FAIRPORT TO DENNY TO IA/MO BORDER 345KV TRANSMISSION ROUTE SELECTION STUDY

Prepared For:

Ameren
1901 Chouteau Avenue
St. Louis, MO 63103

Prepared By:

TRC

REV 1

July 2024

TABLE OF CONTENTS

Figures (larger figures appear after the text)

*Denotes figure is within the body of the report.

Tables

Charts

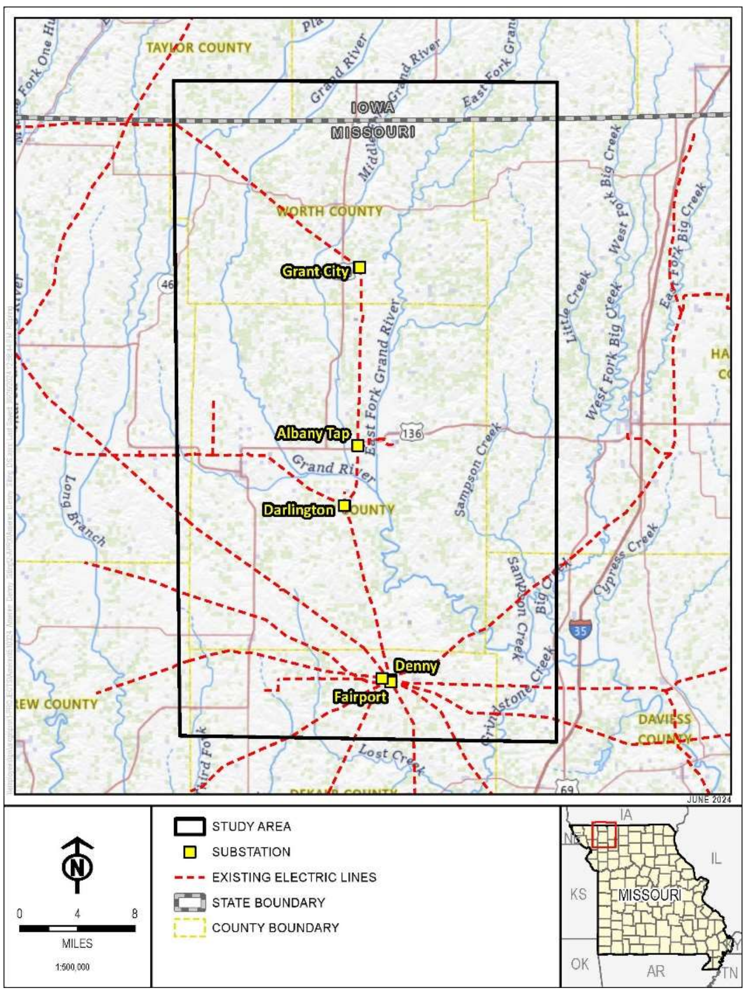
Appendices

1. Introduction and Project Overview

1.1 Project Description and Overview

The Midcontinent Independent System Operator Inc. (MISO) issued a Request for Proposals (RFP) to solicit Proposals from Qualified Transmission Developers (QTDs) to construct, own, operate, and maintain the Fairport to Denny to Iowa/Missouri State Border 345kV Competitive Transmission Project (Project). The scope of the Project includes construction of a new, approximately 44-mile 345kV transmission line to connect an end point on the Missouri-Iowa state line (Figure 1) to a new Denny substation located near the existing Associated Electric Cooperative Incorporated (AECI) owned Fairport Substation. The proposed route will be in Worth, Gentry, and Dekalb counties in Missouri.

Figure 1. Project Vicinity Map



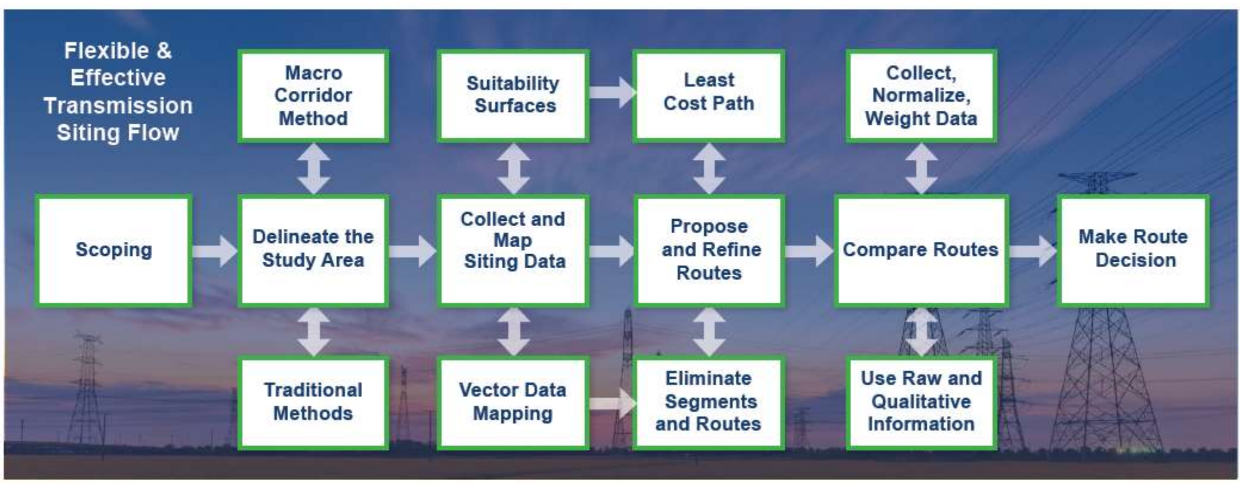
Ameren and its consultant, TRC (the Routing Team), conducted a multi-stage, greenfield route selection study (RSS) to first identify, then compare potential routes for the Project. The aim of the RSS was to find a viable Project route that minimized negative effects on land use, ecology, and the economic activities of the region, while simultaneously providing a cost effective and constructable route.

1.2 Summary of the Route Selection Study (RSS)

The RSS is intended to identify transmission line routes that minimize the overall impacts on land use, ecological, and cultural features, to the extent practical, while also considering economic and technical feasibility. Route selection studies provide an opportunity to explore the many competing interests and criteria that influence transmission line development and construction. A successful RSS will evaluate the technical needs and limitations of a project and will propose routes that minimize permit requirements and resource impacts while maximizing use of existing opportunities.

To facilitate Ameren's siting goals and needs, this RSS draws upon the latest available (at the time the study was prepared) land use and ecological data collected from multiple public sources and commercial providers. This is supplemented through field evaluations by the Routing Team. The field evaluation and public meetings also provided an opportunity to qualitatively assess the various routes once developed. The result of this process is a comprehensive assessment of the Project Area and route alternatives that is compiled and summarized in the RSS report.

Figure 2. The Multi-Stage RSS Process



The RSS consists of a multi-stage process (Figure 2) that takes a large Study Area and using relevant criteria, reduces that large Study Area into a series of approximate routes, or corridors, refines those into routes (i.e., centerlines), and then compares those routes and selects the best based on quantitative and qualitative review. A more detailed summary of these steps is described below.

Scoping and Kick Off: Scoping is a critical first step of the RSS. It is the planning stage where the Project technical requirements are established, where the Routing Team is introduced, and the nature of the Project Area is discussed. Project limitations, specific design criteria, goals, and timelines are also discussed and agreed upon during Project scoping and kick-off. For this Project, TRC understands that Ameren's design goal is to construct a new Denny Substation in Dekalb County, Missouri, near the existing AECI-owned Fairport Substation. The proposed transmission line will run north to the Missouri-Iowa border where it will meet a connecting transmission line to be constructed in Iowa.

Definition of a Project Area: The second step in the RSS is to develop a focused Project Area in which to collect detailed constraint and opportunity data. The Project Area was selected based on the siting experience of the project team and the geographic characteristics of the region, as well as the physical endpoints of the Project (i.e., substation and designated point on the Iowa state line). A Project Area should include the end points of the transmission line and provide a reasonable area in which to identify practical alternatives with reasonable geographic diversity.

Collection and Mapping of Opportunity and Constraint Data: Certain conditions present more favorable locations for placement of transmission lines, which are referred to as opportunities. Opportunities include areas that are generally compatible with transmission lines, such as being close to existing linear corridors. Alternatively, constraints are conditions that are generally unfavorable for placement of a new transmission line. Constraints may include unsuitable terrain/inaccessible areas, developed or congested areas, ecologically sensitive areas, or protected areas. Constraint and opportunity data were collected under three 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 Project Area, and the availability and quality of the dataset.

Propose and Refine Routes: The goal of the RSS 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, ecological resources, and cultural features in the Project Area. In evaluating the routing criteria, it is generally considered desirable to maximize certain criteria that are most compatible with transmission development (e.g. existing 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, the aim is to use a consistent set of siting guides to assist in placement of centerlines, while taking care to avoid/minimize proximity to constraints while maximizing use of opportunity features. These might include:

- *Replacing or upgrading an existing line* typically minimizes natural resource and social impacts by using an existing utility corridor. In this case, the aim of the Project is not to upgrade existing lines, but to construct a new 345kV transmission line to transport a new source of bulk power cross-country.

- *Paralleling existing utility corridors*. Corridor paralleling pairs the transmission line with an existing linear feature, which can include highways, railroads, or other existing transmission or distribution lines. These corridors are considered opportunities because locating a new transmission line parallel to them may require less ROW, concentrates linear land uses (thus reducing fragmentation of the landscape), and creates an incremental impact rather than a new impact. 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 over time to the edge or even into the existing linear easement, making a parallel, easement-sharing route a challenge, or even impractical. In this study, pipelines were considered an opportunity feature. Other linear features such as roads and especially existing transmission and distribution lines were considered stronger opportunities.

- *Cross-Country Route Options*. 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., crop production). In this area agriculture is heavily influenced by the ridge and valley terrain, the dryer upland ridges and hill tops are most used for grazing, whereas the valley bottoms are wetter and are used for crops.

Comparing and Ranking Routes: The purpose of the RSS is to propose and compare viable route alternatives and choose a proposed route. The alternative routes are evaluated and compared against each other quantitatively. The constraint and opportunity data crossed or paralleled by each route (such as number of residences, acres of wetlands, miles of existing utility ROW, etc.), is totaled, scored, and compared. Those that cross less constraints and more opportunities “score” more favorably. This is a method of taking many 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 qualitative review.

A qualitative review is necessary as not everything that is relevant to transmission routing can be counted. Qualitative considerations vary from project to project, and include factors such as areas of local importance, unmapped or undesignated recreational areas and public vistas, and construction issues such as access. The siting process includes a combination of route scoring, engineering design/constructability, and qualitative factors. The result is the selection of a Proposed and Alternate routes.

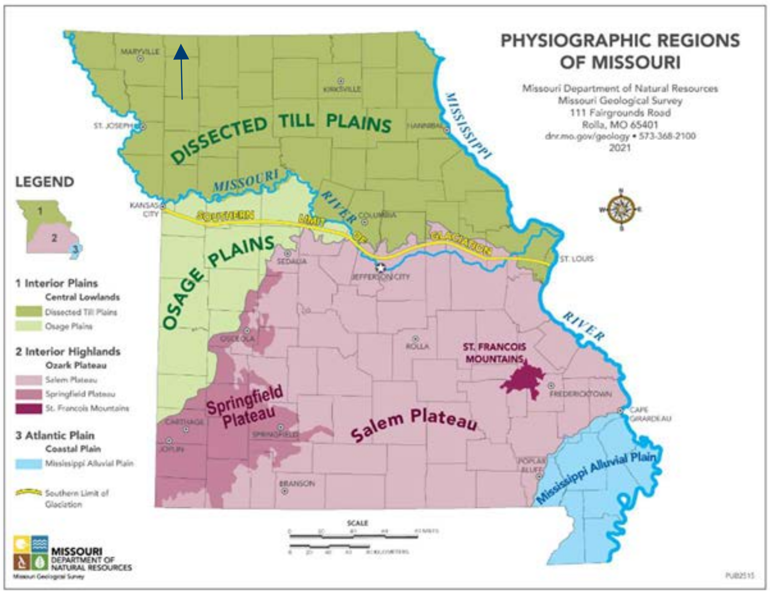
The route evaluation process allows for re-evaluation of routes, corridors, and additional data at any point with minimal additional processing of data inputs. For example, important information was received from property owners at the public open houses, and route refinements were introduced.

1.3 Study Area Characteristics

The 44-mile-long Study Area stretches across northern Missouri from Dekalb County through Gentry County to the Iowa state line in Worth County. The natural resources and physiography of the Study Area proved to be important factors in the siting process. To develop essential context for the Study Area and to help guide decisions on relevant routing criteria, the Routing Team reviewed USGS 7.5-minute topographic maps, FEMA and other flood mapping, digital georeferenced aerial photographs, GIS data layers and online information related to the geology, land use, and general climate and ecology of the Study Area. The southern Project limit is the new proposed location of the Denny Substation, located approximately 2 miles south of the Dekalb and Gentry County border along N State Route A. The northern Project limit is the Iowa state line at any point within a specified range (Figure 1). The area is very sparsely developed and mainly agricultural with crop production dominating in the valley bottoms and cattle grazing on the hill tops and side slopes. Large towns and cities are not present and did not significantly influence siting.

