroSolutions Inc. and Fehringer Agricultural Consulting Inc., 2007) Elsewhere, somewhat different figures were reported for the same project simulations:

"In brief, the consultants say that the 2007 annual costs to farm around a small monopole, a large monopole and a H-pole in the middle of a field planted with spring wheat are $105.09, $107.98 and $120.57, respectively. The costs to farm at the edge of a field for the three structures, with the H-pole built parallel to the edge, would be $13.81, $15.06 and $14.99, respectively." (Thornton, 2007)

Another study based in Ontario examined the potential yield loss for wheat, soybeans, grain corn and silage corn from working around transmission line poles in fields. Based on 1974-5 crop prices, annual economic losses from transmission poles in fields were on the order of $14 to $18 a year for twin poles in a field. (Scott, 1981, 192)

One study of transmission line impacts on agricultural operations found that:

"Average added costs per structure for dryland grain production were estimated to be in the order of $30 to $35 (Canadian) in 1978-79 which amounts to approximately $50 per structure in 1982 Canadian dollar terms. If one assumes an average of 2.5 towers per quarter section (160 acres), then the annual cost to a landowner in lost agricultural productivity is $125. This loss in perpetuity at a real discount rate of 5 percent represents a reduced market value of $2,500 per quarter section from altered current land use." (Thompson, and Phillips, 1983, 33)

Wisconsin Statutes, Chapter 187.017 (b) states: "In determining just compensation for the interest under s..32.09, damages shall include losses caused by placement of the line and associated facilities near fences or natural barriers such that lands not taken are rendered less readily accessible to vehicles, agricultural implements and aircraft used in crop work, as well as damages resulting from ozone effects and other physical phenomena associated with such lines, including but not limited to interference with telephone, television and radio communication."

In order to estimate the loss in farmable area, DATCP used GIS data provided by ATC to identify the likely location of transmission line structures. This information was used to determine whether the proposed pole locations were located in farmland. The location of the poles in farmland determined the affected the soil and average corn yield for each pole was

identified. This yield was multiplied by the area that could not be cultivated under the various pole locations and caisson diameter scenarios described below.

In the following section, we estimate the amount of farmland that would be lost due to restrictions on maneuvering farm equipment around transmission line structures. Three pole location scenarios are assessed: "in-field/on property line"; "in-field along the field edge"; and "in the field corner."
The area for the three pole location scenarios are then estimated for four caisson size diameters. The actual size of the caisson at each pole site will be designed after the project is approved. We expect that the structures in a straight (lateral) section of the line to have a six-foot caisson. Formulas to calculate the area lost are approximations of the actual area. Several factors would influence the amount of loss. These include the size of the tillage, planting and harvesting equipment, the effort the farmer makes to get close to the pole, and the crop being grown will affect the amount of area taken out of production. The path taken to travel around a pole is not precisely known. For purposes of this analysis, let us assume the travel path of the machine is parabolic.

Scenario 1 describes the situations where the pole is located on the property line or in the field. In the first instance, the centerline of the right-of-way would be about 6 feet from the edge of the property line. If the caisson is located in the field, the affected area would be the same.

We calculated the area for the parabolic cross-section for passing by the pole on one side using the equation:

$$A = 2/3 \times H \times D$$

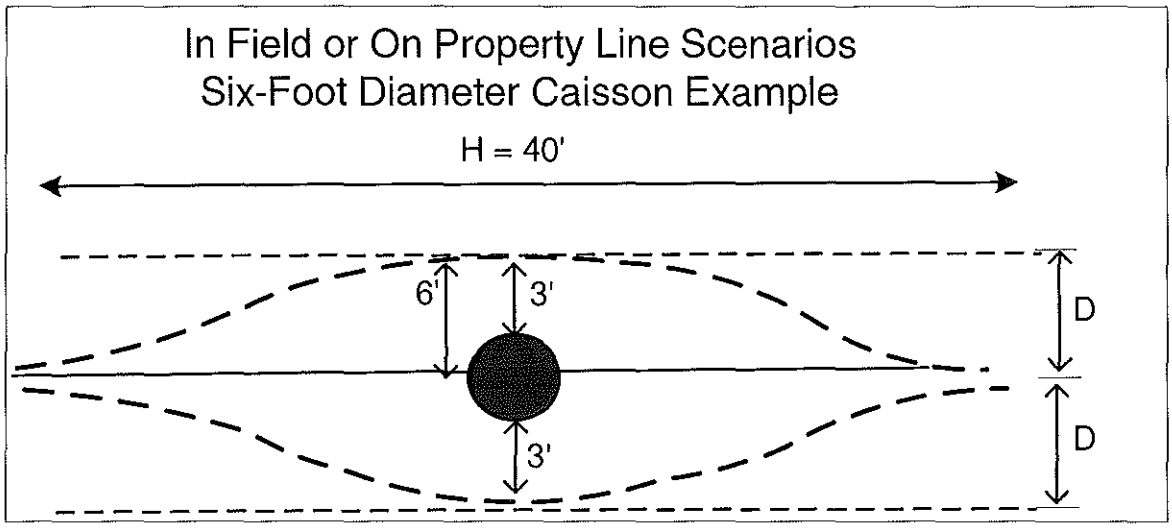
Where:

A = area in square feet,

H = horizontal distance (feet) from the point where the machine begins to turn out around the pole to the point where the machine is back on its regular path of travel,

D = the distance from the center-line of the pole, or edge of the field to the point where the end of the machine passes by the pole. D is perpendicular to H.

Scenario 1: In Field or On Property Line

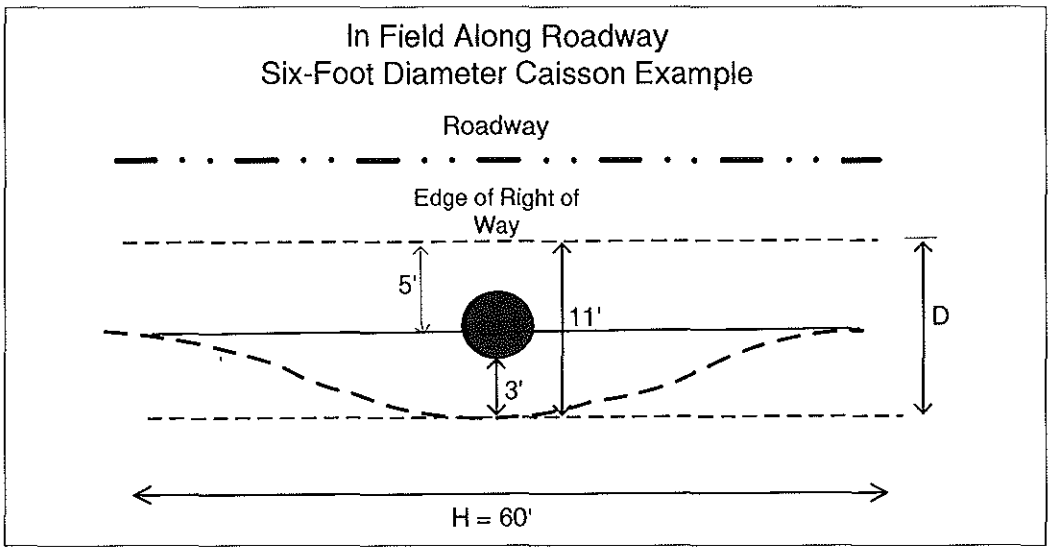


Estimated Loss of Farmable Area – Scenario 1

Caisson Diameter (feet)	D (feet)	H (feet)	Area (square feet)
6	6	40	320
8	7	46	375
10	8	50	530
13	9.5	60	760

Scenario 2 describes the situations where the pole is adjacent to a roadway. In this case, the centerline of the transmission line right-of-way would be about 5 feet from the edge of the road right-of-way. The same formula would be used to calculate the area under this scenario.

Scenario 2: In Field along Roadway



Estimated Loss of Farmable Area - Scenario 2

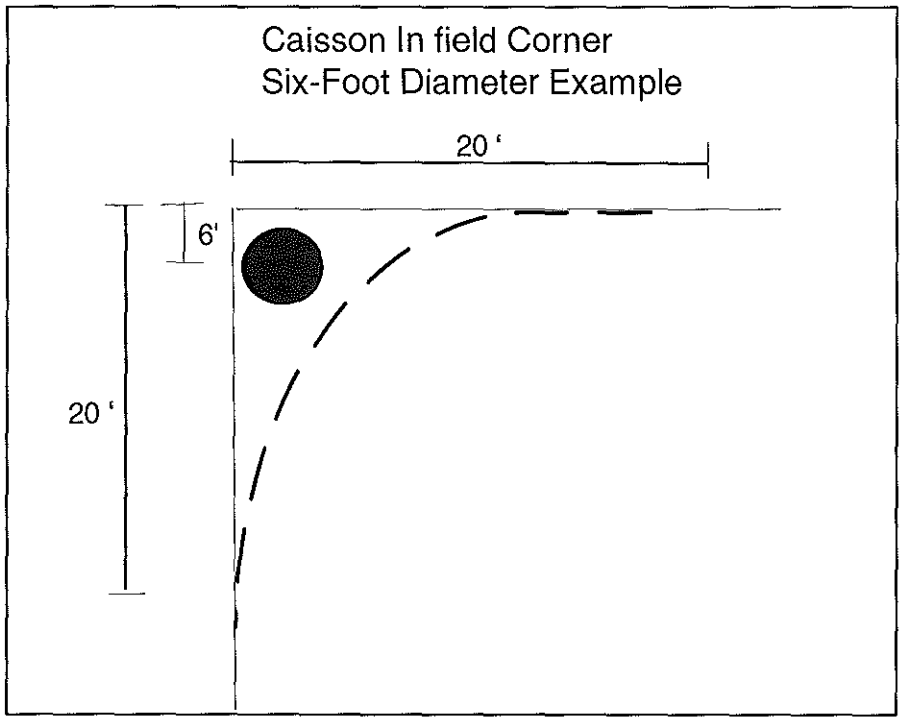
Cassion Diameter (feet)	Depth (feet)	Height (feet)	Area (square feet)
6	11	60	440
8	12	70	560
10	13	80	690
13	16	100	1070

Where the caisson is located in the corner of the field, the area that would not farmable is estimated by using the formula for a triangle

Area = 1/2 x Height (H) x Base (B)

The following table provides estimates for four pole diameter scenarios.

Scenario 3: In Corner of Field



Estimated Loss of Farmable Area - Scenario 3

Cassion Diameter (feet)	Base (feet)	Height (feet)	Area (square feet)
6	20	20	200
8	25	25	310
10	30	30	450
13	40	40	800

Based on these estimates, the amount of cropland that cannot be cultivated due to the location of the transmission line structure can be approximated for each segment and route alternative. DATCP used GIS data provided by ATC to identify the likely location of transmission line structures. The affected soil at each location was then determined. The soil yield[9] and unfarmable area at each structure was used to estimate corn yield loss at each pole location. The per-acre corn yield for each soil was multiplied by the area that could not be cultivated under the various pole locations and caisson diameter scenarios described previously. The amounts for all poles for each segment were added to determine the farmable area lost and corn and soybean yield loss for each segment and route. The following tables summarize these calculations.

