Wood County 138-kV Reinforcement Project

Application to the Ohio Power Siting Board
for a
Certificate of Environmental Compatibility and Public Need

Prepared for

American Transmission Systems, Incorporated,

a FirstEnergy Company

American Transmission Systems, Inc.
a subsidiary of FirstEnergy Corp.

OPSB Case Number 18-1335-EL-BTX

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BEFORE THE OHIO POWER SITING BOARD

Certificate Application for Electric Transmission Facilities

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Acronyms and Abbreviations

ATSI	American Transmission Systems, Inc.
BES	ATSI's Bulk Electric System
BMP	Best management practice
CEII	Critical Energy Infrastructure Information
CETL	Capacity Emergency Transfer Limit
cm	centimeter
DOE	Determination of Eligibility
DR	Demand Response
DSM	Demand-Side Management
EE	Energy efficiency
ELF	extremely low frequency
EMF	electromagnetic field
EPRI	Electric Power Research Institute
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
GIS	geographic information system
HHEI	Headwater Habitat Evaluation Index
ID	identification
kV	kilovolt
MSDS	Material Safety Data Sheet
NA	not applicable
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NHL	National Historic Landmarks
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OAC	Ohio Administrative Code
OAI	Ohio Archaeological Inventory
ODNR	Ohio Department of Natural Resources
ODNR-DOW	Ohio Department of Natural Resources - Division of Wildlife
ODOT	Ohio Department of Transportation
OEPA	Ohio Environmental Protection Agency
OHI	Ohio Historic Inventory
OHPO	Ohio Historic Preservation Office

OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Method
OSHA	Occupational Safety and Health Administration
PADUS	Protected Areas Database of the United States
PEM	palustrine emergent
PHWH	Primary Headwater Habitat
PRD	Price-Response Demand
PUCO	Public Utilities Commission of Ohio
Project	Wood County 138-kV Reinforcement Project
QHEI	Qualitative Habitat Evaluation Index
RAPID	Research and Public Information Dissemination
RFI	Radio frequency interference
ROW	right-of-way
RPM	Reliability Pricing Model
RSS	Route Selection Study
RTEP	Regional Transmission Expansion Plan
SDS	Safety Datasheet
SR	State Route
SWPPP	stormwater pollution prevention plan
T&E	Threatened and endangered
TEAC	Transmission Expansion Advisory Committee
TNW	traditionally navigable waterway
TPL	Transmission Planning Limits
TVI	Television interference
UNT	unnamed tributary
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

4906-5-02 PROJECT SUMMARY AND APPLICANT INFORMATION

(A) PROJECT SUMMARY

American Transmission Systems, Incorporated (ATSI), a FirstEnergy company, plans to construct a new 138-kilovolt (kV) transmission line in Wood County, Ohio. Route alternatives under consideration traverse Middleton, Center and Plain Townships and a portion of the City of Bowling Green. The new transmission line will connect the Lemoyne-Midway 138 kV Transmission Line to the Brim Substation. The proposed Project will eliminate the existing 3-terminal line configuration and create two new transmission lines: Brim-Lemoyne 138-kV Transmission Line and Brim-Midway 138-kV Transmission Line circuits. As the proposed Project is the installation of a second 138-kV source for the Brim Substation, FirstEnergy is seeking approval for a new 138-kV transmission line route that is physically and functionally separate from the existing 138-kV source to provide greater reliability and operational flexibility for the local transmission and sub-transmission system.

(1) General Purpose of the Facility

The purpose of the proposed Project is to improve reliability of the transmission and sub-transmission systems in the Bowling Green and surrounding area, to strengthen the transmission system under numerous planning contingencies, and to improve overall efficiency and flexibility in the operation of the transmission system in Wood County, Ohio. Currently, electric transmission service in the Project area is provided by one 138 kV transmission line that extends south from the Lemoyne-Midway 138 kV Transmission Line to the Brim Substation. Should a fault occur anywhere along the Lemoyne-Midway 138 kV Transmission Line or the existing 138 kV transmission line tap, it would cause voltage problems for Bowling Green and the surrounding area. The proposed Project is the least impactful option to resolve voltage drops, increased service demand, and provide for future system capacity. The Project will support economic development in the area and will allow ATSI to improve electric transmission service reliability by providing increased redundancy and operating flexibility.

Additional details can be found in the Application's Review of Need and Schedule, in Section 4906-5-03.

(2) General Location, Size, and Operating Characteristics

The proposed Project will be located in north central Wood County. The Project begins at the existing Lemoyne-Midway 138 kV Transmission Line, which trends east/west at the northern extent of the Project Area. The proposed transmission line would extend generally south and terminate at the Brim Substation, located at the northwest corner of the intersection of Bishop Road and Brim Road. The Project, as proposed, is a single-circuit transmission line supported on wood poles requiring a 60-foot-wide permanent right-of-way (ROW). The transmission line will be approximately 6.0 miles in length.

(3) Suitability of Preferred and Alternate Routes

ATSI identified a Preferred and an Alternate Route after conducting a Route Selection Study (RSS), which is included as **Appendix 4-1**. The RSS provides details on the selection process utilized by ATSI to identify the Preferred and Alternate Routes proposed in this Application. A detailed discussion of the RSS and selected routes is found in Section 4906-5-04 of this Application.

In general, the RSS is developed through an iterative and incremental process that starts with the identification of reasonable routes given the Project need and overall Project area considerations. Possible routes for review and consideration were initially selected based on the avoidance or minimization of impacts to known sensitive land uses, ecological features, and cultural resources, where identification was possible from existing resources. Potential routes were then evaluated, compared, and ranked to identify potential routes for further evaluation. Based upon this initial review of potential routes, 16 candidate route alternatives were identified and subject to a numerical scoring system. Based on field data collected and route scores, the 16 candidate routes were then ranked first by individual category (i.e. land use, ecological, technical, and cultural) then overall score.

For purposes of identifying the Preferred and Alternate Routes presented in this Application, the siting team considered all of the factors included in the RSS, with a particular emphasis on route alternatives that minimized residential impacts. Information and land owner considerations were also taken into account, where possible, to further reduce impacts.

Ultimately, ATSI identified the Preferred and Alternate Routes as feasible routes and which represent, in the assessment of the Applicant, the minimal adverse environmental impact taking into account all relevant factors.

(i) Preferred Route

The Preferred Route is identified in the RSS as Route 12 (Nodes: A-B-L-Q-S-T-O-P).

Segment A-B was common amongst all candidate routes since all proposed alignments approached Brim Substation from the south in order to maintain a pathway separate from the existing 138kV Tap to Brim Substation. Segments L-Q-S-T-O-P were selected based on overall rank and limited residential impacts. Other variations of this route were also considered including routes 16, 10, 11, 15, 9, 14, 8, and 13; however, each of these candidate routes share over 50% of the same segments making the routes not viable alternatives under Admin. Code Rule 4906-3-05.

Further, following the public information meeting on September 26, 2018, adjustments were made to segments of the Preferred Route based on landowner comments and information regarding existing land use practices (see Section 4906-5-04).

Overall, the Preferred Route is approximately 6.1 miles in length.

(ii) Alternate Route

The Alternate Route is identified in the RSS as Route 3 (Nodes: A-B-C-I-E-J-K). The Alternate Route shares segment A-B with the preferred route. This segment represents approximately 1.4% of commonality between routes 3 and 12 which is consistent with Admin. Code Rule 4906-3-05.

The Alternate Route ranked 1st overall in the RSS, principally due to it having the lowest (more favorable) ranking land use score due to crossing the least amount of properties and avoiding any institutional land uses properties. However, based on the qualitative evaluation of the Application, it was determined to have a larger direct impact on the land uses of the properties crossed, as compared to the more western corridor of route 12. Based on the qualitative evaluation of the various routes considered in the RSS, however, Applicant determined that this route provided a viable alternative to the Preferred Route.

This route was presented at the public information meeting held on September 26. Based on landowner comments, adjustments were made to segments of the route to accommodate existing land use practices and visual concerns (see Section 4906-5-04).

Overall, the Alternate Route is approximately 6.0 miles in length.

(4) Schedule

Construction of the Project is anticipated to begin in February 2020 with an anticipated in-service date of June 2020. The current Project schedule, including all major activities and milestones, is illustrated in a Gantt schedule bar chart provided in 4906-5-03(F)(1).

(B) APPLICANT DESCRIPTION

(1) Company History

ATSI is a wholly-owned subsidiary of FirstEnergy Transmission, LLC (“FET”), which is a wholly-owned subsidiary of FirstEnergy Corp. (“FirstEnergy”). ATSI’s assets are comprised, in large part, of the transmission assets formerly owned by the operating utilities of FirstEnergy in western Pennsylvania and Ohio (i.e., Pennsylvania Power Company (“Penn Power”) in western Pennsylvania, and Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company in Ohio). ATSI commenced the provision of FERC-jurisdictional interstate transmission service in Ohio on September 1, 2000, following approval from the Public Utilities Commission of Ohio (PUCO) to transfer transmission assets from the FirstEnergy Ohio operating companies to ATSI.

FirstEnergy was formed in 1997 through the merger of Ohio Edison Company and Centerior Energy Corporation. Through this merger, FirstEnergy became the holding company for Ohio Edison and its Pennsylvania Power Company subsidiary, as well as The Cleveland Electric Illuminating Company and The Toledo Edison Company. At that time, FirstEnergy served 2.2 million customers within 13,200 square miles of northern and central Ohio and western Pennsylvania, and had approximately 12,000 megawatts of generating capacity. (FirstEnergy, 2016)

In 2001, FirstEnergy nearly doubled its customers to more than 4.3 million when it merged with the former GPU, Inc., based in Morristown, New Jersey. GPU served 2.1 million customers in a 24,000 square-mile service area in Pennsylvania and New Jersey through its three operating companies: Metropolitan Edison Company, Pennsylvania Electric Company, and Jersey Central Power & Light Company. (FirstEnergy, 2016)

In 2011, FirstEnergy completed a merger with Allegheny Energy, a Greensburg, Pennsylvania based company that served 1.6 million customers in Pennsylvania, West Virginia, Maryland and Virginia. The merger provided opportunities for FirstEnergy to grow and expand into new markets with a stronger, more focused competitive operation. (FirstEnergy, 2016)

Today, FirstEnergy is one of the nation's largest investor-owned electric systems serving 6 million customers within a service territory of 65,000 square miles and six states. (FirstEnergy, 2016)

(2) Current Operations and Affiliate Relationships

ATSI is a transmission-only company (or “transco”) that provides transmission services in the western portion of Pennsylvania and in the state of Ohio. Currently, ATSI owns and maintains over 8,100 circuit-miles of transmission lines, substations and other transmission facilities that are located primarily in the ATSI Zone of PJM Interconnection, LLC (“PJM”), which is the regional transmission organization (“RTO”) for the area. ATSI also owns certain limited transmission facilities outside of its zone that are necessary to tie ATSI’s transmission system into the transmission and generation facilities in neighboring utilities’ territories or otherwise necessary to support transmission service in ATSI’s zone. ATSI’s transmission facilities are under the operational control of PJM.

4906-5-03 REVIEW OF NEED AND SCHEDULE

SECTION SUMMARY

This Section of the Application provides an explanation of:

- Why it is necessary to construct the proposed new 138 kV transmission line to Brim Substation;
- How the Project fits into the Applicant's long-term forecast and regional plans for the electric system;
- How the Project serves the interest of system economy and reliability; and,
- provides a schedule for the Project.

As explained in this Section of the Application, when compared to other alternatives, the proposed Project is the best option to improve the transmission and sub-transmission systems in Wood County with enhancements to efficiency, reliability and operational flexibility of these systems. Construction of the Project will improve electric service for approximately 16,000 customers served by the transmission system in the Project area and allow for future economic development and growth in the area.

Constructing a new 138 kV transmission line was selected over other alternatives because it is the most efficient option to resolve thermal loading issues, encroaching low voltage limitations, and provide for future system capacity and economic growth in the area. Specifically, construction of the Project will provide safe and reliable electric service, as well as operating flexibility to avoid the potential for local voltage collapse. Further, the Project adds another source for power flow to and through the Project area and affords the Applicant greater flexibility and capacity for future load growth and system maintenance, ensuring that the businesses, homes and communities in the area will have ready access to safe and reliable energy for many years to come. Finally, the Project provides additional operational benefits that accrue by adding another power source in the Project Area.

(A) NEED FOR PROPOSED FACILITY

This Project involves making improvements to the operation of the transmission and sub-transmission systems in the Project Study Area to strengthen the transmission system under numerous planning contingencies and to improve overall efficiency and flexibility in the operation of the transmission system in Wood County, Ohio.

The Project is one component of planned upgrades necessary to achieve the needed system improvements. These two component projects are:

1. The Project, which involves the construction of the new Lemoyne-Midway 138 kV Transmission Line to Brim Substation. The Project is from a new tap location on the existing Lemoyne-Midway 138kV Line to the new Brim 4-Breaker 138kV Ring Bus at the

existing Brim Substation. The new 138kV transmission line is an extension of approximately 6.1 miles from the existing transmission line to the expanded Brim Substation and further networks the Brim Substation into the transmission system.

2. The second component upgrade is the expansion of the Brim Substation. This component project involves the proposed addition of a second 138/69 kV transformer at the Brim Substation, establishing a 4-Breaker 138 kV Ring Bus, and a 4-Breaker 69 kV Ring Bus. This upgrade is not subject to OPSB jurisdiction.

Implementation of these two upgrades are necessary to fully address the required system reinforcements. More specifically, the Project is needed to reinforce the less than 100 kV Transmission System on the FE/ATSI and Bowling Green Municipality system in the Project Study Area to continue to provide safe and reliable electric service and allow for future economic development and growth in the area. As such, the need for the proposed Facility is provided in the context of the reinforcement of the entire Bowling Green area 69 kV system.

The Project Study Area was evaluated in 2016 and has been re-evaluated in 2018 using the PJM 2017 Load Forecasts from the forecast report dated January 2017. In both evaluations, it was determined that the Project Study Area may experience potential circuit thermal overloads and low voltage values that are either approaching or exceeding criteria limitations under various planning scenarios.

(1) Purpose of the Proposed Facility

ATSI's 138 kV and 69 kV transmission system in and near the Project Study Area are part of the regional transmission grid and – through various substations – provide electric supply to customers within the Toledo Edison service territory and around the Bowling Green area. In the Project Area, the existing Project Area Transmission System serves approximately 16,000 customers or 85 MWs of load in Wood County, Ohio. This area of the FirstEnergy service territory is referenced in this Application as the Project Study Area.

Various planning scenarios for the 2017-year case, including the loss of the existing Brim #1 Transformer and the loss of the existing Pemberville-Bowling Green No. 4 69 kV Transmission Line, results in potential thermal overloads on the Midway-Bowling Green No. 2 69 kV Transmission Line at 172%. The system voltage, under these same contingency losses, is observed to have critically low voltages, enough to result in a potential system voltage collapse in the Project Study Area; including Bowling Green No. 2 69 kV substation bus (78%), Bowling Green No. 3 69 kV substation bus (77%), and Tontogany 69 kV substation bus (81%).

The proposed Project will strengthen the Project Study Area and provide additional system capacity to enable future potential economic development inquiries to be quickly evaluated and provided transmission service with limited system reinforcements; depending on the nature of the service request.

The Project installs a new and separate 138 kV transmission line path and source into the Brim Substation. This new 138 kV source will support the Project Study Area under either the loss of the existing Brim #1 Transformer or the loss of the existing Pemberville-Bowling Green No4 69 kV Transmission Line.

When compared to other alternatives, the proposed Project is the best option to resolve potential thermal overloads, encroaching low voltage limitations, and provide for future system capacity and economic growth in the area.

Overall, the Project will provide the following benefits to the Project Area's transmission system and its customers. The Project will:

1. Address potential thermal overloads on the Midway-Bowling Green No. 2 69 kV line, Maclean-Pemberville 69 kV Transmission Line and the Pemberville #1 Transformer.

2. Improve reliability of the Project Area Transmission System under certain planning scenarios by adding voltage support from the 138 kV to the 69 kV system. The area around Bowling Green, Ohio is vulnerable to low voltage conditions under certain scenarios which will be addressed or mitigated by the addition of the new transmission lines providing an additional 138 kV source.

3. Strengthen the Project Area Transmission System to support future growth in load demand in the Project Study Area; an increase in transmission system service capacity of up to 159% in parts of the system planning area.

(2) System Conditions, Local Requirements, and Other Pertinent Factors

The ATSI transmission system in the Project Area is supported by one ATSI 138-kV line, the Lemoyne-Midway 138 kV Transmission Line Tap to Brim Substation. It has become necessary to build this Project to relieve thermal loading issues, provide additional voltage support, and support future economic growth activities in the area. Greater details can be found in Section (3) -- Load Flow Studies and Contingency Analyses below.

(3) Load Flow Studies and Contingency Analyses

ATSI modeled various planning scenarios and studies of the Project Area's Transmission System for the PJM 2022 and 2017 Forecast summer peak load conditions with, and without, the proposed Project. These studies included evaluation of the effects of multiple element contingencies (N-2 Contingency).

Table 2-2 below lists the applicable system load levels evaluated in the load flow analysis.

Table 2-2: PJM 2017 Load Forecast		
Year	**Load Level**	**Applicable System**
2017	12,994 MW	ATSI
2022	13,011 MW	ATSI

Load Flow Study Results

Table 2-3 and Table 2-4 provide a summary of the 2022 case evaluation of the system power flows and system voltages before and after installation of the proposed Project.

1. The Midway-Bowling Green No. 2 69 kV Transmission Line has a summer emergency (SE) rating of 64 MVA and the analysis of the 2022 planning year indicates that the identified circuit will overload to 163% of its summer emergency rating for the loss of the Brim #1 Transformer and the loss of the Pemberville-Bowling Green No4 69 kV Transmission Line. The 2022 case evaluation also shows that with the proposed Project completed, the identified transmission line loading, under contingency analysis, drops to 5% of the summer emergency rating and provides for additional load growth in the planning area.

2. The Pemberville #1 Transformer has a summer emergency rating (SE) of 10 MVA and the analysis of the 2022 planning year indicates that the identified circuit will overload to 104% of its summer emergency (SE) rating for the loss of the Brim #1 Transformer and loss of the Midway-Bowling Green No2 69 kV Transmission Line. The 2021 case evaluation also shows that with the proposed project completed, the identified transmission line loading drops to 15% of its summer emergency (SE) rating and provides for additional load growth in the planning area.

3. The Bowling Green 69 kV substations including Bowling Green No2 through Bowling Green No7 are subjected to potential voltage collapse (below 0.80 per unit) for the loss of the Brim #1 Transformer and the loss of the Pemberville-Bowling Green No4 69 kV Transmission Line before the project is complete. After the completion of the Project the system voltage is sustained at above 1.0 per unit for the Bowling Green No2 through Bowling Green No7 substations.

Table 2-3: 2022 Case Evaluation of Power Flows

Contingency	Rating (MVA)		Monitored Facility	Before Project	After Project	Capacity Margin Gained (%)
	SN	SE		%Overload (SE)	%Overload (SE)	
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	57	64	Midway - Bowling Green No2 69 kV Transmission Line	163.40%	4.80%	158.60%
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	10	10	Pemberville 69/34.5 kV Transformer #1	103.70%	15.10%	88.60%
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	75	90	Maclean - Pemberville 69 kV Transmission Line	99.90%	13.90%	86.00%

Table 2-4: 2022 Case Evaluation of System Voltages

Contingency	KV	Monitored Facility	Before Project Voltage Results PU	After Project Voltage Results PU	Increased Voltage Margin %
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.2	0.79	1.01	22.2
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.3	0.78	1.01	22.5

Contingency	KV	Monitored Facility	Before Project Voltage Results PU	After Project Voltage Results PU	Increased Voltage Margin %
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.4	0.78	1.01	22.78
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.5	0.78	1.01	22.75
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.6	0.78	1.01	22.69
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Bowling Green No.7	0.78	1.01	22.72
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	PGE	0.78	1.01	22.71
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Weston 69 kV	0.86	1.00	13.99
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Tontogany	0.82	1.01	19.13
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	69	Grand Rapids	0.90	1.01	11.08
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	34.5	Malinta	0.81	0.96	14.97

Contingency	KV	Monitored Facility	Before Project Voltage Results PU	After Project Voltage Results PU	Increased Voltage Margin %
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	34.5	McClure	0.81	0.96	14.78
Loss of the Brim Transformer #1 and loss of the Pemberville-Bowling Green No.4 69 kV Transmission Line	34.5	Weston 34.5 kV	0.84	0.99	14.29
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.2	0.92	1.01	9.36
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.3	0.92	1.01	8.77
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.4	0.93	1.01	8.01
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.5	0.92	1.01	9.31
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.6	0.92	1.01	8.55
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	Bowling Green No.7	0.92	1.01	8.78
Loss of the Brim Transformer #1 and loss of the Midway-Bowling Green No.2 69 kV Transmission Line	69	PGE	0.92	1.01	8.98

<u>Load Flow Study</u>

An electronic copy of the Applicant's load flow data, in the form of a load flow case with the proposed facility, can be provided upon request and under seal to the OPSB Staff as it contains confidential trade secret and Critical Energy Infrastructure Information ("CEII").

(4) System Performance Transcription Diagrams

System Performance Transcription Diagrams are confidential trade secret information and critical energy infrastructure information that will be provided upon request under a seal to the OPSB Staff or the Board.

(5) Base Case System Data

Gas Pipeline Information. Not applicable to this Project.

(B) REGIONAL EXPANSION PLANS

The Project was submitted as a supplement to the PJM Regional Transmission Expansion Plan (RTEP) at the Sub-Regional RTEP Committee on August 31, 2018 to improve operational flexibility, improve reliability, and mitigate low voltage or voltage collapse scenarios. See section (1) (c) below.

(1) Proposed Facility in Long-Term Forecast

(a) Reference in Recent Long-Term Forecast

This Project will be listed in the First Energy Corp 2019 Long Term Forecast Report.

(b) Explanation if Not Referenced

Not applicable, see Section 4906-5-03 (B) (1) (a) directly above.

(c) Reference in Regional Expansion Plans

The Project was also submitted as a supplement to the PJM Regional Transmission Expansion Plan (RTEP) at the Sub-Regional RTEP Committee on August 31, 2018 to improve operational flexibility during maintenance and restoration efforts; improve system protection, coordination, and fault location under the existing three-terminal line configuration; reduce the amount of local load loss under contingency conditions; and mitigate non-planning criteria concerns on the <100kV system under a contingency (P6) condition.

(2) Gas Pipeline Long-Term Forecast Reference

Gas Pipeline Information. Not applicable to this Project.

(C) SYSTEM ECONOMY AND RELIABILITY

Completion of the Project will resolve planning thermal overloads and improve the system voltage on the Project area's transmission system for the future year studied. ATSI has determined that bringing the Project on-line will not adversely impact any of ATSI's other existing transmission facilities, or the transmission facilities and equipment of neighboring utilities. Overall performance on the Project area's transmission system will be improved significantly as a result of the construction of the Project.

Thermal overloads and low voltages will be corrected, and the Project area's transmission system will have additional margin or capacity to allow ATSI the ability to support future economic growth and greater operational flexibility to continue to provide safe, efficient and reliable electricity to its customers. The Project will add a 138 kV to 69 kV source to the area, strengthening the 69 kV transmission system that provides local service to residential, commercial, and industrial customers. In addition, transmission system maintenance and switching procedures will be easier to facilitate with these new transmission lines put in place. Substation equipment and overhead transmission lines are placed on routine inspection and maintenance schedules, to ensure proper reliability and reduce the chances of system outages.

(D) OPTIONS TO ELIMINATE THE NEED FOR THE PROPOSED PROJECT

Alternatives evaluated for this Project included:

The following operations were evaluated for their potential to eliminate the need for the Proposed Project:

1. Reconductor Midway - Bowling Green No.2 69 kV Transmission Line
2. Replace the existing Pemberville #1 Transformer with a larger unit.

The alternatives listed above do not address potential voltage collapse and adding a capacitor bank is not a viable solution for voltage collapse. Future load growth on the system will continue to push existing transmission system elements (transmission lines and transformers) and conditions beyond their design capabilities for safe operation. The proposed Project addresses existing planning criteria violations and builds a reasonable margin and system capacity, as well as improves operational flexibility, beyond what is immediately needed to address the near-term planning horizon of 2022.

ANALYSIS OF NON-TRANSMISSION ALTERNATIVES

Two different types of non-transmission alternatives were considered: (i) energy efficiency alternatives and (ii) demand-side management alternatives. As explained below, although certain features of each non-transmission alternative were attractive, no single non-transmission alternative resolved all of the capacity, thermal and voltage violations on the ATSI 69 kV Transmission System. Accordingly, the non-transmission alternatives were rejected.

Energy Efficiency

Conservation and energy efficiency programs involve actions taken on the customer side of the meter that reduce the customers' overall energy requirements (collectively referred to as "Energy Efficiency" actions). Energy Efficiency actions focus on using energy more efficiently without sacrificing customer comfort or convenience. These actions usually involve installing more efficient equipment or changing processes to conserve energy. Energy Efficiency and conservation programs usually provide financial incentives for customers to purchase and install energy efficient equipment and/or educate consumers on the efficient use of energy. Energy Efficiency also requires customer cooperation – a utility cannot force customers to participate in Energy Efficiency programs. The reduction in peak load would be less than what is necessary to relieve the thermal overload problems on the 69-kV system. Further, Energy Efficiency programs will not provide the transmission infrastructure that is needed for future operational flexibility, voltage support, and the capacity for future economic growth. New transmission lines or transmission sources, similar to the proposed Project, would remain needed to solve the system thermal, voltage, and capacity constraints. Accordingly, this option is not sufficient and, as such, was rejected.

Demand Side Management

Demand-Side Management ("DSM") programs generally involve actions taken on the customer side of the meter that have the intention and effect of reducing the customers' requirements during peak times. DSM programs typically involve utility incentives that are provided to consumers in exchange for reduction or curtailment of customer load at specific times (usually system peak times, but also can be used to address peak times at specific locations). Load management and demand response incentives are most often provided and renewed on an annual basis. Further, DSM also requires customer cooperation – a utility cannot force customers to participate in DSM programs. DSM will not provide for the future required transmission infrastructure needed for continuous reliable transmission service to the Project Area. This would leave the Project Area without a means of maintaining proper system voltages. New transmission lines, similar to the proposed Project, would remain needed to solve the capacity constraint and system voltage concerns.

It is clear that DSM can make only a small and limited contribution to relieving the capacity problems on the 138 kV and 69 kV System. Accordingly, this option is not sufficient and, as such, was rejected.

Inclusion of Energy Efficiency and Demand Side Management in PJM Forecasting

PJM forecasts include Energy Efficiency and Demand Side Management that clear in PJM's Reliability Pricing Model and are already included in the modeling and forecasting done by PJM. Consequently, the ability to address the need for the Project through additional Energy Efficiency or Demand Side Management projects is limited by the fact that existing Energy Efficiency and Demand Side Management recourses are already included in the forecasts that were used in the modeling that demonstrated the need for the Project.

New Generation

ATSI does not build or own generation and can only plan for transmission. In 2001, the State of Ohio made a policy decision to deregulate electric utilities. Through this deregulation process, the State of Ohio mandated that transmission and generation must remain in legally separate and independent companies. As such, ATSI does not build or own generation and can only plan for transmission.

(E) FACILITY SELECTION RATIONALE

The Project which installs an additional 138 kV transmission line circuit into Brim Substation was selected because it is the most efficient long-term solution to resolve the identified thermal overload problems that exist on the ATSI 69 kV transmission system in the Project Study Area, while adding voltage support and additional capacity on the system for future economic load growth and operational flexibility. Construction of the Project will provide operating flexibility to eliminate future violations and adds another source for power flow to and through the Project Study Area, affording greater flexibility and capacity for future load growth and system maintenance and ensuring that the businesses, homes and communities in the area will have ready access to safe and reliable energy for many years to come.

As noted herein, all of the other transmission and non-transmission alternatives either would not resolve all of the capacity and voltage problems or, if such problems would be resolved, the alternatives would: (i) be short term solutions; and (ii) require future additional investments without adding the required overall area improvements.