Physiography & Ecology*:* The Routing Team reviewed aerial photographs, USGS 7.5-minute topographic maps, online biological and climate resources, and street mapping to build a picture of the drainage, topography, and land use within the Study Area.

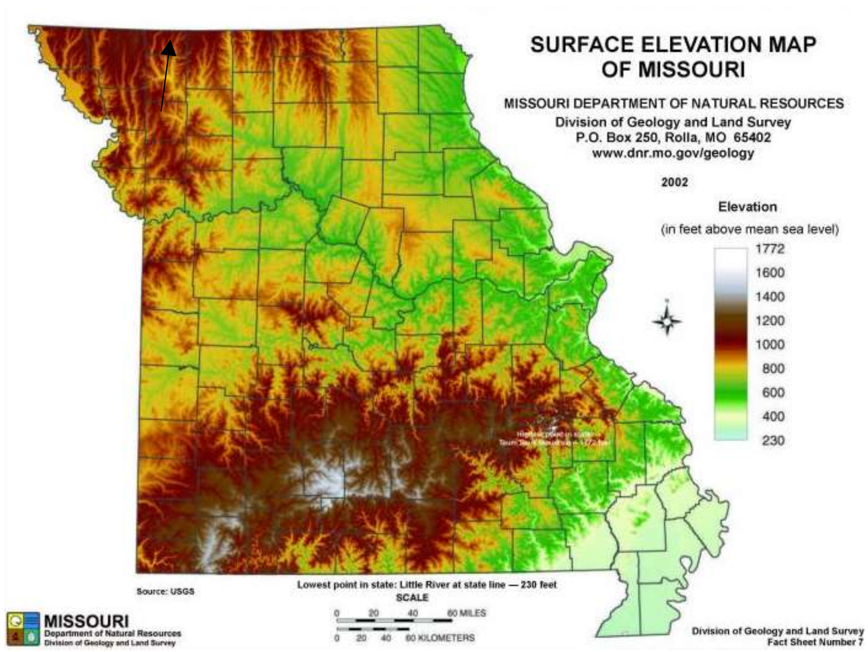
Figure 3. Physiographic Regions of Missouri



Topography and hydrology can have a significant impact directly and indirectly on siting, as they both affect historic and future land use, and can impose engineering challenges on transmission development. The Project is located within the dissected till plains section of northern Missouri (Figure 3) and illustrates Missouri's physiographic regions through which the Project passes (illustrated with the black arrow). This Project is within the limits of the last glacial ice sheet, which deposited a thick layer of glacial drift across the area. This was subsequently eroded by numerous streams and headwaters to form the contemporary undulating, hummocky topography. General topography in the area is characterized by a series of ridges and valleys oriented in a northeast to southwest direction. All these valleys change orientation to trend north to south on a line roughly defined by the towns of Denver and Parnell, approximately ten miles south of the Iowa-Missouri state line. These ridges were attractive for routing some parts of the proposed Project.

Two main river valleys influence the Study Area; the Middle Fork runs along the western study area boundary, and the East Fork runs through the center of the Study Area. The East Fork valley is broad and flat, up to two miles wide, while the West Fork is narrower at about ½ mile wide. The valley bottoms are intensively farmed and potentially wet, while the ridges are dryer and proposed for cattle grazing (Figure 4). The difference in elevation between these valleys and the higher ridges resulted in down cutting by the tributary streams, resulting in the moderately incised ridge slopes, which are often wooded. Terrain becomes more pronounced towards the northwest of the Study Area and valleys become more incised, making terrain a more significant siting factor.

Figure 4. Elevation of Missouri



Source : https://dnr.mo.gov/document-search/surface-elevation-map-mo-pub2874/pub2874

For siting purposes, the ridges were considered preferable, where practical, over the valleys as they present dryer conditions for construction access and maintenance, are less intensively used for crop production, and would likely reduce negative impacts to landowner's property. It is likely that access across the valley bottoms would require more extensive access route construction and use of wood matting to minimize access difficulties and compaction.

Area Land Use and Development: The Project Area includes parts of three northern Missouri counties, which south to north are Dekalb, Gentry and Worth. All are rural with few large towns or settlements. Settlements in the area include Stanbury, Albany, Gentry, Denver, Grant City, Allendale, Sheridan, and Parnell. Of these, Albany, Grant City, and Stanbury are the largest. None of these towns and places played a significant role in the project routing as there were numerous opportunities without having to pass through municipal boundaries.

The road network in the area is generally arranged in north-south/east-west pattern but does deviate for terrain and other factors. The main north-south highway in the western part of the Study Area is US 169 which connects King City in the southwest corner of Gentry County to Stanbury in the west central part of the Study Area. US 169 continues north then east, passing through Gentry before turning north again and passing through Grant City before crossing the state line into Iowa about 4 miles west of the northern project tie in point.

The only other mapped main north south highway is a combination of State Highway A/85 which passes close to the southern end of the Project and heads north then east and north again to pass through the town of Albany (where it becomes State Highway C), then north again to pass through Allendale (where it becomes State Highway T) and into Iowa just over one mile east of the northern tie in point. From south to north, the east-west roads in the area include State Route E, State Highway Z, US 136 (which passes through Albany), State Highway O, Highway M (passes through Denver) and Highway 46 (passes through Allendale).

Numerous minor roads, highways and farm tracks are mapped across the area, and some are not maintained. In certain locations, bridges are unsuitable for heavy traffic, and in some cases are closed. The Routing Team conducted several site visits in the Study Area and observed the road network to be in variable states of repair and quality. Most of the minor roads in the area were observed to be gravel or dirt, and some were semi-passable for non-farm traffic. Roads were not, therefore, considered a universal routing opportunity, but were considered useful if viewed as potential access routes in wetter areas, even if some might need improvement in places.

No major airports are in the Study Area, although the siting team did observe what appeared to be a grass airstrip approximately three miles northeast of Grant City. No aviation navigation aids are in the Study Area and did not impact siting. No active railroads pass through the Study Area. Transmission lines in the Study Area all pass through the Fairport Substation. A 161kV, AECI line heads northwest from the Fairport Substation, and a 69kV AECI distribution line heads north from the Fairport Substation to the Darlington Substation (near Darlington), and then onward to Albany Tap, terminating at the Grant City Substation (four miles southeast of Grant City). This is the only transmission or distribution line in the area that provides a realistic paralleling opportunity and was therefore considered a significant routing opportunity in the siting study. Several natural gas and liquids pipelines pass through the area mostly in a southwest to northeast direction and do not provide useful siting opportunities.

2. Route Selection Study Results

2.1 Establishing the Study Area

The initial Study Area for the Project was developed through review of the geography and physiography of the area and the two Project end points. The review identified the large-scale opportunities and limitations (or constraints) throughout the region. The review (detailed above in Section 1.3) included physiographic, land use, vegetative and ecological characteristics, transportation, and public utilities. The following summary describes how the Routing Team identified the relevant routing data, whether it constituted an opportunity or constraint, and how important that data was compared to the other data used. Those criteria were then mapped to generate an opportunity and constraint map (large format Figures 5a and 5b).

2.2 Selecting Siting Criteria

Once the Study Area was established, the Routing Team leveraged the initial Study Area characteristics review, likely permitting/regulatory needs, and technical requirements/limitations to develop a list of broad/coarse-scale, relevant routing criteria. These represent (i) geographic locations that the Project wishes to avoid to the extent practical, or minimize crossing if complete avoidance is not possible, otherwise referred to as "constraints"; and locations/land uses that are considered preferable to host the Project, otherwise referred to as "opportunities". Collectively, constraints and opportunities are often referred to as siting or routing criteria.

For descriptive purposes, the criteria were organized into three broad categories: Land Use and Cultural, Ecological/Biological, and Technical/Constructability. These were then listed in a *Criteria Table* that included a brief comment on the rationale for using that data. Each criterion was discussed along with a rationale for inclusion (i.e., its relevance to routing the Project). The relevance review was intended as a general check to make sure data was not included that was (i) not present, or not relevant to this geographic area, and/or (ii) too broad, or too finely detailed to be visible at the scale used for this Project stage.

The criteria table was developed initially by TRC and then circulated to the wider Routing Team for review and discussion. The wider Project Team is comprised of TRC's siting experts, biologists and cultural resources staff, and Ameren's ecological, permitting, engineering, and land division teams. Criteria were discussed and refined (including breaking some criteria down into more refined sub-criteria), added and deleted until a final criteria table resulted (Table 1). The table includes a column for the siting team to express a relative weight for each criterion based on the team's assessment of its importance to routing the project in this area. The weighting was scaled from 1 (least important) to 10 (most important).

Table 1. Project Land Use & Cultural, Ecological, and Constructability/Technical Siting Criteria *

Criteria	Opportunity or Constraint	Relevance	Weight
Ecological Constraints and Opportunities			
State Wildlife Management Areas	Constraint	These are areas managed/owned by the State. They require additional studies, and possible permits and mitigation measures.	8
Federal threatened & endangered (T&E) Species	Constraint	Protected species habitat, additional studies, permits, time and cost.	9
State T&E Species	Constraint	Protected species habitat, additional studies, time and cost.	8
Forested Areas	Constraint	Potential species habitat, clearing costs.	6
Wild and Scenic Rivers	Constraint	Subject to additional permitting requirements.	8

Criteria	Opportunity or Constraint	Relevance	Weight
National Wetlands Inventory (NWI) PFO[1] Wetlands	Constraint	Permanent and temporary impacts to wetlands are subject to permitting. PFO is the only wetland type where the vegetation type is permanently impacted by transmission lines.	9
NWI PSS[2] Wetlands	Constraint	Permanent and temporary impacts to wetlands are subject to permitting. Avoidance is proposed.	6
NWI PEM[3] Wetlands	Constraint	Permanent and temporary impacts to wetlands are subject to permitting. Avoidance is proposed.	5
Predominantly Hydric Soils	Constraint	An indicator of potential wetlands.	4
Stream Crossings	Constraint	Every crossing requires assessment of clearing, crossing methods, potential T&E species.	3
Impaired Waters	Constraint	These waters are sensitive to agency scrutiny and especially related to construction stormwater.	3

Criteria	Opportunity or Constraint	Relevance	Weight
Cultural and Land Use Criteria			
National Historic Landmarks	Constraint	Agency scrutiny, public opposition, time, and cost.	9
Federal Lands	Constraint	NEPA trigger, additional time, cost, and documentation.	9
National Register of Historic Places	Constraint	Agency scrutiny, public opposition, time, and cost.	8
National Historic Trails and National Historic Sites	Constraint	Agency scrutiny, public opposition, time, and cost.	8
Cemeteries	Constraint	Agency scrutiny, public opposition, time, and cost.	8
Recreation Lands	Constraint	Crossing recreational land has the potential to change or adversely affect land use on the portion crossed by the transmission line.	7
USDA NRCS Conservation Easements	Constraint	Potential restrictions on development of transmission lines.	3
Quarries, Landfills	Constraint	These are essentially no-go areas unless there is no other alternative.	9
Residences within ROW (75 feet of centerline)	Constraint	Residences within the ROW would have to be removed. These are avoided as far as possible. Cost and schedule implications in addition to an imposition on residents.	10

[1] Palustrine forested (PFO)
[2] Palustrine scrub-shrub (PSS)
[3] Palustrine emergent (PEM)
*Sources are in Appendix B

Criteria	Opportunity or Constraint	Relevance	Weight
Residential Structures within 150 feet of Centerline	Constraint	Residential Structures within 150 feet of centerline may experience some visual effects and potential clearing of vegetation.	7
Non-Residential Structures within ROW (75 feet of centerline)	Constraint	Non-Residential Structures within 75 feet of centerline may have to be removed, potential cost and schedule implications.	10
Non-Residential Structures within 150 feet of centerline	Constraint	Potential visual impacts, land-owner preferences, vegetation clearing may affect landscape trees and shrubs.	7
Sensitive land uses	Constraint	Potential for opposition, access, visual impacts, and agency sensitivity.	9
Commercial Land Use	Constraint	In land use context, open land or ROW is proposed, commercial is developed so there are space challenges, but compared to more sensitive land uses, commercial areas are proposed.	2
Industrial Land Use	Constraint	Industrial land is typically the least sensitive of the developed land uses for transmission, assume there is sufficient space.	1
Commercial Hunting Parcels	Constraint	This is considered an intensive land use and where firearms are used which can damage transmission equipment. Where identified, these were avoided.	6
Municipal owned parcels	Constraint	These are parcels within a town’s limits where development is typically dense. Dense development restricts transmission development as minimum clearances may not be possible.	10
Local Roads	Constraint	Local roads typically provide frontage for residences, and potential for future residential/commercial development. The presence of existing distribution lines along local roads can present routing constraints.	6
Parallel Rail Lines	Opportunity	Existing pathways through terrain, reduces habitat fragmentation, less visual impact, and landowner preference.	2
Parallel Highways	Opportunity	Highways provide existing corridors through a landscape and help reduce habitat fragmentation while providing access.	7
Parallel Existing Large Capacity Pipelines	Opportunity	Existing pathways through terrain, reduces habitat fragmentation, less visual impact, landowner preference. Possible to share some ROW.	8
Existing HV Transmission lines	Opportunity	Existing pathways through terrain, reduces habitat fragmentation, less visual impact, landowner preference. Possible to share some ROW.	9

Criteria	Opportunity or Constraint	Relevance	Weight
Technical & Constructability Constraints and Opportunities			
Route Length	Constraint	Longer routes are more costly, burdensome on the land use and environment.	7
Floodway	Constraint	Placement of structures in floodways has the potential to raise the flood elevation contour and modeling/permitting is usually required. Avoid or span.	8

Criteria	Opportunity or Constraint	Relevance	Weight
Floodplain	Constraint	Floodplain development often required additional count level permitting. Either span or avoid.	5
Transmission Line Crossings	Constraint	Taller poles needed extra engineering and equipment costs.	8
Pipeline Crossings	Constraint	Coordination and potential mitigation.	7
Road Crossings	Constraint	Road crossings require a permit from the county, state or federal government, and can add to the schedule and cost of a project. Fewer road crossings are proposed.	5
Slope (>20%)	Constraint	Additional engineering and stormwater issues.	6
Turn Angles > 15 Degrees	Constraint	Turn angles require a more robust structure to support the sideloads imposed on the transmission line. The angle and number of turns dictates the type of structure required. Ameren use 15 degrees as the initial threshold for a dead-end structure.	6
Turn Angles > 50 Degrees	Constraint	A more robust structure and foundations are required for more acute turn angles, for siting purposes Ameren uses 50 degrees as an average angle that might trigger than requirement.	8
Airports/Navaids	Constraint	FAA Coordination and potential lighting/marking.	10
State Lands	Constraint	Additional permitting and studies depending on the agency and the resources present.	9
Communication Towers	Constraint	Distance limitations may apply, guy wires are a potential hazard.	3
Wells	Constraint	Potential for the need for technical solutions/protection if present.	3

2.3 Initial Segment Placement and Refinement

Preliminary route segments were placed based on review of aerial photography, topographic maps, and the mapped opportunity and constraint data (see the previous table and Figures 5a and 5b). The intent when placing these routes was to avoid identified constraints, including built-up areas, residences (including a 200-foot buffer), wetlands, forested areas, and, where practical, to follow existing developed corridors such as roads and existing transmission/distribution lines.