Table 13 - Area & Yield Loss Estimates

	Area (square feet)	Annual Field Corn Loss (bushels)	Annual Soybean Loss (bushels)
Rockdale - Beltline	19,150	54	18
Albion-Southwestern	81,600	218	72
Albion-Fitchwestern	67,340	194	64
Albion-Fitchbeltline	35,880	109	36

This table shows that the Rockdale – Beltline Route would create the smallest unfarmable area and would have the least impact on corn and soybean yields. The Rockdale – Beltline Route is the agriculturally preferred route. The Albion-Fitchbeltine Route would rank second in minimizing the agricultural impact on affected area and crop yield loss. The third choice is the Albion – Fitchwestern Route. The least preferred, the most damaging agriculturally, is the Albion – Southwestern Route, which has about four times the impact on crop area loss and yield loss when compared to the Rockdale- Beltline Route.

These lost yields can be used to estimate the present value of future lost production in terms of dollars. Table 14 shows the value of lost production assuming a four percent discount rate and five dollar per bushel corn price and ten dollar per bushel soybean price.

Since this is based on crop yield for each route, the ranking of the routes in terms of agricultural impacts is the same as Table 13. The Rockdale – Beltline is the preferred route agriculturally. The Albion – Southwestern Route is the least preferred agriculturally.

[9] Based on NRCS average corn yield data for Dane County.

Table 14 - Present Value of Lost Production				
	Annual Corn Yield Loss (bu.)	Corn Yield Loss Present Value ($)	Annual Soybean Yield Loss (bu.)	Soybean Yield Present Value ($)
Rockdale - Beltline	54	6,750	18	4,468
Albion-Southwestern	218	27,212	72	17,997
Albion-Fitchwestern	194	24,222	64	16,071
Albion-Fitchbeltline	109	13,659	36	8,958

Loss of Agricultural Land to Substations for the Project

All but two transmission line substations involved in the Rockdale to Middleton project already exist on land owned by electrical utilities or ATC. Only two substations could therefore possibly involve new loss of agricultural land. It is proposed that a Cardinal substation be constructed as part of the project on the same parcel as that which the West Middleton substation is located on land owned by MG & E. (ATC Application, October 2007, p.160) Therefore, there would be no new loss of land for it.

If the Albion Southwestern Route, Albion - Fitchbeltline Route or Albion- Fitchwestern Route is chosen, it is also proposed that ATC would purchase about 20 acres of land for a proposed Albion substation. Two sites are being considered for this new substation: the Scheidt site, which is agricultural, and the Vike site, which is predominantly agricultural. (ATC Application, Oct. 2007, p.165) This agricultural land would be permanently lost to private landowners, although it is possible that ATC could continue to rent some of the land for cultivation.

Interference with Precision Farming

Some concerns have been expressed about proposed transmission lines interfering with the precision technology that is currently used or could be used in the future by farmers. Precision agriculture requires consistent contact with satellites in order to determine field location.

Farmers generally apply inputs, such as fertilizer, seed, and pesticides, uniformly based on the average needs of a field. However, the presence of significant variation in soil characteristics of a field means that the most economical application of inputs to such a field would need to be precisely calibrated to such variation. In some cases, the yield variation can be up to 100 percent within a field. Precision farming addresses the spatial and temporal variability in growth limiting factors. It manages fields by adopting a variable rate application of fertilizers, herbicides and pesticides in place of a uniform application across the whole field.

Such variable-rate application technology consists of three steps: collecting data through yield monitoring, grid soil sampling, or remote sensing; analyzing the data, and generating maps that reflect the variability within a field; field use of GIS/GPS map-based systems to identify problems in a field. Two spatial requirements are necessary for the variable-rate application of inputs. One requirement is the knowledge of where the farm equipment is as it moves across a field. The other is information on selected variables important to the farmer as a function of location within the field. These two factors are often referred to as the "where" and "what" components.

Global Positioning Systems (GPS) are used to determine the "where" component to within a few meters accuracy within a field. The "what' factor involves the application of remote sensing or collecting information on a site-specific basis through grid-sampling. Precision-agriculture applications have been relatively limited till now because of the complexity and expense involved in such applications.

Currently, the most common application of precision farming is as a monitor to measure yield data during harvesting. Yield monitors allow farmers to measure crop yield, grain weight and harvested area. Some applications export this information to a personal computer for further analysis. The intended outcome is to enable farmers to compensate for natural and manmade types of variability that affect crop growth.

The question of whether transmission lines may have an effect on increasingly sophisticated agriculture equipment, including the GPS component of precision agriculture systems, has come up frequently in recent years. Some experts in the field have indicated that they believe that there were no effects of transmission lines on GPS, but that the issue deserves further investigation. A technician at John Deere stated that his experience suggested that transmission lines do interfere with the GPS signal, as well as stating that this issue should be formally studied and that he would support such a study.

One peer reviewed study found that magnetic fields of over 500 mG (milligauss) from a transmission line were needed to cause interference with center pivot irrigation systems that utilize cornering systems. As the authors note, "This level is significantly higher than those found near most high voltage transmission lines." (Olsen and Heins, 1998) In particular, the magnetic field strength at the centerline of the proposed Paddock to Rockdale line is only 95.8 mG. (PSC, 2007, 118) Observations of center pivot cornering systems operating near 345 kV transmission lines in Nebraska confirm that there is no effect.

A Minnesota company Xcel Energy reported doing a search to find cases of interference of transmission lines with GPS equipment as part of the environmental review process for a 345 kV transmission line project. They conclude:

> "The utilities Xcel Energy contacted did not report any significant experiences or identify any written industry sources relating to interference between high voltage transmission lines and GPS units, satellite communication devices or cellular phones. Similarly, Company engineers could not identify any circumstances where persons living or working near a high voltage transmission line reported such interference with these

> communication devices. Rather, the Company's engineers noted that Company survey crews use GPS units. The crews routinely work along and under high voltage transmission lines, including 345 kV lines, and have not encountered interference." (State of Minnesota, 2005, Item 54)

Expert testimony by J. Michael Silva for Montana Alberta Tie Ltd. strongly supports the view that a proposed 345 kV transmission line will have no effect Global Positioning System (GPS) electronic devices associated with precision agriculture applications. There has been a concern that close proximity to power lines may interfere with farm equipment's ability to accurately receive the satellite signals needed to guide the field position of variable-application farm equipment.

According to Silva, who has done both extensive measurement and theoretical analysis to determine the possibility of transmission line impacts on PGS signals, a minimum signal-to-noise ratio must be present for the GPS to operate, and "the noise must be in the same frequency band as the GPS receiver to cause interference. As a practical matter, power lines produce little to no noise in these microwave bands." (Silva, 2007, 8) (Note: The microwave frequency of GPS satellite signals is about 1,227 – 1575 MHz.) For the same reason, differential correction signals determined from ground-reference stations, are also unlikely to be affected by transmission lines. (Silva, 2007, 11)

One other possible mode of transmission line interference considered by Silva is whether the overhead wires, or conductors of the line, could partially block satellite signals through scattering. According to Silva, "Theoretical analysis showed that this was not possible due to the small "electrical size" of power line conductors relative to a GPS signal wavelength and the large height ground of the electric wires."(Silva, 2007, 8) Silva performed multiple experiments under varied weather conditions to document the effect on GPS signal strength while driving under several large high voltage transmission lines without finding any effect. Silva also points out that cellular phones are spectrum microwave devices similar to GPS, yet "transmission towers are commonly used for cell phone base stations." In fact, he notes:

> "Many cell phone base stations have a GPS antenna for precise network operations described above. These GPS antennas are mounted directly on high voltage transmission line towers.... The large-scale use of high voltage transmission line towers for cellular base station antennas and for mounting high accuracy GPS antennas is a practical example of modern GPS use near power lines. ... Some of these GPS units are mounted inside high voltage electric power substations." (Silva, 2007)

Silva's testimony does leave room for two possible remaining ways that transmission lines could conceivably act to affect GPS-guided equipment. The first case would be if the power line tower physically blocked the line-of-sight between a fixed base station used to provide differential correction to satellite information and a mobile piece of farm equipment, just as a building or a tree might similarly block a satellite signal "depending on the relative instantaneous satellite and user positions." (Silva, 2007, 12) He sees this as highly unlikely.

The other method by which GPS might be affected, while speculative, remains worthy of further investigation. This would be through the transmission line being a media for conveyance of higher frequency harmonics of electromagnetic energy that are near to GPS frequencies.

> "Performance of GPS can be degraded due to unintentional electromagnetic energy from a variety of sources, especially those that produce higher frequency harmonics near to the GPS frequencies." (Silva, 2007, 13)

Silva sees it as unlikely that harmonics of the 60 Hz. frequency of power lines would be a source of GPS interference.

> "A harmonic is an integer multiple of the basic frequency at which a device is designed to operate and it is usually much lower in intensity than the primary frequency. High voltage transmission lines have very little harmonics and would not be a source of interference to GPS." (Silva, 2007,13)

However, it is documented that radio frequency electric currents are present on transmission lines. These are used for communications and remote control by electric utilities. In addition, there are many high frequency transients present on power lines originating due to switching derived from sources along the line that affect power quality.

Where power line carrier (PLC) techniques are used on power lines for telemetry, protective relaying or supervisory control, some studies demonstrate the potential for the field generated "to degrade navigation signal receiver performance." (Silva and Whitney, 2002) In this case, frequency separation is used for mitigation.

Typically, a transmission company will agree to inspect and repair any loose or damaged hardware to minimize corona effects and to take any necessary action to restore radio or TV or cellular reception to pre-project levels.

Any damages resulting from transmission line interference with GPS-based or other farm equipment is compensable under Wis. Stats., s. 182.017 (7) (b).

Risk of Damage to Machinery

Farming around transmission line poles can be difficult, particularly for larger farm equipment. Farmers may attempt to reduce the area that cannot be cropped around the pole by planting as closely as possible to the transmission line structure. This increases the likelihood of hitting the pole with farm implements. It is unlikely that the transmission line structure proposed for this project would be damaged. However, the farm implements may be damaged significantly. This impact would be especially troublesome if it occurred during crop planting or harvesting when time is especially crucial.

Restriction on Future Agricultural Land Use within Easement

As discussed previously, permanent easements restrict certain activities on the easement area or right-of-way. Easements can be viewed as lost opportunities to the farmland owners. Compensation for easements should take this into consideration. These lost opportunities could include restriction on building construction, expansion or modification of irrigation systems, and planting of certain types of trees or other vegetation that mature to heights above those compatible with maintaining the transmission line. It could also involve foregoing cultivation of deep-rooting crops over corridors where underground lines are buried.

ATC has indicated that it will send damage claims forms and closure letters to each of the affected landowners after construction is completed. ATC also has indicated that it wants to establish a positive relationship and work with landowners to try to address issues in a manner that will be satisfactory to both the landowner and ATC. DATCP recommends that one way to improve the likelihood of establishing a positive relationship with the landowner is to hire an agricultural inspector who would be responsible to facilitate communication between the landowner and the contractors and ATC.