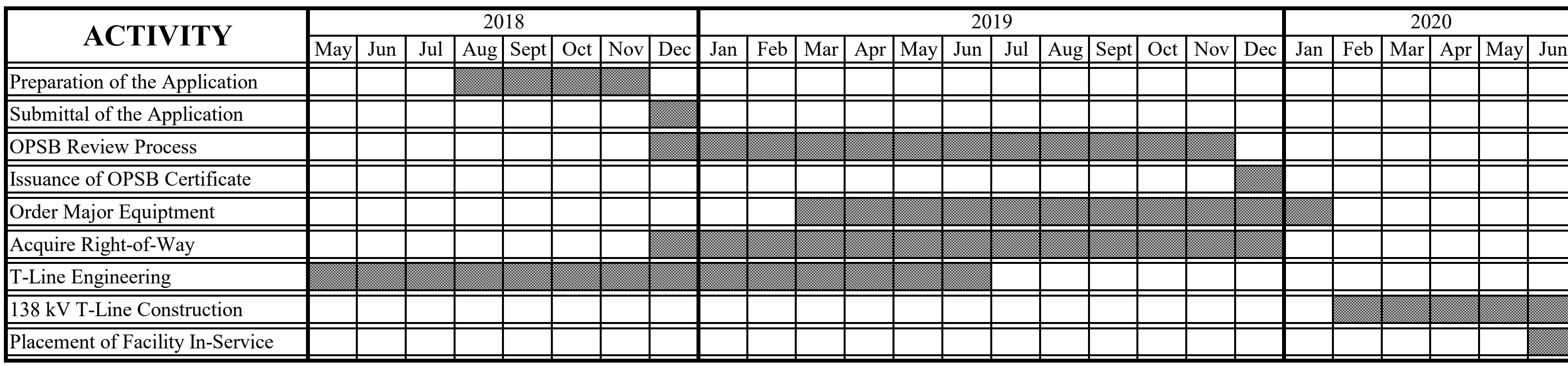
(F) PROJECT SCHEDULE

(1) Overview Schedule

It is anticipated that the overall project will require 24 months to permit, site, design, and build the 138 kV transmission lines from the time of approval. Construction on the Project is expected to begin on approximately February 2020 and is expected to be completed and placed in-service by June 2020. A detailed Project schedule is included as Figure 3-1.

(2) Impact of Critical Delays

Critical delays in construction or other processes necessary to bring the Project on-line may impact the Applicant’s electric customers in the Bowling Green and surrounding area by exposing them to ongoing reliability issues until such time as the Project is brought on-line. This may include lower than desired service voltages and emergency forced load shed to prevent thermal loading issues. Project delays will also limit the ability of the community to respond and provide transmission service to economic growth opportunities in an efficient and timely manner.



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WOOD COUNTY 138-kV REINFORCEMENT PROJECT

FIGURE 3-1
PROJECT SCHEDULE
PREFERRED ROUTE

4906-5-04 ROUTE ALTERNATIVES ANALYSES

(A) ROUTE SELECTION STUDY

ATSI conducted a Route Selection Study (RSS) for the transmission line proposed in the Project. A copy of the RSS is included as **Appendix 4-1**. The goal of the RSS was to identify reasonable routes, while avoiding or minimizing effects on sensitive land uses, ecological, and cultural features in the Project vicinity with the ultimate objective being the identification of a Preferred and Alternate Route for the Project that met all applicable criteria for issuance of a Certificate by the Ohio Power Siting Board. Potential routes were quantitatively and qualitatively evaluated, compared, and ranked to provide the basis for the selection of a Preferred and an Alternate Route.

Prior to beginning the Study, certain key objectives were identified as the minimum criteria needed to achieve the Project goals. These objectives included identifying:

- Route alternatives that must connect the existing Lemoyne-Midway 138 kV Transmission Line to the existing Brim Substation;
- Route alternatives that must include a 60-foot wide cleared ROW;
- Route alternatives that must be able to support required conductor, insulators, and other hardware required by Transmission Planning and/or Transmission Engineering;
- Route alternatives that must be able to have appropriate rights and permits secured to support an in-service date of June 1, 2020; and,
- Route alternatives that must provide sufficient separation from the existing 138-kV line into Brim Substation to minimize the potential for a single event disrupting both lines, thereby improving reliability.

(1) Project Area Description and Rationale

The Project is located in north-central Wood County, Ohio. The Study Area encompasses Middletown, Plain, and Center Township as well as portions of the Village of Haskins and the City of Bowling Green. The Project area is primarily rural, consisting mainly of agricultural land with small pockets of residential development. The Project area is relatively flat with elevations ranging from approximately 663 to 681 feet above sea level. There are no distinct elevation changes, slopes, or landforms present in the Project Study Area. Woodlots are sparse throughout the Project area. There are no large water features (lakes, rivers, reservoirs) present in the Project area.

ATSI considered geographic features such as existing utility corridors and municipal boundaries, as well as applying professional judgment, to define a focused Project area for the Project. The northwestern corner of the Project area was therefore defined by the existing railroad corridor running northeast/southwest. The western boundary of the Project area was defined by Liberty

Hi Road. The southern boundary was defined by the existing Brim Substation. It is a best practice to limit the Study Area in the opposite direction from the direct path between the start and end point. The southeastern corner of the Project area was defined by the existing railroad corridor running northeast/southwest. The eastern boundary of the Project area was defined by Mercer Road. The northern boundary was defined by the existing transmission corridor. It is a best practice to limit the Study Area in the opposite direction from the direct path between the start and end point.

(2) Project Area Map

Figure 2-1 of the RSS (**Appendix 4-1**) illustrates the approximate boundary of the Study Area.

(3) Map of Project Area, Routes, and Sites Evaluated

Figure 2-1 of the RSS report (**Appendix 4-1**) illustrate the boundary of the Study Area, route segment alternatives, and the route alternatives that were evaluated and scored in order to guide the selection of Preferred and Alternate Routes.

(4) Siting Criteria

The list and description of all quantitative siting criteria as well as the weighting values for each criterion utilized in the RSS are presented in Table 2-3 of the RSS report (**Appendix 4-1**). The quantitative siting criteria consist of constraint and attribute data, including, but not limited to, locations of individual residences, property boundaries, institutional land uses, forested lands, wetlands, streams, existing transmission lines, and other land use features. As the relative importance of various siting criteria vary from project to project, the following criteria were identified as the most relevant for route selection purposes: number of residences near the route, number of properties crossed, and impacts to institutional land use properties (include schools, churches, hospitals, etc.). These criteria were assigned weighting values based on the professional judgment of the siting team which allowed for the calculation of final route scores.

Sensitive areas identified in the RSS included residential parcels, a church, a cemetery, historic structures and places, and ecological resources. As the Study Area is primarily a rural setting, the number of residential structures were primarily located adjacent to existing roadways and sporadically located amongst agricultural land with exception to several dense residential areas in the southern portion of the Study Area. The location of residential structures significantly limited the placement of route alternatives near the southern extent of the Study Area near Brim Substation. Previously identified cultural resource sites were generally concentrated in the southeastern section of the Study Area. Anticipated impacts to cultural resources did not significantly limit the placement of route alternatives. Ecologically sensitive areas include specific locales of streams, minimal wetlands and forest habitat throughout the Study Area.

(5) Siting Process for Preferred and Alternate Routes

After the Study Area and siting criteria were established, preliminary routes were drawn based on the results of the map analysis, review of aerial photography, topographic maps, and the mapped attribute and constraint data. The intent when placing these working centerlines, 16 in total, was to minimize impacts to residences, and, where practical, to follow existing developed corridors, such as roads and transmission or distribution lines.

Various siting criteria were quantified for each route and then each quantified value was normalized to assign each criteria a suitability value based on a scale of 0 (most suitable) to 100 (least suitable). This makes the data simpler to compare and removes inadvertent weighting of the information. Normalizing the data into a score is vital so that all of the constraints are directly compared according to the same scale. ATSI's siting team identified weighting factors for each siting criteria category (ecological, cultural resources, land use, and technical). The various RSS route alternatives (combinations of selected route segments) were then numerically scored to identify the overall top-ranked route alternatives.

In addition to quantitative scoring, ATSI's siting team, relying on its experience and familiarity with siting major transmission line projects, further refined the routes based on qualitative factors. For this Project, the Applicant took into consideration local public preferences in reaching the final decision regarding the proposed Preferred and Alternate Routes.

A combination of qualitative factors, route scoring, public input, and engineering design/ constructability were ultimately all used to determine Preferred and Alternate Routes. The entire siting process, methodology, and results are described in detail in the RSS report in **Appendix 4-1**.

(6) Route Descriptions and Rationale for Selection

The Preferred Route is identified as Route 12 in the RSS. This route is approximately 5.7 miles long and initially ranked second based solely on the quantitative factors. It had the lowest (best) ecological score due to the minimal amount of tree clearing needed (approximately 0.1 acre, compared to a range of approximately 0.1 to 1.0 acre). Route 12 also had the 2nd most favorable ranked land use score, with no residences within 30-ft of the right-of-way (compared to a range of 1 to 9 residences) and 29 property owners crossed by the centerline (compared to a range of 26 to 84 property owners). Route 12 ranked 4th in the technical category with a fewer number of road crossings (8, compared to a range of 7 to 15) and approximately 47% of the centerline paralleling existing roadways (2.7 miles, compared to a range of 0.3 to 5.9 miles), and the total length of the route measuring approximately 5.74 miles (compared to a range of 5.33 to 7.07 miles). The Route 12 land use score was negatively impacted by the portion of the alignment that traverses property owned by the City of Bowling Green.

The Alternate Route is identified as Route 3 in the RSS. Route 3 is approximately 5.6 miles long and initially ranked first overall solely on the quantitative factors. It scored third in the environmental category (approximately 0.16 acre impacted, compared to a range of approximately 0.1 to 1.0). Route 3 also had the lowest (best) land use score with one residence within 30-feet (compared to a range of 1 to 9), and crosses twenty-six parcels (compared to a range of 26 to 84). Route 3 scored third overall in the technical category with eight road crossings (compared to a range of 7 to 15) and approximately 0.32-miles paralleling the existing road/rail corridor (compared to a range of 0.3 to 5.9 miles). The Route 3 technical use score was negatively impacted by the minimal length that the route that parallels existing road/rail corridors.

Route 3 (A-B-C-I-E-J-K) and route 12 (A-B-L-Q-S-T-O-P) were the most favorable routes overall representing the two corridors approaching the Brim Substation from the west and east. Crossing residential land use is localized near Bishop Road for Route 3 where the route crosses two residential properties where segment B-C parallels Bishop Road (with one residence within 30 feet). The increased level of residential development near the Brim Substation generally was one of the primary reasons for the number of dwellings within 1,000 feet of both of the proposed routes. However, Route 3 has approximately 27% more residences within 1,000 feet due to the northern trend of segment C-I on the eastern side of the residential community. The amount of agricultural land crossed by each route is similar with Route 3 traversing approximately 5.13-miles and Route 12 traversing approximately 5.49 miles.

Although the amount of tree clearing required for either route is minimal, another variable that was considered was the need for adjacent priority tree rights. In addition to the property rights needed to occupy and maintain the proposed 60-foot ROW, adjacent “Priority Tree” rights are needed to allow for the select removal of trees that are dead, diseased, dying, structurally deficient, leaning in, or otherwise growing in such a manner that poses a risk to the facility. Priority Tree rights may extend as much as 150-feet from the centerline. Including the number of parcels needed to secure appropriate priority tree rights along with the number of parcels actually traversed by the proposed routes, Route 3 involves 47 parcels and Route 12 involves 35 parcels.

(B) COMPARISON TABLE OF ROUTES, ROUTE SEGMENTS, AND SITE

Table 3-3 and Figure 3-4 of the RSS Report (**Appendix 4-1**) provide scoring and ranking results for the route alternatives. This table includes the individual category scores (ecological, cultural resources, land use, and technical) for each route alternative and the corresponding relative rank of each.

(C) PUBLIC INVOLVEMENT

ATSI conducted a public information program to raise awareness, communicate Project details, and seek feedback from residents and local elected officials. Part of the public engagement program involved conducting a public informational meeting (open house forum) in the area to seek feedback from the community on the Project and the routes being considered. Prior to the public information meeting, ATSI mailed invitation letters to residents and tenants, and published a newspaper public notice and news release of the public information meeting. A Project website was created with Project mapping and a summary description. At the public information open house, ATSI representatives were available to answer questions, listen, and receive feedback from the public to incorporate in the siting process. A summary of the public informational meeting is provided below.

(1) Official Public Information Open House

ATSI conducted the informational meeting on September 26, 2018 at the Middleton Township Building in Bowling Green, Ohio. The initial route selection studies discussed above and in **Appendix 4-1**, and RSS Routes 3 and 12 were presented for public comment, along with other Project information at the meeting. Route 12 was referred to as Alternative 1 (western route) and Route 3 was referred to as Alternative 2 (eastern route).

Detailed maps of the route alternatives were presented that included property boundaries with unique parcel identification (ID) numbers referenced to a list of property owners. Forty people attended the public information meeting.

ATSI encouraged those attendees with specific objections to suggest alternatives. Fifteen comment cards were received during the meeting. Three comment cards specified a preference for Alternative 1. Two comment cards specified a preference for Alternative 2. Four comment cards provided alternatives to the proposed alignments through agricultural properties. Two comment cards noted concerns regarding current farming practices. One comment card noted a dislike of the visual aspect of the proposed transmission line. One comment card proposed that the alignment for Alternative 2 along Bishop Road be constructed underground. Two comment cards noted concerns regarding radio interference. Finally, one comment card requested further information on when a decision would be made regarding the transmission line.

Following the public information meeting on September 26, 2018 route adjustments were considered and made to both proposed routes based on landowner comments.

Regarding Alternative 1, the Preferred Route, the first adjustment occurred near Hull Prairie Road and Hanna Road where property owners requested the alignment follow parcel lines and the edge of their fields where possible (**Appendix 4-1**, Figure 4-2). To accommodate this adjustment, the alignment was adjusted to trend west from Hull Prairie Road and then north towards Hanna Road following the parcel boundaries. Once the alignment crosses Hanna Road, it trends west along Hanna Road towards the existing proposed alignment.

Minor adjustments were also made between Hanna Road to Cross Creek Road and Middleton Pike to the existing transmission line corridor to accommodate property owner requests to follow existing ditches through the agricultural fields (**Appendix 4-1**, Figures 4-3 and 4-4).

Regarding Alternative 2, the Alternate Route, the first adjustment occurred near Bishop Road and SR-25 (N. Dixie Highway) where property owners requested the alignment be relocated further away from the residential community located at the northeast corner of Brim Road and Bishop Road (**Appendix 4-1**, Figure 4-5). To accommodate this adjustment, the alignment was shifted eastward away from the residential development. Once the alignment crosses SR-25, the alignment was adjusted to follow the parcel boundaries as it extends eastward before trending north.

An additional adjustment was made to Alternative 2 south of Middleton Pike at the request of the property owner to follow the parcel boundaries (**Appendix 4-1**, Figure 4-6).

Following the official public information meeting ATSI reviewed and incorporated the requested adjustments described above. After review of the adjusted routes, ATSI chose to move forward with Alternative 1, designated as the Preferred Route, and Alternative 2, designated as the Alternate Route with the adjustments discussed above.

Route Selection Study, Wood County 138-kV Reinforcement Project

Prepared by

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December 2018

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Acronyms and Abbreviations

Application	Certificate of Environmental Compatibility and Public Need
ATSI	American Transmission Systems, Incorporated
GIS	geographic information system
IROL	Interconnection Reliability Operating Limits
kV	kilovolt
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
ODNR	Ohio Department of Natural Resources
OHPO	Ohio Historic Preservation Office
OPSB	Ohio Power Siting Board
PADUS	Protected Areas Database of the United States
Project	Wood County 138-kV Reinforcement Project
PUCO	Public Utilities Commission of Ohio
ROW	right-of-way
SR-25	State Route 25/N. Dixie Highway
SR-285	Middleton Pike
T&E	threatened and endangered
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

1 Introduction and Project Overview

1.1 Project Scope and Purpose

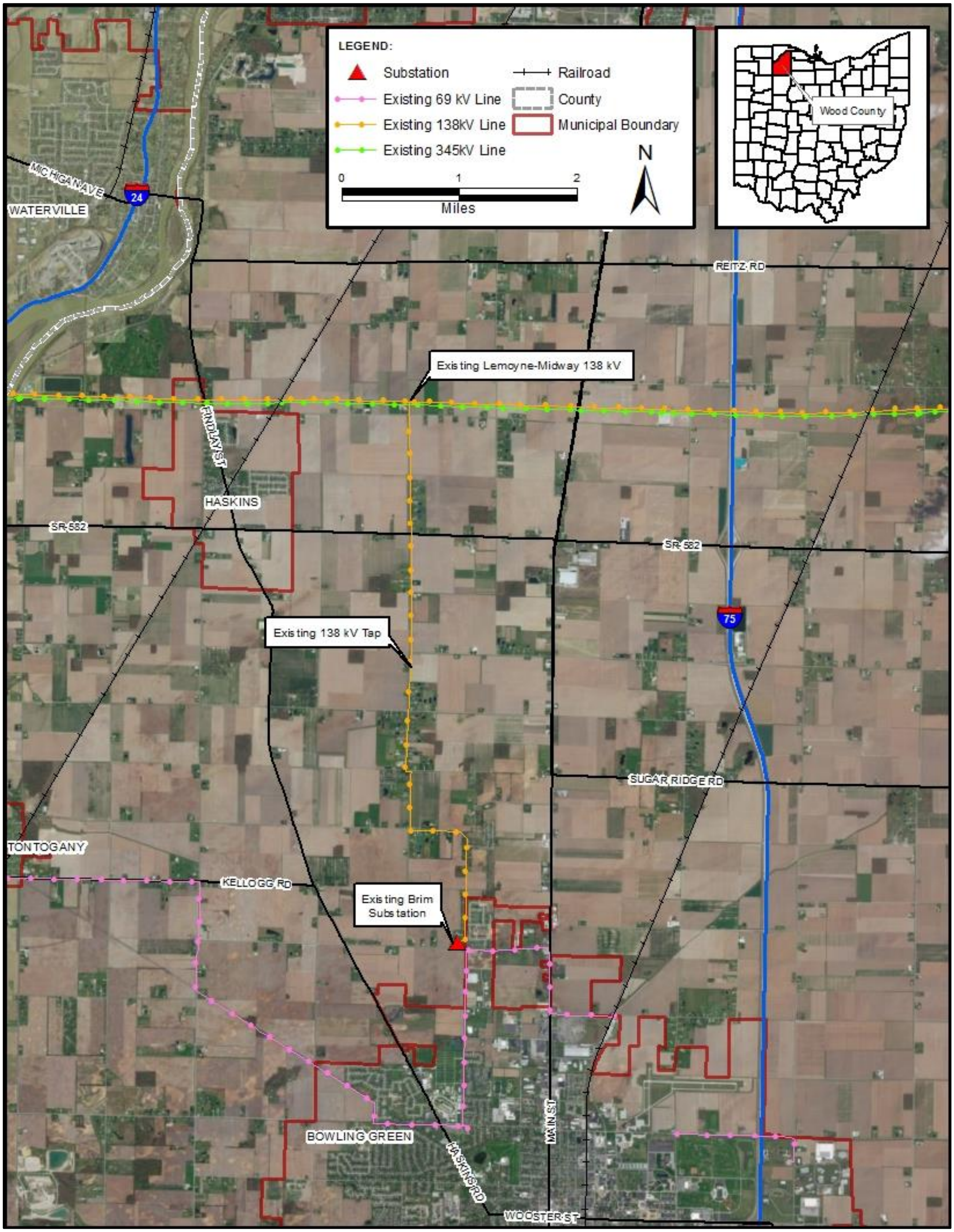
American Transmission Systems, Incorporated (ATSI or Applicant), a FirstEnergy company, is proposing to construct a new 138 kilovolt (kV) electric transmission line from the existing Lemoyne-Midway 138 kV Transmission Line to the existing Brim Substation, located in Plain Township, Wood County, Ohio. The Project is referred to as the Wood County 138 kV Reinforcement Project ("Project"; Figure 1-1). Depending on the route selected, the Project length will range from approximately five to seven miles. The proposed work will eliminate the existing 3-terminal line configuration and create the Brim-Lemoyne 138 kV Transmission Line and Brim-Midway 138 kV Transmission Line circuits. The proposed Project will provide a second 138 kV source for the Brim Substation. For reliability purposes, it is necessary to physically separate the two 138 kV sources for the substation to minimize the potential for the same "event" to disrupt both feeds. Therefore, in this Study, sharing 138 kV right-of-way is not considered an acceptable resolution for Project need.

This document presents the Route Selection Study (Study) conducted to identify and compare route alternatives for the Project. The purpose of this Study is to identify viable alternatives that maximize opportunities (i.e. land uses and conditions favorable for electric transmission lines) and avoid or minimize constraints (land uses and conditions unfavorable for electric transmission lines) for the Project, and an assessment of the ecological, cultural, land use, and technical variables present in the Study Area that will help determine the optimal route. The Study identifies major opportunities and constraints and uses an evaluation process to compare alternative transmission line routes for the Project that avoid or minimize constraints and maximize opportunities to the extent practicable.

In Ohio, a project of this scope requires the submittal of a Standard Application for a Certificate of Environmental Compatibility and Public Need (Application) as outlined in 4906-1-01 APPENDIX A of the Ohio Revised Code. The Application is reviewed by the Ohio Power Siting Board (OPSB) which is responsible for issuing Certificates of Environmental Compatibility and Public Need (Certificate) for major utility projects that meet certain statutory criteria established in Ohio law. As part of the Application process, Applicants are required to complete a route selection study and report the results in the Application. Among other requirements, the OPSB's rules require the Applicant to evaluate route alternatives in accordance with a series of criteria established by the OPSB and to present a Preferred and Alternate Route for the proposed transmission line project.

This Study outlines the process used by ATSI to identify and evaluate transmission alternatives for the Project and to decide on the Preferred and Alternate Routes presented in the Application. This Study was prepared in support of the Application for the Project and the final Preferred and Alternate Routes presented in the Study are the same as those presented in the Application.

FIGURE 1-1
Project Vicinity



1.2 Summary of the Siting Process

The methodology of the Study is designed to identify transmission line routes that minimize the overall impacts on land use, ecological, and cultural features, to the extent practical, while taking into account economic and technical feasibility. The Study draws upon the latest available land use and ecological data collected from multiple public sources and commercial providers. This is supplemented through field evaluations by FirstEnergy staff and consultants, including representatives from siting, engineering, and construction groups within FirstEnergy. The field evaluation also provides ATSI with the opportunity to qualitatively assess the various routes. The result of this process is a comprehensive assessment of the Study Area and route alternatives that is compiled and summarized in the Study report.

The Study consists of a multi-stage suitability analysis that identifies areas of opportunity and constraint and then directly compares the resulting route alternatives. The Study is comprised of four main steps:

1. **Project Scoping**: Prior to beginning the Study, certain key objectives need to be identified as the minimum needed to achieve the project aims. In this Study, the following objectives must be met:
    - Route alternatives must connect the existing Lemoyne-Midway 138 kV Transmission Line to the existing Brim Substation;
    - Route alternatives must include a 60-foot wide cleared ROW;
    - Route alternatives must be able to support conductor, insulators, and other hardware required by Transmission Planning and/or Transmission Engineering;
    - Route alternatives must be able to have appropriate rights and permits secured to support an in-service date of June 1, 2020; and
    - The route alternatives must provide sufficient separation from the existing 138 kV line into Brim Substation to minimize the potential for the same storm or other event from disrupting both lines.

2. **Definition of a Study Area**: The first step in the Study is to develop a focused Study Area in which to collect detailed constraint and opportunity data. The Study Area was selected based on professional judgment and the geographic characteristics of the region, as well as the physical endpoints of the Project (i.e., substation and existing transmission line location). A Study Area should include the end points of the transmission line and provide a reasonable area in which to identify practical alternatives. In this case, the boundaries of the Study Area were developed based on a review of United States Geological Survey (USGS) maps, state and county road maps, and aerial photographs. Key features of the area that helped identify the limits of the study area included the existing transmission line (northern limit), existing substation (south), I-75 (east), Haskins Road and the town of Haskins (west).

3. **Collection and Mapping of Opportunity and Constraint Data**: Constraint and opportunity data were collected under four broad categories including ecological, cultural, land use, and technical. Multiple individual criteria were collected under these broad categories and selected based on their relevance to the Project, the Study Area, and the availability and quality of the dataset.

4. **Identification of Candidate Routes**: The goal of the Study was to identify viable candidate routes based on reasonable physical placement of the proposed transmission line that avoided or minimized effects on sensitive land uses and ecological, and cultural features in the Study Area. In evaluating the routing criteria, it is generally considered desirable to maximize certain criteria that are most compatible with transmission development, such as, paralleling existing railroad or utility corridors. These more favorable criteria are known as opportunities. Undesirable criteria for routing, such as residences, wetlands, and historic properties, are generally referred to as constraints and the RSS seeks to avoid or minimize their proximity to the Project. When siting transmission lines, three main routing opportunities are generally focused on, where viable:

    - Replacing or upgrading an existing line -- this option typically minimizes natural and social impacts by utilizing an existing ROW.
    - Utilizing an existing corridor through corridor sharing -- corridor sharing pairs the transmission line with an existing linear feature, which can include roads, highways, railroads, railroad

corridors, gas pipelines, or other existing transmission lines. These corridors are considered opportunity areas because locating a new transmission line parallel to them may require less ROW, concentrates linear land uses thus reducing fragmentation of the landscape, and has incremental impacts rather than new impacts regardless of surrounding land use. It is important, however, to realize that it is not always possible, or necessarily the best option to parallel these features. Often, other land uses have encroached overtime to the edge or even into the existing linear easement, making a parallel, easement-sharing route a challenge, or even impractical. Each has to be evaluated.

  - While corridor sharing presents an opportunity, it should be noted that private rights from adjacent property owners may still be required to provide adequate clearance to build and operate the transmission facilities. For example, constructing facilities along a public roadway will typically require private rights from adjacent properties for placement of structures and/or removal of incompatible vegetation for both construction and future maintenance. physical occupancy of the facilities, as well as adjacent tree rights which may be required from parcels across the roadway.

- Utilizing brownfield areas such as former industrial corridors or underutilized commercial areas.
- Utilizing greenfield areas such as pasture or fallow fields or agricultural areas to identify routes that cross open lands. Identifying these routes involves assessment of parcel boundaries and land use practices to define routes that minimize potential impacts to private properties and any agricultural or other farming activities (e.g., orchards or center pivot agriculture).

5. **Quantitative and Qualitative Analysis of the Alternative Routes to Guide Selection of the Proposed Route**: Initially, the candidate routes are evaluated and compared against each other quantitatively. This refers to collecting data on what each route comes close to, or crosses (such as number of residences, acres of wetlands, miles of existing utility ROW, etc.), totaling it and comparing each route candidate. Those that cross less constraints and more opportunities score more favorably. The quantitative data is normalized, with a maximum score of 100. A lower value represents a more favorable score. This is a method of taking a large number of options and filtering them down to the most likely and favorable options for more detailed analysis. Based on the final quantitative results, a subset of the most favorable routes will be selected for further consideration and qualitative review.

   The route selection process utilized by FirstEnergy, however, takes into account the fact that not every factor that is relevant to transmission routing can be reduced to a score. In all cases where quantitative methods are used, FirstEnergy also includes a subsequent qualitative review. Qualitative factors vary from project to project, and include those factors that are not readily quantifiable, or can be counted. These might include areas of local importance, public perception, unmapped or undesignated recreational areas and public vistas.

   Therefore, the siting process includes a combination of route scoring, public input, engineering design/constructability, and qualitative factors. The end result is the selection of a Preferred and an Alternate Route.

The route evaluation process is also iterative in that it allows for the re-evaluation of routes, corridors, and additional data at any point in the process. For example, if important information is received from property owners at a public information meeting, route adjustments generally can be introduced into the process and incorporated into the outcome without disruption to the general route selection process.

1.3 Study Area Characteristics

The Project is located in north-central Wood County, Ohio. The Study Area encompasses Middleton, Plain, and Center Township as well as portions of the Village of Haskins and the City of Bowling Green. The Study Area is relatively flat with elevations ranging from approximately 663 to 681 feet above sea level. There are no distinct elevation changes, slopes, or landforms present in the Study Area. The Study Area is primarily rural, consisting mainly of agricultural land with small pockets of residential development. Woodlots are sparse throughout the Study Area. There are no large water features (lakes, rivers, reservoirs) present in the Study Area; however, there are several residential ponds.