Terrain in the area strongly influences the land use and drainage. The upland ridges were less intensively farmed for crops (cattle grazing was the dominant land use) and were relatively well drained. The lower, intervening valleys tended to be used for crop production and were wetter, making access for construction and outage maintenance potentially problematic. Routes were therefore proposed across higher, better drained land with some segments on the less well drained portions that followed existing roads (where they appeared accessible and suitable) or transmission routes.

The Routing Team considered paralleling property lines where it made practical sense to follow them without resulting in excessive sharp turns. Turns require more robust transmission structures which are significantly more costly[4] and may require concrete foundations (and therefore more heavy construction equipment access). One of the more subjective decisions when placing routes was how to re-route around constraints such as residences on otherwise "good" routes. A close reroute would expose the residences to transmission views on at least three sides. Therefore, an attempt was made to place these routes further from residences or bring a stretch of the route away from road frontage and place behind the properties. In addition, the Routing Team considered minimizing routes that cut diagonally across crop fields to reduce landowner's agricultural impacts. These preliminary segments were assigned an identifier and are shown on the large-scale Figure 5a and 5b. The following general siting preferences were used when selecting routes/segments.

- The Project will not cross state lines.
- Favor well-drained uplands over valley bottom and floodplain agricultural land.
- In developed areas favor commercial and industrial land use over residential land use.
- Generally try to avoid/minimize identified constraints and maximize opportunities.
- Opportunities include major roads, existing transmission, property lines, and vacant land.
- Avoid/minimize crossing over existing high-voltage transmission lines.
- Avoid/minimize making excessive turns that require more expensive angle structures.
- Avoid/minimize environmentally sensitive areas.

Although shown as lines, initial routes were considered "corridors" nominally about 500 feet wide to allow for adjustment as the team focused on the best overall opportunities. Large scale constraints and opportunities were considered first, then smaller scale constraints (such as structures, communication towers, outbuildings, etc.) were considered and the corridors refined into candidate routes with more defined centerlines. For example, segments were aligned along existing roads or transmission lines with the understanding that they might need to switch from one side to another as more detailed review (including field review) was conducted.

Each segment was evaluated according to the criteria table developed by the Routing Team, and discussed to identify potential problems from a constructability, environmental, and real estate perspective, among other key considerations. In many cases, a series of segments was compared to an alternative series that provided alternate pathways to connect the same points. These were compared and the series with the least impact was retained. This operation was performed for all the initial segments until a refined segment group was developed that avoided duplication and maximized opportunities. These refined segments were combined to develop route alternatives.

[4] "Cost" is not the primary driver in siting, but it is a metric that state regulators consider and that the end users are ultimately responsible for through electric rates. Therefore, issues that increase the cost of a route are weighted against the potential benefits of that route.

During the refinement process, segments were generally retired if:

- They passed through constraints that were considered high impact and there were alternatives that offered a lower impact path.
- There were shorter alternatives.
- There were alternatives with fewer turns or other technical challenges.
- The routing team determined the option was too complex and there were better alternatives.
- Access might be difficult with potentially wet conditions or steep slopes.

2.4 Initial Routes

Following segment refinement, the Routing Team met to resolve the segments into candidate routes. This process involved stringing segments together that did not reverse direction or otherwise form longer or more circuitous routes than necessary. Where there are multiple segments, it is possible to form an enormous number of possible route combinations if this type of rationalization is not performed. The segment groups summarized above were organized into routes and compared to each other. The segment groups and their associated Route ID is shown in the table below. Figure 6 below provides a reference for the route segment discussion in Table 2 and the following sections. Route segments are also included in Figure 5a and 5b (large format constraint maps following the report text).

Table 2. Segment Groups and Associated Route ID

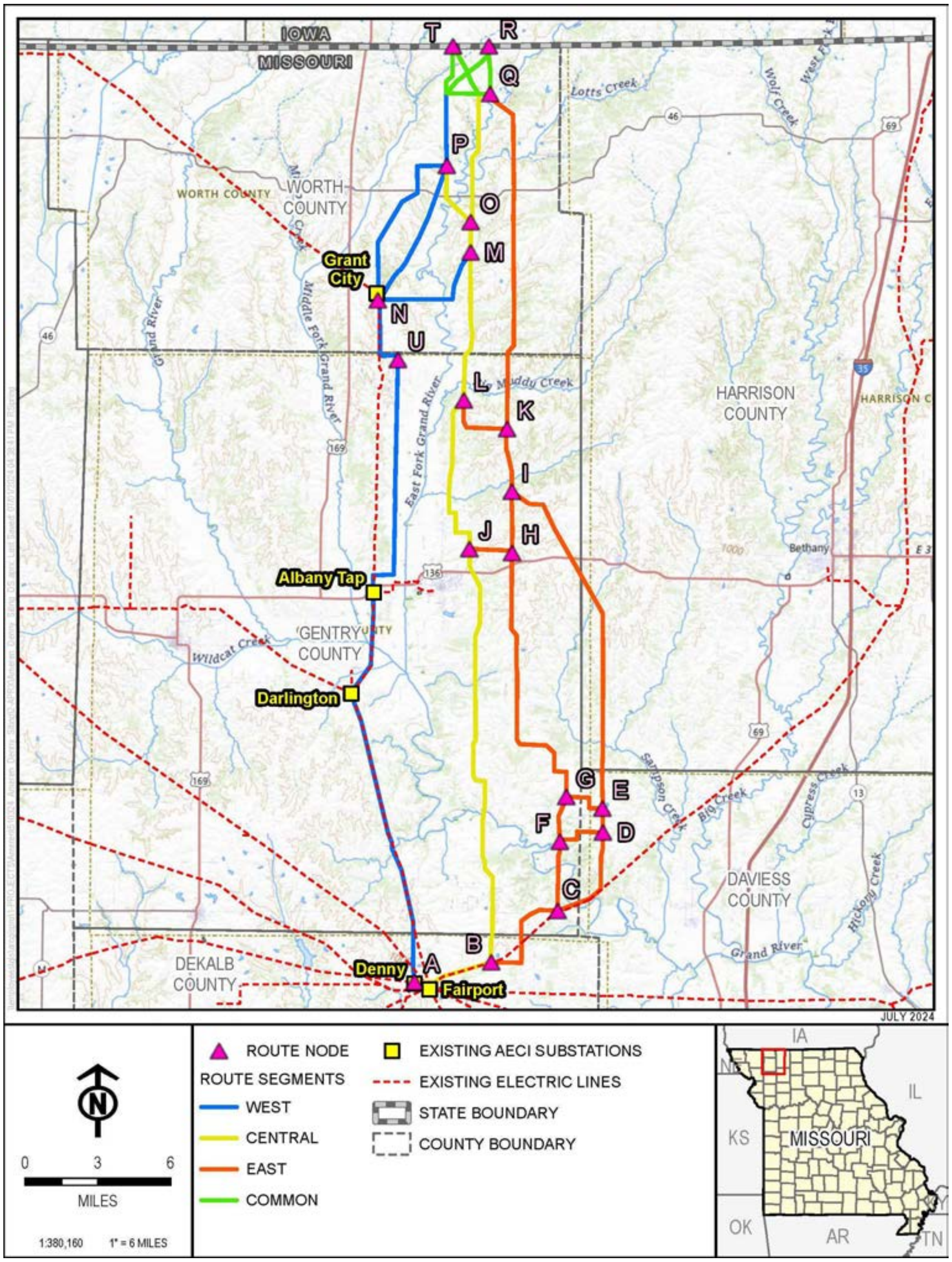
Route	Segment Combinations	Brief Comment
DO-1	A-N-P-R	Western route, follows the NW Electric Power Cooperative transmission line to Grant Substation then a central diagonal cross-country segment to P
DO-2	A-N-M-O-P-R	Western route follows the NW Electric Power Cooperative transmission line to Grant Substation then a segment that heads to the east and connects to a central route. Then a connector that returns to the west.
DO-3	A-N-M-O-Q-R	Western route follows the NW Electric Power Cooperative transmission line to Grant Substation then a segment that heads to the east and connects to a central route. Then a connector that returns to the west.
DO-4	A-B-C-F-G-H-J-L-M-O-P-R	Combination eastern (at the south end) and central route. Cross-country route
DO-5	A-B-C-F-G-H-J-L-M-O-Q-R	Same as DO-4 except for a jog to the west for the most northerly segment
DO-6	A-B-C-F-G-H-I-K-Q-R	Eastern Route: Same as DO-4 until Node H where it carries on to the north forming the eastern most alternative.
DO-7	A-B-C-F-G-H-I-K-L-M-O-P-R	Combination Eastern and Central Route: Same as DO-4 except it eliminates the H-J-L westerly jog just north of Albany

Route	Segment Combinations	Brief Comment
DO-8	A-B-C-F-G-H-I-K-L-M-O-T	Combination Eastern and Central Route: Same as DO-7 with a central final segment rather than a western segment
DO-9	A-B-C-F-D-E-I-K-Q-R	Eastern route that includes segment D-E-I furthest to the east of all the route options, and includes the most eastern of the northern segments (K-Q)
DO-10	A-B-C-F-D-E-I-K-L-M-O-P-R	Same as DO-9 without the eastern northern segment K-Q, uses K-L-M-O-P-R, the central then final western segments.
DO-11	A-B-C-F-D-E-I-K-L-M-O-Q-R	Same as DO-10 but with a central final segment
DO-12	A-B-C-F-D-E-G-H-J-L-M-O-P-R	These are eastern routes that use different combinations of re-routes the east at the southern end of the project between Node C and Node I. All are cross-country following field lines and minor roads where practical while avoiding identified constraints.
DO-13	A-B-C-F-D-E-G-H-J-L-M-O-Q-R	
DO-14	A-B-C-F-D-E-G-H-I-K-Q-R	
DO-15	A-B-C-F-D-E-G-H-I-K-L-M-O-P-R	
DO-16	A-B-C-F-D-E-G-H-I-K-L-M-O-Q-R	
DO-17	A-B-C-D-E-I-K-Q-R	
DO-18	A-B-C-D-E-I-K-L-M-O-P-R	
DO-19	A-B-C-D-E-I-K-L-M-O-Q-R	
DO-20	A-B-C-D-E-G-H-J-L-M-O-P-R	
DO-21	A-B-C-D-E-G-H-J-L-M-O-Q-R	
DO-22	A-B-C-D-E-G-H-I-K-Q-R	
DO-23	A-B-C-D-E-G-H-I-K-L-M-O-P-R	
DO-24	A-B-C-D-E-G-H-I-K-L-M-O-Q-R	
DO-25	A-B-J-L-M-O-P-R	Central Route: One of two purely central routes, and uses the western final segment into the northern tie in point
DO-26	A-B-J-L-M-O-Q-R	Central Route: Same as DO-25 except using the central final segment into the northern tie in point.
DO-27	A-N-P-T	This is the western route, following the existing NW Electric Power Cooperative transmission line until Grant Substation where it follows the most westerly segment along a ridge into the northern tie in point.

2.5 Initial Route Descriptions

The route options resulting from the Study Area review, constraint and opportunity mapping and preference "rules" are shown in Figures 5a and 5b following the report text, and in summary on Figure 6 below, and can be approximately categorized for descriptive purposes into combinations of western, central, and eastern routes. Each route is comprised of a series of lettered segments for descriptive purposes.

Figure 6. Summary Map of Route Segments and Descriptive Designation of Western, Central and Eastern Routes.