In the "Landowners Bill of Rights," two of the rights that ATC will often ask landowners to waive are #2 and #6. They ask landowners to waive #2 so ATC will have more flexibility in weed control (ATC sometimes uses a weed killer called Garlan 4). ATC may ask landowners to waive #6 because access on farm lanes or other private roads may be less damaging than using the right-of-way for access. Landowners are not required to waive these rights. Refer to Appendix for the complete text of the "Landowners' Bill of Rights."

The easement for overhead transmission lines generally allows continued cultivation of crops underneath the line between the pole structures. However, where the Rockdale to Middleton project anticipates relocating distribution lines underground on farmland, it is not clear that continued cultivation of crops would be permitted above the buried line. This may depend on the depth of root activity involved for each crop.

Potential Reduction in Property Values

Numerous studies have shown there is often a small but real discount in residential property values due to the presence of transmission lines on a property. This discount appears in many peer reviewed studies comparing the market value of similar properties with and without transmission lines crossing them. There are also a number of peer reviewed studies which show no significant difference in sale price between properties with and without a transmission tower on them. A review summarized by the Wisconsin Public Service Commission found that the presence of a power line can reduce home values up to 14 percent, but that effects tend to decrease over time. (PSC, 2000, 214-215) Negative proximity effects on residential properties are not limited to properties actually crossed by a line. (Colwell, 1990, 127)

Studies have attempted to link electromagnetic radiation to health risks. Data from these studies have produced differing levels of evidence supporting or failing to support the validity of this linkage. The possibility of a connection between electromagnetic fields and health risks could

affect the real estate market, irrespective of whether this connection is scientifically established. Since it is nearly impossible to prove a negative - for example that something does not cause cancer - it is likely that the EMF controversy will not soon be resolved.

A transmission line may also create a negative visual impact. This depends on the landowner's perception of the pole placement across their property, which would include each individual landowner's perception of what is visually acceptable or unacceptable.

Impacts of Risks from Electromagnetic Fields on Property Values

One area of concern with transmission line projects has been the way that the market value of the property for resale could be affected, involving the right of the landowner to dispose of the property. Damages related to increased risk of economic loss associated with impairments to a property that exist or may occur are sometimes known as "stigma" damages. (Mitchell, 2000, 162-163) In many cases, landowners have sought to demonstrate that the fear of adverse health effects from exposure to transmission line electromagnetic (EM) fields on their land contributes to reduced re-sale value for their parcel.

Aesthetics

Aesthetics are often assumed to be a factor in reducing the value of properties encumbered by a transmission line right of way. Case law has upheld in many cases the admissibility of potential negative aesthetic effects of transmission lines on the value of farm property, but only where the line is actually located on the property in question. (For examples, see 97 American Law Reporter 3d, "Unsightliness of Powerline or Other Wire, Or Related Structure, As Element of Damages in Easement Condemnation Proceeding") In other cases, courts have held that "unsightliness" was inadmissible without a showing of direct physical disturbance to the subject property resulting in damage "in excess of that sustained by the general public." (Ibid., p.594)

In general, courts require that in order to be compensable, damages suffered by a subject property must be different in kind, not merely in degree, from those suffered by the general public or other properties in the neighborhood of the line. This distinction is commonly known and referred to as that between "special" and "general" damages.

The issue of how and the extent to which subjective aesthetic concerns may affect the value of property, including farmland, may vary greatly from case to case. However, in general, there has been an evolution toward increasing public concern or opposition to transmission lines related to their appearance. This concern is often focused on lines that go through wealthy or high-amenity urban parks or rural landscapes. It is considerably less common to see it applied to the flat, generic farmland typical in some parts of the country. However, in other parts of the country, like New England or certain parts of Wisconsin, farmland itself has significant scenic power and contributes to agricultural tourism and tourism generally, within certain regions. The variation in attractiveness of viewsheds along a linear corridor can be mapped, and such techniques have been increasingly accepted in court decisions on appraised value of wilderness or rural properties. (Devitt, 1988; Chenoweth, 1991)

> "Whatever the nature of the landscape between the observer and the transmission line, the immediate surroundings of each tower will influence the potential visual effect magnitude of the structure." (Hadrian, Bishop and Mitcheltree, 1988, 268)

Despite utility concerns with the aesthetic impact of power lines and structures for the last 40 years, one industry survey concluded that there has been little reliable research on the subject. A 1990 report found that "the paucity and inconclusiveness of the research can be interpreted as an indication that transmission line aesthetic evaluation is an area of professional practice that is in too early a stage of development to have generated either pressures for validation or a framework for evaluation." (Priestley and Evans, 1990 cited in Tikalsky and Willyard, 2007,31)

> "The effect of aesthetic design on public perception of electrical transmission structures remains an elusive topic. ...Despite more than 40 years of research, findings relating these two subjects are far from being established as definitive." (Tikalsky and Willyard, 2007, 31)

Complicating the ability to measure the impact of transmission lines on perceived landscape scenic beauty is the difficulty in separating people's aesthetic complaints about the lines from their growing concerns and fears about the potential biological effects of EM fields around the lines. One study observed that "vague public fears about health, safety, and other environmental aspects of the transmission system often get attached to the appearance issues." (Priestley, 1984 cited in Tikalsky and Willyard, 2007, 30)

Electromagnetic Fields (EMF)

Electric and magnetic fields (EMF) are produced by everything that carries or is operated by electricity. EMFs exist in the air around all electrical equipment and devices from toasters to power lines. An electric field is produced by voltage, the electrical force that causes current to flow in a conductor. Electric fields are reduced in strength (shielded) by trees and buildings. These fields are measured in units of kilovolts per meter (kV/m) or volts per meter (V/m) for weaker fields. Current, the movement of electrons in the conductor, produces a magnetic field. Magnetic fields pass through most objects including buildings. They are usually measured in units of milligauss (mG). Alternating electric fields and magnetic fields both cause induced currents.

The current consensus from most studies that have been done to assess transmission line effects in farm situations is that the electromagnetic fields generated by the transmission lines running through farms have no significant effects on crops:

- Osborn, C. Tim, et. al. (1982) "Overhead Electric Transmission Line and Support Structures: Cost and Yield Effects in the Production of Cotton and Soybeans." Journal of the American Society of Farm Managers and Rural Appraisers. Vol. 46, No. 2, October.
- Roy, W. R. and J. V. King. (1983) A Study of the Growth of Winter Wheat Near an Ultra-High Voltage Transmission Line. American Electric Power. North Liberty, Indiana.

or on livestock:

- Algers, Bo and Katarina Hennichs. (1985) "The Effect of Exposure to 400 kV Transmission Lines on the Fertility of Cows. A Retrospective Cohort Study." Preventive Veterinary Medicine. Vol. 3.
- Algers, Bo and Jan Hultgren. (1987) Effects of Long-Term Exposure to a 400 kV, 50-Hz Transmission Line on Estrous and Fertility in Cows." Preventive Veterinary Medicine. Vol. 5.
- Amstutz, Harold E. and David B. Miller (1980) "A Study of Cattle Near 765 kV Transmission Lines." International Congress on Diseases of Cattle. Vol. 1.
- Angell, R. F., et. al., (1990) "Effects of a High-Voltage Direct-Current Transmission Line on Beef Cattle Production." Bioelectromagnetics. Vol. 11.
- Ganskopp, D. C., et. al. (1989) Distribution and Behavior of Cattle Exposed to +500 kV DC Transmission Lines. Eastern Oregon Agricultural Research Center. Burns, Or.
- Ontario Hydro Environmental Resources Section. (1980) High Voltage Transmission Effects on Livestock. December.
- Mercer, Dwight. (1985) "Biological Effects of Electric Fields on Agricultural Animals." Veterinary and Human Toxicology. Vol. 27, No. 5. October.

Stray Voltage

Stray voltage is defined by the PSCW as a natural phenomenon that can be found at low levels between two contact points in an animal confinement area where electricity is used. Electrical systems, including farm wiring systems and utility distribution systems, must be grounded to the earth according to the electrical safety code to ensure continuous safety and reliability.

Stray voltage often goes unnoticed by humans but can affect cows on dairy farms. Small stray voltage shocks are created when a cow makes contact between an energized point, such as a feeder, and the earth or concrete floor at a different voltage. Dairy cows can show changes in behavior or production if a level of stray voltage above a few volts is present, but these behavioral changes alone are not good indicators of the electrical situation. DATCP and the PSCW Rural Electrical Power Service (REPS) program suggest that all farmers routinely (every year or two) have their electrical system tested for stray voltage and other electrical safety concerns.

According to the PSCW docket 05-EI-106, the response level for stray voltage is 1.0 volt at cow contact from all sources. This level of stray voltage is considered to be below the level at which most cows would react. If an investigation determines that the utility is contributing 0.5 of a volt or more to the cow contact voltage, the utility will take immediate action to lower its contribution. Free investigative services are available to landowners who have livestock containment facilities. Landowners should contact their electricity provider to request such investigations prior to transmission line construction.

Distribution lines carry lower voltages (12.5 kV and lower) than transmission lines and they distribute power to neighborhoods and individual homes and businesses. Although it is not common, there is a possibility that a transmission line paralleling a distribution line may induce a measurable steady voltage or neutral to earth voltage (NEV) on the distribution neutral. There

are methods that ATC can use to address this issue where transmission lines parallel distribution lines. The relocation of distribution lines away from the proposed 345 kV transmission line is in part addressing this concern.

Crop Rotations

The most common rotation is 2 - 3 years of field corn, followed by soybeans, and then 3 years of alfalfa for the livestock (beef and dairy) farms. There is a trend toward fewer livestock operations and more cash grain (corn and soybean) farms.

The construction activity across a field may cause farmers to alter the rotation. A farmer may plant an extra year of row crop and delay planting the field to alfalfa if construction will occur in the seeding year. Given the high cost of seeding the crop, it may pay for the operator to avoid the loss of a 25 – 40 foot strip of production across the field for 3 years, by delaying planting alfalfa for a year. One can reseed, but the effort may not be successful. But one result for a dairy operation may be a shortage of alfalfa forage (hay or silage), which results in: 1) a need to buy haylage or hay or; 2) a need for more corn silage; and 3) an adjustment in the programmed diet for the herd. There may be increased feed costs for buying forage or protein supplements, such as soybean oil meal.

The farmer may choose to keep a field in alfalfa an extra year, rather than move to the first year of field corn. The population of alfalfa plants in the field is reduced each year, with an increase in the percentage of grass. Without advance knowledge of the construction schedule, the farmer may not fertilize (top-dress) the forage with potassium (K2O) in the fall. The result is lower yield and poorer quality of the forage (alfalfa) than the previous year.

The farmers can make adjustments in their crop rotation, if they know the construction schedule in advance. They may wish to plant a row crop during the year of construction and the year following construction to have an additional opportunity for tillage to remove any residual effects of compaction caused by the construction equipment.