Land use in the Study Area is predominantly agricultural with pockets of residential development located throughout the Study Area. Dense residential development is present in the Village of Haskins in the northwest portion of the Study Area, localized development in the central portion of the Study Area in Middleton Township, and in the south-central portion of the Study Area in Plain Township and Bowling Green. Notably, there is a higher prevalence of residential development to the north and east of the Brim Substation. Light industry, and commercial land is concentrated along State Route 25 (SR-25) which runs north/south through the eastern portion of the Study Area. These land uses consist of a trucking company, Christmas tree farm, animal hospital, metal fabricator, automobile sales and service, Tractor Supply, screen printer, food service distributor, and Dixie Driving Range.

Existing electric infrastructure within the Study Area includes the existing ATSI-owned Dowling-Midway 138 kV, Lemoyne-Midway 345 kV, and Dowling-Fulton 345 kV Transmission Lines that border the Study Area along the northern boundary. There is an existing ATSI owned 138 kV transmission tap line that extends approximately 5.1-miles from the Lemoyne-Midway 138 kV Transmission Line to the Brim Substation. Also present in the Study Area along the south-central border, is an approximately 0.90-miles long Bowling Green Electric-owned 69 kV line. Additionally, distribution lines are prevalent through the Study Area paralleling many of the roadways supplying power to residences and businesses.

2 Detailed Siting Study Steps

2.1 Step 1 – Study Area Delineation

The Study Area can be defined based on a combination of three basic criteria: technical limitations, geographic constraints, and professional judgement. Certain criteria are reviewed when identifying a practical study area such as environmental and cultural impacts balanced with technical and economic viability. Avoiding sensitive natural and man-made features in the landscape minimizes environmental and cultural impacts. These impacts may be further minimized using technological methods that may decrease the proposed transmission line length, which would decrease the total area of impact. Natural and man-made barriers are also influential in defining the study area. It is expensive and may be technically difficult for a new transmission line to cross significant barriers. For example, wide river valleys or other high voltage transmission lines are potentially technically challenging and costly to cross (although paralleling transmission lines can be beneficial in some instances), and thus represent potential study area limits.

With these criteria in mind, the Study Area was identified by reviewing recent aerial imagery, USGS topographic maps, and available state and county-wide environmental data that were overlain and examined in a Geographic Information System (GIS). Initial observations of the general Study Area indicate it is relatively rural and flat in nature with no natural barriers allowing the Study Area to be expanded in all directions. However, since routing options that have a shorter overall length will generally have fewer impacts, the best approach for this Project would be to use the geographical features present within the Study Area and professional judgement to define the Study Area. As a general best siting practice, a route should not extend out perpendicular from the straight line between end points more than half of the total straight-line length. The straight-line distance between the Lemoyne-Midway 138 kV Transmission Line and the Brim Substation Line is approximately 4.6-miles, thus the study area should not (typically) extend to the west or east further than 2.3-miles. It is also a best practice to limit the study area in the opposite direction from the direct path between the start and end point to help limit alternatives to reasonable distances. The Study Area boundaries defined are shown in Figure 2-1 and described below in Table 2-2.

FIGURE 2-1
Study Area

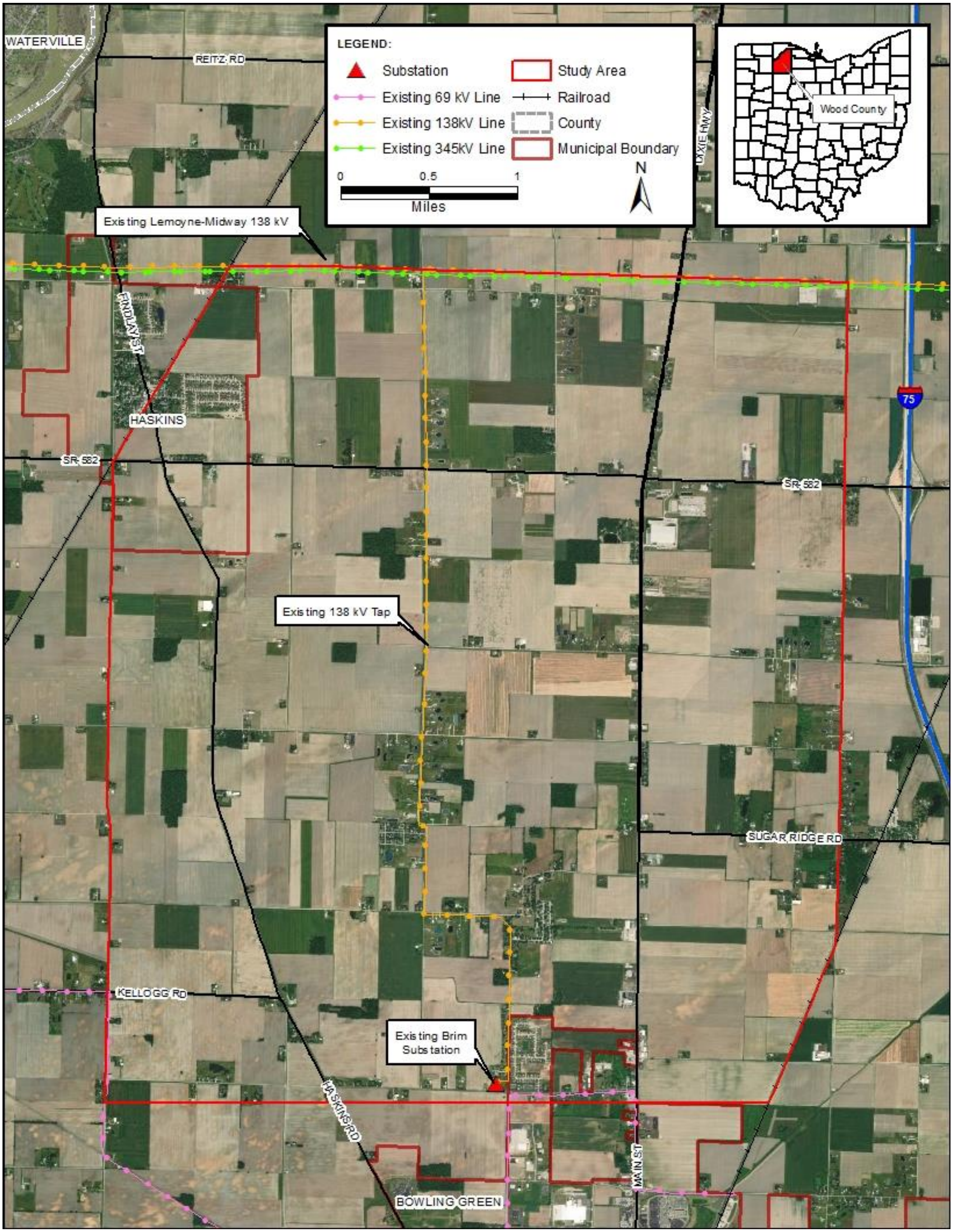


TABLE 2-2
Study Area Boundaries

Northwestern Boundary:	The northwestern corner of the Study Area was defined by the existing railroad corridor running northeast/southwest.
Western Boundary:	The western boundary of the Study Area was defined by Liberty Hi Road.
Southern Boundary:	The southern boundary was defined by the existing Brim Substation. It is a best practice to limit the Study Area to not extend past the beginning and end points.
Southeastern Boundary:	The southeastern corner of the Study Area was defined by the existing railroad corridor running northeast/southwest.
Eastern Boundary	The eastern boundary of the Study Area was defined by Mercer Road.
Northern Boundary	The northern boundary was defined by the existing transmission corridor. It is a best practice to limit the Study Area to not extend past the beginning and end points.

2.2 Step 2 – Evaluation Criteria and Placing Route Centerlines

2.2.1 Constraint and Attribute Data Collection

The siting team collected detailed land use, ecological, technical, and cultural data for the Study Area. Using this data, the siting team developed a set of evaluation criteria to compare the routes numerically to one another (Table 2-3). The data collected (evaluation criteria) and used to evaluate and compare the routes that were selected by the Project team based on their relevance to the Project, the Study Area, and the availability and quality of the dataset. A brief rationale for the criteria selected is provided in Table 2-3. The evaluation criteria include both opportunity and constraint data. Opportunity criteria represent features that are favorable for the development of an electric transmission line (i.e. paralleling existing utility infrastructure), whereas constraint data represent areas that are unfavorable to development of an electric transmission line (i.e. residential areas).

TABLE 2-3
Route Selection Study Evaluation Criteria

	Criteria	Source	Rationale
Ecological	Area of woodlots within 60-foot ROW	Digitized from 2017 aerial photograph	Trees that would require clearing. OPSB requires report of woodlots, potential loss of habitat, and cost for clearing.
	Area of National Wetlands Inventory within 60-foot ROW*	U.S. Fish and Wildlife Service	Impacts to wetlands triggers additional construction, maintenance, and permitting cost and schedule issues. Agencies seek to avoid, minimize, and then mitigate for impacts to wetlands. NWI data is dated but is a reasonable analog for overall wetland impact potential at the siting scale.
	Number of NHD stream crossings requiring tree clearing	U.S. Geological Survey (USGS) (The National Map) - National Hydrography Dataset; 2017 aerial photograph	May require additional permitting and consultation with Ohio Department of Natural Resources (ODNR).
	Federal or State Endangered or Threatened Species Areas within 60-ft ROW*	ODNR, Division of Wildlife (Ohio Natural Heritage Program)	T&E species and habitat are reviewed by ODNR and OPSB and may have implications if federal permits are required. It is better to avoid known locations in the siting study.
	Federal or State Endangered or Threatened Species Areas between ROW and 1,000-ft Buffer*		
	Federal or State Protected Species Areas within 60-ft ROW*		
	Federal or State Protected Species Areas between ROW and 1,000-ft Buffer*		
Cultural	National Register of Historic Places (NRHP) within 1,000 feet*	Ohio Historic Preservation Office (OHPO)	Avoid aesthetic impact to historic structures where possible.
	Archaeology sites within 100 feet*		Avoidance of archaeological sites minimizes the need for additional archaeological work.
	Ohio Historical Inventory structures within 1,000 feet*		Avoid aesthetic impact to historic structures where possible.
	Cemeteries within 100 feet*		Potential aesthetic impacts exist.
Land Use	Residences within 30-ft of the ROW edge	Digitized from 2017 aerial photograph	Residences and residential areas are avoided where possible; being further away from residences is preferred. Typically, physical occupancy/encumbrance of residential properties with
	Residences between 30 and 100-ft of ROW edge		
	Residences between 100 and 1,000-ft of ROW edge		

TABLE 2-3
Route Selection Study Evaluation Criteria

	Criteria	Source	Rationale
			right-of-way is less favorable than the visual effect of locating facilities within 1,000-feet of a residence.
	Properties Crossed by Centerline	Wood County Auditor	A lower number of properties crossed is preferred for schedule, cost, and public impact considerations.
	Linear feet of institutional land uses crossed	ArcGIS	Required to report on by OPSB.
	Number of institutional land uses within 1,000 feet*		
	Linear feet of other sensitive land uses crossed*	ArcGIS, Protected Areas Database of the U.S., ODNR, and Federal Aviation Administration	Required to report on by OPSB.
	Number of other sensitive land uses within 1,000 feet*		
Technical	Centerline road crossing	ArcGIS and 2017 aerial photograph	Road crossing permits during construction.
	Centerline railroad crossing*	ArcGIS	Railroad crossing permit during construction. Railroads have specific and often time-consuming procedures for applying for and receiving crossing permits.
	Turn angles	Developed from geographic information system (GIS) data	Requires more expensive dead-end structure and potential for guying.
	Length of segment overbuilding existing transmission line - Inverted*	ATSI and U.S. Energy Information Administration – U.S Energy Mapping System	Uses at least a portion of the existing corridor. Limits forest and property fragmentation and minimizes overall impacts.
	Length of segment paralleling gas pipeline - Inverted*	U.S. Energy Information Administration – U.S Energy Mapping System	Follows existing disturbed corridor and limits fragmentation of property.
	Length of segment paralleling road - Inverted	ESRI	Follows existing disturbed corridor and limits fragmentation of property.
	Length of segment overbuilding existing distribution	Aerial Imagery	May require taller structures to accommodate distribution underbuild.
	Length of route	Developed from GIS Data	The shorter the length the less to potentially impact and less cost.

2.2.2 Placement of Initial Centerlines

Preliminary route candidate centerlines were placed based on review of aerial photography, topographic maps, and the collected opportunity and constraint data. The intent when placing these centerlines was to avoid residences, wetlands, forested areas, and, where practical, to follow existing developed corridors such as roads and existing transmission/distribution lines.

These preliminary route centerlines were assigned lettered nodes at segment intersections for descriptive purposes and were overlaid on aerial photograph-based and U.S. Geological Survey (USGS) topographic based maps populated with the siting constraint data.

The route segments are shown on Figures 2-4A and B and summarized in Tables 2-5A and B.

FIGURE 2-4A
Proposed Segments

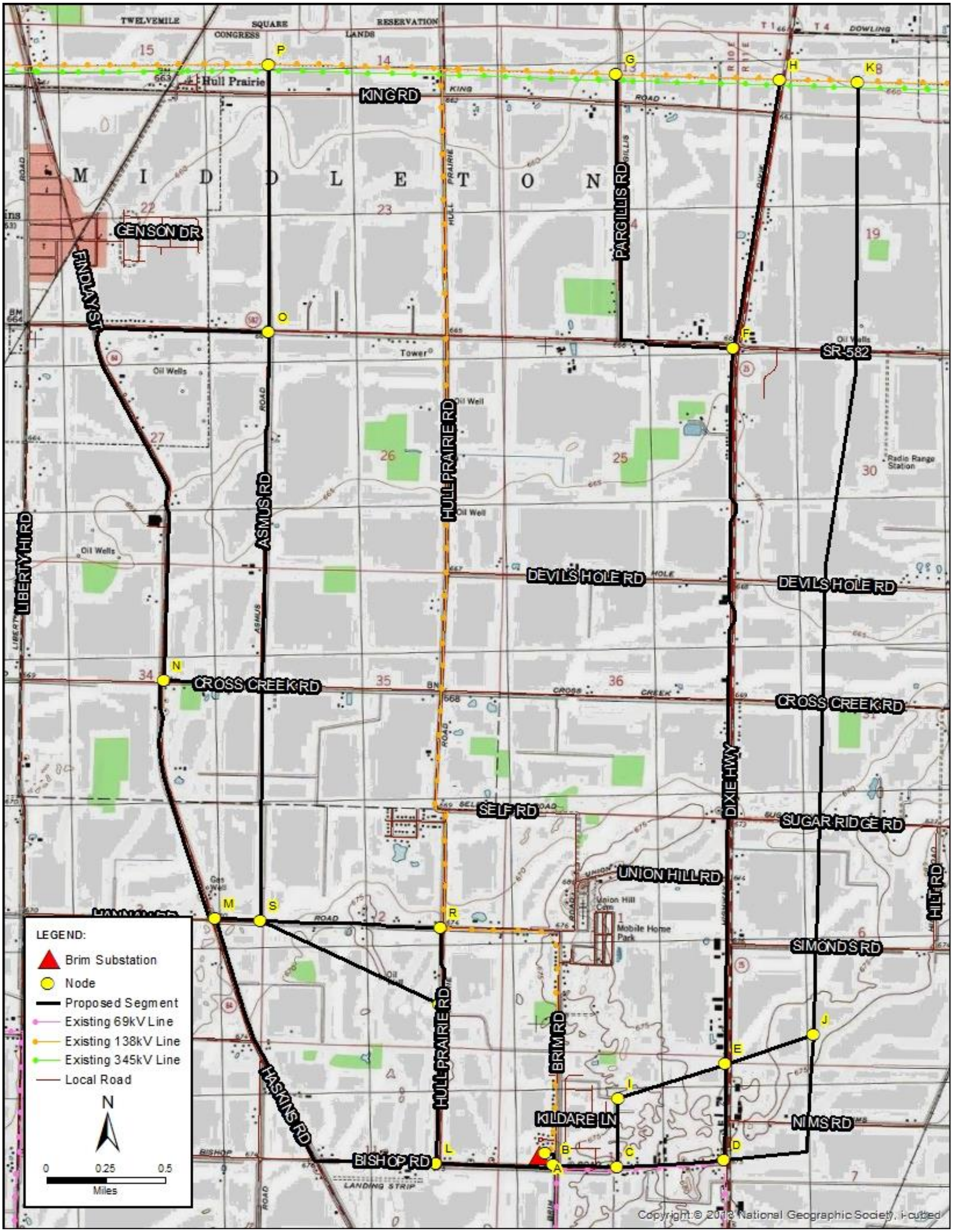
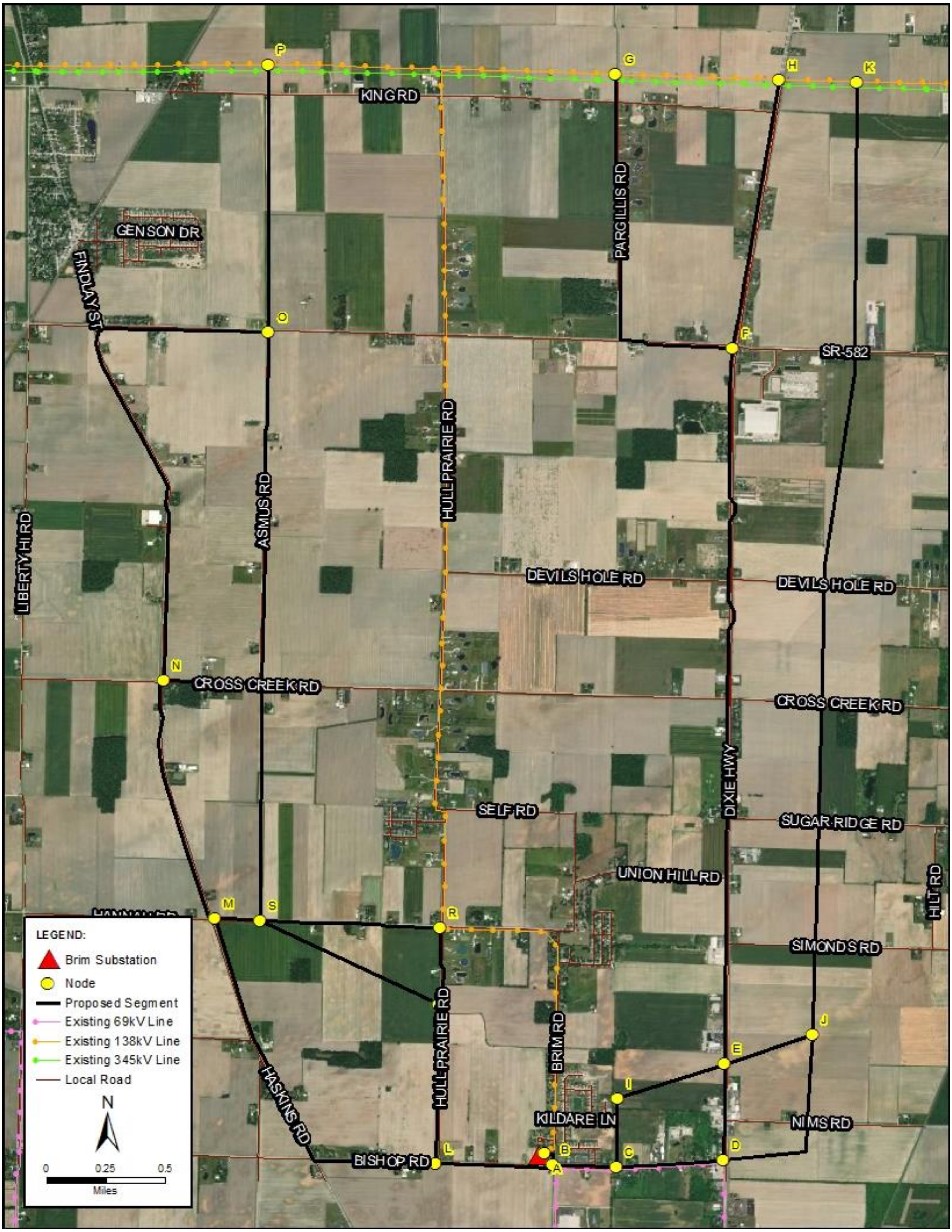


FIGURE 2-4B

Proposed Segments



Two main alternative scenarios were developed based on the location of the existing 138 kV transmission line. These include a set of Western Routes and a set of Eastern Routes. Given the location of the terminal position for the transmission line inside the substation, all proposed routes will share segment A-B, which is approximately 0.08-mile in length and parallels Brim Road just outside the Brim Substation.

The **Eastern Routes** trend east from Brim Substation along Bishop Road and all share segments A-B-C. There are essentially two main north/south corridors: C-I-E-J-K and C-D-E-F-H. The routes utilizing D-E-F-H parallel SR-25 while the routes utilizing I-E-J-K follow a cross-country alignment.

TABLE 2-5A
Main Corridors & Segment Alternatives Summary - East

SEGMENTS	LENGTH	COMMENTS
C-I-E-J-K (Eastern Cross-Country Corridor)	6.0 miles	This cross-country corridor extends north and north east from Bishop Road (node C) through agricultural fields to node I. Segment C-I would be within 1,000-feet of a higher concentration of residential development. The alignment would then trend northeast towards SR-25 (Dixie Highway) near node E. The alignment crosses SR-25 and continues to trend northeast to node J through agricultural fields before turning north to node K again traversing through agricultural fields before reaching the existing Lemoyne-Midway 138 kV Transmission Line at node K.
C-D-E-F-H (Eastern Road Corridor)	5.1 miles	This option parallels roads for most of its length. It parallels Bishop Road on the north side along segment C-D in close proximity to six (6) dwellings and across road frontage owned by the Bowling Green City School District. The corridor then trends generally north along SR-25 to node E and continues north to node F crossing over SR-25 as needed to avoid clearance issues concerning the proximity of buildings and dwellings before reaching node H. The majority of this corridor would need to accommodate the existing distribution lines.
F-G (Segment Alternative)	1.6 miles	This segment provides an alternative to segment F-H and would parallel SR-582 and Pargillis Road. This alignment would have several road crossings associated with it in order to avoid residential properties.

The **Western Routes** trend west from the Brim Substation along Bishop Road and all share segments A-B-L and terminal segment O-P. There are essentially two main north/south corridors: L-M-N-O and L-Q-S-T-O. The corridor utilizing L-M-N-O parallels roadways while the corridor utilizing L-Q-S-T-O is a combination of cross-country segments and segments paralleling existing roadways.

TABLE 2-5B
Main Corridors & Segment Alternatives Summary – West

SEGMENTS	LENGTH	COMMENTS
L-M-N-O (Western Road Corridor)	5.3 miles	This main corridor extends east along Bishop Road, then trends generally north along Haskins Road through nodes M and N before turning east and paralleling SR-582 to node O.

SEGMENTS	LENGTH	COMMENTS
L-Q-S-T-O (Western Mix Road & Cross-Country Corridor)	4.0 miles	This main corridor extends north from Bishop Road paralleling Hull Prairie Road to node Q. From there, the corridor trends northwest through an agricultural field to node S near Hannah Road. Then, the corridor trends north through an agricultural field paralleling a drainage feature, crosses Cross Creek Road near node T, and continues north paralleling Asmus Road to node O.
Q-R-S (Road Corridor Alternative)	1.7 miles	These segments provide an alternative to segment Q-S. Segments Q-R-S would parallel Hull Prairie Road and Hannah Road. This segment would share the intersection of Hannah Road and Hull Prairie Road (node R) with the existing 138 kV transmission line.
S-M (Road Corridor Alternative)	0.19 miles	This segment provides the option to utilize L-M paralleling roadways and then utilize segments S-T-O through agricultural fields and adjacent to roadways.
T-N (Road Corridor Alternative)	0.41 miles	This segment provides the option to utilize L-M-N paralleling roadways and then utilize segments T-O paralleling roadways.

3 Quantitative and Qualitative Analysis

3.1 Evaluation Process

Once the preliminary route options were identified, they were evaluated according to the opportunity and constraint data identified in Table 2-3. The process is outlined as follows:

1. **Raw Data Collection:** Data for each of the evaluation criteria were collected (e.g. acres of forest within the ROW, number of houses within 1,000 feet, length of wetland crossed etc).
2. **Data Tabulation:** The raw data for each criterion was tabulated in a spreadsheet, known as the raw data table. This included the raw data collected by segment and route.
3. **Data Normalization:** Raw data for each route was collected, tabulated, and then normalized. A normalization calculation is used to assign each criteria a suitability value based on a scale of 0 (most suitable) to 100 (least suitable). Each individual evaluation criteria, identified in Table 2-3 was "normalized" in this way, such that all criteria received a suitability score between 0 and 100.
   - The range of data for all criteria across the routes was resolved or normalized to a range of 0-100. This makes it simpler to compare and removes inadvertent weighting of the information. Normalizing the data into a score is vital so that all of the constraints are directly compared according to the same scale. It also allows the data categories to be weighted later as the siting team sees fit. The following formula was used to normalize the raw data:

   Normalized Score = (i-Min(Range))/(Max(Range)-Min(Range))*100

   Where:

   - "**i**" is the raw criteria value (e.g. acres of wetland crossed by route 1)
   - "**Min**" is the minimum value present for that criteria across all the route candidates (e.g. the minimum observed value for acres of wetland crossed by any/all the route candidates)
   - "**Max**" is the maximum value present in the set. The "set" refers to all the quantitative values for one individual criteria. (e.g. the maximum observed value for acres of wetland crossed by any/all the route candidates)
   - "**Range**" is the difference between the min and max values.

   Having the best score does not mean a route is "good" or "bad" according to any external standard, it just means it is "better" or "worse" than the other routes evaluated for the Project based on the criteria selected.
4. **Weighting:** The next step in this process is to apply weighting to the criteria, if desired. Weighting is a widely used method that recognizes under certain circumstances, one evaluation criterion is more relevant to determine an outcome than another. The criteria weighting values are determined by consensus of the siting team and is based on the specific Study Area setting and primary land uses, and professional judgement of the siting team members' experience routing project in a similar setting.

3.1.1 Discussion of Ecological Criteria

Ecological criteria considered within the Study Area included woodlots, stream crossings (National Hydrography Dataset source), threatened or endangered species, and wetlands (National Wetland Inventory "NWI").

Woodlots are sparse throughout, with the majority being located in the southcentral portion of the Study Area, and most were avoided when placing route segments.

NHD streams present in the Study Area primarily run parallel to roadways or agricultural fields. The NHD streams are all unnamed features within the Study Area and have no surrounding woody growth and appear to be channelized drainageways likely developed to support farming. A windshield survey of the Study Area indicated that when NHD features are found adjacent to roadways and agricultural fields, and there is typically a small buffer zone between the NHD stream and land that is actively farmed.

NWI wetlands are distributed throughout the Study Area and consist of freshwater emergent or freshwater forested/shrub wetlands, freshwater ponds, and riverines. Those features identified as NWI riverines are analogous to the NHD streams identified. A majority of the freshwater ponds are associated with residential properties.

Comments received from the Ohio Department of Natural Resources (ODNR) indicate that a record for Brushy horseweed (*Conyza ramosissima*), state potentially threatened, was identified within the search parameters. Additionally, the project is within the range of the Indiana bat (*Myotis sodalis*), state and federally endangered, and the ODNR recommends cutting occur between October 1 and March 31 if suitable habitat occurs within he Study Area. The Study Area is within the known range of the following aquatic species: pondhorn (*Uniomerus tetralasmus*), state threatened mussel, western banded killifish (*Fundulus diaphananus menona*) state endangered fish, and the spotted turtle (*Clemmys guttata*), state threatened species. Due to the location and lack of proposed in-stream work, the project is not likely to impact these species. The Study Area is also within the known range of the following birds: northern harrier (*Circus cyaneus*), state endangered, lark sparrow (*Chondestes grammacus*), state endangered, and the upland sandpiper (*Bartramia longicauda*), state endangered. These birds typically inhabit, hunt and nest in large marshes, grasslands, disturbed open areas, and pasture land. Online consultation with the USFWS indicated the Study Area is within the range of the Indiana bat (*Myotis sodalis*) and the Northern Long-eared Bat (*Myotis septentrionalis*). The USFWS comments did not indicate any known critical habitats in the Study Area.

No construction is anticipated within any of the wetlands and streams identified in the Study Area. Best management practices (BMPs), as identified on the Ohio Rainwater and Land Development Manual, will be utilized should access be needed across a wetland or stream. The sensitivity of tree clearing with respect to the Northern long-eared bat and Indiana bat is recognized. Tree clearing to support either of the route alternatives proposed would be minimal, and impacts can be avoided by adhering to the seasonal clearing restrictions.

Ecological constraints are shown on the aerial and topographic constraint maps (Figures 3-2 and 3-3).