Western Options: The western route options were created to take advantage of the existing AECI distribution line that runs to the north northwest from the approximate start of the Project. These routes parallel the west side of the existing NW Electric Power Cooperative line for approximately 12 miles to the Darlington Substation. To avoid lines entering and exiting the substation and an existing guyed cell tower, the routes cross over the existing NW Electric Power Cooperative line and parallel it on the eastern side as it heads northeast then north, passing to the west of Albany. Paralleling the existing NW Electric Power Cooperative line north of US 136 proved a challenge as numerous residences and a hunting ranch were observed adjacent to the line. Alternatives to this portion of the route included an option to the west and one to the east. The western routes followed State Highway N for several miles before rejoining the existing NW Electric Power Cooperative line corridor. The eastern option is a more substantial 10-mile re-route that parallels the transmission line, albeit about 1 mile to the east, and initially follows 540th Road then across fields until it parallels State Route N before rejoining the east side of the existing NW Electric Power Cooperative route.

The existing NW Electric Power Cooperative transmission line ends at the Grant City Substation, so from here route alternatives must head cross-country to the northern termination point. Three alternative segments were developed that connected the route from Grant City Substation (Node N) to the end point, all these routes were developed to take advantage of more elevated and dryer terrain to assist with construction and maintenance access for the line. These included a western option (N-P-2), a central option (N-P-1) and an eastern option (N-M-O-P). From Node P all three options head north along the same pathway to the Project endpoint.

Central Options: Central and eastern options are both cross-country, not following existing transmission infrastructure and largely taking advantage of higher ground while avoiding identified constraints. They join and use common segments in places. The main central route uses A-B-J-L-M-O-Q-R or O-P-R. A-B crosses fields, heading east-northeast until Node B where it turns north to parallel the west side of State Highway A. The segment crosses to the other side of the highway several times to avoid residences and other roadside structures. Highway A turns west about 4 miles south of Albany while segment B-J continues north across fields, deviating around residences in several places. North of Node J, the route stair steps along several property boundaries until heading north on a cross-country alignment. The route continues north, across fields, crossing several small streams and headwaters, paralleling roads, and property lines where practical, before heading northwest to the northern termination point.

Eastern Options: The eastern options follow one of two paths after Node C. One option heads north cross-country, generally following field/property lines were practical several connectors link this option to the central route (at Nodes H-J and K-L), while another two connectors link it to a more eastern option at Nodes C, F, and G. A far eastern version of the eastern route continues northeast from Node C to Node D then E, then heads north approximately 17 miles before rejoining the initial eastern route at Node I.

2.6 Scoring and Ranking the Initial Routes

Once the routes were established, they were evaluated according to the attributes and constraints identified earlier. Raw data for each segment were collected, quantified, and then normalized to a dimensionless parameter (a “score”) according to its suitability. Lower scores indicate “better” and higher indicate “worse”.

Normalizing the data into a score is one way to directly compare the constraints. It also allows the data categories to be weighted (weights were developed by the siting team for each criterion). The following formula, which is easily incorporated into a spreadsheet or GIS attribute data table, was used to normalize the raw data:

Normalized Score = ((Xij – Min Valuej) / Range) *100

where: i = x^{th} value in constraint (or the observed value to convert to a score)

j = constraint

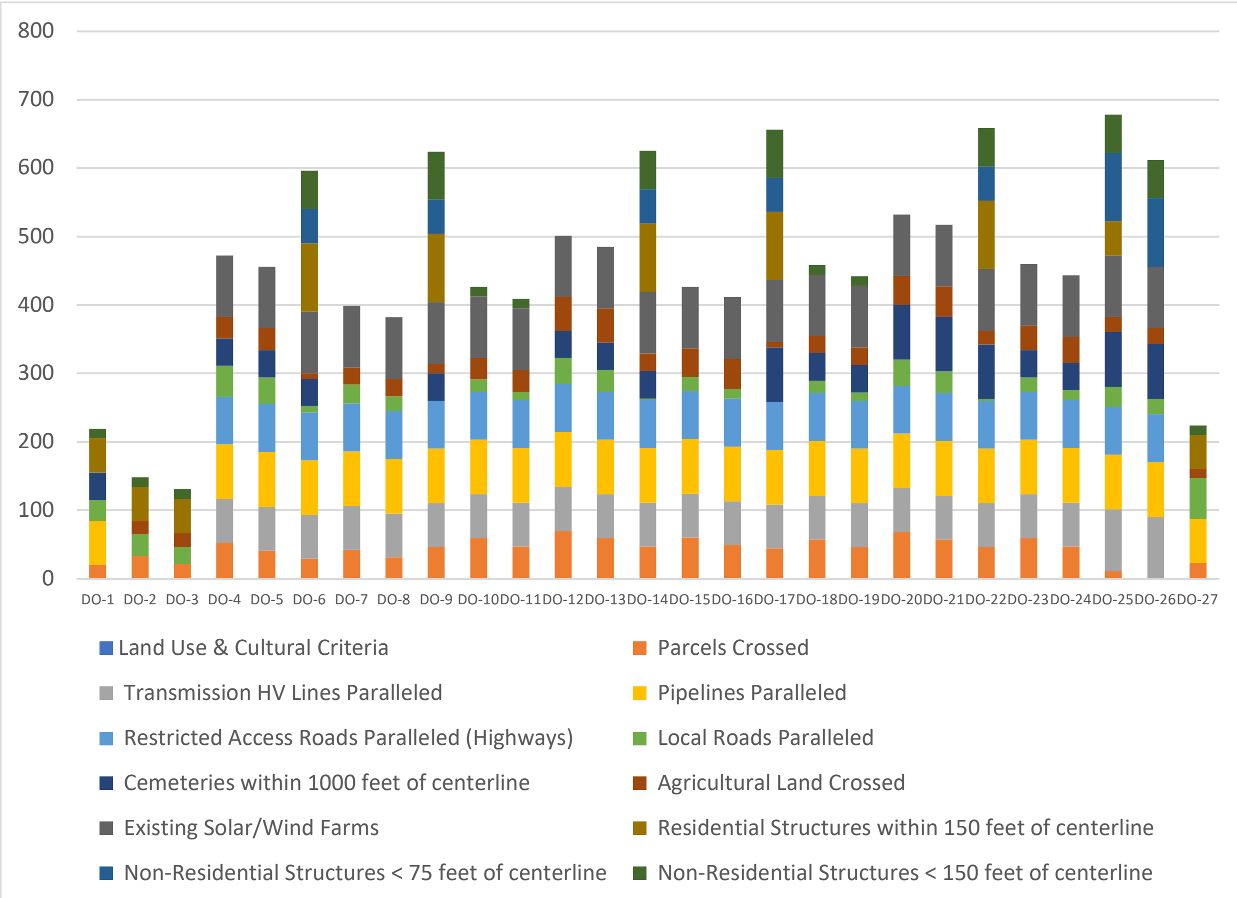
This formula takes an observation for a route (e.g., residences within 100 feet) and compares it to all the other residence observations for the other routes. It assigns a scale of 0-100 to the range of the data and converts every data point to its relative score within that range. So, if the range of observations for residences is from a minimum of 25 to a maximum of 350, the range is 325 (350-25). If, for example, our observation is 45, it is converted into a score by: ((45-25)/325)*100. The raw count of 25 residences is converted to a residence score of 6.15/100.

If the criterion is an opportunity instead of a constraint, then the formula subtracts the Max Value and multiplies by -100. In the example described above, the opportunity score would be calculated by: ((45-350)/325) * -100. In this way the route with the highest occurrence of an opportunity will receive the smallest (i.e., most favorable) score.

This normalizing method means there is no “bunching” of the data and avoids one constraint category being unintentionally influential based solely on which units are used. Essentially, it uses the data from the Project to establish the range so the routes can be compared to one another. Having the best score does not mean a route is “good” or “bad” according to any external standard; it means it is just comparatively “better” or “worse” than the other routes evaluated for the Project according to the data collected. It is a way to sort the huge volumes of relevant and useful data collected and guide the Routing Team in their decision making. The following is a summary of the evaluation and results.

Initial Route Scoring and Route Optimization: Constraint and opportunity data for each of the segment combinations identified and described in Table 1 was collected. The segments were assembled into 27 route options identified as Routes DO-1 through DO-27 (Table 2). A map showing the routes is included as Figures 5a and 5b, and a summary version is included in the text as Figure 6. The raw data tables and normalized and weighted data tables for Routes DO-1 through DO-27 are included as Appendix A.

Chart 1. Land Use/Cultural Normalized Data Comparison



Land Use and Cultural Data Comparison: Chart 1 shows a stacked bar chart of the normalized land use and cultural data for all 27 of the Denny-Orient Routes. The data strongly indicates Routes DO-1, DO-2, DO-3, and DO-27 are all more favorable than the remaining routes. Significantly, all these routes follow the existing NW Electric Power Cooperative electric transmission line and are "western" routes. They differ only after the existing line terminates, and they take different paths to the Project end point. They score more favorably because:

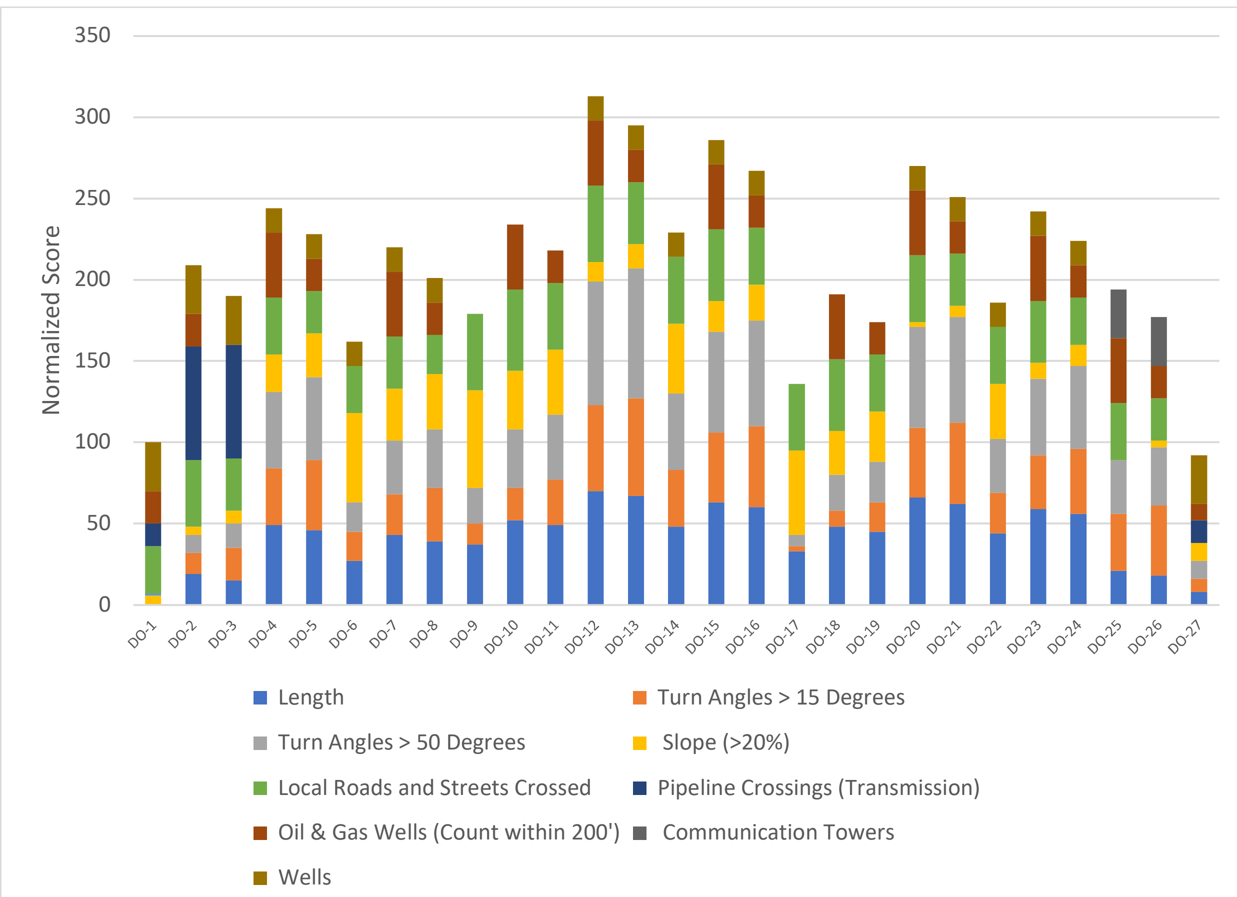
- Paralleling existing linear infrastructure, especially transmission, was regarded as a significant opportunity.
- They cross relatively fewer properties than most of the other routes, and less active cropland, therefore have less overall impact on the landowners of those parcels.
- They do not come within 75 feet of any existing residences, although they are middle of the pack when it comes to residences and other non-residential structures within 150 feet, but this number is low.
- This group of routes does not parallel much roadway, because it parallels transmission ROW, and the scoring really does not take this into account.

- Cultural resources are not a decisive factor as only scattered cemeteries were identified, and no published historic districts are present (note that no agency outreach or field visits have been conducted relative to cultural resources to date).