Safety Issues when Farming Near Transmission Lines

Direct Contact and Arcing

The most significant risk of injury from a transmission line is the danger of electrical contact.

Unlike the wiring in a home, the conductors of overhead transmission lines are not enclosed by an insulating material. Electrical contact between an object on the ground and an energized conductor can occur even if the two do not actually touch. In the case of high voltage lines, electricity will arc across an air gap if the object on the ground comes close enough to a conductor. The distance between an object and a transmission line needed for arcing varies with the voltage at which the line is operated. In general, the arcing distance for a 345 kV line is two to three feet and for a 115 kV line it is one to one and one half feet. However, it is recommended that objects on the ground not be raised more than 14 feet above the ground in the vicinity of any power line. The 14-foot limitation is a general rule of thumb. In some instances, it can be exceeded without any problems. Farmers should contact ATC if they need to exceed this recommendation to be sure that their situation is safe for anticipated farming activities.

Transmission circuits are built to automatically de-energize upon contact with the ground or if phase conductors are severed. Therefore, the danger of electric shock from a downed transmission line is minimal.

Farmers must be careful where transmission lines sag due to high air temperatures. In areas where the soil shifts significantly with wind, the resulting dunes can elevate the earth under a line. If the safety limit needs to be exceeded or equipment close to the height limit is routinely used under a line, - such as bale wagons, bale elevators, grain augers, cranes, or large combines, - farmers should check with ATC to confirm the necessary clearance requirements. This may include confirming that the earth-to-line distances have not changed since the line was constructed.

Injuries are more likely to occur with lower voltage power lines (12.5 kV to 115 kV) than with higher voltage lines because contact with the lower voltage lines is more likely. The electrical conductors for lower voltage lines are closer to the ground, smaller, and less noticeable. An injury from contact with a 12.5 kV line can be just as serious as that from a 500 kV line. Some general safety tips for farmers working near any power line include the following. Most of these are taken from *Farmers Urged to Watch Electrical Hazards during Harvest Season* found at www.safeelectricity.org.

- Always lower portable augers or elevators to their lowest possible level (under 14 feet) before moving or transporting and be aware of your surroundings when raising them.

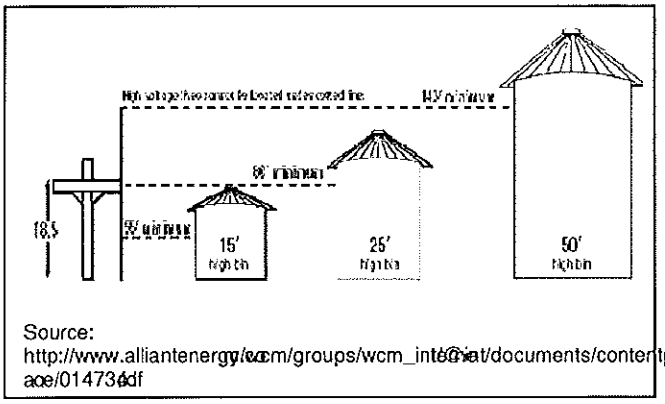
- When moving large equipment or high loads near a power line, always use a spotter, someone to help make certain that contact is not made with a power line.
- Be aware of increased height when loading and transporting larger modern tractors with higher antennas.
- Never attempt to raise or move a power line to help clear a path.
- Never raise ladders, poles, pipes, or rods near power lines. Remember that nonmetallic material such as lumber, tree limbs, and hay can conduct electricity depending on moisture and dirt contamination.

From the Ozark Border Electric Cooperative website:

> "The overhead electric wires aren't the only electrical contact that can result in a serious incident. Pole guy wires are grounded to the neutral; but when one of the guy wires is broken, it can cause an electric current disruption. This can make those neutral wires anything but harmless. If you hit a guy wire and break it, call the utility to fix it. Don't do it yourself. When dealing with electrical poles and wires, always call the electric utility.
>
> It's also important for operators of farm equipment or vehicles to know what to do if the vehicle comes in contact with a power line. It's almost always best to stay in the cab and call for help. Warn others who may be nearby to stay away and wait until the electric utility arrives to make sure power to the line is cut off.

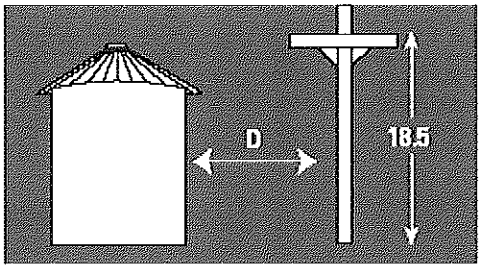
If the power line is energized and you step outside, your body becomes the path and electrocution is the result. Even if a (distribution) power line has landed on the ground, there is still the potential for the area nearby to be energized. Stay inside the vehicle unless there's fire or imminent risk of fire. In that case, the proper action is to jump – not step – with both feet hitting the ground at the same time. Do not allow any part of your body to touch the equipment and the ground at the same time. Continue to shuffle or hop to safety, keeping both feet together as you leave the area. Once you get away from the equipment, never attempt to get back on or even touch the equipment. Many electrocutions occur when the operator dismounts and, realizing nothing has happened, tries to get back on the equipment."

The National Electric Safety Code requires that power lines be at least 18 feet above the highest point on any grain bin with which portable augers and other portable filling equipment is used. The following diagram illustrates the recommended distances that grain bins should be away from transmission lines. It was taken from Alliant Energy's *Safety Notice: Grain Bin Clearance Regulations* from its Overhead Power Lines web page.



Source:
http://www.alliantenergy.com/groups/wcm_internet/documents/content/pace/014736.pdf

Height of Grain Storage Structure	D= Minimum distance from line* to bin wall
15 feet	55 feet
20 feet	68 feet
25 feet	80 feet
30 feet	93 feet
35 feet	104 feet
40 feet	118 feet
50 feet	143 feet
60 feet	168 feet
70 feet	193 feet
80 feet	218 feet



Because transmission lines are not coated like electrical cords, contact with the line is dangerous. Farmers must be cautious when moving tall farm equipment like elevators and conveyors near transmission line. Adequate clearance must be maintained between farm machinery and transmission lines. An 18-foot clearance should be maintained from the highest fill port of the grain bin and the transmission lines.

According to the Bonneville Power Administration (BPA) located in the northwestern United States, "All types of irrigation systems, including center-pivot systems, can be operated safely near or on a power line right-of-way. However, irrigators should avoid situations where a solid stream of water can come in contact with a conductor, even if the possibility is remote." Also from BPA, "Caution should be used in storing, handling, and installing irrigation pipe, and in operating spray irrigation systems near power lines. Irrigation piping should be moved in a horizontal position under and near all power lines to keep it away from conductors overhead." Regarding center-pivot systems, BPA says, "Center-pivot circular irrigation systems installed near or under transmission lines can develop hazardous shock potentials during operation and maintenance. To eliminate these hazards: farmers should provide a good electrical ground for the pivot point; farmers should not touch the sprinkler pipe or its supporting structures when the system is operating under, or parallel to and near, a transmission line; and farmers should perform repairs/maintenance of the system with the sprinkler pipe perpendicular to the transmission line." This information comes from BPA's *Living and Working Safely around*

High-Voltage Power Lines

Although there has been no report of the accidental ignition of fuel caused by spark discharges induced from transmission line fields, it is recommended that vehicles be refueled at least fifty feet from the centerline of a transmission line corridor that is 345 kV or greater.

Farm Electrical Safety Resources

The following websites provide additional information about electrical safety on farms.

Wisconsin Public Service Corporation's Farm Safety Webpage
http://www.wisconsinpublicservice.com/farm/safety.asp

Safe Electricity, an Illinois project
http://www.safeelectricity.org/results.asp?ID=260&mode=print

Living and Working Safely around High-Voltage Power Lines, a publication of Bonneville Power Administration
http://www.transmission.bpa.gov/NewsEv/pdfs/LivingAndWorking.pdf

Farming Safely around Electrical Power Lines, a publication of ElectSafe
http://www.elecsafe.info/images/farmer_safety_booklet.pdf

Static Discharge

Under certain conditions, a perceptible electrostatic voltage can be induced on such objects as large vehicles, permanent and temporary fences, metal buildings, shade cloth support structures used in ginseng gardens, or irrigation systems. This can happen when the object is near a high-voltage transmission line and is insulated from the ground. When a person or animal touches the object, a shock will be felt similar to what you may receive when you cross a carpet and then touch a doorknob. The static discharge is momentary, but can be painful. The magnitude of the static discharge depends on the voltage of the transmission line, distance from the conductors, size or length of the object, its orientation to the line, and the extent of grounding of the object to the earth.

This condition can be corrected by effectively grounding the object to the earth. Sometimes this is simply done by dragging a chain behind a tractor. Irrigation systems, metal buildings, and long wire fences may require additional assistance from ATC to remove the nuisance static discharges if they are close to the right-of-way.

Induced Internal Currents

An internal electric voltage and current are induced in any conducting object such as a plant or an animal that is in an AC electric or magnetic field. These fields are also referred to as electromagnetic fields (EMF). Induced internal current is one of the primary mechanisms by which EMF from power lines could cause a biological response. Unlike a static discharge or stray voltage, the level of the induced internal current density does not usually reach a sufficient level to cause a perceivable shock.

Some of the many factors that influence the induced current densities are the strength of the electric field, the shape of the body in the field, the cross-sectional areas at any point between the

line and the earth, the extent of grounding of the object to earth, and the nature of the internal structures of the object.

Corrosion on buried pipelines running parallel to a transmission line can occur if those pipelines are not properly grounded. This occurs where pipelines and transmission lines share a portion of their rights-of-way. Transmission lines can induce voltages on a nearby pipeline, which could lead to corrosion of the pipeline. This problem has been made worse by improvements in coatings that reduce the number of imperfections on the surface of a pipeline, which reduces the number of grounding opportunities. The problems of induced voltages and pipeline corrosion can be reduced by properly grounding the pipeline and providing adequate distance between the power line conductors and the pipeline.

The following are some safety considerations to remember when doing farm work around power lines.

- Check for overhead power lines before lifting or clearing debris from irrigation pipes.
- Never stack hay bales or other items under overhead power lines.
- Do not spray water on power lines or equipment. For irrigation systems, there may be a safety problem with arcing across the "air gap" because the end guns spray a stream of water much higher than the desired 15-foot maximum height under the transmission line. The problem can be handled by carefully orienting the "end guns" so they are not operating near the transmission line.
- Keep farm machinery away from power lines, poles and guy wires (the support cables for power poles). If you strike a guy wire or pole, call your power company immediately, you may have weakened the structure or created slack in the line.

Temporary Access for Maintenance and Repair

ATC will notify landowners and renters in person about one week before any scheduled maintenance starts. Landowners and renters who live out of the area will receive written notification via mail. In cases where ATC does not know who is renting an affected agricultural parcel, notification of the renter will occur after the owner is contacted. For emergency repairs, landowners and renters will normally be contacted afterwards.