3.1.2 Discussion of Cultural Criteria

Ohio Historic Inventory structures, National Register of Historic Places, archaeology sites, and cemeteries were all considered in the route selection study. While these metrics were present within the Study Area, none were tallied for any of the routes considered.

3.1.3 Discussion of Land Use

Land use criteria considered within the Study Area consisted of residences, properties crossed by centerline, institutional land uses, and other sensitive land uses (Figures 3-2 and 3-3).

Although the Study Area is primarily agricultural, there are residential pockets of development throughout the Study Area. In the northwestern portion of the Study Area, there is dense residential development north of Middleton Pike, south of King Road, and east of S. Findlay street. In the central portion of the Study Area, there is dense residential development that radiates outward from the intersection of Cross Creek Road and Hull Prairie Road. Just south of that area, there is a dense cluster of dwellings on Hannah Road extending east from Hull Prairie Road. The Maurer Mobile Home Court and surrounding residential development is clustered near the intersection of Brim Road and Hannah Road. Additional residential development is present north and east of the Brim Substation along Brim Road. Other residences are scattered along roadways primarily surrounded by agricultural land. A majority of the parcels within the Study Area include large tracks, consistent with agricultural land use.

Institutional land uses include schools, churches, and hospitals. No schools or hospitals are mapped in the Study Area. However, there is a property located on Bishop Road, in the southeastern potion of the Study Area, that is owned by the Bowling Green City School District. The parcel houses the Bowling Green City School Bus Garage. One church was identified; the Maumee Valley Unitarian Universalist Congregation located on SR-25. Other sensitive land uses are typically characterized as lands associated with parks, preserves, managed areas, conservation sites, golf courses and airports. One driving range was identified; Dixie Driving Range located on SR-25. The Nietz Airfield, a private airfield, was identified along the southern boundary of the Study Area on Bishop Road.

Municipal owned land was also identified in the Study Area. The Middleton Township Board of Trustees owns a parcel located on SR-25 in the northeast portion of the Study Area. In addition, the City of Bowling Green owns four parcels in the Study Area. Two are located along Bishop Road southeast of the Brim Substation and appear to be actively farmed. The third is located south of the intersection of Bishop Road and SR-25 and houses a Bowling Green Electric substation. The fourth is located in the northwest portion of the Study Area on King Road and is traversed by the existing transmission corridor that dictates the northern boundary of the Study Area. This parcel appears to be actively farmed.

The Haskins Village Children's Park is composed of eight parcels owned by the Village of Haskins located in the northwest portion of the Study Area. This park is primarily surrounded by residential development within the Village of Haskins limits. In addition, there are four parcels associated with Lusher Park located on Findlay Street which are owned by the City of Haskins. The City of Haskins also owns two additional parcels located in more developed residential areas. There are also seven parcels that comprise the Union Hill Cemetery which is jointly owned by Plain, Center, and Middleton Townships. The Wood County Park District owns three parcels within the Study Area. Two parcels are located on Mercer Road and function as the corporate office. The third parcel is located on Cross Creek Road and is identified as the Fuller Preserve, a Wood County Owned Park. The Wood County Regional Water & Sewer District owns two developed parcels in the Study Area along Middleton Pike/SR-582.

3.1.4 Discussion of Technical Criteria

Technical features considered within the Study Area consist of roads, railroads, turn angles, paralleling existing infrastructure (transmission corridor, gas line, road, railroad, etc.), overbuilding existing distribution, and the overall route length. The majority of the roads within the Study Area form a grid pattern running in a north-south or east-west direction. Major roads in the Study Area include Middleton Pike (SR-582), N. Dixie Highway (SR-25), and Haskins Road (SR-64). Local roads include King Road, Pargillis Road, Asmus Road, Hull Prairie Road, Devils Hole Road, Cross Creek Road, Hannah Road, Brim Road, and Bishop Road. The northwestern and southeastern boundary of the Study Area parallels railways owned by CSX Transportation, Inc. Distribution lines are present throughout the Study Area paralleling roadways. Existing transmission lines in the Study Area include ATSI-owned Dowling-Midway 138 kV, Lemoyne-Midway (Brim) 138 kV, Lemoyne-Midway 345 kV, and Dowling-Fulton 345 kV Transmission Lines. ATSI also owns the final three spans of the Bowling Green No. 5 Bishop-Brim 69 kV Transmission Line into the Brim Substation. In addition, Bowling Green Electric has several 69 kV lines in the southeastern portion of the Study Area.

The presence of the foreign (i.e. non-ATSI owned) 69 kV transmission lines near Brim Substation and the existing Lemoyne-Midway 138 kV Transmission Line Tap to Brim Substation present a technical concern. The transmission lines in this area include the Bowling Green No. 5 Bishop-Brim 69 kV and Bowling Green No. 2 Poe-Bowling Green No. 5 Bishop 69 kV Transmission Line. The Bowling Green No. 5 Bishop-Brim 69 kV Transmission Line extends from the Brim Substation south to Bishop Road, extends east along Bishop Road and across Brim Road, extends south across Bishop Road, and then trends east on the southern side of Bishop Road towards the Bowling Green Electric Substation located on the corner of Bishop Road and SR-25. The Bowling Green No. 2 Poe-Bowling Green No. 5 Bishop 69 kV Transmission Line extends north out of the Bowling Green Electric Substation and trends west on the southern side of Bishop Road on double circuit structures towards Brim Road where the alignment then trends south out of the Study Area.

The existing 138 kV transmission line tap to Brim Substation extends south from the Lemoyne-Midway 138 kV Transmission Line along Hull Prairie Road, trends east for a short distance on Hannah Road, turns south east towards Brim Road, and extends south along Brim Road to the Brim Substation. The need for the proposed undertaking requires a diverse pathway for the new 138 kV transmission line. The existing 138 kV transmission tap presents a physical barrier that must be avoided in order to create a new and separate pathway for the second 138 kV source. In the Study Area there are four major roads that traverse north-south: SR-64/Haskins Road, Asmus Road, Hull Prairie Road, and SR-25/N. Dixie Highway. Portions of Hull Prairie Road and Brim Road are almost exclusively used by the existing 138 kV transmission line tap to Brim Substation; therefore, these road segments cannot be utilized for the new diverse alignment. The inability to utilize Brim Road to approach the Brim Substation from the north creates a bottleneck effect where all potential alignments stemming from the eastern side of the existing Lemoyne-Midway 138 kV Transmission Line Tap location must utilize Bishop Road to reach the Brim Substation. Furthermore, the southern side of Bishop Road is occupied by the Bowling Green Electric owned 69 kV transmission lines; and existing distribution lines are present on the northern side of the road. Therefore, an alignment along the northern side of Bishop Road would need to accommodate for distribution underbuild.

The technical constraints are shown on the aerial and topographic constraint maps (Figures 3-2 and 3-3).

3.2 Ranking and Selection of Routes

The timeline below identifies the steps used to determine a Preferred and Alternate Route for the Project. These events are described in detail in Sections 3.2.1 through 3.2.5.

- Initial Segments Identified – October 2017
- Initial Route Evaluation – November 2017
- Decision on Route Alternatives for Initial Public Information Meeting – November 2017
- Public Information Meeting – September 2018
- Route Adjustments – September to October 2018
- Decision on Preferred and Alternate Route for OPSB Application – November 2018
- Submission of OPSB Application – December 2018

3.2.1 Route Evaluation

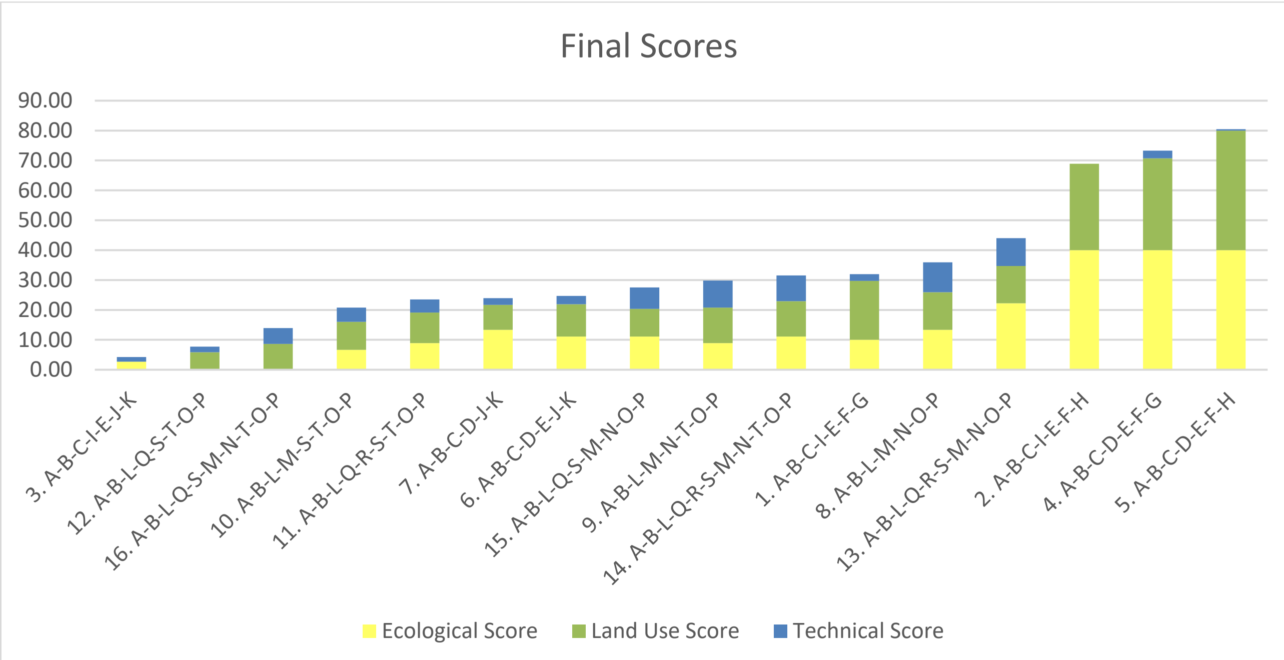
Sixteen route alternatives were identified and compared to one another through numerical scoring (Table 3-3). Based on the data collected and route scores, the routes were ranked first by individual category (i.e. land use, ecological, technical, and cultural) then overall (Figure 3-4). Table 3-3 shows the final scores for the route alternatives ranged from 4.23 to 80.44 out of a possible 100. Routes shaded in purple in Table 3-3 represent varieties of the western route, while routes unshaded represent varieties of the eastern route. Since very few measurable criteria were identified within the Study Area, the numerical quantitative comparison had to be supplemented with more qualitative considerations to ensure the robust consideration of route alternatives. Additionally, the siting team focused on route alternatives that minimized residential impacts. The scoring data is useful for identifying groups of routes that are significantly less or more favorable than others and guide the subsequent qualitative evaluation.

TABLE 3-3
Route Evaluation – Final Scores

Route	Ecological Score	Ecological Rank	Land Use Score	Land Use Rank	Technical Score	Technical Rank	Final Score	Final Rank
3. A-B-C-I-E-J-K	2.67	3	0.00	1	1.56	3	4.23	1
12. A-B-L-Q-S-T-O-P	0.00	1	5.83	2	1.91	4	7.74	2
16. A-B-L-Q-S-M-N-T-O-P	0.00	1	8.64	4	5.27	11	13.91	3
10. A-B-L-M-S-T-O-P	6.67	4	9.34	6	4.76	10	20.77	4
11. A-B-L-Q-R-S-T-O-P	8.89	5	10.21	7	4.41	9	23.51	5
7. A-B-C-D-J-K	13.33	11	8.36	3	2.26	6	23.95	6
6. A-B-C-D-E-J-K	11.11	8	10.81	8	2.80	8	24.72	7
15. A-B-L-Q-S-M-N-O-P	11.11	8	9.24	5	7.20	12	27.55	8
9. A-B-L-M-N-T-O-P	8.89	5	11.88	10	9.04	14	29.81	9
14. A-B-L-Q-R-S-M-N-T-O-P	11.11	8	11.82	9	8.63	13	31.55	10
1. A-B-C-I-E-F-G	10.00	7	19.75	13	2.22	5	31.96	11
8. A-B-L-M-N-O-P	13.33	11	12.60	12	10.00	16	35.93	12
13. A-B-L-Q-R-S-M-N-O-P	22.22	13	12.50	11	9.31	15	44.04	13
2. A-B-C-I-E-F-H	40.00	14	28.90	14	0.00	1	68.90	14

4. A-B-C-D-E-F-G	40.00	14	30.73	15	2.57	7	73.30	15
5. A-B-C-D-E-F-H	40.00	14	40.00	16	0.44	2	80.44	16

FIGURE 3-4
Route Evaluation – Final Scores



The siting team met to discuss the route selection results and to decide on route alternatives to present at the public information meeting. The team observed that the routes fell into several groups based on overall suitability. A discussion of these groups is presented below. Segment A-B is common amongst all the routes and represents the termination of the alignment into Brim Substation.

3.2.2 Eastern Routes

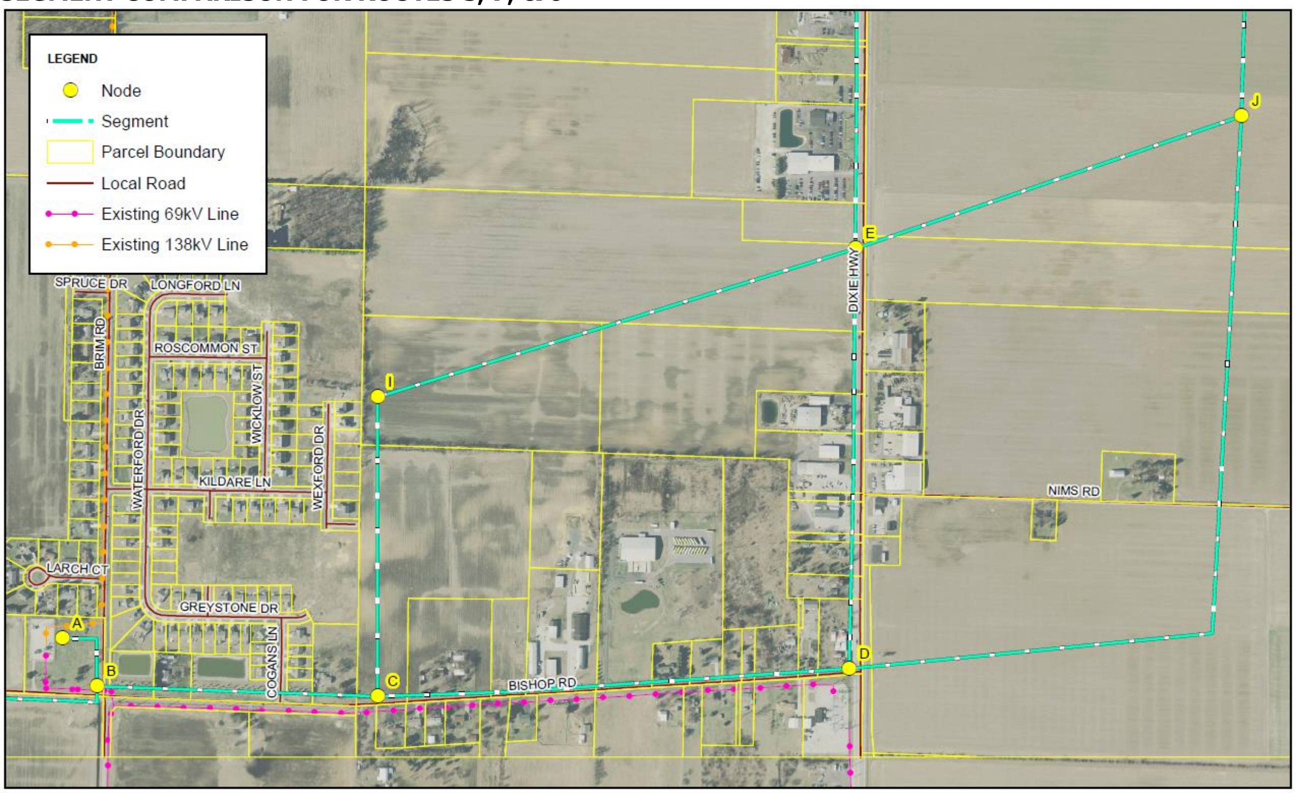
All seven (7) routes heading east from Brim Substation use segments A-B-C, with segment A-B common to all proposed routes. Segment B-C parallels Bishop Road, coming close to two residences on the northern side, and in view of the dense residential community further to the north. At the closest point, the centerline for segment B-C is approximately 33-feet from the nearest dwelling. In addition, segment B-C would involve locating the structures several feet off the parcel boundary and have aerial ROW over the public ROW for approximately 870 feet along Bishop Road.

The Eastern Routes that generally score the best are the options that follow cross-country alignments after Node C. I-E-J-K is a series of segments that overall scores most favorable for the eastern routes. Segment combinations D-E-F-H, parallels SR 25 in close proximity to dwellings which requires several road crossings to achieve necessary clearances. Routes utilizing the D-E-F-H segment combination are adversely affect by these reasons previously stated, and therefore their scores are negatively impacted. Segment F-G is an alternative terminal segment for F-H. Segment F-G would be unfavorable for the same reasons as D-E-F-H. Therefore, based on the combined attribute and constraint data, the most favorable routes are those that avoid the roads and head cross country. Table 3-5 is a selection of the land use data collected for Segments C through J, and Figure 3-6 depicts the subject segments. The table shows those options along Bishop Road have greater immediate residential impacts than the cross-country segments. The four eastern routes using segment E-F-H or F-G therefore were set aside from detailed analysis, leaving Routes 3, 6, and 7.

TABLE 3-5
SEGMENT COMPARISON FOR ROUTES 3, 7, & 6

Route	Segment Combination	Segment Length (in miles)	Segment Approximate distance crossing residential properties (in feet)	Number of residences within 100 feet of ROW per Segment	Number of residences within 1,000 feet of ROW per Segment	Agricultural land crossed (in miles) per Segment
3	C-I-E-J	1.17	0	0	83	1.2
7	C-D-J	1.31	1,050	8	42	0.9
6	C-D-E-J	1.25	1,220	9	41	0.5

FIGURE 3-6
SEGMENT COMPARISON FOR ROUTES 3, 7, & 6



Of these three routes, Route 3 scored more favorably than Routes 7 or 6 in the land use category due to the C-I-E-J segments traversing agricultural land versus segments C-D-J or C-D-E-J which parallel Bishop Road and/or SR-25 which locates the centerline in close proximity to residences. Ecological scores for these three routes were very similar. Tree clearing would be less than an acre for each route. Route 3 would require the shortest length of distribution underbuild (approximately 0.32 miles), while route 7 would require approximately 0.78 miles and route 6 approximately 1.2 miles. The length of distribution underbuild typically increases as more of the centerline is located parallel to existing roadways.

Based on the data above, Route 3 was considered to be the most favorable of the Eastern Routes out of Brim Substation and was retained for consideration as either the preferred or the Alternate Route.

3.2.3 Western Routes

Nine (9) Western Routes were identified and all use Segments A-B-L, with segment A-B common to all proposed routes. These routes would all utilize segment A-B, and then parallel Bishop Road on the southern side as segment B-L trends westward. The alignment along Bishop Road would be located on the edge of an agricultural field and would accommodate distribution underbuild. At the closest point, the centerline for segment B-L is located approximately 85-feet from the nearest dwelling across Bishop Road.

The Western Routes that generally score the best are the options that primarily follow cross-country alignments after Node L. Q-S-T-O-P is a series of segments that overall scores most favorable for the Western Routes. This group of segments parallels roadways on the edge of agricultural fields and follows cross-county alignments.

Routes containing segment combination Q-R-S (Routes 11, 13 and 14) were eliminated from further review since the alignment near Node R would share the same intersection as the existing Lemoyne-Midway 138 kV Transmission Line Tap to Brim Substation. Sharing this intersection was deemed too close to the existing Lemoyne-Midway 138 kV Transmission Line Tap to Brim Substation and would hinder the overall goal of creating a new and separate pathway.

The remaining six (6) routes (routes 8, 9, 10, 12, 15 and 16) were retained for detailed analysis. Of these six (6) routes, Route 12 and 16 scored more favorably overall. Routes 8, 9, 10, and 15 had relatively higher ecological scores due to tree clearing, higher land use scores due to proximity to residences and the number of properties crossed, and generally higher technical scores due to the number of road crossings, turn angles, length of distribution underbuild needed, and overall route length. For these reasons, Routes 8, 9, 10, and 15 were removed from consideration.

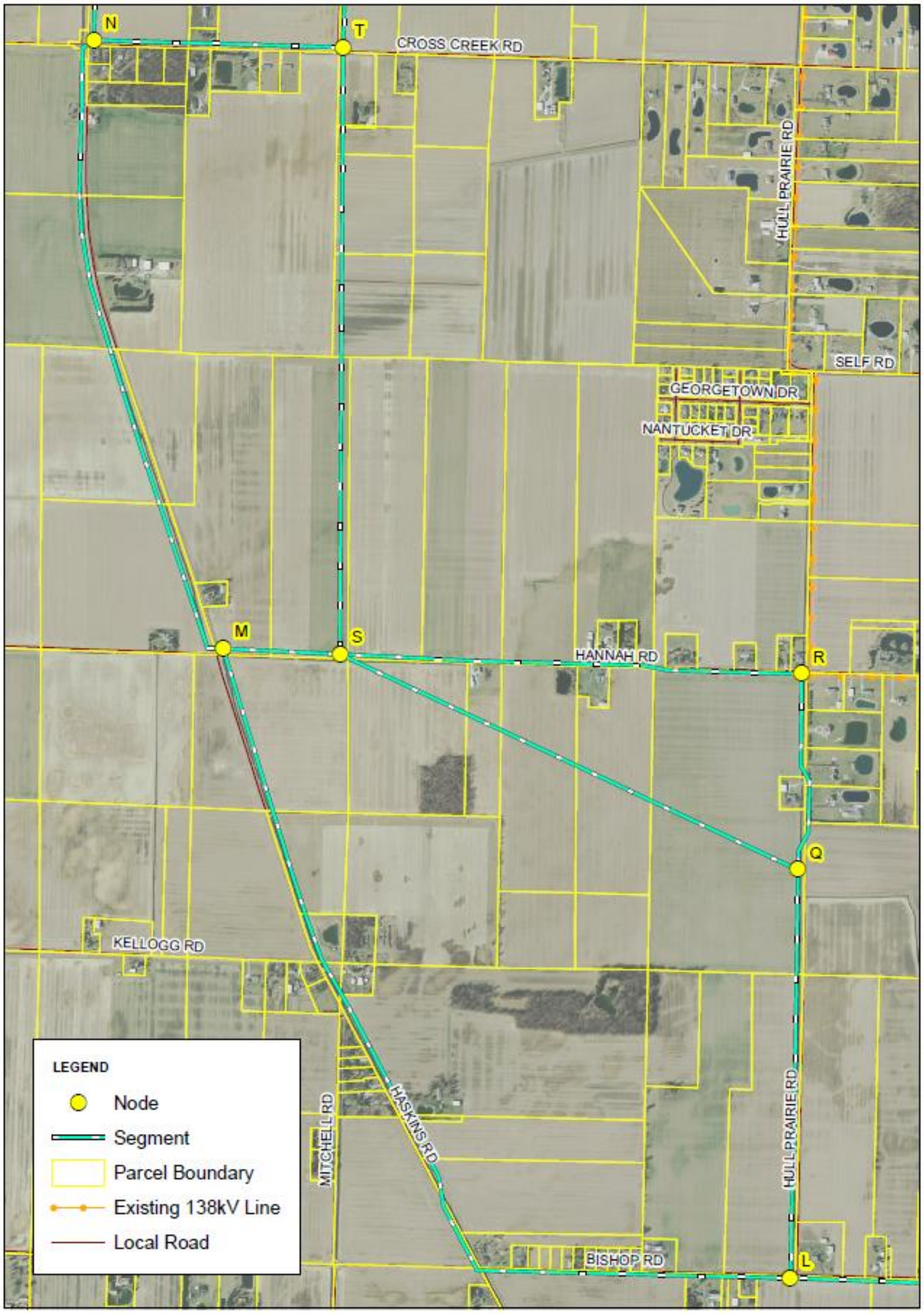
The remaining two (2) routes (routes 12 and 16) scored the most favorable overall for the series of Western Routes. Both routes scored the same in terms of ecological impacts. Route 12 crosses less properties than Route 16, and therefore scored more favorable than Route 16 in the land use category. Route 12 also scored more favorably than Route 16 in four of the five technical categories. Table 3-7 is a selection of the land use data collected for Segments L-Q-S-T and L-Q-S-M-N-T, and Figure 3-8 depicts the subject segments.

TABLE 3-7

SEGMENT COMPARISON FOR ROUTES 12, 16, & 10

Route	**Segment Combination**	**Segment Length (in miles)**	**Approximate distance crossing residential properties (in feet) per Segment**	**Number of residences within 100 feet of ROW per Segment**	**Number of residences within 1,000 feet of ROW per Segment**	**Agricultural land crossed (in miles) per Segment**
12	L-Q-S-T	2.52	0	0	16	2.5
16	L-Q-S-M-N-T	3.20	340	7	27	2.9

FIGURE 3-8
SEGMENT COMPARISON FOR ROUTES 12 & 10



Based on the data above, Route 12 was considered to be the most favorable of the Western Routes out of Brim Substation and was retained for consideration as either the Preferred or the Alternate Route.

Route 3 (A-B-C-I-E-J-K) and route 12 (A-B-L-Q-S-T-O-P) were the most favorable routes overall representing the two corridors approaching the Brim Substation from the west or east. Between Routes 3 and 12, the only shared segment is A-B which extends east from Brim Substation, and angles south towards the intersection of Brim Road and Bishop Road. Segment A-B is approximately 435 feet in length. This represents approximately 1.4% of commonality between Routes 3 and 12 which is consistent with Admin. Code Rule 4906-3-05, which limits alternative routes to less than twenty per cent in common. The percentage in common shall be calculated based on the shorter of the two routes." Table 3-9 shows an overview comparison between Routes 3 and 12.

TABLE 3-9

COMPARISON OF ROUTES 3 & 12

Route	Segment Combination	Woodlots (acres)	Length (in miles)	Approximate distance crossing residential properties (in feet)	Number of residences within 100 feet of ROW	Number of residences within 1,000 feet of ROW	Length of Distribution Overbuild (in miles)	Agricultural land crossed (in miles)
3	A-B-C-I-E-J-K	0.16	5.58	415	4	122	0.32	5.13
12	A-B-L-Q-S-T-O-P	0.10	5.74	0	6	89	1.10	5.49

The amount of tree clearing required would be minimal for either route. Crossing residential use land is localized near Bishop Road for route 3. Route 12 doesn't cross any residential use land; however, the edge of the 60-foot ROW is within 100-feet of several residences. Route 3 crosses two residential use properties and is within 100-feet of two additional properties where segment B-C parallels Bishop Road near the dense residential development. The dense residential development near the Brim Substation also contributes to the number of dwellings within 1,000 feet of the proposed routes, with Route 3 having approximately 27% more residences within 1,000 feet due to the northern trend of segment C-I on the eastern side of the residential community.

Table 3-9 also notes agricultural land crossed. Agricultural lands crossed is slightly higher for route 12 than route 3; however, considerations can be made to ensure current farming practices are not altered by the addition of the transmission line. Plow patterns and large irrigation systems are agricultural related qualitative factors that can't be measured through numerical scoring and ranking. There were no large irrigation systems noted based on the windshield survey and review of aerial imagery. The proposed routes attempted to follow existing plow patterns where practical. Route 3 follows existing plow patterns based on aerial imagery with exception of segments I-E-J and portions of J-K where adjustments were needed to avoid residences. Route 12 also primarily follows existing plow patterns with the exception of a portion of segment B-L where the alignment runs parallel to Bishop Road; however, the presence of the alignment would not preclude the land from being farmed. In addition, there is already a distribution line that parallels the edge of the field. Segment Q-S traverses diagonally through agricultural land. This segment avoids impacts to residential properties that would be impacted if the alignment were located along Hull Prairie Road and Hannah Road. Segment S-T parallels the boundary between fields that are plowed in different directions and parallels a drainage ditch which acts as physical barriers between neighboring fields. Segment T-O parallels the existing roadway and neighboring agricultural land and has several road crossings to avoid residential properties. Finally, segment O-P primarily parallels a drainage ditch and traverses through a portion of an agricultural field north of Kind Road before terminating at the existing Lemoyne-Midway 138 kV Transmission Line.