The poorest scoring routes are DO-6, DO-9, DO-14, DO-18, DO-22, DO-25, and DO-26. These are all eastern routes and perform less favorably mainly due to structures and residences within 150 feet, structures within 75 feet and a relative lack of existing linear infrastructure to parallel.

Technical and Constructability Comparison: Like the land use comparison, Routes DO-1 and DO-27 are western routes that score most favorably compared to the remaining route options in terms of technical and constructability factors (Chart 2). Unlike the land use data, Routes DO-2 and DO-3 do not emerge among the most favorable, largely because of a combination of additional turn angles north of the departure from the NW Electric Power Cooperative transmission line, and several existing pipeline crossings. They are also slightly longer than the other western routes.

Chart 2. Technical/Constructability Normalized Score Data Comparison



Absent the pipeline crossings, the western routes, notably DO-1 and DO-27 perform most favorably because:

- They have the fewest turn angles.
- They are the shortest routes.
- They cross among the least steep terrain/slopes.

Chart 3. Subset of the Technical/Constructability Score Data

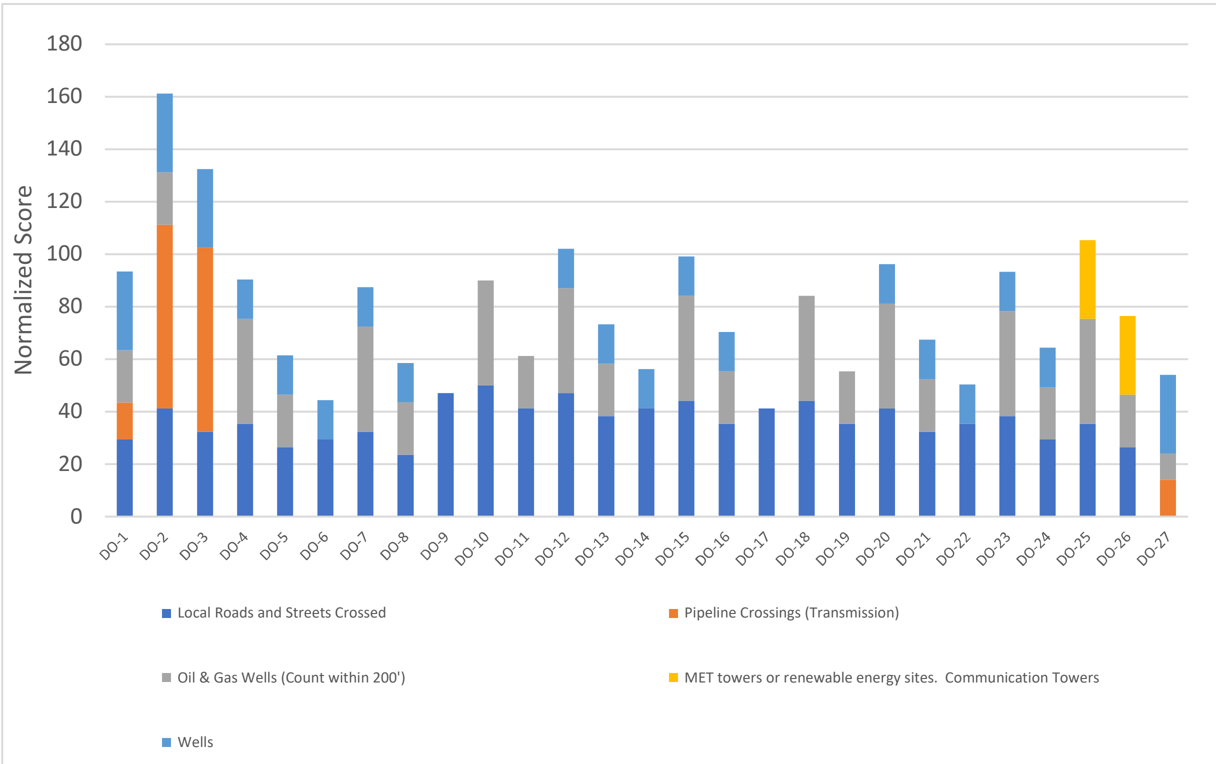
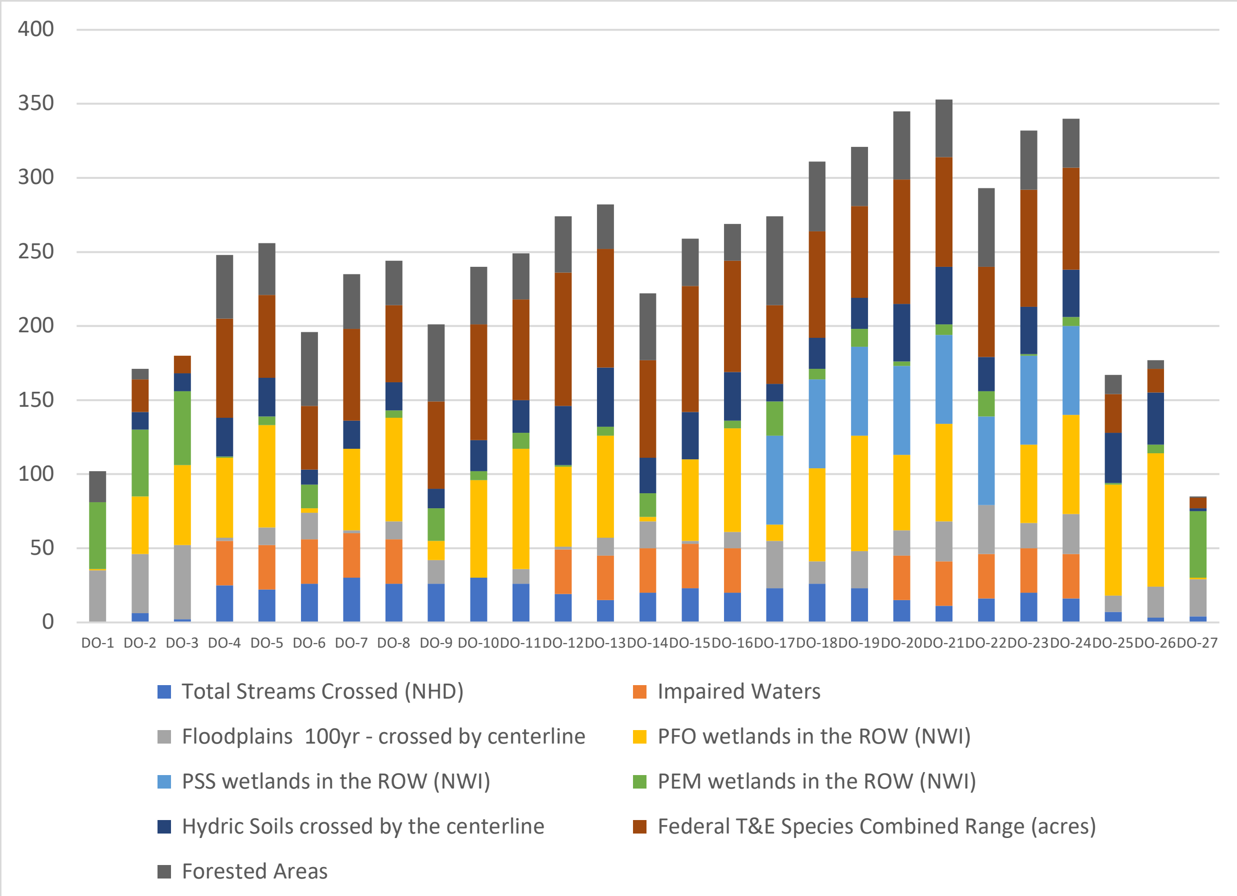


Chart 3 shows a subset of the Technical and Constructability data, namely the road and pipeline crossings, wells, and towers. That data indicates it is mostly pipeline crossings that are responsible for the relatively poor showing of DO-2 and DO-3 compared to DO-1 and DO-27.

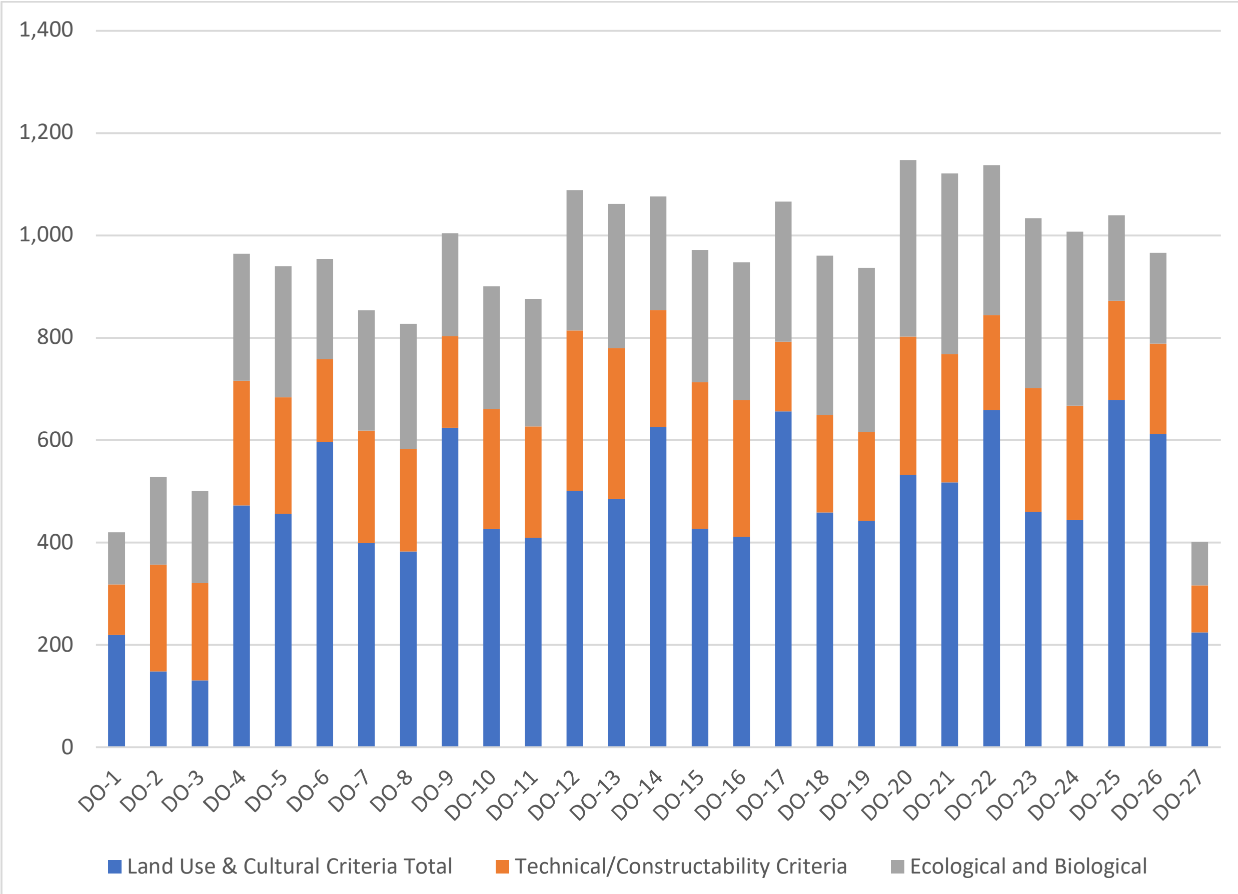
Ecological Data Comparison: Review of the ecological data available for the area, summarized in Chart 4 below, indicates that the western routes once again score most favorably compared to the other routes, especially routes DO-1 and DO-27. They cross the least amount of forested wetland, fewer streams, among the least potential threatened and engendered species ranges, the least acreage of tree clearing and among the least mapped hydric soils. Routes that use a combination of the eastern segments in the beginning then the central options up to the Iowa border score poorly ecologically. These include Routes DO-20, DO-21, DO-23, and DO-24. Combinations of these two routes are among the poorest scoring ecologically.

Chart 4. Ecological Normalized Score Data Route Comparison



Combined Data Comparison: The combined data indicated the western routes that follow the existing NW Electric Power Cooperative line are significantly more favorable according to the siting criteria selected for review. These include DO-1, DO-2, DO-3, and DO-27. Of these DO-1 and DO-27 score the best. DO-27 is the same as DO-1 with a northern re-route that avoids several streams and woodland crossings by bringing the route onto the higher ridge line, likely also improving construction and maintenance access. Based on these results, a western route was selected as the Proposed Route, and among those Route DO-27 was selected as the Proposed Route for the Project, as it had the best overall score.

Chart 5. Combined Normalized Score Data Comparison by Route



Generally, the poorest scoring routes were those that used the southern half of the central route (i.e., B-J-L), and the northern half of the eastern route. Various alternatives that used reroutes even further to the east (Routes DO-11, DO-16, DO-19, and DO-24) had no advantage over those routes that used the C-F-G-H-I-K series of segments. The northern half of the eastern routes is described by the segment I-Q, and routes using this segment scored more poorly than those using the K-L-M-O-Q series of segments (the northern half of the central route).

2.7 Route Review and Adjustments for Updated Iowa Border Tie in Point

Following the detailed routing study where a Proposed route and a group of alternatives was selected, the MISO RFP was released for the Project. The RFP indicated a northern termination point for the Project that was approximately 1.5 miles further west than originally assumed. The Routing Team therefore re-evaluated the northernmost 2-3 miles of the Project routes. The northern segments were re-oriented to the more westerly termination point using the same routing preferences previously used, i.e., avoiding identified constraints where practical, using the higher ridges and avoiding the low, wet areas.