After maintenance or repairs are completed, a representative from ATC's real estate department will contact landowners and renters to establish compensation for damages. Damage payments for crops are based on the most up-to-date commodity prices and the condition of the affected area.

Biosecurity

ATC will use farm mitigation practices that focus on avoiding contact with livestock and manure. If avoidance is not possible, ATC will work with the farmers to develop protocols specific to a landowner's farm operation. These protocols could include cleaning the equipment between parcels. (See ATC's "Agriculture Protection Practices" submitted to the PSC (Reference #49311))

The farm disease mitigation measures that ATC will use may include the removal of manure, organic material, and soil from tires where equipment crosses land containing livestock or certain high-value specialty crops that are especially susceptible to contamination, such as organic crops, ginseng or potatoes. This may be done by using cleaning stations.

If the PSCW approves the project, ATC has indicated that it will work with the agricultural producers along the approved route to follow any farm disease mitigation practices currently in place on the affected farms. ATC will work to ensure that currently practiced farm disease mitigation standards will be adhered to during construction of the project. If an agricultural landowner has no biosecurity plan in place, ATC will work with that landowner, at their request, to develop farm disease mitigation practices relevant to their agricultural operation. ATC will hire farm disease mitigation specialists to assist in these activities.

The least expensive method to minimize the spread of agricultural diseases and pests would be to isolate the property within the proposed easement and remove it from agricultural production during the construction period. However, this may be problematic especially given that from start to completion, line construction may take several months. Compensation could be offered to the agricultural landowner for not producing a crop or spreading manure during this period. Other options include the use of cleaning stations.

Impacts on Forested Land

Affected forest land owners will maintain ownership of any trees that need to be cut as a result of the proposed project. The manner in which these trees are handled should be negotiated between ATC and the affected landowner before construction begins. Typically, any timber or saw logs are stacked on the edge of the right-of-way in upland locations for the landowner's disposition. Smaller diameter trees and limbs, often referred to as slash, are usually chipped and disposed of according to the landowner's wishes: spread on the right-of-way, piled on the edge of the right-of-way for the landowner's use, or disposed of according to other agreed-upon arrangements. Slash may also be disposed of by burning, but local permits may be required for this.

When right-of-way is cleared on forest land, the contractor may use a technique called feathering. This means that the right-of-way is not left with a straight, abrupt edge along the cleared area. Instead, trees are cut in a manner that leaves a staggered edge. This may reduce the potential for degrading the quality of the remaining forest by reducing the amount of sunlight and wind in the remaining forest. Increased sunlight and wind can cause changes in the microclimate along the cleared edge of a forest. Feathering may also soften the visual impacts of

right-of-way clearing. Planting low-growing trees and shrubs along forested edges of cleared right-of-way can have positive effects similar to feathering.

Impacts to Farm Buildings

ATC has stated that no farm buildings or residences will be taken by the current project. ATC also did an inventory of the number of farmsteads along the various alternative project routes where buildings would be within 100 feet of the proposed right-of-way centerline. The Beltline to Rockdale route has four equipment storage buildings and a metal shed/equipment storage building within 100 feet of the centerline while the Rockdale Southwest and Albion Southwest routes each include five animal housing buildings and five equipment storage buildings. The Rockdale Southwest route also has four metal sheds within 100 feet of center, while the Albion Southwest route has three metal sheds. Segments M in the Rockdale-Verona Alternate route and Albion-Verona Alternate route had one animal building and one metal shed within 100 feet.

Negotiation Process for Establishing the Amount of Compensation

After ATC receives approval for its application and the PSC issues the order to build the project, they will begin contacting landowners to inform them of the PSC order and to request surveying permission. ATC has said that they will try to work with landowners to address their concerns. However, if landowners don't respond to ATC's contact attempts, the company will not know what concerns landowners might have. ATC's offer of compensation should be based on the fair market value of the easement to be acquired and any damages to the remaining parcel. If easement negotiation is not possible, ATC may seek condemnation of the easements needed.

If an easement is acquired through condemnation, the court assigns the legal obligations. Under a court-ordered settlement, ATC may not be as capable of flexibly addressing individual landowner concerns ATC has said it would still be willing to work with the landowners in such cases. The "Landowner Bill of Rights" still applies on condemned land. But if condemnation is used, it doesn't result in an easement contract between ATC and the landowner. It results in a court decision.

TEMPORARY CONSTRUCTION IMPACT

Time Loss during Negotiations

It is important that the farm owner understand how his farmland may be impacted both during and after construction. In some cases, farmland owners choose to consult with an attorney prior to signing an easement. The time spent negotiating easements can be time-consuming and represents a cost to the farmland owners; it is time that cannot be spent on managing his farm operation. This is particularly significant if these negotiations occur during planting or harvesting times.

Delayed Compensation and Cash Flow Impact

If negotiations are prolonged and a settlement is not forthcoming, the farmer may not receive timely compensation for crops that are not planted or harvested due to construction activities through his farmland. In some cases, this could result in cash flow problems to the farm operation.

Soil Erosion during Construction

An erosion problem occurs if ruts or wheel tracks run up or down the slopes. This is why farmers are careful not to leave a dead-furrow when moldboard plowing in the fall. The spring snowmelt will erode the soil severely with channelized flow if a dead-furrow is present.

Rutting the soil with construction equipment in the transmission corridor will create a similar erosion problem. The silty soils of the project area are very susceptible to flowing water. The rutting also mixes topsoil with the subsoil. The impact depends on the depth of the ruts.

The obvious solution is to stay off the soil when it is wet, to avoid rutting. DATCP recommends that ATC not construct through farmland when rutting is greater than 6 inches deep. The other possibility is to use some form of matting that prevents rutting by the equipment. During pre-construction planning, ATC staff should ask land owners about the extent of their existing and/or planned drainage tiles and systems. They should also document existing drainage problems that could affect the construction easement area.

Noise and Dust during Construction

Dust and noise due to transmission line construction can affect landowners and farm animals. If blasting is necessary to place the poles, dairy and beef cattle can stampede, breaking down fences and escaping the farm property. Fur animals and poultry are particularly sensitive to noise.

Cattle Fencing during Construction

ATC should fence off the construction area to prevent cattle from wandering onto the right-of-way. If transmission line construction divides a field used for grazing, access between the divided parcels could be restricted. ATC will need to work with the farmer to develop an access plan for the livestock or else compensate the landowner for the cost related to restrictions on grazing. If any cutting of fences is necessary during construction, ATC will see that a temporary gate is installed. (*Wis. Stats.* §182.017 (7)(c)5.) Such gates may be left in place at request of the landowner.

One of the questions that ATC staff should ask landowners about is the presence of animals on their farm operations, and the type of operation, i.e. feedlot, managed grazing, etc. Landowner schedules for manure application and storage in proximity to the right-of-way should be ascertained.

Farm Roads Needed to Access Construction Corridor

According to their application, for all segments, ATC is proposing to directly access the ROW from public roads or ATC ROW unless the construction contractor hired by ATC is able to arrange for alternative access that minimizes environmental impacts (ATC Application, October 2007, p. 115) The exception would occur where an ATC contractor "is able to arrange for alternative access that minimizes environmental impacts."

ATC's access plan may identify existing fields, field roads, forest roads, and public and private trails outside of the right-of-way that may also be used for access. On previous projects, the company has tried to obtain voluntary permission to use these alternate access routes in order to minimize impacts to sensitive areas. It is likely that ATC will begin talks with landowners to arrange appropriate access routes if necessary once a final route is selected.

ATC develops an access plan for a given project that identifies where the right-of-way will be accessed by the contractor. However, the contractor may choose to ignore this plan and find alternate access if that access is less damaging to the environment or less costly and the affected landowner agrees. The contractor reports to ATC where they have deviated from ATC's access plan. ATC is responsible to the landowner for damage done outside of the access plan.

Access roads should be designed to allow proper drainage and minimize soil erosion. If desired by the landowner, temporary roads will be left in place after construction is completed. If access roads are removed, soil restoration practices should be applied to the road to mitigate compaction.

Impacts to Agricultural Land Leased for Laydown and Staging Areas

About 195 acres of land has been leased for laydown, storage and staging areas for the Rockdale to West Middleton project at nine different sites in Dane County. (ATC Application, October 2007, p. 135) ATC has indicated that the selected sites are "primarily agricultural". (Ibid., p. 155) They plan to utilize at least 10 acres at each site, and a 30-foot access path would be utilized for ingress and egress. (Ibid. p. 156) ATC has also stated that the amount of clearing and grading at these sites will be minimized. (Ibid. p. 155)

DATCP believes that same avoidance, mitigation, and restoration protocols recommended for the transmission line right-of-way should be followed on the laydown and staging areas on farmland. This would include avoidance or mitigation for soil compaction and soil mixing in these areas. Following project completion, the same backfilling and decompaction procedures required on the corridor right-of-way should also be applied for these storage areas.

Temporary Wire Pulling/Handling Areas

ATC has indicated that during construction temporary areas will need to be set up every 5,000 to 10,000 feet along the chosen route for wire-pulling and handling. (ATC Application, p. 156) These areas are described as about 40 feet by 300 feet. It is not stated whether such areas are able to be accommodated entirely within the planned construction right-of-way, or whether they

would involve additional temporary easement areas. If additional temporary easement areas are necessary, the same topsoil removal and decompaction protocols should be applied as are used for the main construction right-of-way.

Impacts Associated with Surveying and Staking Transmission Line Right-of-Way

If surveying or construction crews leave wire surveying flags, equipment, or other debris behind after their work is completed, these items can pose a hazard to livestock. When livestock ingest such material, they can develop what is known as "hardware disease". Ingested wires or other objects can damage the animal's viscera and may lead to death.

Another hazard to livestock that can occur during right-of-way clearing or maintenance is the disturbance of black walnut trees. The roots of these trees produce a toxin known as juglone that causes an allergic reaction in horses and may also affect other livestock. Care should be taken when clearing any black walnut trees to make sure that all roots, wood, bark, leaves, hulls, and sawdust are removed from any area to which livestock may have access. Even the ash from trees that have been burned may still contain the toxin. Relatively small amounts of juglone are also found in Persian (English or Carpathian) walnut trees as well as butternut, pecan, and hickory trees.

Dewatering of Caisson Hole

The caisson hole will fill with water when the hole for the caisson is augured into somewhat poorly to poorly drained soils with either a perched or apparent water table. A 6-foot diameter hole, 10 feet deep will contain 283 cubic feet or 2,117 gallons of water. A 30-foot deep hole will contain 848 cubic feet or 6,342 gallons of water.

The usual procedure is to pump the water from the hole to a safe disposal area or to a tank truck for removal. The high water table soils along the proposed transmission line routes have characteristics that are going to make it very difficult to dewater the hole. Sand lenses will carry water to the hole quickly during the pumping process. Essentially, one has a shallow well with a high recharge rate. Disposing of the water on flat land is a significant problem.