Another variable is the need for adjacent priority tree rights. In addition to rights needed to occupy and maintain the proposed 60-foot wide ROW, adjacent "Priority Tree" rights will be needed to allow for the select removal of trees that are dead, diseased, dying, structurally deficient, leaning in, or otherwise growing in such a manner that poses a risk to the facility. Priority Tree rights may be required extending as much as 150-feet from the centerline. The approximate number of parcels and property owners encompassed in each category is noted below in Table 3-10.

TABLE 3-10

PROPERTY RIGHTS & ADJACENT TREE RIGHTS

Route	Number Parcels Crossed for 60-foot ROW	Additional Parcels needed for 150' adjacent tree rights	Total Number Parcels Involved	Number of Properties Owners
3	36	26	62	47
12	44	19	63	35

As shown in table 3-10, route 3 crosses few parcels with respect to the 60-foot ROW; however, its alignment is nearer to adjacent parcels and thus would require adjacent tree rights from more parcels compared to route 12. The total number of parcels involved, including ROW and adjacent tree rights, is similar between the two routes. However, route 12 would affect fewer property owners due to the fact that multiple parcels are owned by single individuals or entities.

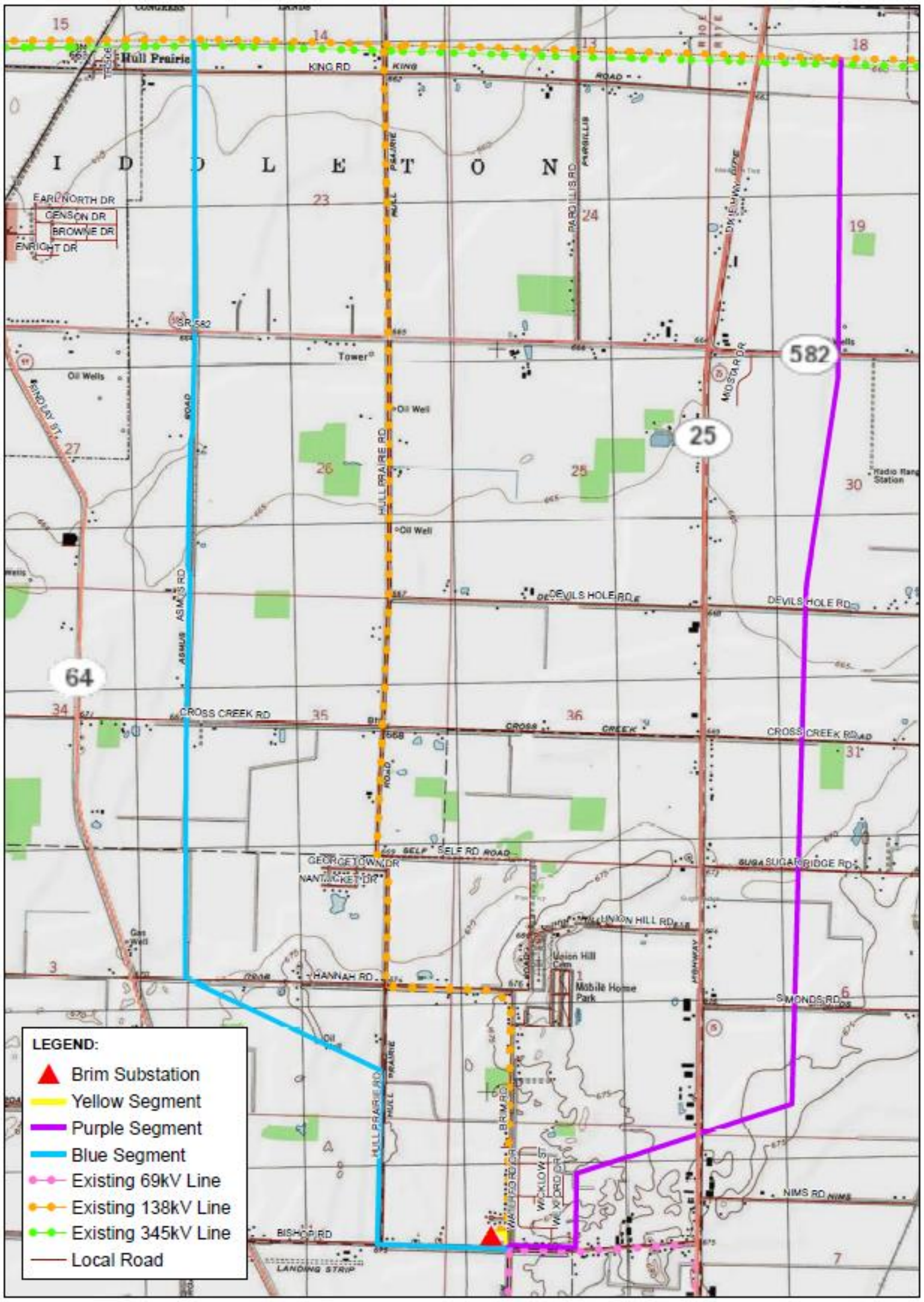
Based on the information presented in the Study, FirstEnergy chose to proceed with Route 12 and Route 3 for the initial public information meeting. Route 12 was presented as Alternative 1, the western alternative, and Route 3 was presented as Alternative 2, the eastern alternative.

4 Public Involvement

Routes 12 and 3, Alternatives 1 and 2 respectively, were ultimately selected for presentation to the public because they represent two unique and diverse pathways which have the least overall impact to residences. This is reflected in the land use category where these routes scored 1st and 2nd respectively. These routes were distinguished by color for the public meeting. The two routes are shown in Figure 4-1.

- Route 12 – (Alternative 1; Western Route Alternative) – Combination of yellow and blue segments
- Route 3 (Alternative 2; Eastern Route Alternative) – Combination of yellow and purple segments

FIGURE 4-1
Public Information Meeting Routes



4.1.1 Public Information Meeting

The public information meeting was held on September 26, 2018 at the Middleton Township Building in Bowling Green, Ohio. Detailed maps of the proposed route alternatives were present throughout the meeting. Property boundaries were also indicated on the mapping with the unique parcel ID numbers referenced to an ownership spreadsheet. Forty (40) people attended the public information meeting.

ATSI encouraged those attendees with specific objections to suggest alternatives. Fifteen comment cards were received during the meeting. Three comment cards specified a preference for Alternative 1. Two comment cards specified a preference for Alternative 2. Four comment cards provided alternatives to the proposed alignments through agricultural properties. Two comment cards noted concerns regarding current farming practices. One comment card noted a dislike of the visual aspect of the proposed transmission line. One comment card proposed that the alignment for Alternative 2 along Bishop Road be constructed underground. Two comment cards noted concerns regarding radio interference. Finally, one comment card requested further information on when a decision would be made regarding the transmission line.

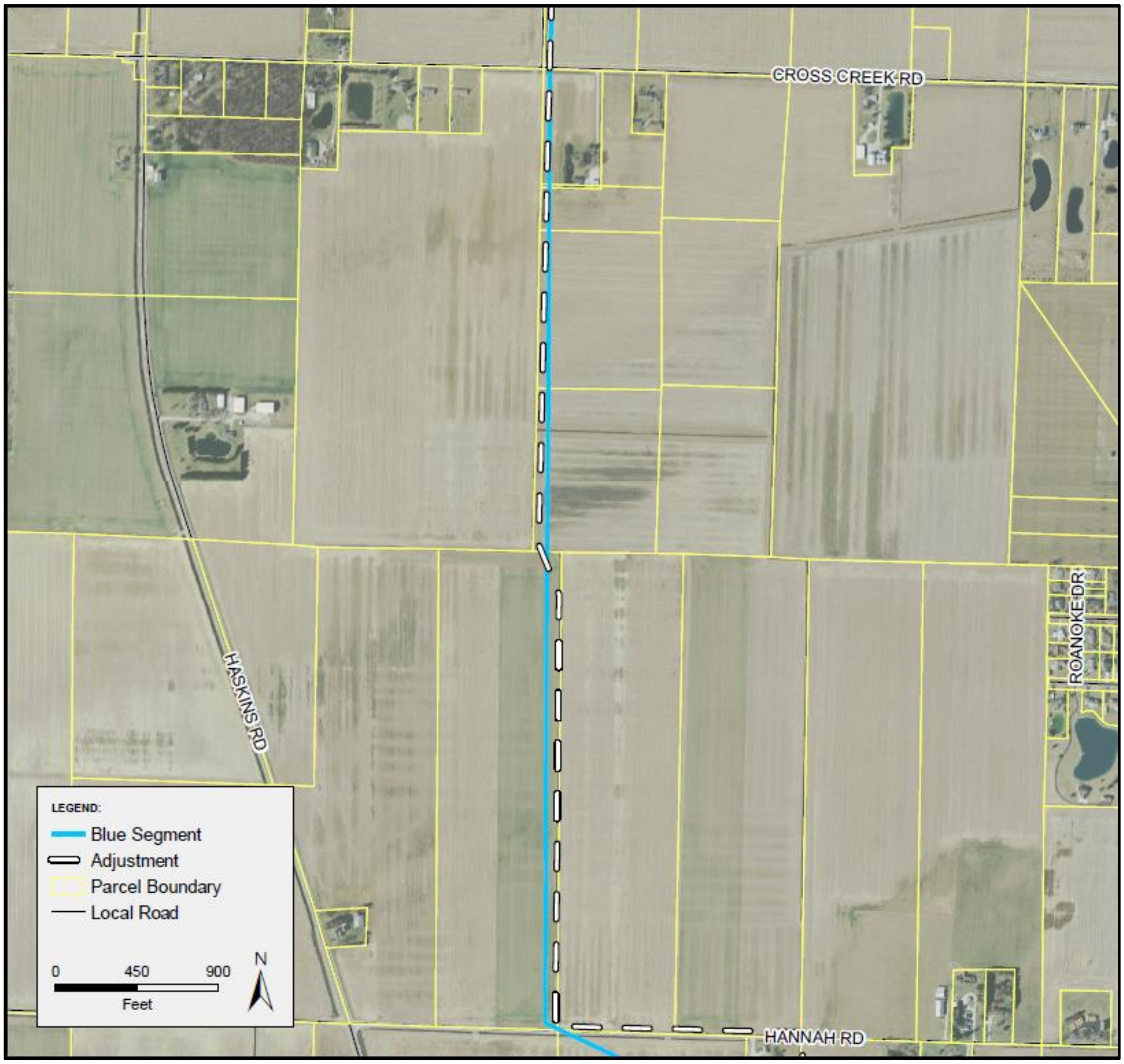
4.1.2 Route Adjustments

Following the public information meeting, five route adjustments were made to accommodate landowner comments with three adjustments to Alternative 1, and two adjustments to Alternative 2.

FIGURE 4-2
Adjustment 1: Blue Segment

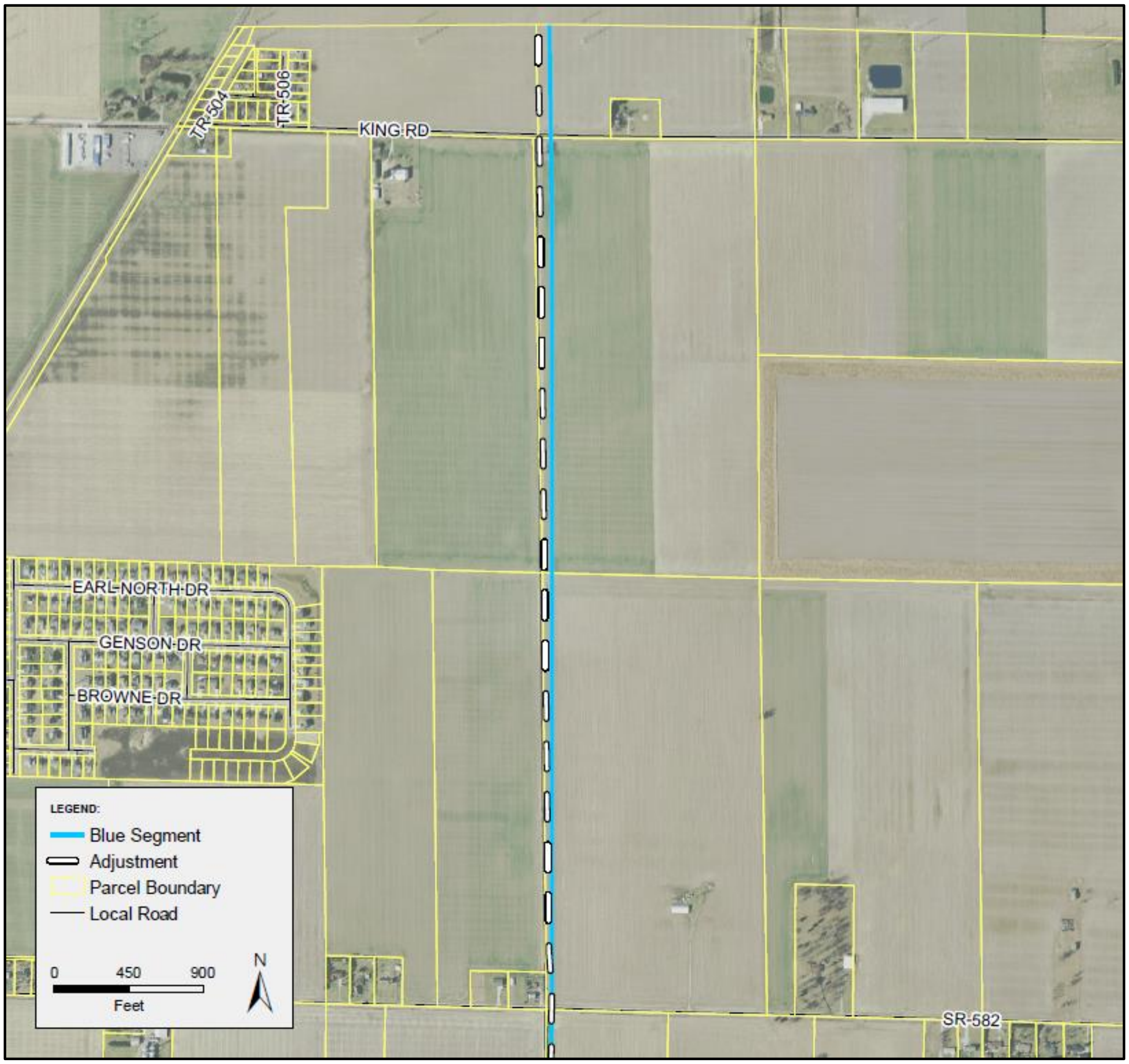
Adjustment 1 was made to the blue segment near Hull Prairie and Hanna Road. Rather than traversing through the agricultural fields, the property owners requested that the centerline follow the parcel boundaries or field edges. The adjustment makes the proposed overall route slightly longer and adds two angle points; however, it accommodates the property owner's requests and reduces any potential effects on current farming practices.

FIGURE 4-3
Adjustment 2: Blue Segment



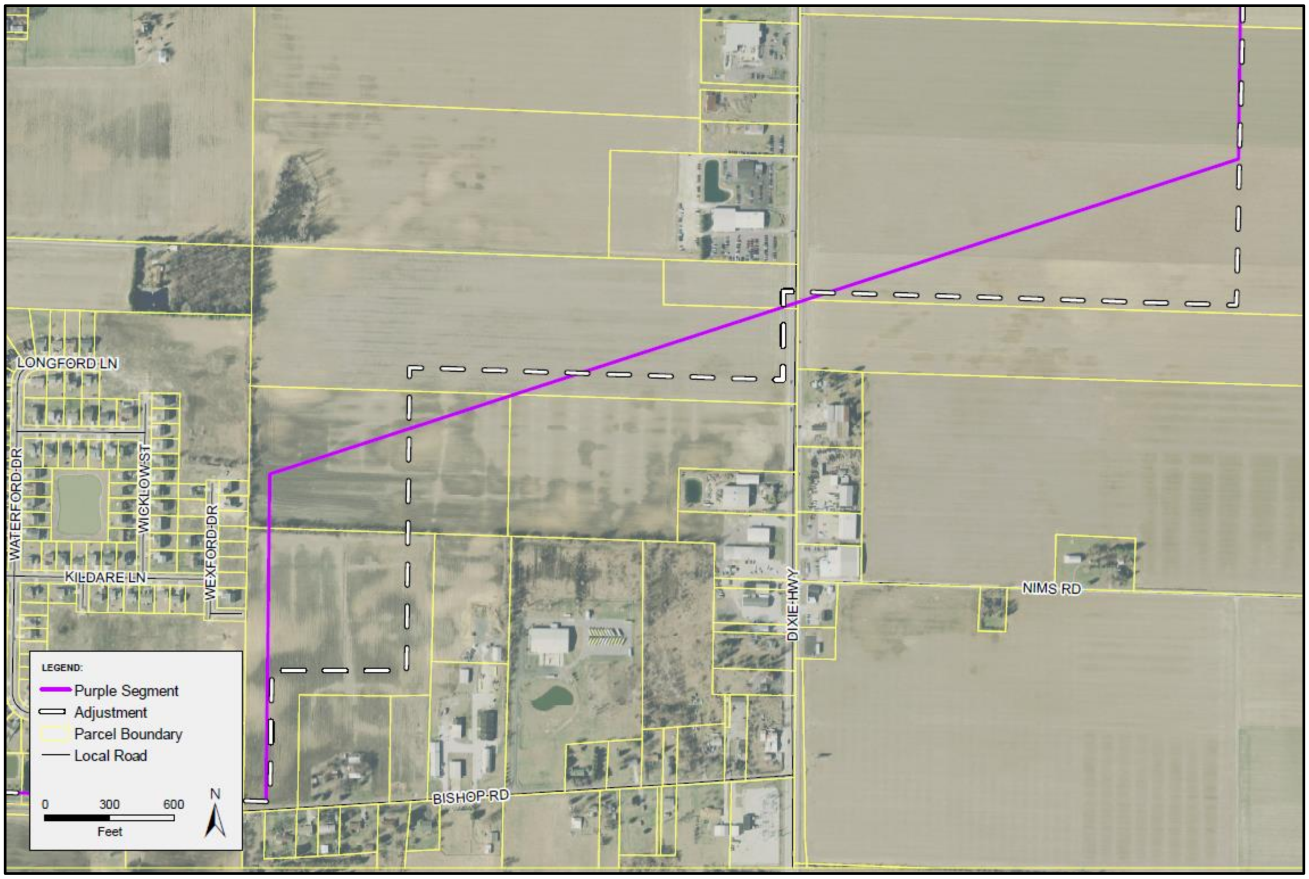
Adjustment 2 was made to the blue segment where the centerline extends north of Hannah Road towards Cross Creek Road. The centerline was adjusted to parallel field ditches to accommodate farming practices at the request of the property owners. The adjustment resulted in the addition of two angle points. The overall length of the route was not substantially altered.

FIGURE 4-4
Adjustment 3: Blue Segment



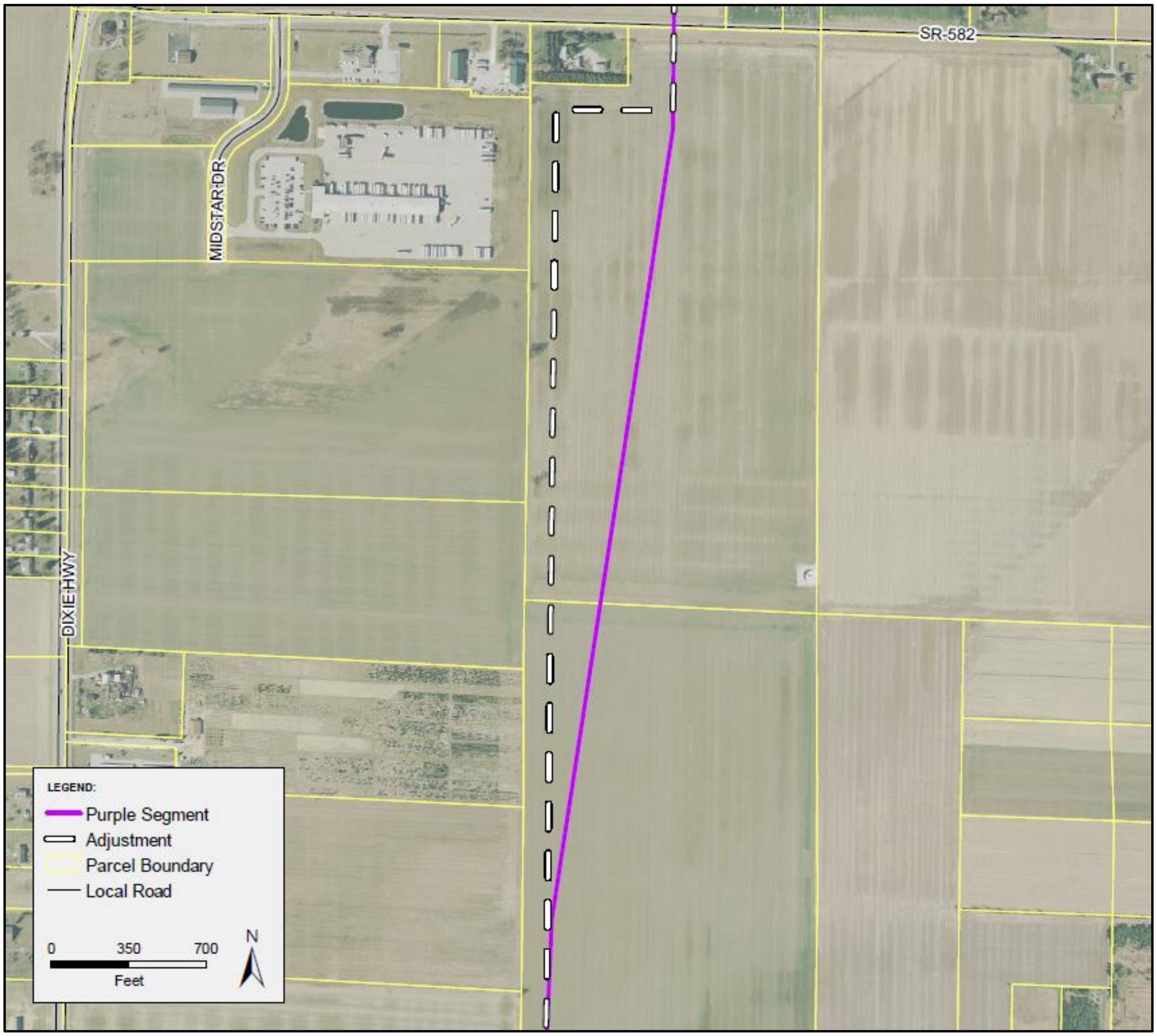
Adjustment 3 was made to blue segment where the centerline extends north from Middleton Pike (SR-582) towards King Road and to the existing transmission corridor at the northern extent of the Study Area. The centerline was adjusted to parallel field drainage ditches to accommodate farming practices as the request of the property owners. The overall length of the route was not substantially altered.

FIGURE 4-5
Adjustment 4: Purple Segment



Adjustment 4 was made to the purple segment between where the centerline extends north from Bishop Road and where it crosses S.R 25 (N. Dixie Highway) and extends eastward. To accommodate property owner requests, the centerline was shifted further away from the residential development located at the northeast corner of Brim Road and Bishop Road. Shifting the centerline east added two angles as the alignment extends east and then north. An additional angle point was added as the alignment trends east towards S.R. 25 in order to avoid traversing diagonally through the agricultural field. The centerline would then parallel S.R. 25 before crossing over and extending east through the agricultural field and then extending north. The adjustment increases the overall length of the route and adds four additional angle points; however, it accommodates the property owner requests.

FIGURE 4-6
Adjustment 5: Purple Segment



Adjustment 5 was made to the purple segment south of Middleton Pike (SR-582). To accommodate property owner requests, the centerline was shifted to parallel the parcel boundary avoid traversing diagonally through the agricultural field. The adjustment results in replacing two light angle structures with two corner deadend structures and slightly increases the overall length.

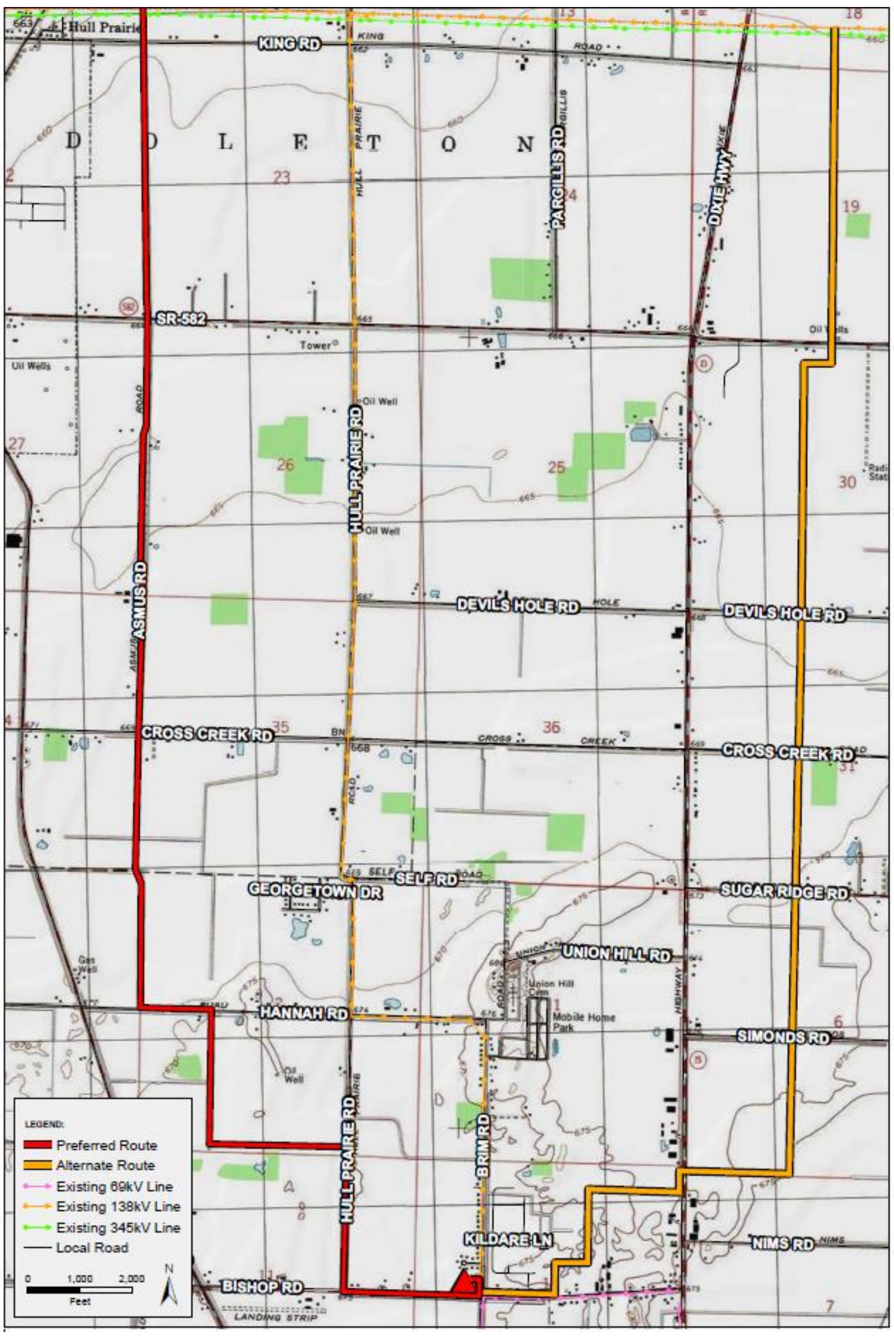
4.1.3 Selection of the Preferred and Alternate Route

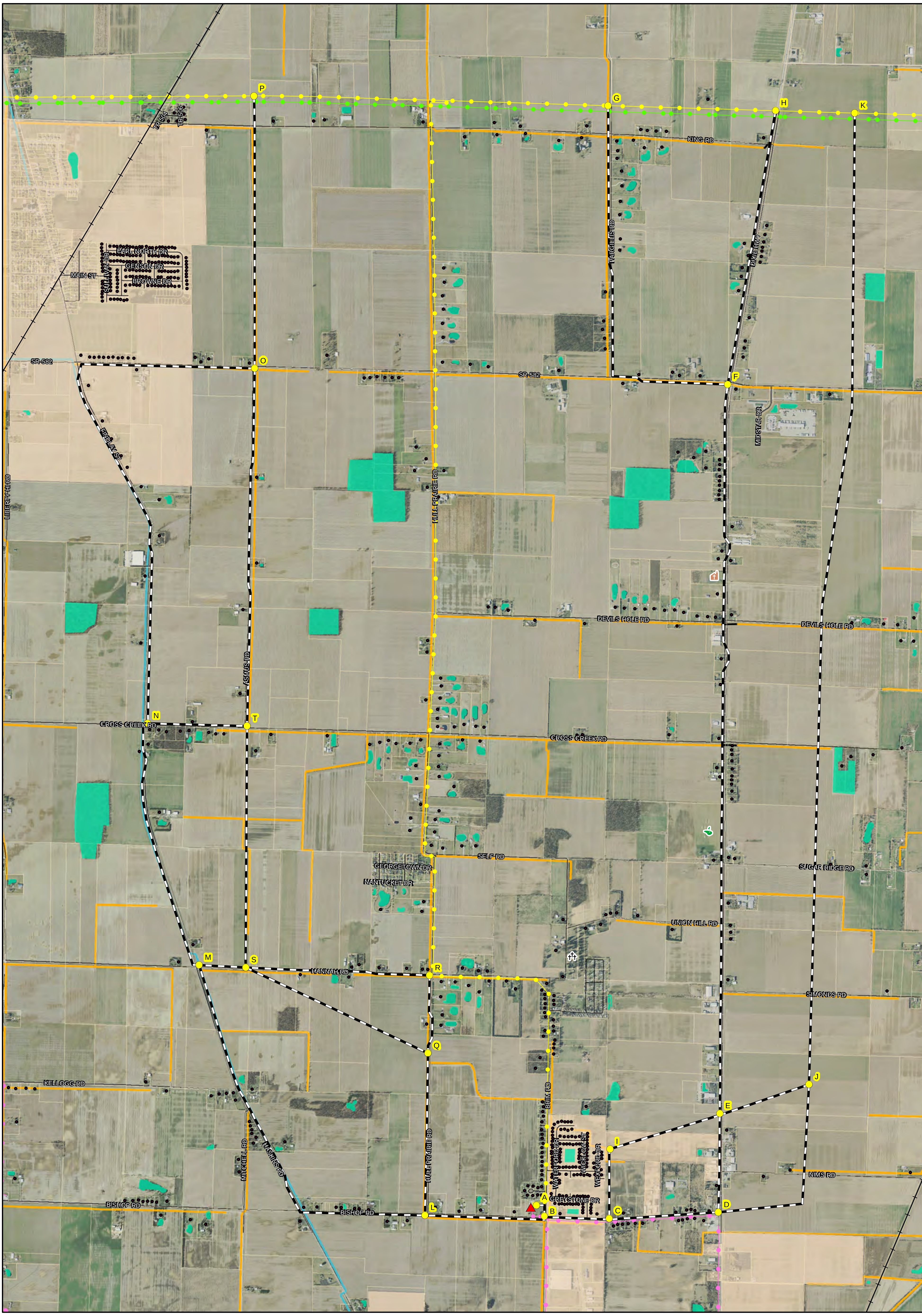
Following the September 2018 public information meeting, the siting team met in October 2018 to discuss adjustments and decide on a Preferred and Alternate Route. Based on landowner comments and discussion with the siting team, ATSI chose to move forward with the yellow and blue segments, designated as the Preferred Route, and the yellow and purple segments, designated as the Alternate Route, taking into account the route revisions discussed above.