These options are illustrated in Figures 8a and 8b. The adjusted segments were compared using raw (i.e., non-normalized) data counts as this was a relatively simple comparison rather than an effort to compare multiple options across multiple criteria.

Table 3. Direct Constraint Data Comparisons of Northern Re-Route Options

Routing Criteria	Proposed Route Option 1	Proposed Route Option 2	Alternative 1	Alternative 2	Alternative 3
Land Use Criteria					
Number of Parcels Crossed by Centerline	7	7	10	13	15
Local Roads Paralleled (miles)	0.07	0.25	0.00	0.00	0.89
Agricultural Land (linear mileage)	0.04	0.04	0.59	0.47	0.88
Technical/Constructability Criteria					
Length (miles)	1.81	1.83	3.73	4.24	5.40
Turn Angles > 15 Degrees	0	3	5	3	0
Ecological and Biological					
Total Streams Crossed (NHD)	2	1	1	6	11
Impaired Waters Crossed	0	0	0	0	0
100-year Floodplain (feet crossed)	792.0	950.4	1161.6	1108.8	792.0
PFO wetlands in the ROW (NWI) - acres	0.0	0.0	0.8	0.0	0.0
PSS wetlands in the ROW (NWI) - acres	0.2	0.3	0.3	1.3	2.1
PEM wetlands in the ROW (NWI) - acres	0.0	0.0	0.0	0.1	0.0
Hydric Soils crossed by the centerline (length in mi)	0.8	1.1	2.3	2.3	2.8
Federal T&E Species Combined Range (acres)	691.3	697.2	1389.7	1574.9	4002.4
Forested Areas (acres to clear)	4.1	3.9	1.9	10.3	19.7

Proposed Route: Table 3 above includes opportunity and constraint information only for those criteria present in the area. According to the data, Proposed Route Option 1, the most direct diagonal route to the Project end point, is shorter, has fewer turn angles, crosses less floodplain (and wetter fields) than Proposed Route Option 2, and crosses less mapped hydric soil. The issue of access across fields and low-lying areas is not explicitly quantified, but Proposed Route Option 1 stays on more if the higher and dryer ground than Proposed Route Option 2. For these reasons the routing team recommended Proposed Route Option 1 as the most suitable option.

Alternative Routes: Alternative Route Option 1 is a diagonal, relatively direct option on alternate route that crosses the least number of landowners and is the shortest of all the three alternate options, in addition to a significant reduction in environmental impacts due to this option following the highest elevations in the area. Using the higher elevations also reduces potential impacts to active crop production in the lower lying fields.

Alternative Route Option 2 follows more property lines, taking a more “stair step” path to the new endpoint. It is slightly longer than the diagonal option (Alternative Route Option 1), resulting in more parcels crossed and more turn angles, however, this option does reduce floodplain crossing length and forested wetlands crossed. This option will also require significantly more tree clearing compared to Alternate Route Option 1.

Alternative Route Option 3 heads to the original endpoint Node R then follows a gravel road to the west to meet the new northern tie in at Node T. Segment R-T is the longest overall (30% longer than alternative route option 1), while also increasing the number of stream crossings, crosses steeper slopes, has more tree clearing, and crosses more agricultural land.

Based on review of the northern re-routes, the overall Proposed Route and remaining alternatives were adjusted to incorporate segments terminating at Node T, as shown on Figures 7a and 7b – large format maps in the figures section following the report text.

The routes that were not selected for consideration were considered alternatives. These routes did not meet the stated needs of the Project as completely as the Proposed Route. The top four ranked routes were essentially variations of one western route with slightly different northern segments. The Routing Team therefore selected the highest ranked of these four routes (DO-27) to be the Proposed Route. Qualitative review did not indicate any non-quantitative considerations that would alter the numeric ranking and ultimate route decision by the Routing Team. Following completion of this phase of project routing, ATXI submitted the projects for formal review into the MISO Process. ATXI's bid was selected as the winning project.

2.8 Adjustments Following Public Meetings

Following selection of ATXI's project by MISO, in April 2024, ATXI conducted a series of public information meetings. Because of the MISO application process, this was the first opportunity ATXI had to present the project to the public and receive their input. ATXI presented detailed mapping and Project technical data and schedule information to the public and local officials. The mapping showed the Project end points and a Study Area. In addition, GIS stations and large format maps were available with property lines and identification to allow attendees to identify their properties in relation to the Project. The public was invited to comment on the Project including adding land use information the Routing Team might not be aware of, and making suggested route changes especially where it might affect their properties. The meetings were held in each county within the Study Area in the morning from 11:00 AM-1:00 PM and in the evening from 5:00 PM-7:00 PM.

ATXI's Public Engagement Team received formal comments during and mailed after the April 2024 public open house meetings. Most comments were provided at the GIS mapping stations and tabletop maps during the meetings. Common comment categories included utility corridors, environmental concerns, residential development areas, future land use, and structures. Common comments also included parcel specific information provided by landowners, including related to farming or cattle operations such as pivot irrigation, site features such as drainage tile, future planned development, and present habitat for wildlife species.

Based on the information collected at the public information meetings, which included several landowner-suggested reroutes, and additional evaluation of the routes where changes were made, ATXI developed a new route (DO-28) that combined elements of the original Proposed Route (DO-27) and incorporated a new northern section.

Several issues drove the need for the re-route. These included:

- A USDA-regulated hog farm is located on a large property southeast of the intersection of Highway N and 230th Road (County Line Road) at the border of Gentry and Worth counties. Route DO-27 originally made a turn to the west at 230th Road and followed the south side of the road. Further investigation revealed the property adjacent to the south of 230th Road was also part of the hog farm. This presented access issues both for construction and ongoing line maintenance, as the facility restricts access due to contamination concerns.
- A residence is located at the intersection of Highway N and 230th Road which effectively prevents the route from continuing north on the original alignment from the intersection of Highway N and 230th Road (this was one of the reasons for DO-27 making the turn to the west at this point). The owner of this residence expressed concern at the public meeting over the proximity of the line to their residence.
- Proximity to newly constructed residences north of Highway 46 identified by landowners at the public meeting (see Figure 10 in the Appendices).

To address these issues, ATXI therefore considered a route that turned east at the intersection of Highway N and Kent Lane (Route 156), keeping the line approximately 1,000 feet further south of the residence than the originally proposed DO-27 alignment. This would also completely avoid parcels that are associated with the USDA-regulated hog farm. This adjustment effectively moves the northern portion of the proposed route to an alignment that approximately parallels the original DO-27 route but approximately one and a half miles further east. See Figure 10 in the Appendices for a detailed map of this reroute along with the identified constraints.

The Routing Team evaluated the DO-28 reroute with the same data collected for the original DO-27 Proposed Route. The raw data comparison for the two routes is presented in Table 4 below. The data collection of the DO-27 and DO-28 comparison discussed in the following section was completed in May 2024. The original analysis of the preliminary alternative routes was completed in late 2022/early 2023. During that time, ATXI finalized the substation engineering design, which necessitated micro-siting adjustments around the Fairport Substation station bay as well as the tie-in to the new Denny Substation. Additionally, some databases may have updated their information during that time period. Therefore, there may be discrepancies between the DO-27 data in Appendix B and Table 4 below. The data shown below demonstrates a comparison of Routes DO-27 and DO-28 and should not be used for a comparison of the originally proposed routes.

Table 4. Direct Constraint Data Comparisons of Proposed Route DO-27 and New Proposed Route DO-28

Routing Criteria	DO-27	DO-28
Land Use & Cultural Criteria		
Number of Parcels Crossed by Centerline	133	129
Transmission Lines Paralleled (miles)	14	11
Pipelines Paralleled (miles)	0	0
Restricted Access Roads Paralleled (Highways) (miles)	0	0
Local Roads Paralleled (miles)	2	9
Cemeteries within 1,000 feet of centerline	0	0
Agricultural Land crossed (linear mileage)	34	35
Existing Solar/Wind Farms crossed	0	0
Residential Structures within 150 feet of centerline	1	2
Non-Residential Structures within 75 feet of centerline	0	2
Non-Residential Structures within 150 feet of centerline	3	5
Technical/Constructability		
Length (miles)	44	42
Turn Angles > 15 Degrees	18	17
Turn Angles > 50 Degrees	11	9
Slope (>20%) (Linear miles of individual segments spanning > 500')	1	1
Local Roads and Streets Crossed	40	42
Pipeline Crossings (Transmission)	3	4
Oil & Gas Wells (Count within 200')	1	5
MET towers & Communication Towers (within 1,000')	0	0
Water Wells (Count within 200')	2	0
Ecological & Biological		
Total Streams Crossed (NHD)	60	68
Impaired Waters	0	0
100yr floodplain crossed by centerline (feet)	30,119	34,725
PFO wetlands in the ROW (NWI) - acres	5	15
PSS wetlands in the ROW (NWI) - acres	0	1
PEM wetlands in the ROW (NWI) - acres	8	7
Forested Areas (acres to clear)	111	175

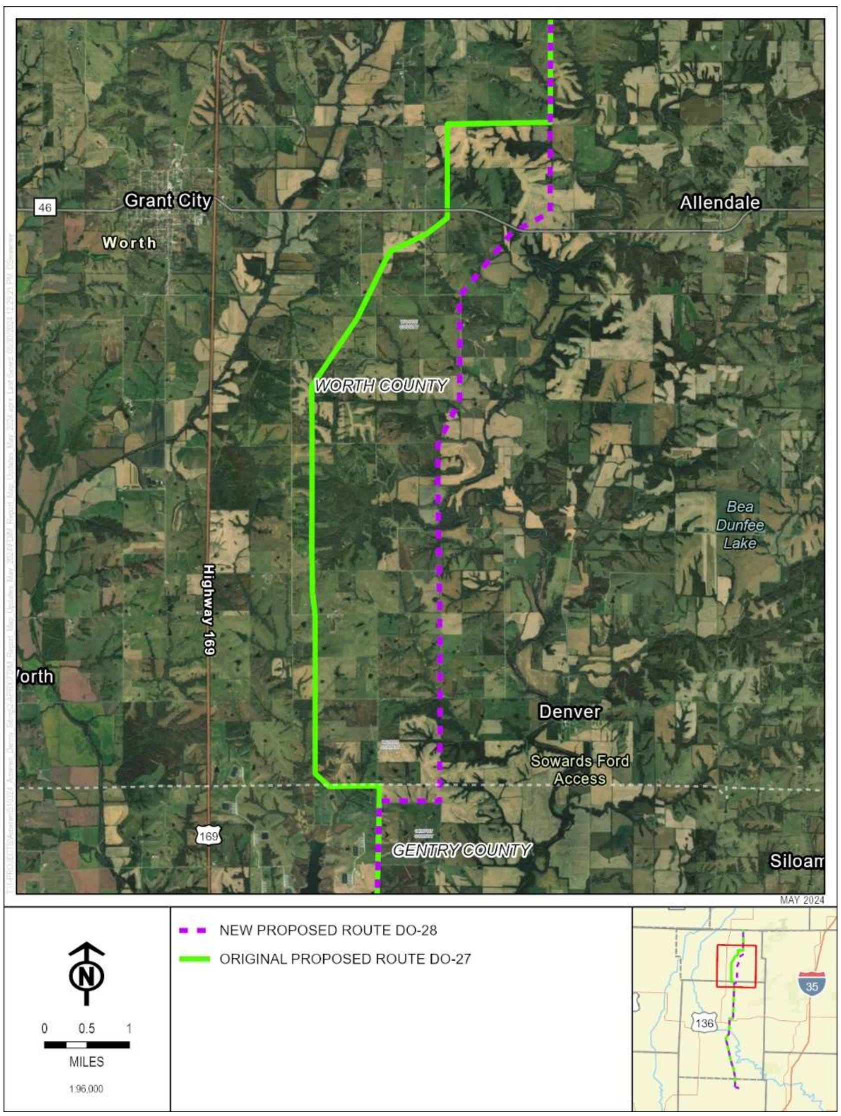
2.9 Discussion of DO-27 and DO-28

Land Use Criteria: As the data in Table 4 shows, in terms of land use criteria, DO-28 centerline crosses four fewer parcels, and crosses one additional mile of agricultural land. The route comes close to one additional residential structure. Overall, in terms of land use DO-28 appears to be a comparable or slightly better option than the original DO-27.

Technical Criteria: DO-28 is two miles shorter than DO-27 and has fewer turn angles. Access for construction and maintenance may be more challenging due to the potentially wetter terrain for some portions of the new alignment. However, construction access issues may be alleviated by being close to existing roadways. Overall, from a technical standpoint, there is little difference between the two options, and DO-28 is likely slightly less challenging.

Ecological Criteria: DO-28 crosses more woodland, floodplain, and potential forested wetland than DO-27. This reflects the routing of this segment of the project in a lower lying area. However much of the reroute portion passes close to existing roadways and is therefore accessible for construction and maintenance. Nevertheless, DO-28 has the potential to be slightly more sensitive than DO-27 regarding wetland and woodland clearing.