The contractor may be able to place the concrete in the caisson hole using the "tremie" concrete placement process. This can greatly reduce the volume of water to be pumped. In this process, the concrete is pumped into the bottom of the hole which displaces the water until the concrete approaches the top of the hole or is above the water table. (Some concrete which has been diluted is skimmed off.) The reinforcement steel cage is then vibrated into the concrete and the structure finished. This process avoids the need to pump and dispose of very large quantities of water.

Proper dewatering of the caisson hole requires pre-construction identification by ATC contractors of low areas and hydric soils that are likely to collect water during construction, as well as suitable areas for the discharge of water accumulated within the caisson hole or other excavated areas. ATC contractors should structure work to minimize accumulation of water within the excavated area and get ATC and landowner approval for all discharge locations and techniques used. Discharge locations must be well-vegetated areas that prevent the water from

returning to the right-of-way, that are as far from backfilling activities as possible, and that avoid deposition of gravel or sediment onto fields, pastures, or watercourses.

If delivery of water onto cropland is unavoidable, crops cannot be inundated for more than 24 hours without severe damage to the crop. Discharge of water from non-organic farms or from hydrostatic testing is not allowed if that runoff would flow onto adjacent organic farm operations.

Silt or sediment extraction from the excavation site is minimized by preventing the intake from touching the bottom or sides of the trench, and by assuring that the intake is supported by a flotation device. Erosion control measures must be used to divert the flow of pumped water and prevent erosion. Dewatering should be monitored and stopped whenever necessary. When construction in hydric soils creates wet trenching and dewatering activities that cause damage that cannot be avoided, ATC should reasonably compensate the landowner for such damages and restore the land and crops to pre-construction conditions.

The following table shows data on depth to water table for soils in farmland along the four routes.

Table 15 - Depth to Water Table for Farm Soils Along Rockdale to Middleton Routes

Farmland Soil Area Along Rockdale to Middleton Routes: (segments making up the route)	Total Farmland Soils Area Along the Route (acres)	Area in Acres (% of Total Farmland Soil Area) where Water Table <= 1 foot down	Area in Acres (% of Total Farmland Soil Area) where Water Table <= 1 to 3 ft. down	Area in Acres (% of Total Farmland Soil Area) where Water Table <= 3 to 5 ft. down
Beltline to Rockdale Route (O, H,B,A)	94.7	10.3 (10.8%)	25.5 (27.0%)	47.5 (50.2%)
Albion Southwest Route (N,G,E2,Q)	420.8	37.1 (8.8%)	119.3 (28.3%)	192.3 (45.7%)
Beltline-Albion Alternate Route (O,L,K2,P,F,E2,Q)	220.2	14.9 (6.8%)	31.8 (14.4%)	78.5 (35.7%)
Albion-Verona Alternate Route (N,M,F,E2,Q)	341.1	26.8 (7.9%)	68.0 (19.9%)	157.7 (46.2%)

POTENTIALLY TEMPORARY IMPACTS

Some impacts to agricultural can be "temporary" if effective construction protocols are implemented when constructing through farmland. The construction and maintenance of high-voltage transmission lines across or adjacent to cropland and pastures can affect the farming practices and operations in several ways.

Farmers have invested in their cropland to improve or maintain yields. Some of the invested costs are an annual expense, such as fertilizer and lime. Others involve a long-term investment in agricultural drainage systems, erosion control, and sprinkler irrigation. An assessment of the possible impacts and damages to cropland begins with knowledge of the soil and its characteristics.

Soil Compaction

Equipment used to construct transmission lines has the potential to compact soil and thereby reduce soil productivity on the farmland traversed during construction. Soil compaction reduces pore space between soil particles, restricting the movement of water and gases through the soil. This can affect the rooting depth of crops and the uptake of soil nutrients and water. In addition, soil compaction can decrease soil temperature, decomposition of organic matter, and a plant's ability to access required nutrients found lower in the rooting zone. It can also increase the likelihood of water erosion on farm fields.

Studies by several universities have shown yield reduction due to compaction can range from 10% to 40%.[10] Compaction is most evident when the crop is under additional stress. For example, this could include drought conditions or excessively wet conditions.

Several factors influence whether a soil becomes compacted. An important influence is soil moisture: the wetter the soil the more likely it is to be compacted from traffic. The potential for compaction also depends on the soil texture. Coarser textured soils, like sand or sandy loam, are less likely to become compacted than are clay or silty clay loams. Finally, the axle weight of the construction equipment affects compaction. The expected compaction depth increases as the axle load increases and as soil moisture content increases.

Compaction of the soil in the root zone of agricultural crops results in reduced yields. The depth at which the compaction occurs is very important. The combination of soil structure and the soil's internal drainage are major factors in determining whether compaction will occur and at what depth. The soil structure most resistant to compaction is granular or single grained. Subangular blocky structure resists compaction forces reasonably well at a soil moisture content of roughly 50 percent field moisture capacity. (Field moisture capacity is defined as the water content of soil after the excess water has drained away. It is the maximum amount of water stored in the soil for crop production.) The soil structure least able to resist compaction forces is platy structure. A platy structure has the soil particles arranged around a plane, generally horizontal. Platy structure appears laminated. Several of the soils on the transmission line routes have a platy structure in one or more soil horizons from 9 to 30 inches below the soil surface.

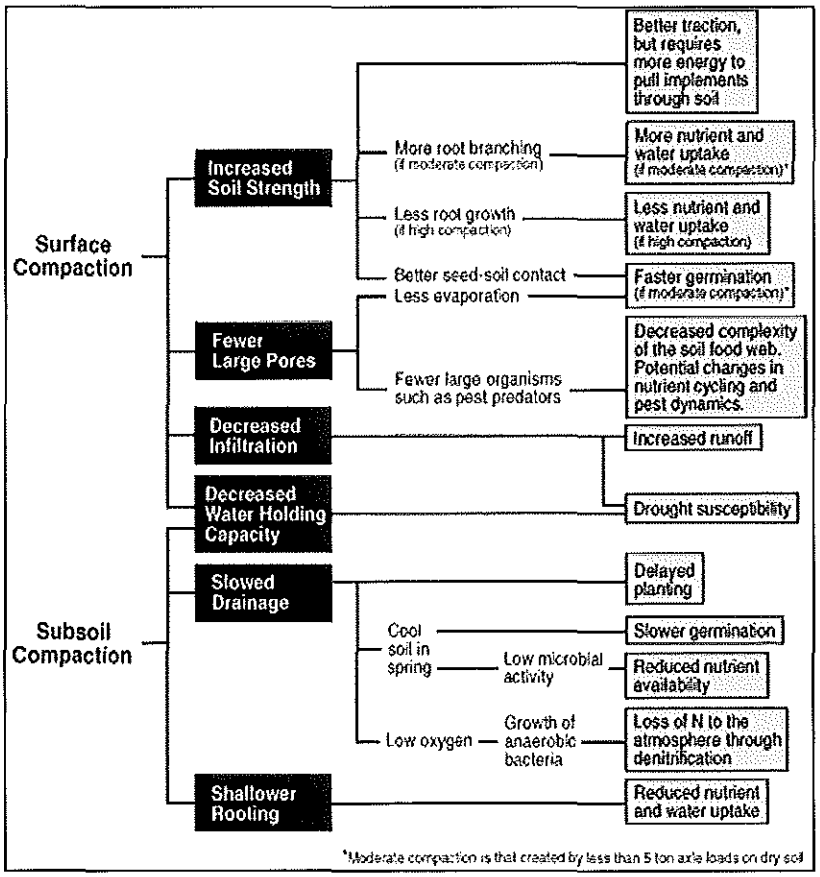
Topsoil compaction and subsoil compaction can be viewed separately. When traffic loads are relatively lightweight, less than 10 tons per axle, the soil generally will not be compacted below the 8-10 inch range - the depth at which the topsoil layer is commonly found. Compaction at this depth normally can be decompacted with typical farm tillage equipment.

Some of the heavier construction equipment that will be used on the project can compact soil to depths of 20 inches or more, resulting in subsoil compaction that is very difficult to alleviate, especially with regular tillage equipment.

[10] Effect of Compaction on Corn Yield, University of Wisconsin Publication A3367.

Subsoil compaction is related to weight-per-axle. Total axle load affects the depth of compaction, generally the subsoil layer, while contact pressure (psi) more commonly affects the topsoil layer. Subsoil compaction affects nutrient uptake, available water capacity, and can delay spring planting under wet conditions, consequently reducing crop yield. Indicators of soil compaction include abnormal root growth, excessive erosion, soil crusting, standing water, and uneven emergence of crops.

IMPACTS OF COMPACTION THROUGHOUT THE SOIL PROFILE



Soil Drainage and Texture Definitions

The soil drainage classes used in the description of the soils reflect the combined effects of surface runoff, soil permeability, and internal soil drainage. The classes are:

Excessively well drained – Water is removed from the soil very rapidly.

Well drained – Water removed readily, but not rapidly.

Moderately well drained – Water removed from the soil somewhat slowly so that the profile is wet for a small, but significant part of the time.

Somewhat poorly drained – Water is removed from the soil slowly enough to keep it wet for significant periods. The soil has a slowly permeable layer in the profile, a high water table, seepage from up-hill, or a combination of the above.
Poorly drained – Water is removed so slowly that the soil remains wet for a large part of the time. The water table is commonly at or near the surface during a large part of the year. The soil has a high water table, slowly permeable layers within the profile, up-hill seepage, or a combination of the above.
Very poorly drained – Water is removed from the soil so slowly that the water table remains at or near the surface the greater part of the time. Soils of this drainage class usually occupy level or depressed sites, and are frequently ponded.

The water table is the upper limit of the waterlogged soil. Growing plants will remove soil water by transpiration; during the growing season this will lower the water table and reduce downhill seepage.

An apparent water table results from an impermeable or essentially impermeable layer, below the soil profile. A perched water table occurs because a slowly permeable soil layer within the soil profile causes part of the profile to be waterlogged.

The field description of soil structure established by the soil mapper/classifier provides (1) the grade (distinctness) of structure which is the degree of aggregation, (2) The class or size of the aggregate or ped, and (3) the type of structure.

The grade or distinctness of the structure is expressed as (1) Weak being equal to poorly formed or indistinct peds (aggregates), (2) Moderate being equal to well formed or distinct peds, and (3) Strong equaling durable peds.

The class or size of aggregate or ped is expressed as (1) very fine or very thin, (2) fine or thin, (3) medium, (4) coarse or thick, and (5) very coarse or very thick. The reference to thin applies to platy or laminated structural shape.

The types of soil structure shape are (1) Platy (laminated) where the soil particles are arranged around a plane, generally horizontal, (2) Prism like (prismatic or columnar) where the soil particles are arranged around a vertical axis, (3) Block like or polyhedral (angular or subangular) where the soil particles are arranged around a point and bounded by flat or rounded surfaces, and (4) Spheroidal or polyhedral represented by granular or crumb. Structure-less soils are either "single grain" or massive. A massive structure is a condition where the soil particles adhere without any regular cleavage, as in a hardpan.