5 Conclusion

The siting team conducted a detailed route selection study in an area of Wood County between the Lemoyne-Midway 138 kV Transmission Line and the Brim Substation. Detailed constraint and attribute data were used, along with high-resolution aerial photographs, to place proposed route segments. A total of 16 route alternatives were identified and numerically scored and ranked relative to each other. A detailed quantitative and qualitative analysis was then completed by the siting team, which resulted in the presentation of two segment options for public comment at the initial public information meeting. Following the meeting, the siting team made route adjustments based on landowner comments, and ATSI chose to retain Route 12 as the Preferred Route and Route 3 as the Alternate Route. The final Preferred and Alternate Routes are illustrated in Figure 5-1.

FIGURE 5-1
Preferred and Alternate Routes





LEGEND:

- Node
- Brim Substation
- Church
- Driving Range
- OGS Cemeteries
- Dwelling
- Segment
- Railroad
- Existing 69kV Line
- Existing 138kV Line
- Existing 345kV Line
- Perennial Stream (NHD)
- Canal Ditch (NHD)
- NWI Wetland
- Parcel Boundary
- Municipality

N

Location: Wood County, OH

Source(s): FirstEnergy GIS, Ohio Genealogical Society (OGS), Ohio Department of Transportation - Transportation Information Mapping System (ODOT TIMS), Ohio Geographically Referenced Information Program (OGRIP), National Hydrography Dataset (NHD), National Wetland Inventory (NWI)

NAD 1983 StatePlane Ohio North
Projection: Lambert Conformal Conic
Linear Unit: U.S. Foot

0 1,000 2,000 4,000
Feet

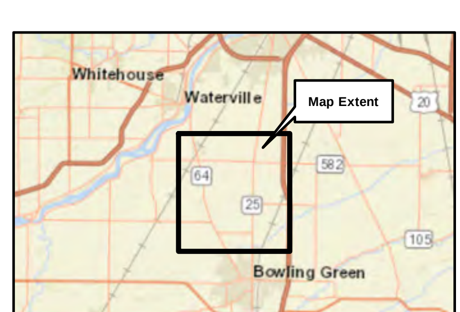


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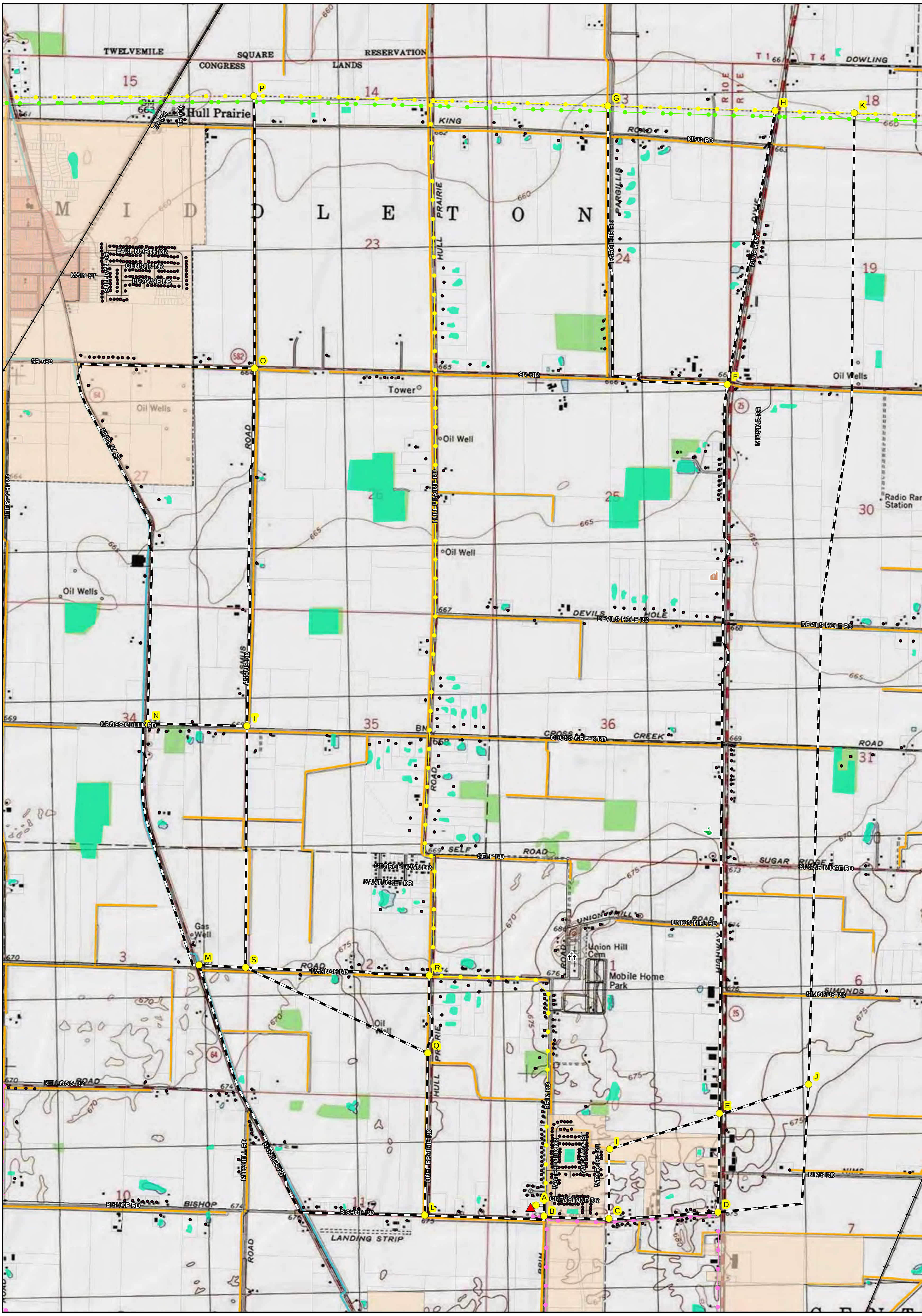
FIGURE 3-2
AERIAL CONSTRAINT MAP

WOOD COUNTY 138-kV
REINFORCEMENT PROJECT



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- Municipality

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Location: Wood County, OH

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NAD 1983 StatePlane Ohio North
Projection: Lambert Conformal Conic
Linear Unit: U.S. Foot

0 1,000 2,000 4,000
Feet

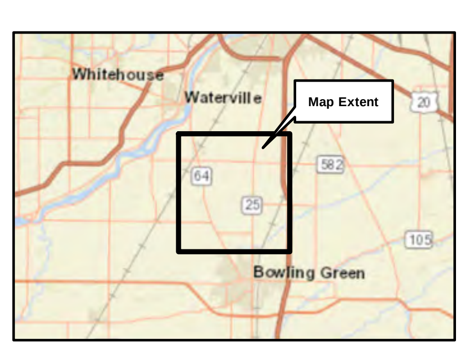

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FIGURE 3-3
TOPOGRAPHIC CONSTRAINT MAP

WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

4906-5-05 PROJECT DESCRIPTION

(A) PROJECT AREA DESCRIPTION

The map provided in 4906-5-07 (**Figure 7-1**) includes a description of the Project Area's geography, topography, population centers, major industries, and landmarks.

(1) Project Area Map

Figure 7-1 provides a map at 1:24,000-scale, showing the Preferred and Alternate Routes for the Project. This map includes a 1,000-foot corridor on each side of the proposed transmission centerlines (hereafter referred to as the 2,000-foot corridor). This map depicts the proposed transmission line, roads and railroads, major institutions, parks, and recreational areas that are publicly identified and publicly owned, existing gas pipeline and electric transmission line corridors, named lakes, reservoirs, streams, canals, and rivers, and population centers and legal boundaries of cities, villages, townships, and counties. The map utilizes the Bowling Green North (2016) U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle as a base map.

The information on the map was updated by reviewing digital, georeferenced aerial photography, property parcel data from the Wood County Auditors Office, and field reconnaissance conducted in October 2018. The aerial photographs are georeferenced, ortho-corrected color images derived from ESRI® ArcGIS Online.

(2) Proposed Right-of-Way, Transmission Length, and Properties Crossed

The proposed permanent ROW width is 60 feet wide, with 30 feet on either side of the centerline of the proposed routes. **Table 5-1** provides the Preferred and Alternate Routes ROW acreage, length, and properties crossed based on the proposed centerline."

TABLE 5-1
Right-of-way Area, Length, and Number of Properties Crossed for the Preferred and Alternate Routes

	Route Alternatives	
	Preferred	Alternate
Proposed ROW area (in acres)	44.4	43.6
Length (in miles)	6.1	6.0
Number of properties crossed (by ROW)	43	25

(B) ROUTE OR SITE ALTERNATIVE FACILITY LAYOUT AND INSTALLATION

(1) Site Clearing, Construction, and Reclamation

The following describes the proposed site clearing, construction methods, and reclamation operations for the Project.

(a) Surveying and Soil Testing

The transmission line will be surveyed to establish the centerline location. The surveying will be completed using conventional and/or aerial methods. The location of significant topographic features and man-made structures along or near the centerline of the transmission line that may affect the design of the transmission line will be identified during the survey. Some minimal clearing of small trees and brush may be required if the surveyor's line of sight is obstructed. Offsets will be used to survey around large trees and other large obstructions. Profile measurements will also be obtained by conventional or aerial methods. Structure locations will be staked prior to construction.

Soil and/or rock tests may be performed along portions of the final approved route if foundations for poles are necessary based on final engineering design. In those few locations where steel structures on concrete foundations may be necessary, geotechnical soil testing using truck-mounted drilling equipment may be utilized. Soil tests will be performed using a drop hammer to drive a sampler tube. Soil bearing capacity is tested by the number of blows required to drive the tube 12 inches into the ground. Soil samples taken with a split-spoon at 5-foot intervals will be used to determine soil type. Typically, the testing will be performed to a depth of between 20 to 40 feet. If rock is encountered, a carbide-tipped bit will be used to drill an exploratory boring 5 to 10 feet into the rock.

(b) Grading and Excavation

No significant grading is anticipated to construct the transmission line on either route. The existing terrain within the Preferred and Alternate routes' ROW generally provides a suitable surface for construction vehicle operation. Some minor local leveling may be necessary for designated laydown and set-up areas for construction equipment; however, any grading would be restricted to the immediate area.

Each wood pole installation requires a machine-drilled hole for placement of the structure. The excavation for these poles will average 3 feet in diameter and 9 to 17 feet deep. A portion of the excavated soil will be used for backfill. The excess material will be placed around the structure or hauled offsite to an approved spoils disposal facility.

The installation of steel poles on concrete foundations may be needed at certain locations. These structures will require a machine-drilled hole for placement of the pole foundation. The excavation for each concrete foundation will be approximately 10 feet in diameter and approximately 35 feet deep. A portion of the excavated soil will be used for backfill around the foundation, and the excess soil material will be placed around the pole or hauled offsite to an appropriate spoils disposal site.

(c) Construction of Temporary and Permanent Access Roads and Trenches

Construction access will be required for the stringing of the conductor cable or wire and installation of the structures. Access roads will require landowner's input and approval. Preliminary access roads for the Preferred and Alternate Route will occur from existing public roads in close proximity to, or crossed by, the transmission line ROW.

Proposed access roads are identified in **Figures 8-2A through E** and **8-3A through E**. The location of these access roads cannot be finalized until after a route is approved and Applicant's discussion with affected landowners. Where access across wetlands or streams is necessary, construction matting or equivalent will be used to minimize disturbance. If field conditions necessitate the modification of the finalized access road locations during construction, the concurrence of the property owner will be obtained, necessary environmental field studies will be performed, and necessary permits will be updated.

(d) Stringing of Cable

Conductor installation for the proposed line will be accomplished using the tension stringing method. Lightweight guy cables or ropes will be fed through the stringing sheaves of the sections of line that require stringing. Conductors will then be pulled through under sufficient tension to keep the conductor off the ground. This protects the conductor from surface damage.

Temporary guard or clearance poles will be used as a safety precaution at locations where the conductors could create a hazard to either crew members or the general public. The locations and heights of clearance poles will be such that the conductors are held clear of power and communication circuits, vehicular traffic, and other structures. The stringing operation will be under the observation of crew members at all times. The observers will be in radio and/or visual contact with the operator of the stringing equipment.

(e) Installation of Electric Transmission Line Poles and Structures, Including Foundations

Generally, the Project will be constructed using direct embed wood poles. In some locations, steel poles may be needed. In these locations a machine-drilled hole for placement of the pole's concrete foundation will be necessary.

(f) Post-Construction Reclamation

After construction is complete, the Project workspace will be restored to conditions as good as those that existed prior to construction. This includes the restoration of drainage ditches, repair or replacement of any pre-existing or damaged fencing or field drainage tiles (or damage thereto), the seeding and mulching of disturbed non-cultivated areas; and the removal of temporary soil erosion and sedimentation control measures after vegetative cover has been established. Disturbed areas adjacent to streams and wetlands will be revegetated using methods to minimize soil erosion and degradation.

Lawn or garden areas, or paved areas damaged during the construction of the transmission line, will be restored to original condition. Landscaping or landscape plantings damaged during construction will also be restored to original condition or replaced to the extent possible and practical as requested by the affected property owner.

Temporary and permanent seeding will be coordinated with construction activities to provide re-vegetation and soil stabilization at the earliest reasonable time. Following construction, all pole locations, material storage sites, and temporary access roads will be restored and seeded with a suitable grass seed mixture that will be specified in the erosion and sediment control plan.

(2) Facility Layout

No new associated facilities such as new substations are proposed for the Project. The existing Brim Substation is being expanded to accommodate the new 138 kV line exit from the substation. The substation expansion is a non-jurisdictional activity and is not included as part of this Project.

(a) Transmission Line Route Map

Figures 8-2A through E and **8-3A through E** show maps at 1:6,000-scale of the Preferred and Alternate Routes, respectively. These maps contain the data required by Admin. Code Rule 4906-5-05(A)(1). The additional information required by Admin. Code Rule 4906-5-05 (B)(2)(a) (e.g., pole structure locations) will not be finalized until a final route is approved by the Board and the final engineering design is complete. The data and information required by Admin. Code Rule 4906-5-05 (B)(2)(a) includes temporary access roads and proposed locations of transmission line poles and buildings. This information will be provided to the Board as requested, if the Project is approved and prior to construction activities.

No fenced-in or secured areas are planned for the transmission line Project.

ATSI is currently identifying staging areas and laydown areas for the Project. To date, none have been identified within the Project area. After sites are identified, ATSI will provide final locations that support this Project.

(b) Proposed Layout Rationale

A detailed description of the reasons for the proposed layout (i.e. the Preferred and Alternate Routes) are presented in the RSS (**Appendix 4-1**). There are no unusual features within the Project Study Area.

(c) Plans for Future Modifications

On behalf of ATSI, FirstEnergy’s planning engineers generally forecast future transmission projects in a 5-year planning window. Except as otherwise described in this Application, ATSI currently has no plans for future modification of the proposed Project.

(C) DESCRIPTION OF PROPOSED TRANSMISSION LINES

(1) Electric Power Transmission Lines

The majority of the Project will be installed on wood pole construction. Steel structures may be required at some locations. The exact number and location of structures along the centerline of the proposed routes will be determined during detailed engineering design, if the Board approves the Project.

(a) Design Voltage

The Project will be designed for, and operated at, 138-kV.

(b) Tower Designs, Pole Structures, Conductor Size and Number per Phase, and Insulator Arrangement

The proposed new transmission line will be supported on multiple structure types. The general features of these structures are described in the following sections.

1. For tangent configurations on the Preferred and Alternate routes, **Figure 5-1A** conceptionally shows a typical single wood pole tangent structure. These typical structures will consist of a single wood pole with three horizontal post insulators to support the transmission conductors on each side of the pole. These tangent structures will have optional distribution underbuild and/or communication facilities.

2. For structures with a light angle configuration on the Preferred and Alternate routes, **Figure 5-1B** conceptually shows a single wood pole structure, with three horizontal post insulators and down guys may be utilized. These structures will have optional distribution underbuild and/or communication facilities. **Figure 5-1C** conceptually shows a single steel structure equivalent that may be used to eliminate the need for guying.

3. **Figure 5-1D** conceptually shows a single wood pole structure, with three suspended insulators and down guys that may be used for structures with a light angle configuration on the Preferred and Alternate routes. These structures will have optional distribution underbuild and/or communication facilities. **Figure 5-1E** conceptually shows a single steel structure with foundation equivalent that may be used to eliminate the need for guying.

4. For deadend structures, **Figure 5-1F** conceptually shows a single wood pole deadend structure with down guys that may be used for structures on the Preferred and Alternate routes. **Figure 5-1G** conceptually shows a single wood pole deadend structure with a stub pole and down guys. **Figure 5-1H** shows a steel pole deadend structure and concrete foundation. These structures will have optional distribution underbuild and/or communication facilities.

5. **Figure 5-1I** conceptually shows the wood pole tap structure that would be utilized for the Preferred and Alternate routes. This structure will have optional distribution underbuild and/or communication facilities.

6. **Figure 5-1J** conceptually shows a double circuit steel pole deadend structure that may be utilized to replace the existing steel lattice tower in the existing Lemoyne-Midway (Brim) 138 kV corridor.

Although it is not anticipated, the design or ROW conditions may dictate that other types of structures need to be utilized. If these unanticipated conditions arise, they will be addressed on a case-by-case basis.

The conductor used for both the Preferred and Alternate routes will be designed and constructed for 138-kV operation and will be 556.5 26/7 ACRS per phase. This conductor has a maximum strength of approximately 22,600 pounds. Optical Ground Wire (OPGW will be installed on both the Preferred and Alternate routes. The phase conductors and overhead ground wires will be installed in accordance with the latest version of the National Electrical Safety Code (NESC). The conductors will be supported by aluminum clamps attached to the polymer horizontal post insulators. Aluminum clamps will support the overhead ground wire. At deadends, bolted-type deadend clamps will be used on the conductor and on the ground wire.

(c) Base and Foundation Design

A small number of steel structures on concrete foundations may be necessary. The excavation for each concrete foundation will be approximately 10 feet in diameter and 35 feet deep.

(d) Cable Type and Size, where Underground

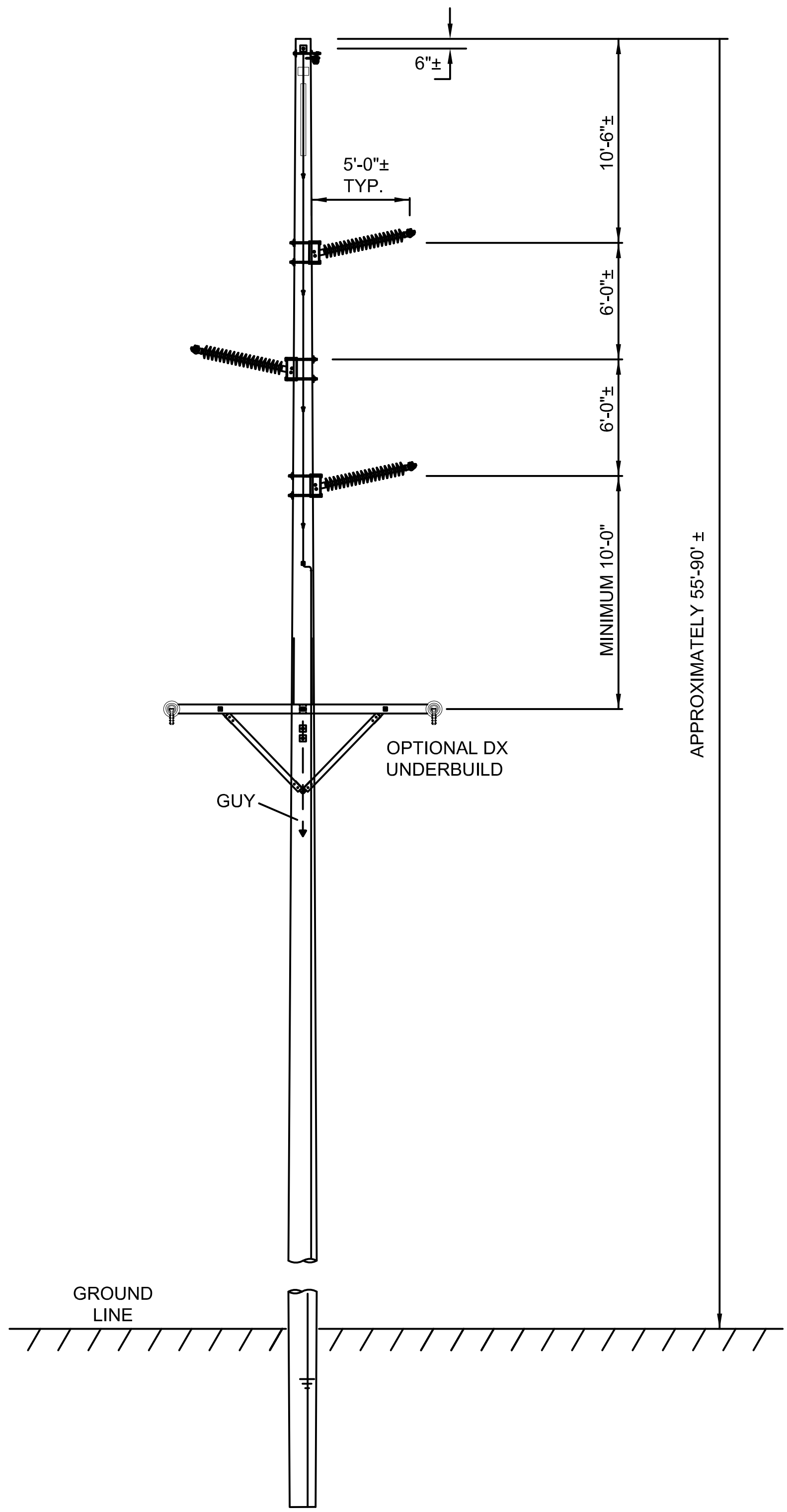
No underground cables are associated with this Project; therefore, this section is not applicable.

(e) Other Major Equipment or Special Structures

No other major equipment or special structures are required for the Project.

(2) Diagram of Electric Power Transmission Substations

No new electric power transmission substations are proposed for this Project.