Figure 11. Proposed Reroute Area Map Following Public Meetings



2.10 Final Route Decision

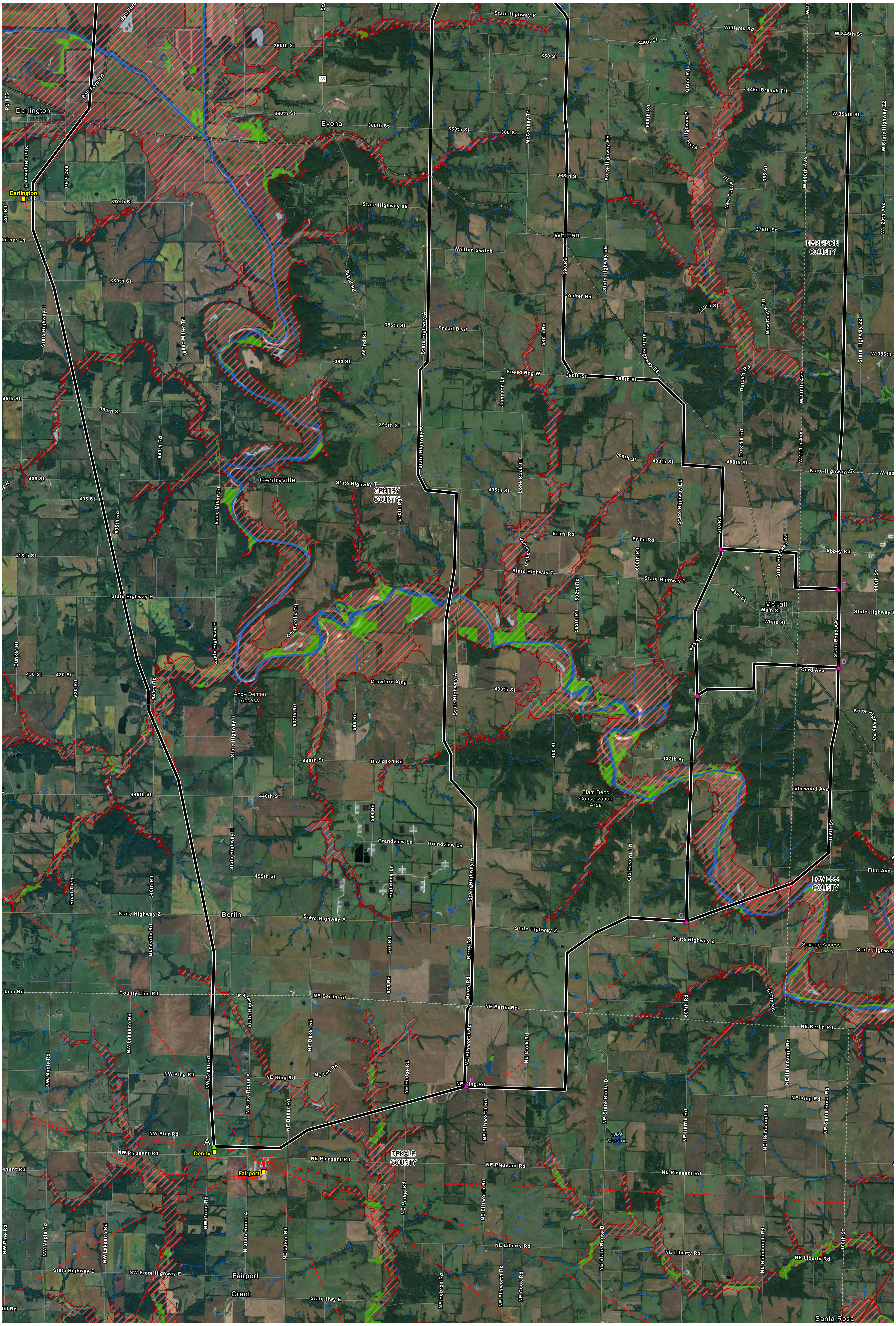
When compared to DO-27 and other potential routes scored in the route selection study, DO-28 is the most acceptable in terms of construction, land use, and accounts for stakeholder input. ATXI and the Routing Team considered DO-28 as the most viable route considering the overall ecological, land use and technical considerations, in addition to input received from the public and right-of-way considerations. Therefore, DO-28 is selected as the Final Proposed Route for the Fairport to Denny to Iowa/Missouri State Border Project.

2.11 Optical Ground Wire (OPGW)

The MISO RFP for the Project requested the applicants consider options for the OPGW cable to connect the two proposed Project substations. The Routing Team considers the optimal placement of the OPGW will be in the same ROW as the Proposed Route. This would be incorporated into the same easement/ownership agreements with the local landowners and would use the same access as the transmission route. The option for the OPGW on private property would also omit the need for potential relocation of the route should a public ROW be altered.

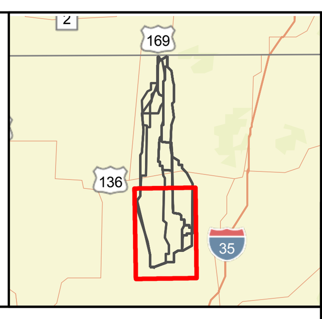
Figures

Coordinate System: NAD 1983 UTM Zone 15N 1; Map Rotation: 0
-- Saved By: DSWEENEY on 5/18/2024, 09:38:25 AM; File Path: T:\1-PROJECTS\Ameren\510324_Ameren_Denny_Siting\2-APRX\Ameren_Denny_Siting_RS.aprx; Layout Name: Fig 5a-Constraints Map Aerial 22x34P



STUDY AREA
EXISTING SUBSTATION
START POINT
STOP POINT
ROUTE NODES
PROPOSED ROUTE SEGMENT
EXISTING ELECTRIC LINES
NATURAL GAS PIPELINES
REFINED PRODUCTS PIPELINES
100-YEAR FLOODPLAIN
COUNTY BOUNDARY

WETLANDS (NWI)
FRESHWATER EMERGENT WETLAND
FRESHWATER FORESTED/SHRUB WETLAND
FRESHWATER POND/LAKE
RIVERINE



PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
CONSTRAINTS MAP
USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	FIGURE 5A	
APPROVED BY:	J. NICHOLAS	SHEET 1 of 3	
DATE:	MAY 2024		

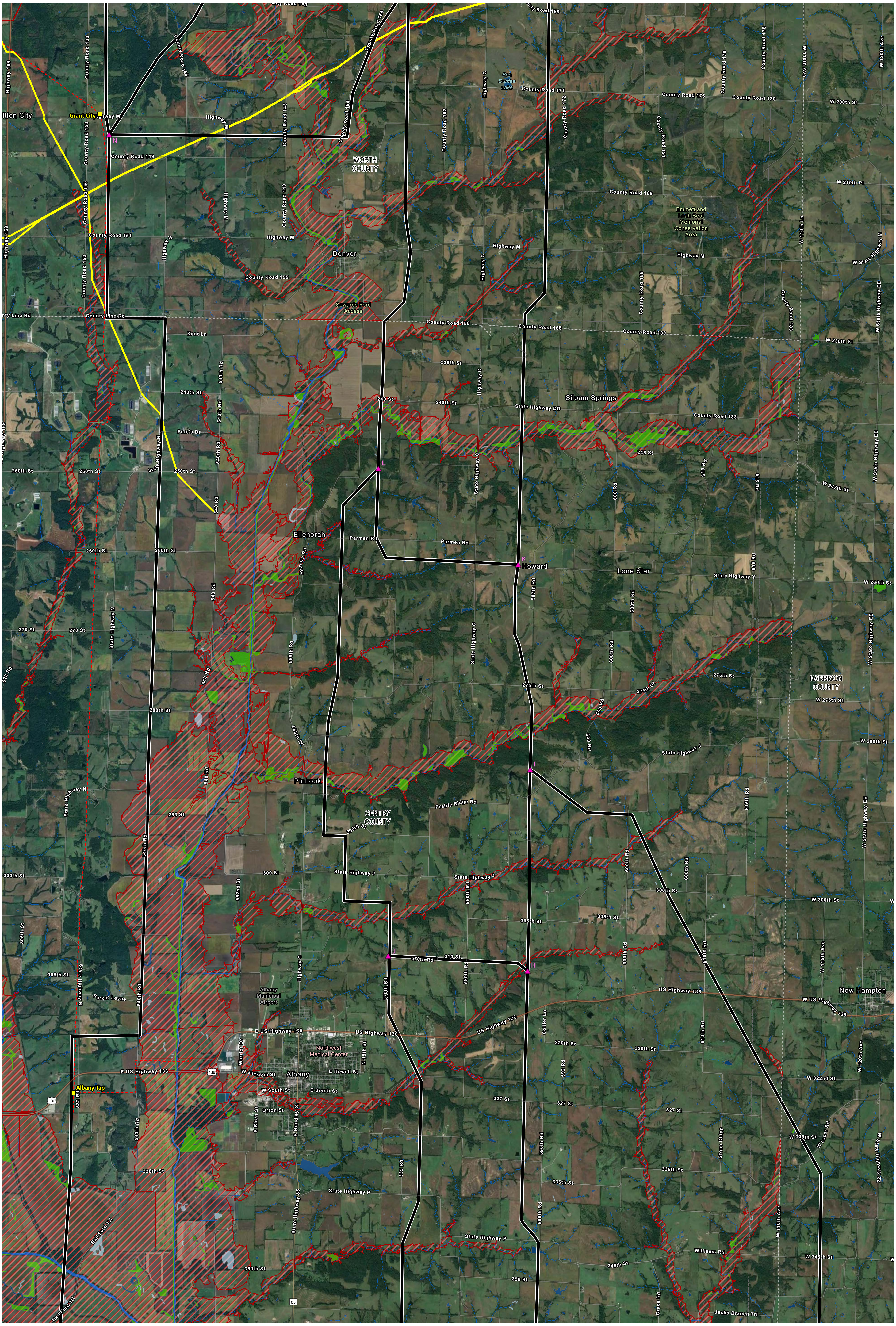
BASE MAP: GOOGLE IMAGERY ONLINE IMAGERY SERVICE
DATA SOURCES: TRC, AEIC, USGS, REXTAG, NWI, NHD, NRCS, FEMA

0 1,500 3,000 FEET
1:36,000 1" = 3,000'

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

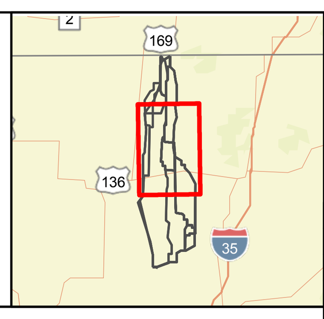
FILE: Ameren_Denny_Siting_RS

Coordinate System: NAD 1983 UTM Zone 15N 1; Map Rotation: 0
-- Saved By: DSWEENEY on 5/18/2024, 09:38:25 AM; File Path: T:\1-PROJECTS\Ameren\510324_Ameren_Denny_Siting\2-APRX\Ameren_Denny_Siting_RS.aprx; Layout Name: Fig 5a-Constraints Map Aerial 22x34P



STUDY AREA
EXISTING SUBSTATION
START POINT
STOP POINT
ROUTE NODES
PROPOSED ROUTE SEGMENT
EXISTING ELECTRIC LINES
NATURAL GAS PIPELINES
REFINED PRODUCTS PIPELINES
100-YEAR FLOODPLAIN
COUNTY BOUNDARY
WETLANDS (NWI)
FRESHWATER EMERGENT WETLAND
FRESHWATER FORESTED/SHRUB WETLAND
FRESHWATER POND/LAKE
RIVERINE

BASE MAP: GOOGLE IMAGERY ONLINE IMAGERY SERVICE
DATA SOURCES: TRC, AEIC, USGS, REXTAG, NWI, NHD, NRCS, FEMA



0 1,500 3,000 FEET
1:36,000 1" = 3,000'