"Soil consistence when moist" is the consistence when the soil moisture is midway between air dry and field moisture capacity. "Friable" describes a condition where the soil material crushes easily under gentle to moderate pressure between the thumb and fore-finger. "Firm" represents the condition when the soil material crushes under moderate pressure between the thumb and fore-finger, but resistance is distinctly noticeable. Color is the easiest condition to observe. The color of the soil material is provided to help us recognize when the surface layer becomes the subsoil, and subsoil become substratum.

Construction of a Soil Compaction Index

DATCP staff have utilized a soil compaction assessment to predict the possibility of compaction occurring on soils in agricultural fields during periods when the soil is not frozen. A soil compaction index is used as an indicator of compaction risk. This measure combines internal soil drainage (wetness) with soil structure in the soil horizons to predict compaction risk. The scalar for internal soil drainage assigns a value of 1 for "excessively drained", 2 for "well drained" and "moderately well drained", 3 for "somewhat poorly drained", and 4 for " poorly drained" to "very poorly drained" soils. The scalar for soil structure assigns a value of 1 for a granular structure, 2 for a subangular blocky and/or prismatic structure, and 3 for a platy structure. Table 16 shows the affected soils susceptibility to compaction.

Table 16 - Compaction Index

Soil Name	Drainage Class	Scale Value	Soil Structure	Scale Value	Compaction INDEX	Compaction Possibility
Sogn silt loam	Excessively	1	Granular	1	1	None
Edmund silt loam	Well	2	Granular	1	2	None
Eleva sandy loam	Excessively well	1	Subangular Blocky	2	2	None
Elkmound sandy loam	Excessively well	1	Subangular Blocky	2	2	None
Griswold loam	Well	2	Granular	1	2	None
Troxel silt loam	Well / Moderately well	2	Granular	1	2	None
Basco silt loam	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Boyer sandy loam	Well	2	Subangular Blocky	2	4	Maybe
Dodge & Kidder soils	Well	2	Subangular Blocky	2	4	Maybe
Dodge silt loam	Well	2	Subangular Blocky	2	4	Maybe
Dresden loam	Well	2	Subangular Blocky	2	4	Maybe
Dunbarton silt loam	Well	2	Subangular Blocky	2	4	Maybe
Gale silt loam	Well	2	Subangular Blocky	2	4	Maybe
Grays silt loam	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Hixton loam	Well	2	Subangular Blocky	2	4	Maybe
Kidder loam	Well	2	Subangular Blocky	2	4	Maybe

McHenry silt loam	Well	2	Subangular Blocky	2	4	Maybe
Meridian loam	Well	2	Subangular Blocky	2	4	Maybe
NewGlarus silt loam	Well	2	Subangular Blocky	2	4	Maybe
Otter silt loam	Poorly	4	Granular	1	4	Maybe
Pecatonica silt loam	Well	2	Subangular Blocky	2	4	Maybe
Plano silt loam	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Plano silt loam, gravelly substratum	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Port Byron silt loam	Modereately well	2	Subangular Blocky	2	4	Maybe
Ringwood silt loam	Well	2	Subangular Blocky	2	4	Maybe
Rockton silt loam	Well	2	Subangular Blocky	2	4	Maybe
Salter sandy loam	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Seaton silt loam	Modereately well	2	Subangular Blocky	2	4	Maybe
St. Charles silt loam	Well / Moderately well	2	Subangular Blocky	2	4	Maybe
Westville silt loam	Well	2	Subangular Blocky	2	4	Maybe
Whalen silt loam	Well	2	Subangular Blocky	2	4	Maybe
Batavia silt loam, gravelly substratum	Well	2	Platy	3	6	Likely
Dells silt loam	Somewhat poorly	3	Subangular Blocky	2	6	Likely
Dresden silt loam	Well	2	Platy	3	6	Likely
Elburn silt loam	Somewhat poorly	3	Subangular Blocky	2	6	Likely
Hayfield silt loam	Somewhat poorly	3	Subangular Blocky	2	6	Likely
Huntsville silt loam	Well / Moderately well	2	Platy	3	6	Likely
Kegonsa silt loam	Well	2	Platy	3	6	Likely
Salter sandy loam, wet variant	Somewhat poorly	3	Subangular Blocky	2	6	Likely
Virgil silt loam, gravelly substratum	Somewhat poorly	3	Subangular Blocky	2	6	Likely
Marshan silt loam	Poorly	4	Subangular Blocky	2	8	Definitely
Sable silt loam	Poorly	4	Subangular Blocky	2	8	Definitely
Wacousta silty clay loam	Poorly	4	Subangular Blocky	2	8	Definitely
Orion silt loam	Somewhat poorly	3	Platy	3	9	Definitely
Radford silt loam	Somewhat poorly	3	Platy	3	9	Definitely

CONCLUSIONS AND RECOMMEDATIONS

The agriculturally preferred route for the Rockdale to West Middleton transmission line project is the Rockdale-Beltline Route. This route affects the fewest acres of farmland and has the least overall impact on agriculture. The least preferred route for the Rockdale to West Middleton transmission line is the Albion-Southwestern Route. This route affects the greatest number of acres of farmland and has the greatest overall impact on agriculture.

The DATCP recommends the following to mitigate the potential adverse impacts associated with the proposed project:

1. The highest priority should be given to locating transmission lines parallel to and adjacent to existing transmission lines, railroad corridors or highways. When this is not possible, all support structures should be spaced to minimize their placement impact on cropland.

2. Where the transmission line is adjacent to and parallel to an existing transmission line, highways or railroad right-of-way, but on privately owned farmland, the support structures should be placed out of agricultural cropland whenever possible.

3. If this project is approved, ATC should construct as much of the project as possible when the ground is frozen. This would minimize soil compaction and reduce the risk of spreading weeds, diseases and pests between farms.

4. ATC should provide funds for independent construction inspectors that report to the PSC to ensure compliance with ATC's Agricultural Protection Construction Practices and other landowner or agency-related agreements.

5. After construction of the line is complete, ATC should determine whether the soils in the ROW have been compacted by construction or other equipment. This is commonly done by comparing the compaction levels of soils on the portion of the right-of-way that carried construction traffic to the soils off the ROW. If soils on the ROW are compacted, steps should be taken to correct the problem. Where soil compaction is identified by the

independent environmental inspector, ATC should decompact the soil with the appropriate tillage tool.

6. Significant rutting (in excess of 6") in agricultural areas should be avoided to prevent excessive soil mixing, compaction, and additional erosion control issues. If significant rutting is anticipated or begins to occur, mitigation measures must be employed such as stopping work to allow the area to firm up/dry out, placing construction mats, or finding alternate access to avoid the area. Where rutting or compaction does occur, areas will be repaired and restored using appropriate equipment.
7. To avoid topsoil runoff, the ATC Environmental Monitors should identify areas where erosion control devices are needed; including matting in areas where other erosion control measures are not feasible.
8. The Contractor should strip and segregate topsoil and subsoils at all excavation sites and restore stockpiled topsoil and subsoils as soon as practicable. New topsoil should be spread at agricultural locations where topsoil has been lost or substantially mixed with subsoils.
9. Landowners who will have easements acquired for the proposed project should be familiar with the "Landowners' Bill of Rights" which is found in §182.017 (7). ATC may ask landowners to waive some or all of the rights listed in this statute, but the landowners are not required to waive the rights.
10. Farmers should be given advance notice of ROW acquisition and construction schedules. This would enable farmers to adjust their farming activities accordingly. To the extent feasible, the timing of the acquisitions and construction/restoration should be coordinated with farm operators to minimize crop damage and disruption of farm operations.

11. ATC should make every reasonable effort to replace, repair, or pay to repair drainage systems damaged during transmission line construction.

12. If the farmland owner is paid for any work which is needed to correct damage to the farm property, ATC should pay the current commercial rate for such work.

13. ATC should repair or pay the landowner to repair any soil conservation practices - such as terraces and grassed waterways - which are damaged due to transmission line construction. The repairs should be made in accordance with the Dane County Land Conservation Department's recommendations.

14. ATC should remove from the farmland owner's property all construction related debris.

15. ATC should avoid excessive erosion on all lands disturbed by construction by implementing practices included in their Environmental Agricultural Protection Construction Practice (ENV CP 01 J).

16. All parent material/spoil excavated during pole placement should be removed from the field unless the landowner agrees to have it disposed of on his/her land at an upland location. (*Wisconsin Statutes Section 182.017, (7) (c) 4.)*

17. If trees are to be removed from privately owned farmland, the ATC should consult with the landowners to determine if the trees are of any commercial or other value to the landowner. If the trees have value to the landowner, the ATC should allow the landowner the right to retain ownership of the trees with the disposition of the trees to be negotiated prior to commencement of land clearing. If the landowner decides that the trees have no value, ATC should dispose of the trees by burning, burial or complete removal in accordance with the landowner's wishes.`

18. ATC should provide the farmland owner with a minimum of 24 hours prior notice before entering the landowner's property. Prior notice should consist of a personal contact or a phone call, when possible.

19. Prior to construction of the transmission line, ATC should provide the farmland owner with a phone number that he/she can call to alert the ATC if the landowner finds that the work relating to the agricultural impact mitigation is inferior.

Appendix 1 Agricultural Impact Statements

The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) is required to prepare an Agricultural Impact Statement (AIS) whenever more than five acres of land from at least one farm operation will be acquired for a public project if the agency acquiring the land has the authority to use eminent domain for the acquisition(s). The DATCP has the option to prepare an AIS for projects affecting five or fewer acres from each farm. An AIS would be prepared in such a case if the proposed project would have significant effects on a farm operation. The agency proposing the acquisition(s) is required to provide the DATCP with the details of the project and acquisition(s). After receiving the needed information, DATCP has 60 days to analyze the project's effects on farm operations, make recommendations about it and publish the AIS. DATCP will provide copies of the AIS to affected farmland owners, various state and local officials, local media and libraries, and any other individual or group who requests a copy. Thirty days after the date of publication, the proposing agency may begin negotiating with the landowner(s) for the property.

Section 32.035 of the Wisconsin Statutes: Agricultural impact statement.

(1) Definitions. In this section:
(a) "Department" means department of agriculture, trade and consumer protection.
(b) "Farm operation" means any activity conducted solely or primarily for the production of one or more agricultural commodities resulting from an agricultural use, as defined in s. 91.01 (1), for sale and home use, and customarily producing the commodities in sufficient quantity to be capable of contributing materially to the operator's support.
(2) EXCEPTION. This section shall not apply if an environmental impact statement under s. 1.11 is prepared for the proposed project and if the department submits the information required under this section as part of such statement or if the condemnation is for an easement for the purpose of constructing or operating an electric transmission line, except a high voltage transmission line as defined in s. 196.491(1)(f).
(3) PROCEDURE. The condemnor shall notify the department of any project involving the actual or potential exercise of the powers of eminent domain affecting a farm operation. If the condemnor is the department of natural resources, the notice required by this subsection shall be given at the time that permission of the senate and assembly committees on natural resources is sought under s. 23.09(2)(d) or 27.01(2)(a). To prepare an agricultural impact statement under this section, the department may require the condemnor to compile and submit information about an affected farm operation. The department shall charge the condemnor a fee approximating the actual costs of preparing the statement. The department may not publish the statement if the fee is not paid.