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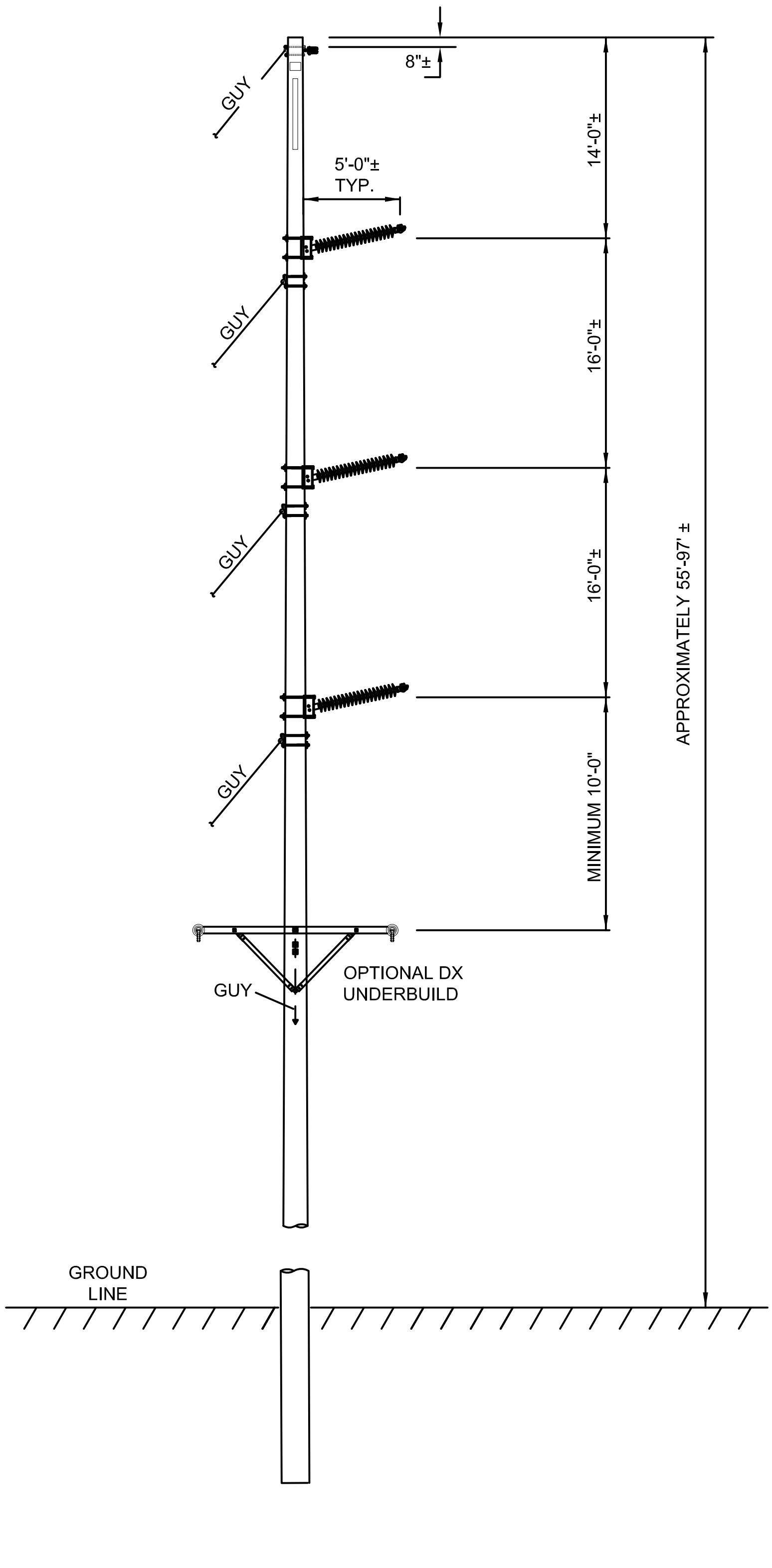
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

**NOT TO SCALE

138kV SINGLE CIRCUIT WOOD POLE STRUCTURE
HORIZONTAL POST, DELTA, SINGLE POLE

EXHIBIT 5-1A



**NOT TO SCALE

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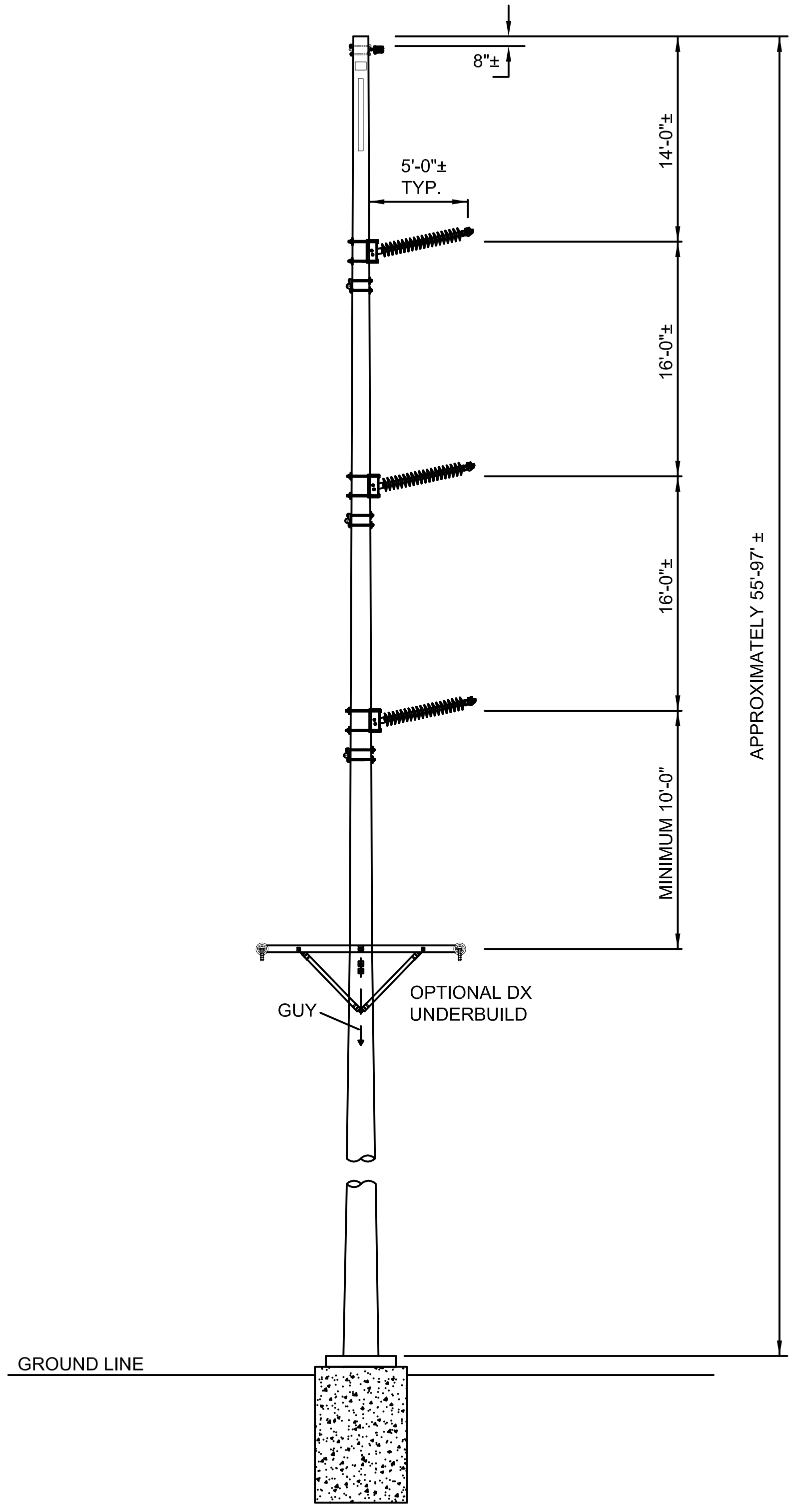
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT WOOD POLE STRUCTURE
LINE HORIZONTAL POST, VERTICAL SINGLE, POLE

EXHIBIT 5-1B



**NOT TO SCALE

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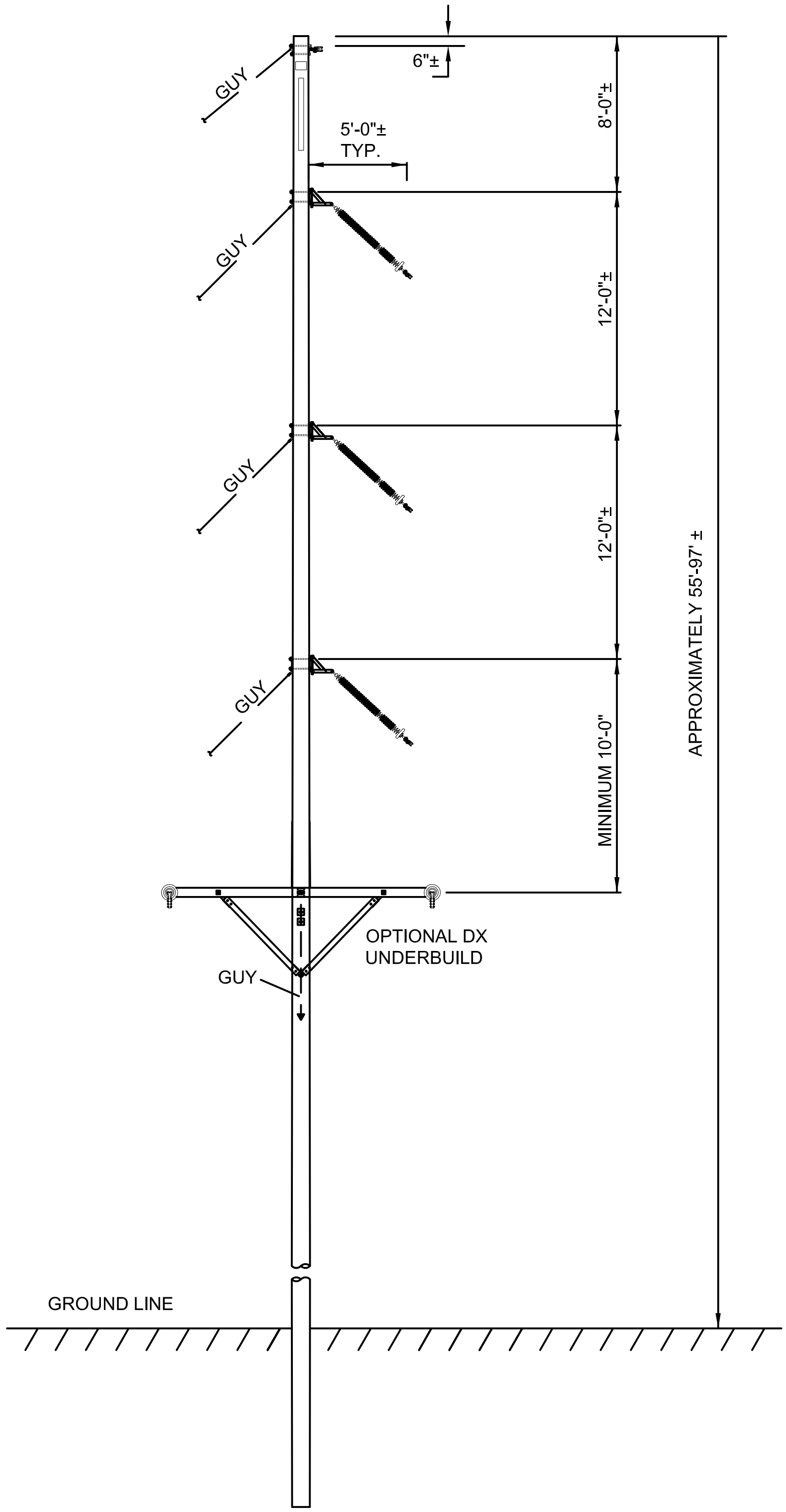
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT STEEL POLE STRUCTURE
LINE HORIZONTAL POST, VERTICAL, SINGLE POLE

EXHIBIT 5-1C



**NOT TO SCALE

ATSI®
American Transmission Systems, Inc
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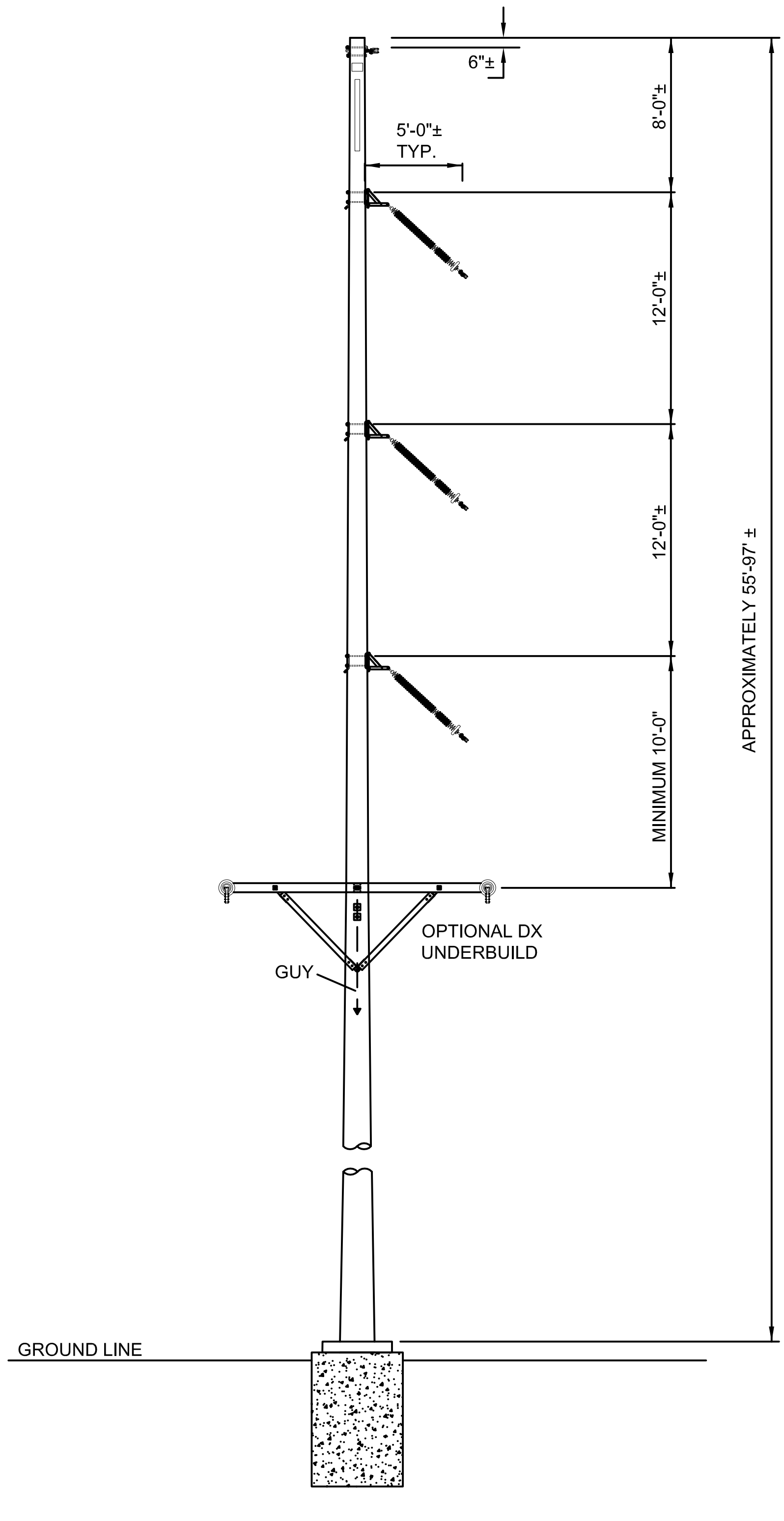
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT WOOD POLE STRUCTURE
SUSPENSION, VERTICAL, SINGLE POLE

EXHIBIT 5-1D



**NOT TO SCALE

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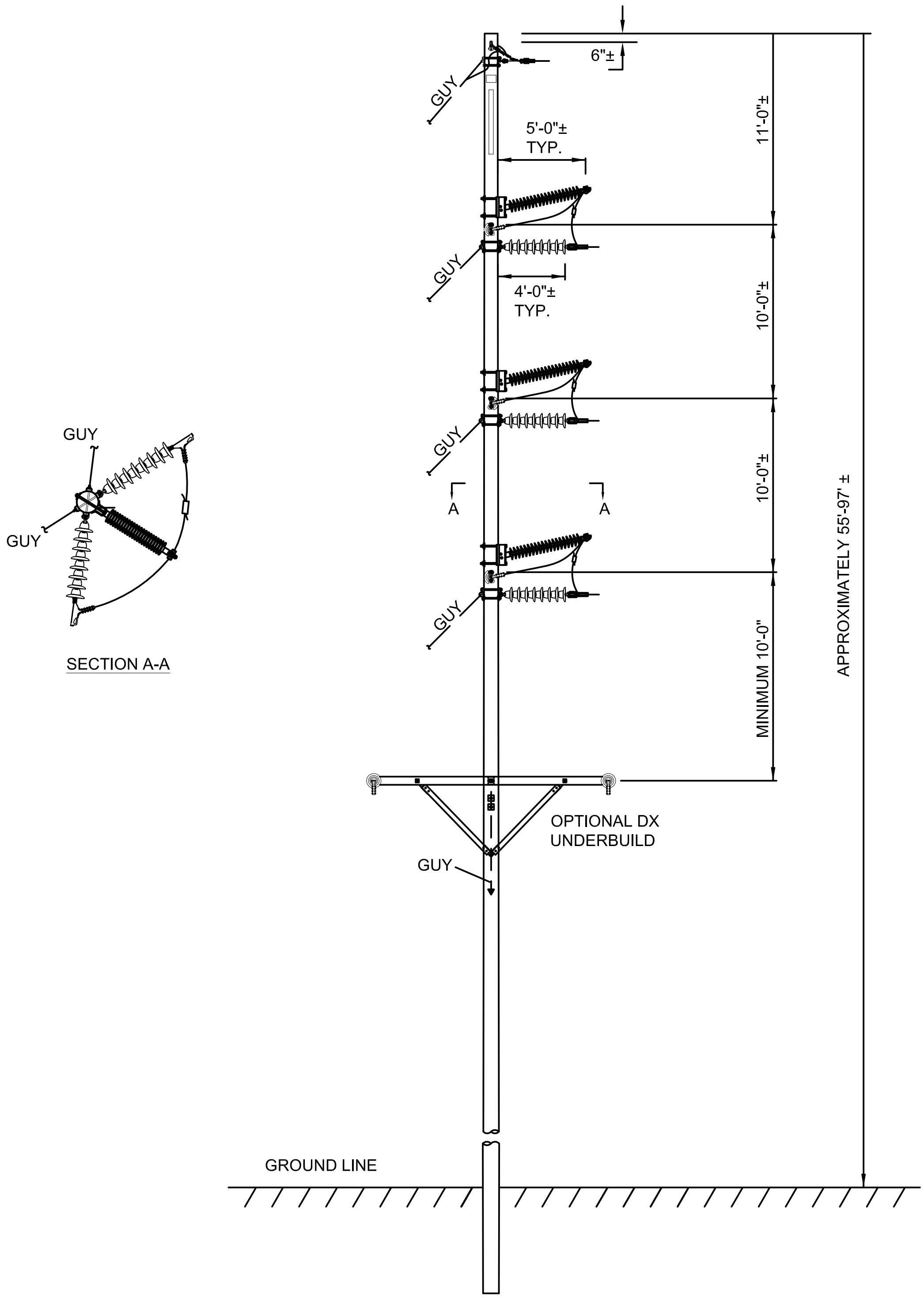
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT STEEL POLE STRUCTURE
SUSPENSION, VERTICAL, SINGLE POLE

EXHIBIT 5-1E



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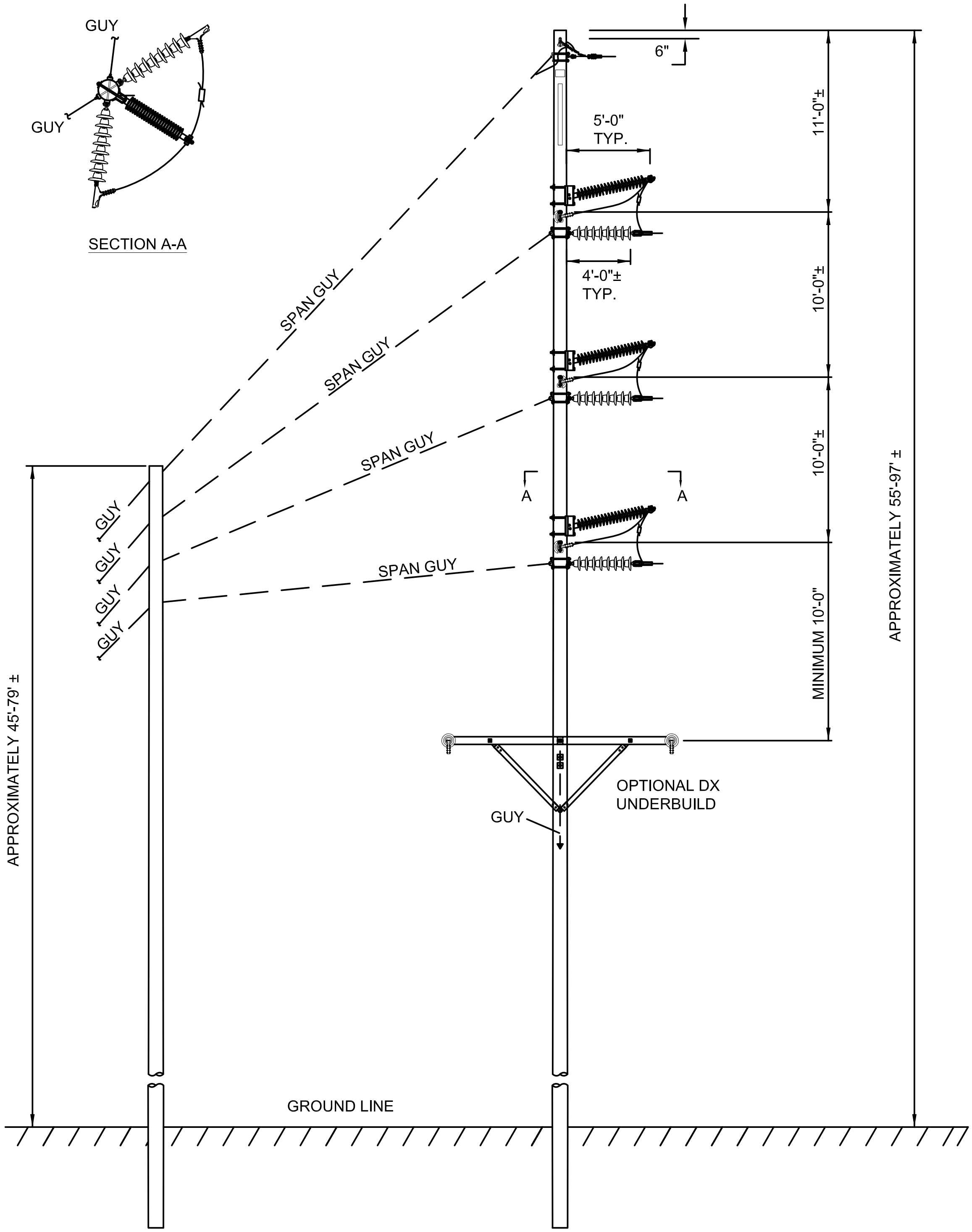
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT WOOD POLE STRUCTURE
DEADEND, VERTICAL, SINGLE POLE

EXHIBIT 5-1F



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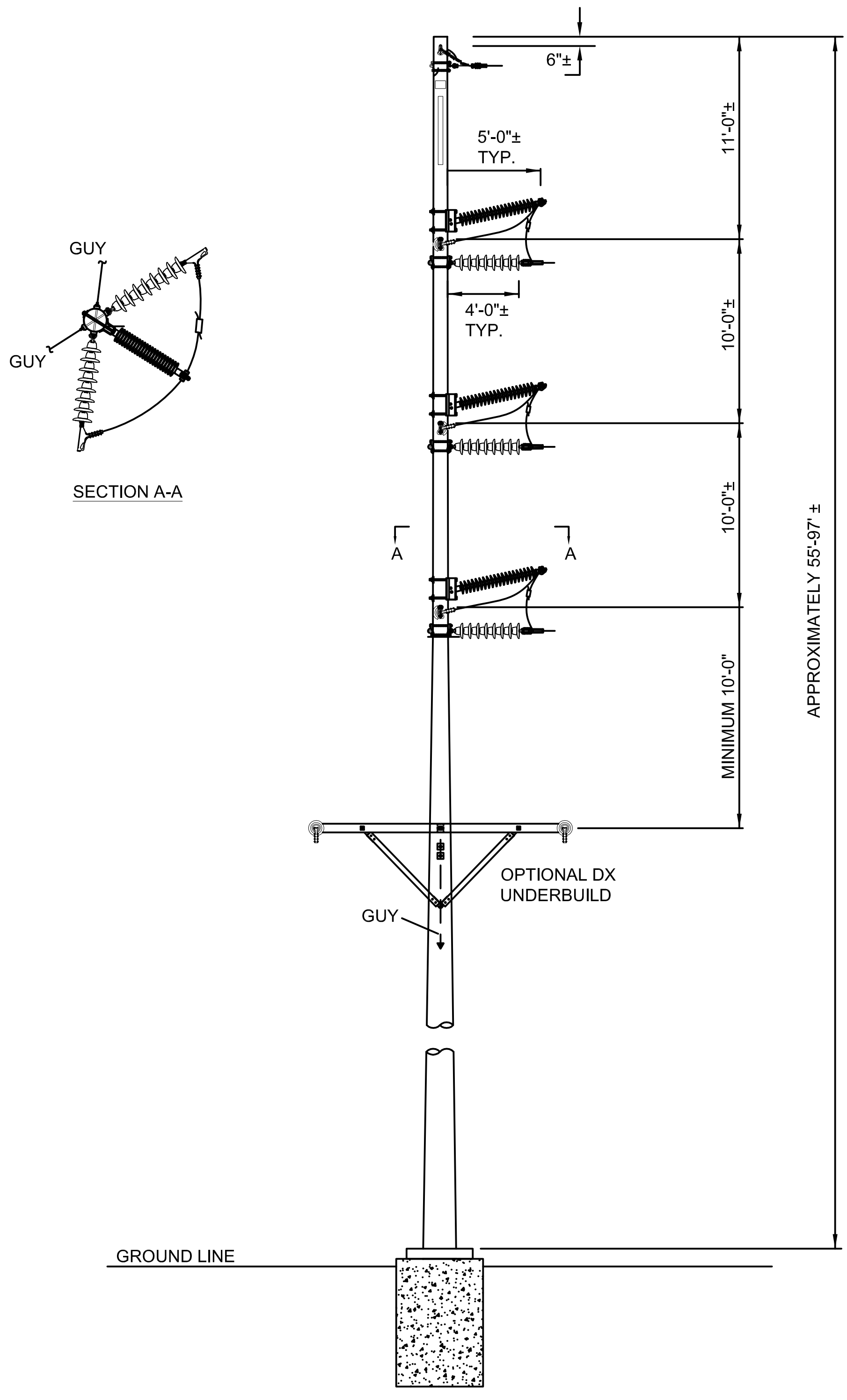
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV SINGLE CIRCUIT WOOD POLE STRUCTURE
DEADEND, VERTICAL, SINGLE POLE WITH
STUB POLE

EXHIBIT 5-1G



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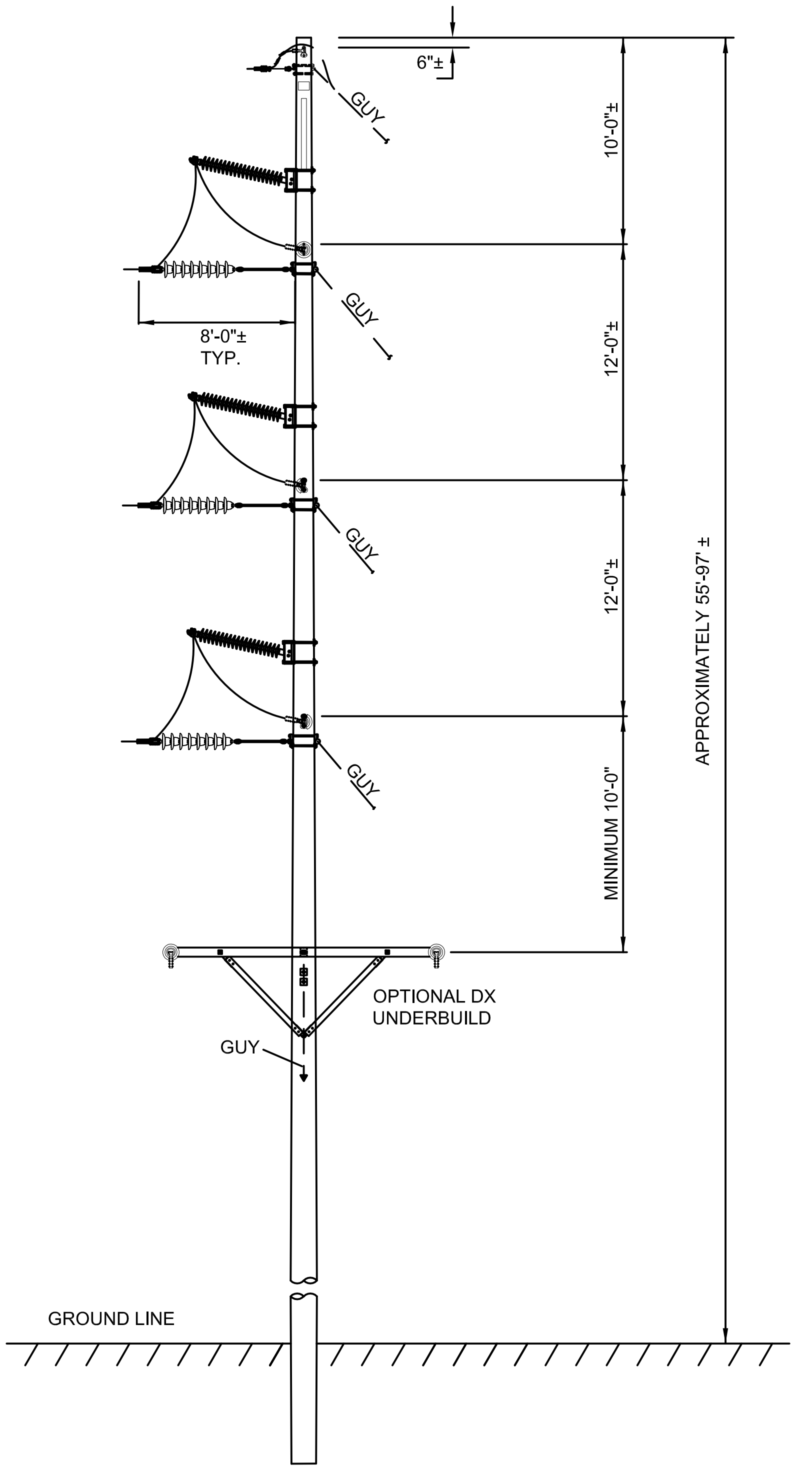
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

**NOT TO SCALE

138kV SINGLE CIRCUIT STEEL POLE STRUCTURE
DEADEND, VERTICAL, SINGLE POLE

EXHIBIT 5-1H



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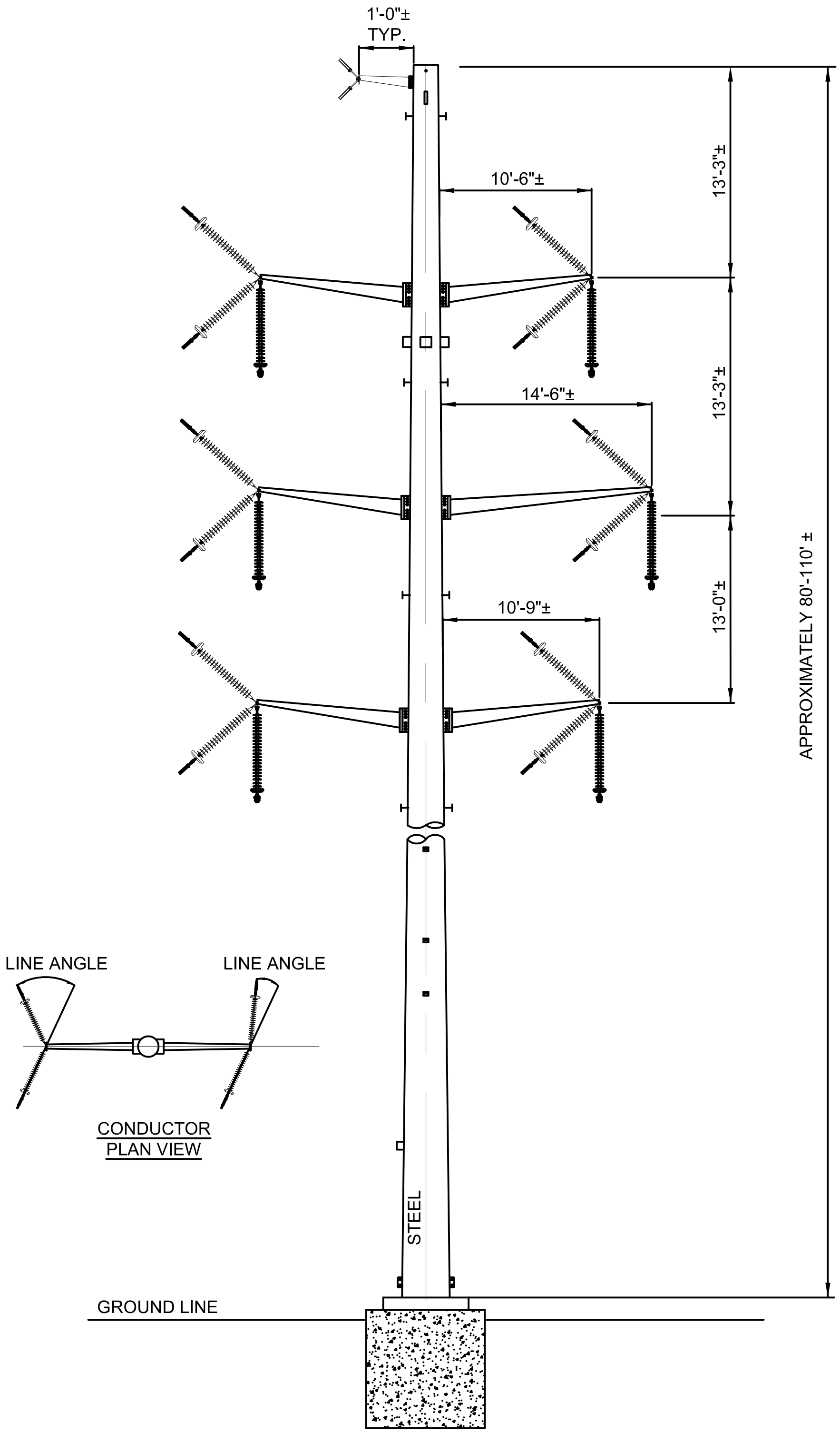
WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

**NOT TO SCALE

138kV SINGLE CIRCUIT WOOD TAP STRUCTURE
VERTICAL, SINGLE POLE

EXHIBIT 5-11



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WOOD COUNTY 138-kV
REINFORCEMENT PROJECT

138kV DOUBLE CIRCUIT STEEL POLE STRUCTURE
DEADEND, VERTICAL, SINGLE POLE

EXHIBIT 5-1J

4906-5-06 ECONOMIC IMPACT AND PUBLIC INTERACTION

(A) OWNERSHIP OF PROPOSED FACILITY

ATSI will construct, own, operate, and maintain the proposed Project.

Both the Preferred and Alternate Routes will consist of new construction located primarily in new ROWs acquired for the Project. In general, Applicant will obtain through negotiation with property owners any easements necessary for the ROW for the Project, although acquiring property rights by fee purchase of land or other types of agreements may occur.

Although Applicant endeavors to reach an amicable agreement with all impacted property owners, it is possible that some property owners may not be willing to provide Applicant with the necessary easements on negotiated terms. Where the necessary ROW for the transmission line along the route approved by the OPSB cannot be obtained through negotiations, appropriation of the necessary ROW will be pursued.

(B) CAPITAL AND INTANGIBLE COSTS ESTIMATE FOR ELECTRIC POWER TRANSMISSION FACILITY ALTERNATIVES

Table 6-1 includes estimates of applicable intangible and capital costs for both the Preferred and Alternate Routes of the Project. Cost estimates are provided only for those items listed in the rule that are applicable to this Project.

TABLE 6-1
Estimates of Applicable Intangible and Capital Costs for Both the Preferred and Alternate Sites

FERC Account Number	Description	Preferred Route	Alternate Route
350	Land and Land Rights, Engineering Construction, etc.	$4,404,600	$4,399,200
352	Structures and Improvements	$0	$0
353	Substation Equipment	$0	$0
354	Towers and Fixtures	$0	$0
355	Poles and Fixtures	$1,321,400	$1,306,100
356	Overhead Conductors and Devices	$0	$0
357	Underground Conductors and Insulation	$0	$0
358	Underground-to-Overhead Conversion Equipment	$0	$0
359	Right-of-Way Clearing, Roads, Trails or Other Access	$2,740,000	$2,740,000
	TOTAL	$8,466,000	$8,445,300

FERC = Federal Energy Regulatory Commission

(C) CAPITAL AND INTANGIBLE COSTS ESTIMATE FOR GAS TRANSMISSION FACILITY ALTERNATIVES

This Application is for an electric transmission line therefore this section is not applicable.

(D) PUBLIC INTERACTION AND ECONOMIC IMPACT

This section of the Application provides information regarding public interaction and the economic impact for each of the route alternatives.

(1) Counties, Townships, Villages, and Cities within 1,000 feet

The Preferred Route, including all areas within 1,000 feet of the centerline, is located in Middleton Township and Plain Township. The Alternate Route is located in Middleton Township, Center Township, Plain Township, and the City of Bowling Green. Both the Preferred and Alternate routes tap the existing Lemoyne-Midway 138 kV Transmission Line and head south ultimately terminating at the existing Brim Substation.

(2) Public Officials Contacted

ATSI contacted several local officials to discuss the Project. **Appendix 6-1** provides a list of the local public officials who have been contacted to date or who will be provided a digital or hard copy of the Application, once accepted by the OPSB.

(3) Planned Public Interaction

ATSI's already completed public interaction includes mailing the required notice letters to residents, tenants, and elected officials, public notice of a public information open house, the creation and maintenance of a Project website and conducting a public information open house. ATSI will also complete all necessary notice requirements associated with the filing of this application and the subsequent public and adjudicatory hearings as required by the OPSB's rules.

During the construction of this Project, ATSI will regularly provide Project updates on its website; retain ROW land agents that discuss project timelines, construction and restoration activities with property owners and other concerned members of the public; and convey this information to affected owners and tenants. Copies of informational materials that were available at the public open house are included in **Appendix 6-2**.

During this Project, the public may direct questions or comments to the FirstEnergy transmission projects hotline at 1-800-589-2837, or email transmissionprojects@firstenergycorp.com.

Applicant does request that any communications concerning the Project include the Project name. To access the Project's website, please visit:
https://www.firstenergycorp.com/about/transmission_projects/ohio/wood-county-reinforcement.html.

As required by the Board, if any member of the public wishes to review or request a hard copy of this Application, they can:

- Go to the local Library;
- Go to http://opsb.ohio.gov/ and search for this project's case number; or
- Access the project's website on https://www.firstenergycorp.com/about/transmission_projects/ohio/wood-county-reinforcement.html and follow the directions to obtain a copy.

Applicant will log comments and information provided through its public interaction program and this information will be shared with the Board, if requested.

At least 7 days prior to any construction activities, an ATSI ROW agent will notify the impacted landowner or the tenant by mail, telephone, or in person, depending on landowner preference.

(4) Liability Insurance or Compensation

FirstEnergy Service Company, as the parent company of ATSI currently self-insures against Commercial general liability and property damage exposure, as well as Commercial liability exposure in connection with its automobile operations. ATSI purchases excess Commercial General Liability insurance covering indemnity to at least $35,000,000 in excess of $10,000,000. This insurance is on a per occurrence basis and is arranged under a broad form that includes automobile and contractual liability. Present coverage is arranged with AEGIS and is renewable on a year-to-year basis.

(5) Tax Revenues

The Preferred and Alternate Routes are located within Wood County. ATSI will pay property taxes on utility facilities in this jurisdiction. The approximate annual property taxes associated with the Preferred and Alternate Routes over the first year after the Project is completed are $567,595 and $568,446, respectively.

Based on the 2018 tax rates, the following information includes preliminary estimates for these taxing authorities:

<u>Preferred Route:</u>

Wood County	$116,430
Middleton Township	$43,804
Plain Township	$36,791
Bowling Green Local Schools School District	$111,043
Otsego Local School District	$259,527
	TOTAL $567,595

Alternate Route:

Wood County	$116,145
Middleton Township	$37,931
Center Township	$27,880
Plain Township	$17,292
Bowling Green Local Schools School District	$225,235
Eastwood Local School District	$85,774
Perrysburg Exempted Village School District	$17,245
Otsego Local School District	$40,943
	TOTAL $568,445

APPENDIX 6-1
Wood County 138-kV Reinforcement Project
Officials to Be Served a Copy of the Certified Application

Wood County

Board of County Commissioners
Dr. Theodore Bowlus
One Courthouse Square, 5th Floor
Bowling Green, OH 43402

Board of County Commissioners
Ms. Doris Herringshaw
One Courthouse Square, 5th Floor
Bowling Green, OH 43402

Board of County Commissioners
Mr. Craig LaHote
One Courthouse Square, 5th Floor
Bowling Green, OH 43402

Wood County Engineer's Office
Mr. John Musteric
One Courthouse Square, 5th Floor
Bowling Green, OH 43402

Wood County Planning Commission
Mr. Dave Steiner, Director
One Courthouse Square, 5th Floor
Bowling Green, OH 43402

Wood County Soil & Water District
Mr. Jim Carter, District Admin.
1616 E. Wooster St.
Suite 32
Bowling Green, OH 43402

Middleton Township

Middleton Township Officials
Mr. Jim Bostdorff, Trustee Chairman
19210 Haskins Road
Bowling Green, OH 43402

Middleton Township Officials
Ms. Penny Getz, Trustee
216 E. Greenwood Dr.
Haskins, OH 43525

Middleton Township Officials
Mr. Fred Vetter, Trustee
11440 Devils Hole Road
Bowling Green, OH 43402

Middleton Township Officials
Ms. Laurie Limes, Fiscal Officer
15228 Cross Creek Road
Bowling Green, OH 43402

Plain Township

Plain Township Officials
Mr. Donald Bechstein, Trustee
16375 Sand Ridge Road
Bowling Green, OH 43402

Plain Township Officials
Mr. Gary Cromley, Trustee
13370 Union Hill Road
Bowling Green, OH 43402

Plain Township Officials
Mr. Jim Rossow, Trustee
15821 Green Road
Bowling Green, OH 43402

Plain Township Officials
Ms. Elizabeth Bostdorff, Fiscal Officer
18617 Brim Road
Bowling Green, OH 43402

Center Township

Center Township Officials
Mr. Dale Brown, Trustee
17441 Carter Road
Bowling Green, OH 43402

Center Township Officials
Mr. Doug Wulff, Trustee
11300 E Kramer Road
Bowling Green, OH 43402

Center Township Officials
Mr. Rick Engle, Trustee
17123 Barr Road
Bowling Green, OH 43402

Center Township Officials
Ms. Jill Foos, Fiscal Officer
17100 Carter Road
Bowling Green, OH 43402

City of Bowling Green

City of Bowling Green Mayor's Office
Mayor Richard Edwards
304 North Church Street
Bowling Green, OH 43402

Bowling Green City Council
Mr. Bruce Jeffers
304 North Church Street
Bowling Green, OH 43402

Bowling Green City Council - Ward 4
Mr. William Herald
1030 Conneaut Ave
Bowling Green, OH 43402

Bowling Green City Council - Public Utilities Committee
Mr. Michael Aspacher
25 Parkwood Drive
Bowling Green, OH 43402

Bowling Green Engineering Division
Mr. Jason Sisco, City Engineer
304 North Church Street
Bowling Green, OH 43402

Bowling Green Planning Commission
Attn: Planning Commission
304 North Church Street
Bowling Green, OH 43402

Libraries

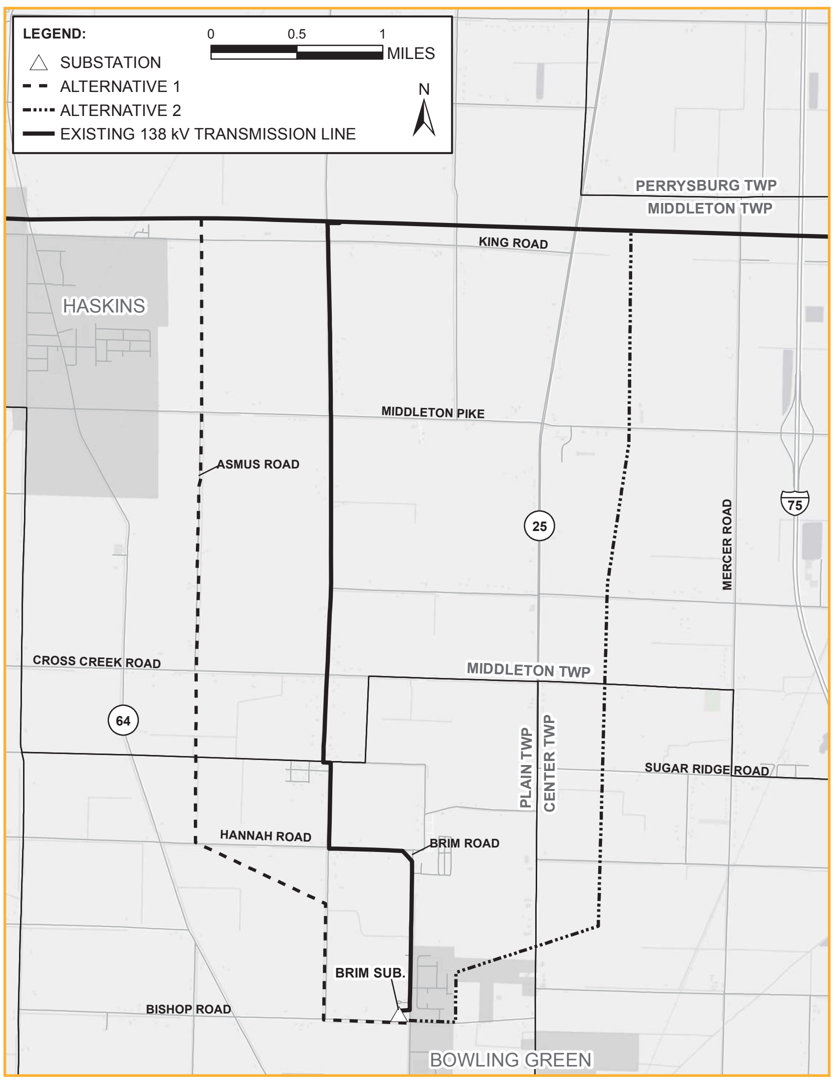
Wood County District Public Library
Mr. Michael Penrod, Director
251 N. Main Street
Bowling Green, OH 43402

Energizing the FUTURE

Wood County 138-kV Reinforcement Project

Proposed 138-Kilovolt (kV) Transmission Line Project to Enhance Service Reliability for Toledo Edison and Bowling Green Area customers in Wood County.

American Transmission Systems, Inc. (ATSI), a FirstEnergy company, is proposing to build the Wood County 138-kV Reinforcement Project to enhance electric service for Toledo Edison and Bowling Green Area customers in Wood County, Ohio. The project will benefit approximately 16,000 customers in the area by improving voltage stability, adding redundancy to the network, and allowing for future load growth when new businesses or homes are built.



Project Overview

The project consists of three primary components:

- Expanding an existing a 138/69-kV substation in Plain Township to help reinforce the local transmission system
- Constructing an approximately 5.5-mile 138-kV transmission line connecting the expanded substation to the nearby Lemoyne-Midway 138-kV transmission line
- Constructing a short, approximately 0.15-mile 69kV transmission line that will connect the expanded substation to nearby Bowling Green municipal facilities.

FirstEnergy's ATSI affiliate will build and own the new facilities. The estimated project cost is approximately $20-25 million.

Continued on back

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Project Siting

Multiple routes for the transmission line were carefully evaluated to avoid potentially sensitive areas and minimize impacts to land owners and the community. A line route evaluation identified two potential routes for the line, which are illustrated on the accompanying map. The company will seek input on these routes from the community at a public open house meeting to be held in September to identify a Preferred and an Alternate Route. Only one route is required to complete the project.

Regulatory Approval

ATSI must obtain authorization from the Ohio Power Siting Board (OPSB) for the proposed line and substation expansion before construction can begin. The company expects to make the necessary submittals to the Board for the project by year end 2018. Construction will begin once approval is received.

About Energizing the Future

Through *Energizing the Future*, FirstEnergy has upgraded or replaced existing transmission lines, incorporated new, smart technology into the grid, and outfitted dozens of substations with new equipment and enhanced security features. These upgrades are producing reliability improvements across the company's transmission system. FirstEnergy will continue these investments through 2021.

For more information, visit firstenergycorp.com/transmission.

Energizing the FUTURE

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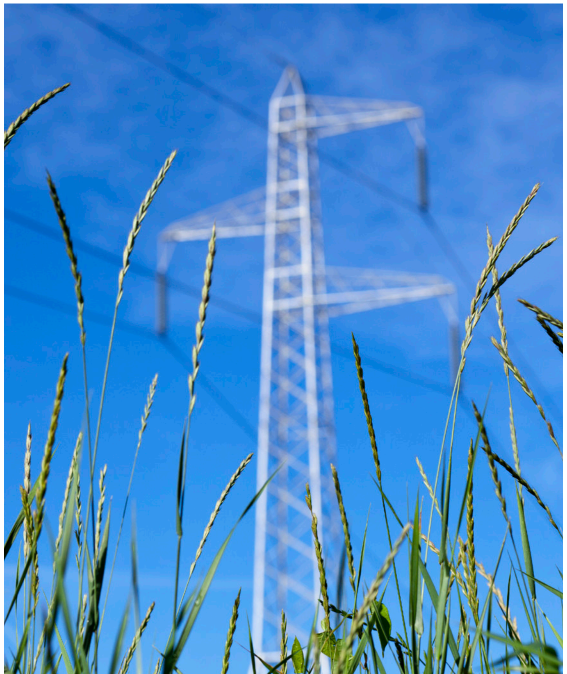


What Are Electric and Magnetic Fields?

Electric and magnetic fields surround anything that generates, transmits, or uses electricity. **Electric fields** result from voltage that pushes electric current through an electrical wire. **Magnetic fields** are produced when electrical current flows through wires and electrical devices. Together, these electric and magnetic fields from electric power sources are commonly referred to as EMF.

Since electricity plays an important role in modern life and in almost everything we do, EMF can be found almost everywhere. The electricity system that is used to transmit and distribute electricity (e.g., transmission lines, distribution lines, and substations) is a source of EMF. When we use electricity in our homes, offices, schools, workplaces, hospitals, and public areas to power the many appliances, devices, and equipment we use for work, leisure, and transportation, EMF also are present.

Are There Guidelines That Limit Exposure to EMF?

There are no federal exposure limits in the United States and no state agency has adopted exposure limits based on a finding that EMF causes adverse health effects. Scientific organizations, however, have recommended exposure guidelines to protect the general public and workers from very high EMF levels, that have the potential to cause nerve and muscle stimulation, which are short-term and reversible effects. EMF levels found in our environment, including those near high-voltage power lines, however, are far too low to cause these effects.

Where Can I Find More Information?

Health Canada

http://healthycanadians.gc.ca/healthy-living-vie-saine/environment-environnement/home-maison/emf-cem-eng.php

National Cancer Institute

http://www.cancer.gov/cancertopics/factsheet/Risk/magnetic-fields

World Health Organization

http://www.who.int/peh-emf/en/

National Institute of Environmental Health Sciences

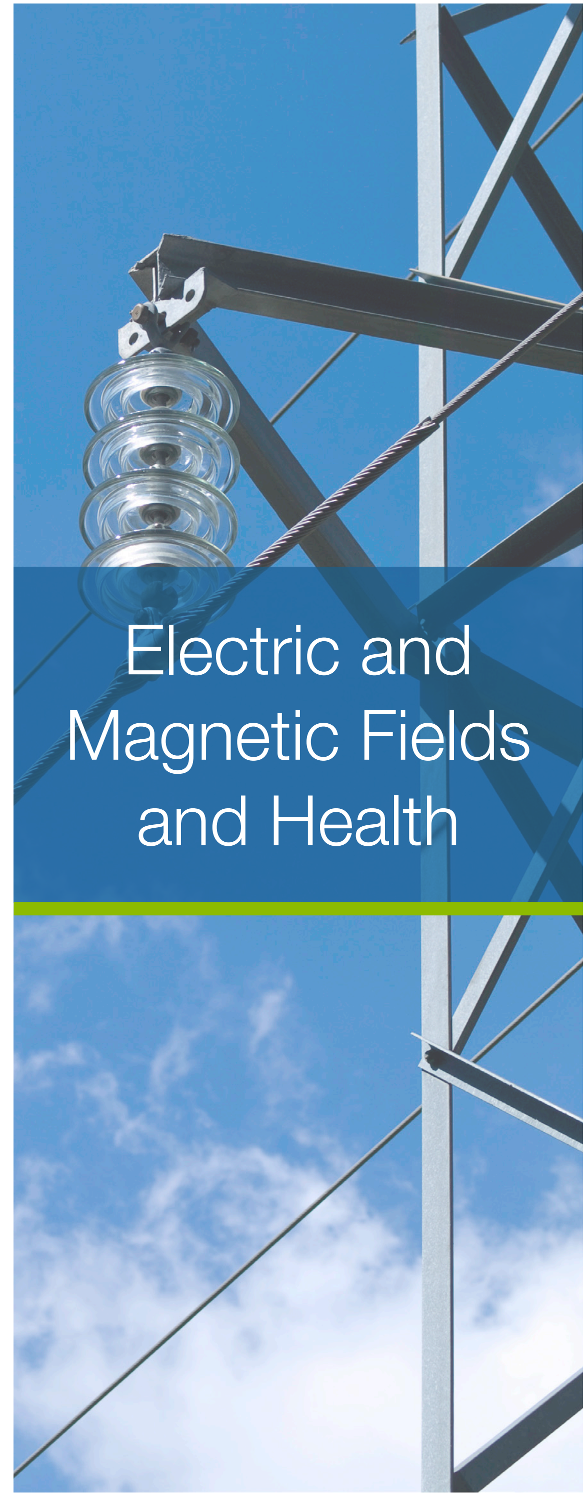
http://www.niehs.nih.gov/health/materials/electric_and_magnetic_fields_associated_with_the_use_of_electric_power_questions_and_answers_english_508.pdf

European Commission – SCENIHR

http://ec.europa.eu/health/scientific_committees/consultations/public_consultations/scenihr_consultation_19_en.htm

Exponent®

Prepared by Exponent for FirstEnergy | January 2016



Electric and Magnetic Fields and Health

How Is EMF Measured and What Are Typical Levels in the Home?

Electric fields are measured in units of volts per meter (V/m) and magnetic fields are measured in milligauss (mG), microtesla (μT) or millitesla (mT) (1 mG = 0.1 μT = 0.0001 mT). The highest levels of EMF are measured directly near the source, and decrease rapidly with distance. Since electric fields are easily blocked or weakened by walls or other objects, more research has been conducted on magnetic fields.

In our homes, magnetic fields are generated from appliances, the wiring that powers those appliances, the distribution lines that deliver electricity to the home, and any currents flowing on water pipes. Magnetic fields from nearby transmission lines also have the potential to contribute to the magnetic-field levels inside a home, but since magnetic fields decrease rapidly as you get farther away from the source, the contribution of transmission lines to a home's magnetic-field level may be less than from other closer sources. The typical average level of magnetic fields in homes in the United States measured away from appliances is approximately 1 mG, while in close proximity to common appliances that are in use, the magnetic-field level can range from tens to hundreds of mG (Table 1).

Table 1. Magnetic Fields Measured from Appliances

Source	Distance from Source* 6 inches (mG)	1 foot (mG)	2 feet (mG)
Can Opener	600	150	20
Vacuum Cleaner	300	60	10
Hair Dryer	300	1	–
Portable Heater	100	20	4
Electric Range	30	8	2
Dishwasher	20	10	4
Toaster	10	3	–
Coffee Maker	7	–	–

Source: EMF Questions and Answers (NIEHS, 2002)

* The numbers represent the median magnetic field (i.e., half of the appliances tested had higher levels and half had lower levels than those shown in the figure).

Equipment within substations also produces magnetic fields, but here too, the fields drop off quickly with distance. At the boundary of substation sites, the magnetic field from substation equipment is typically within the range of levels found inside our homes. The dominant source of magnetic fields near substation boundaries is the power lines serving the substation.

How Are Potential Health Effects Studied?

There are three main approaches that scientists use to study potential effects of exposure to any physical, chemical, or biological agent, including EMF. Over the past 35 years, thousands of studies have been published in research areas related to EMF.

Epidemiologic studies are conducted among people to observe if persons with a disease (such as cancer) experienced higher exposures to EMF than persons without that disease.

Laboratory animal studies (also called *in vivo* studies) are conducted in laboratory animals, most commonly mice and rats, to test whether extended exposures to high levels of EMF cause increased rates of disease or toxic effects.

Laboratory studies of cells and tissues (also called *in vitro* studies) are conducted to see if exposure to EMF can cause any changes in biological processes that could lead to disease.

How Are Scientific Conclusions Drawn from Health Studies?

First and foremost, no single study or a selected small group of studies can form the sole basis of a valid scientific assessment. The method that scientists use to conduct health risk assessments involves the evaluation of all relevant studies in the three main research areas discussed above. The three areas have varying strengths and limitations, thus, they contribute different information to a scientific evaluation and have to be weighed together. Because epidemiologic studies are conducted among people, the main interest of health research, they provide highly relevant scientific evidence. *In vivo* studies can be well controlled by the investigators and can expose animals to high levels of exposure for long time periods up to the entire lifetime of the animals. While animal studies require extrapolation between species, these tests form the primary basis for assessing the safety of all drugs and medicines. *In vitro* laboratory studies may contribute to better scientific understanding of biological processes and potential exposure effects on a cellular level; however, because cells and tissues may not react the same way in experimental settings as in intact organisms, no direct conclusions can be drawn from *in vitro* studies about disease and adverse health effects. In the overall evaluation, scientists look for overall patterns within and across the three research areas. Epidemiology and *in vivo* studies have primary importance, while *in vitro* studies contribute secondary information in the assessment of scientific evidence. Studies also vary greatly in their quality, thus, each study contributes different weight in the overall evaluation. Higher quality studies contribute more weight, while lower quality studies contribute less weight, and studies with very poor methods may not contribute at all.

What Have Authoritative Scientific Organizations Concluded?

Numerous scientific organizations have assembled groups of independent scientists with expertise in a variety of disciplines to perform comprehensive reviews of EMF research. These organizations include the International Agency for Research on Cancer, the International Commission on Non-Ionizing Radiation, the National Institute of Environmental Health Sciences, the World Health Organization, and most recently in 2015, a Scientific Committee of the European Commission. Overall, the conclusions of these panels are consistent and can be summarized generally, as follows:

- The research does not support the conclusion that EMF causes any long-term, adverse health effects.
- Some epidemiologic studies have reported a statistical association between high, average magnetic-field levels and childhood leukemia. No authoritative agency has concluded, however, that magnetic fields cause childhood leukemia due to the limitations of these studies and the lack of evidence from laboratory studies.
- The *in vivo* studies, overall, do not report an increase in cancer among animals exposed to high levels of EMF even after lifetime exposures.
- The *in vitro* studies provide no explanation as to how magnetic fields could cause disease.