Appendix 2 -Wisconsin Statutes Section 182.017 "Landowners' Bill of Rights"

(7) High-voltage transmission lines. Any easement for rights-of-way for high-voltage transmission lines as defined under s. 196.491(1)(f) shall be subject to the conditions and limitations specified in this subsection.

(a) The conveyance under ch. 706 and, if applicable, the petition under s. 32.06(7), shall describe the interest transferred by specifying, in addition to the length and width of the right-of-way, the number, type and maximum height of all structures to be erected thereon, the minimum height of the transmission lines above the landscape, and the number and maximum voltage of the lines to be constructed and operated thereon.

(b) In determining just compensation for the interest under s. 32.09, damages shall include losses caused by placement of the line and associated facilities near fences or natural barriers such that lands not taken are rendered less readily accessible to vehicles, agricultural implements and aircraft used in crop work, as well as damages resulting from ozone effects and other physical phenomena associated with such lines, including but not limited to interference with telephone, television and radio communication.

(c) In constructing and maintaining high-voltage transmission lines on the property covered by the easement the utility shall:

1. If excavation is necessary, ensure that the top soil is stripped, piled and replaced upon completion of the operation.
2. Restore to its original condition any slope, terrace, or waterway which is disturbed by the construction or maintenance.
3. Insofar as is practicable and when the landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.
4. Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.
5. Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If cutting a fence is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the landowner's request.
6. Repair any drainage tile line within the easement damaged by such construction or maintenance.
7. Pay for any crop damage caused by such construction or maintenance.
8. Supply and install any necessary grounding of a landowner's fences, machinery or buildings.

(d) The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the landowner. If weed and brush control is undertaken by the landowner under an agreement with the utility, the landowner shall receive from the utility a reasonable amount for such services.

(e) The landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the landowner fails to do so, the landowner shall nevertheless retain title to all trees cut by the utility.

(f) The landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.

(g) The utility shall employ all reasonable measures to ensure that the landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.
The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of-way, without the written consent of the landowner.
The rights conferred under pars. (c) to (h) may be specifically waived by the landowner in an easement conveyance

Appendix 3 - Example of ATC Transmission Line Easement

Document Number

ELECTRIC TRANSMISSION LINE EASEMENT
CERTIFICATE OF COMPENSATION
NOTICE OF RIGHT OF APPEAL
Wis. Stat. Sec. 182.017(7)

The undersigned Grantor(s) _____ **(hereinafter called the "Landowner")**, in consideration of the sum of one dollar ($1.00) and other good and valuable consideration, receipt of which is hereby acknowledged, does hereby grant, convey and warrant unto **American Transmission Company LLC, a Wisconsin limited liability company, hereinafter called the "Grantee"**, its successors, assigns, licensees and manager, the perpetual right and easement to construct, install, operate, maintain, repair, replace, rebuild, remove, relocate, inspect and patrol a line of structures, comprised of wood, concrete, steel or of such material as Grantee may select, and wires, including associated appurtenances for the transmission of electric current, communication facilities and signals appurtenant thereto, upon, in, over and across property owned by the Landowner in the _____ **of** _____, **County of** _____, **State of Wisconsin, described as follows:**

(Add description of land and description of easement strip)

The location of the easement strip is as shown on the attached drawing, marked Exhibit "C", and made a part of this document.

The easement has the following specifications:

EASEMENT STRIP:

Length _____

Width _____

TRANSMISSION STRUCTURES:

Number _____

Maximum height above existing ground level _____feet

TRANSMISSION LINES:

Maximum nominal voltage _____ kV

Number of circuits _____

Number of conductors _____

Number of static wires _____

Minimum height above existing landscape (ground level) _____

Record this document with the Register of Deeds

Name and Return Address:

American Transmission Company LLC
Attn: Real Estate Department
(add address)

Parcel Identification Number(s)

The Grantee is also granted the associated necessary rights to:

1) Enter upon the easement strip for the purposes of exercising the rights conferred by this easement. 2) Construct, install, operate, maintain, repair, replace, rebuild, remove, relocate, inspect and patrol the above described facilities and other appurtenances that the Grantee deems necessary. 3) Trim, cut down and remove any or all brush, trees and overhanging branches now or hereafter existing on said easement strip. 4) Cut down and remove such trees now or hereafter existing on the property of the Landowner located outside of said easement strip which by falling might interfere with or endanger said line(s), together with the right, permission and authority to enter in a reasonable manner upon the property of the Landowner adjacent to said easement strip for such purpose.

The Grantee shall pay a reasonable sum for all damages to property, crops, fences, livestock, lawns, roads, fields and field tile (other than trees trimmed or cut down and removed), caused by the construction, maintenance, replacement or removal of said facilities.

Landowner, for itself, its successors and assigns, agrees that it will not locate any dwelling or mobile home intended for residential occupancy within the limits of the easement strip. Landowner, for itself, its successors and assigns, further agrees that within the limits of the easement strip it will not construct, install or erect any structures or fixtures, including but not limited to swimming pools, construct any non-residential type buildings or store any inflammable goods or products, plant trees or shrubs, place water, sewer or drainage facilities, or change the grade more than one (1) foot without first securing the prior written consent of the Grantee.

The parties hereto do hereby agree to the terms and conditions set forth in Exhibit "A", "B" and "___", attached hereto and incorporated herein. The term "utility" on said Exhibit "A" shall mean Grantee.

This agreement is binding upon the heirs, successors and assigns of the parties hereto, and shall run with the lands described herein.

As provided by PSC 113, the Landowner shall have a minimum period of five days to examine materials approved or provided by the Public Service Commission of Wisconsin describing the Landowner's rights and options in the easement negotiating process. The Landowner hereby voluntarily waives the five-day review period, or acknowledges that they have at least five (5) days to review such materials.

Landowner warrants and represents that Landowner has good title to the property described herein, free and clear from all liens, except: _____

The Landowner hereby accepts a lump sum payment in consideration of the grant of this easement.

WITNESS the signature(s) of the Landowner this _____ day of _____, 200__.

_____(SEAL)
Signature

_____
Printed Name

_____(SEAL)
Signature

_____
Printed Name

_____(SEAL)
Signature

_____
Printed Name

_____(SEAL)
Signature

_____
Printed Name

Landowner

Printed Name of Mortgagee or Corporation

By _____
Signature

_____
Printed Name

Attest:

By _____
Signature

_____
Printed Name

Mortgagee

ACKNOWLEDGEMENT

STATE OF WISCONSIN)
) ss
COUNTY OF)

Personally came before me this _____ day of _____, 200__, the above named _____ to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

_____
Signature of Notary

_____
Printed Name of Notary

Notary Public, State of Wisconsin

My Commission expires (is) _____

ACKNOWLEDGEMENT

STATE OF WISCONSIN)
: SS
COUNTY OF_____)

Personally came before me this _____ day of _____, 200__, the above named _____to me known to be the person(s) who executed the foregoing instrument and acknowledged the same.

_____
Signature of Notary

_____
Printed Name of Notary

Notary Public, State of _____

My Commission expires (is) _____

ACKNOWLEDGEMENT

STATE OF WISCONSIN)
: SS
COUNTY OF _____)

Personally came before me this _____ day of _____, 200__, _____ President, and _____, of the above named corporation, known to me to be the persons who executed the foregoing instrument and to me known to be such _____ President and _____ of said corporation, and acknowledged that they executed the foregoing instrument as such officers, as the deed of said corporation, by its authority.

_____
Signature of Notary

_____
Printed Name of Notary

Notary Public, State of _____

My Commission expires (is) _____

EXHIBIT "A"
[WI Sta. 182.017(7)]

1. In constructing and maintaining high-voltage transmission lines on the property covered by the easement, the utility shall:

   a) If excavation is necessary, ensure that the topsoil is stripped, piled and replaced upon completion of the operation.

   b) Restore to its original condition any slope, terrace, or waterway, which is disturbed by the construction or maintenance.

   c) Insofar as is practicable and when the Landowner requests, schedule any construction work in an area used for agricultural production at times when the ground is frozen in order to prevent or reduce soil compaction.

   d) Clear all debris and remove all stones and rocks resulting from construction activity upon completion of construction.

   e) Satisfactorily repair to its original condition any fence damaged as a result of construction or maintenance operations. If cutting a fence is necessary, a temporary gate shall be installed. Any such gate shall be left in place at the Landowner's request.

   f) Repair any drainage tile line within the easement damaged by such construction or maintenance.

   g) Pay for any crop damage caused by such construction or maintenance.

   h) Supply and install any necessary grounding of a Landowner's fences, machinery or buildings.

2. The utility shall control weeds and brush around the transmission line facilities. No herbicidal chemicals may be used for weed and brush control without the express written consent of the Landowner. If weed and brush control is undertaken by the Landowner under an agreement with the utility, the Landowner shall receive from the utility a reasonable amount for such services.

3. The Landowner shall be afforded a reasonable time prior to commencement of construction to harvest any trees located within the easement boundaries, and if the Landowner fails to do so, the Landowner shall nevertheless retain title to all trees cut by the utility.

4. The Landowner shall not be responsible for any injury to persons or property caused by the design, construction or upkeep of the high-voltage transmission lines or towers.

5. The utility shall employ all reasonable measures to ensure that the Landowner's television and radio reception is not adversely affected by the high-voltage transmission lines.

6. The utility may not use any lands beyond the boundaries of the easement for any purpose, including ingress to and egress from the right-of-way, without the written consent of the Landowner.

EXHIBIT "B"

CERTIFICATE OF COMPENSATION

SECTION 32.06 (2A) WISCONSIN STATS.

DATED THIS _____ DAY OF _____, 200__ .

Pursuant to Section 32.06(2a) notice is hereby given of the acquisition of a certain easement attached hereto and made a part hereof by this reference. The names of all persons or parties having an interest of record in the property affected by such easement immediately prior to the acquisition of the easement are the following:

Landowner:

Mortgagee(s):

Land Contract Vendor(s):

Others:

Such easement grants unto Grantee, its successors and assigns, the right, permission and authority to construct, maintain and operate (an) electric transmission line(s) for the purpose of transmitting electric energy, communications and signals upon, in, over and across the easement strip as described on the instrument to which this exhibit is attached.

The total consideration paid for such easement was $ _____ .

NOTICE OF RIGHT OF APPEAL

In accordance with Section 32.06 (2a) Wisconsin Stats., any of the above named persons or parties shall have six (6) months from the date of the recording of this certificate to appeal the amount of compensation herein stated by filing a petition with the Judge of the Circuit Court of _____ County, Wisconsin, who shall assign the matter to the Chairperson of the County Condemnation Commissioners for hearing under Sub. (8). Notification of such petition shall be made to all persons or parties having an interest of record in the above property, and the procedures prescribed under Subs. 9 (a) and (b), 10, 12 and Chs. 808 and 809 shall govern such appeals.

This instrument drafted by _____ on behalf of American Transmission Company, PO Box 47, Waukesha, Wisconsin 53187-0047.