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

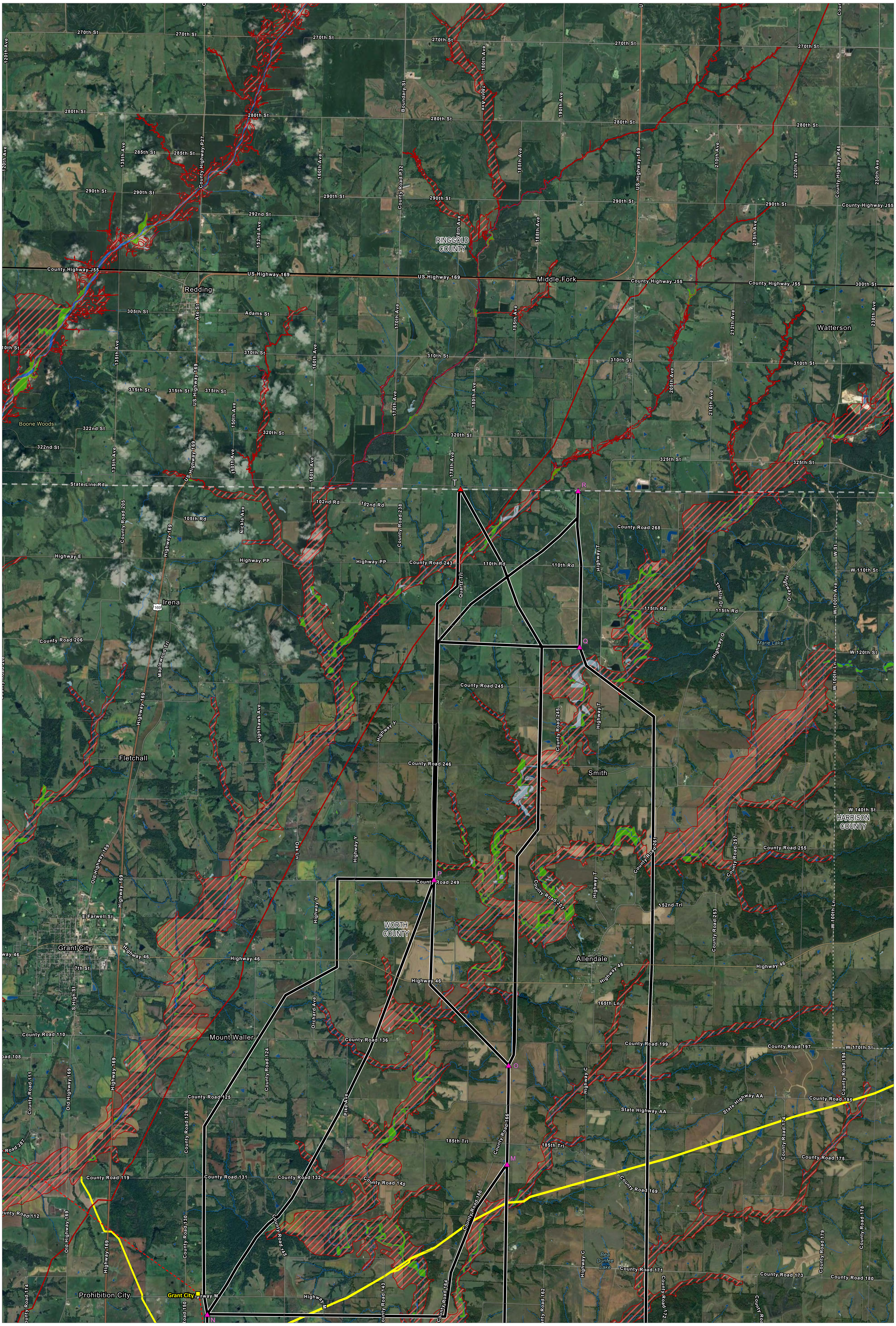
TITLE:
CONSTRAINTS MAP USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	FIGURE 5A SHEET 2 of 3	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: Ameren_Denny_Siting_RS

Coordinate System: NAD 1983 UTM Zone 15N 1; Map Rotation: 0
-- Saved By: DSWEENEY on 5/18/2024, 09:38:25 AM; File Path: T:\1-PROJECTS\Ameren\510324_Ameren_Denny_Siting\2-APRX\Ameren_Denny_Siting_RS.aprx; Layout Name: Fig 5a-Constraints Map Aerial 22x34P



STUDY AREA	ROUTE NODES	REFINED PRODUCTS PIPELINES	WETLANDS (NWI)
EXISTING SUBSTATION	PROPOSED ROUTE SEGMENT	100-YEAR FLOODPLAIN	FRESHWATER EMERGENT WETLAND
START POINT	EXISTING ELECTRIC LINES	COUNTY BOUNDARY	FRESHWATER FORESTED/SHRUB WETLAND
STOP POINT	NATURAL GAS PIPELINES		FRESHWATER POND/LAKE
			RIVERINE

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
CONSTRAINTS MAP
USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	FIGURE 5A	
APPROVED BY:	J. NICHOLAS	SHEET 3 of 3	
DATE:	MAY 2024		

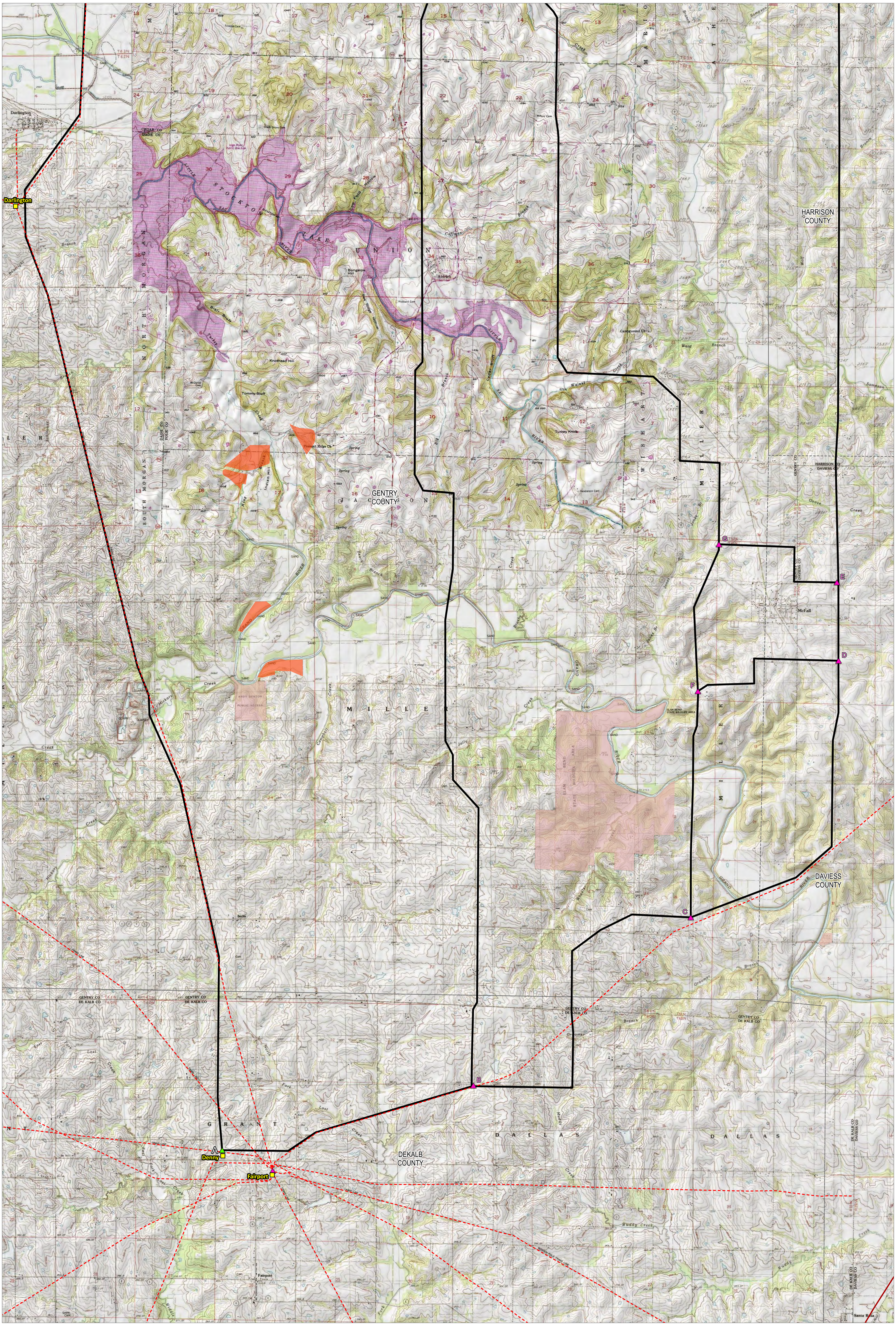
BASE MAP: GOOGLE IMAGERY ONLINE IMAGERY SERVICE
DATA SOURCES: TRC, AEIC, USGS, REXTAG, NWI, NHD, NRCS, FEMA

0 1,500 3,000 FEET
1:36,000 1" = 3,000'

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: Ameren_Denny_Siting_RS

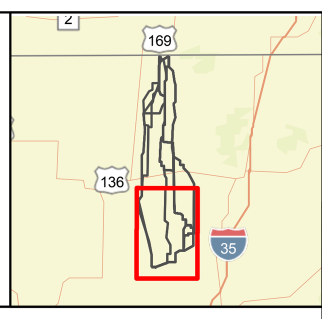
Coordinate System: NAD 1983 StatePlane Missouri West FIPS 2403 Feet; Map Rotation: 0
-- Saved By: DSWEENEY on 5/18/2024, 09:38:25 AM; File Path: T:\1-PROJECTS\Ameren\510324_Ameren_Denny_Siting\2-APRX\Ameren_Denny_Siting_RS.aprx; Layout Name: Fig 5b-Constraints Map USGS Topo 22x34P



STUDY AREA	PROPOSED ROUTE SEGMENT
EXISTING SUBSTATION	EXISTING ELECTRIC LINES
START POINT	REFINED PRODUCTS PIPELINES
STOP POINT	NATURAL GAS PIPELINES
ROUTE NODES	COUNTY BOUNDARY

LAND OWNERSHIP
- U.S. FISH AND WILDLIFE SERVICE (FWS)
- NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
- JOINT, OTHER, UNKNOWN; JOINT, OTHER, UNKNOWN

BASE MAP: USGS TOPOGRAPHIC MAP ONLINE SERVICE LAYER
DATA SOURCES: TRC, AEIC, USGS, REXTAG



0 1,500 3,000 FEET
1:36,000 1" = 3,000'

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

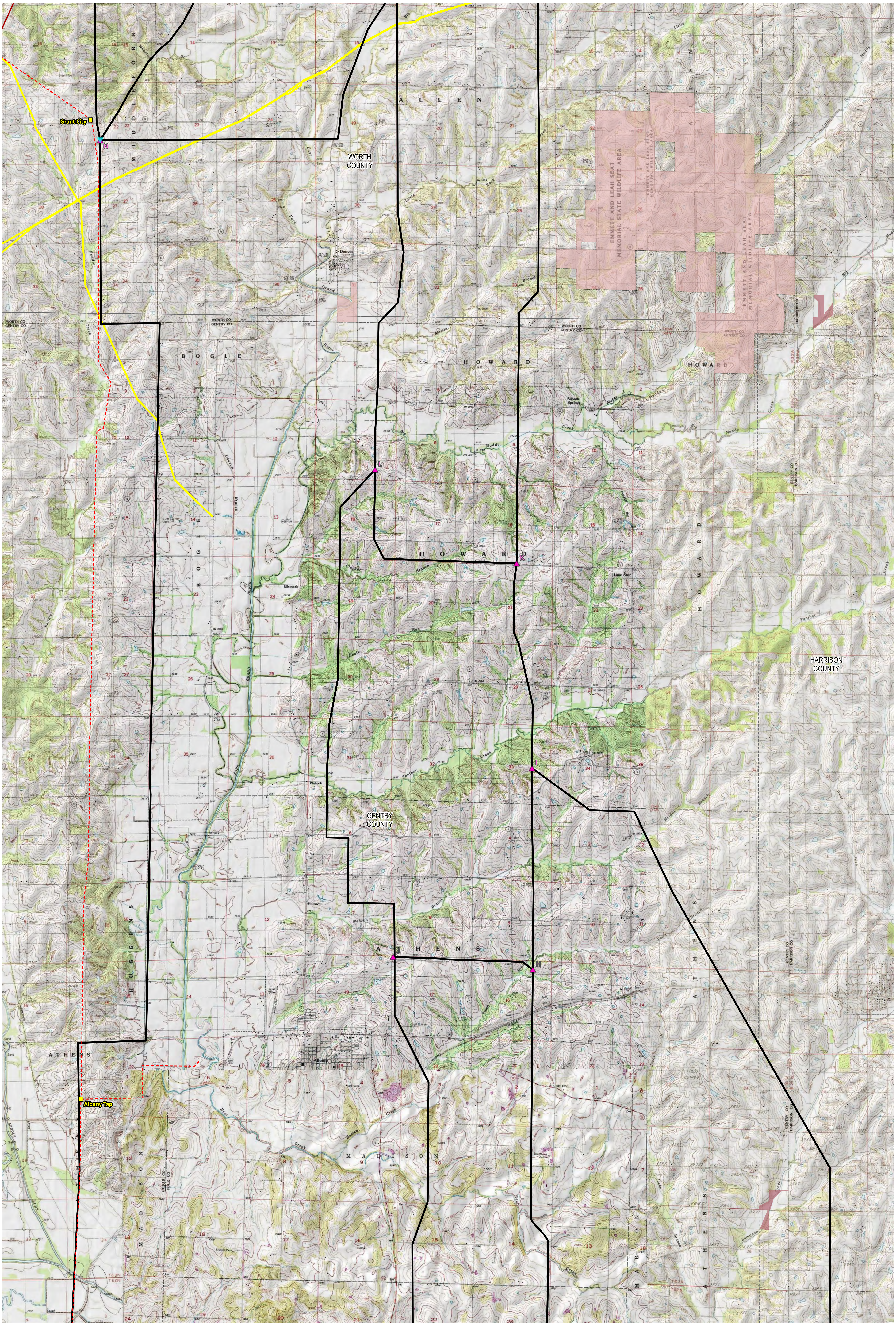
TITLE:
CONSTRAINTS MAP USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	FIGURE 5B SHEET 1 of 3	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: Ameren_Denny_Siting_RS

Coordinate System: NAD 1983 StatePlane Missouri West FIPS 2403 Feet; Map Rotation: 0
-- Saved By: DSWEENEY on 5/18/2024, 09:38:25 AM; File Path: T:\1-PROJECTS\Ameren\510324_Ameren_Denny_Siting\2-APRX\Ameren_Denny_Siting_RS.aprx; Layout Name: Fig 5b-Constraints Map USGS Topo 22x34P



STUDY AREA
EXISTING SUBSTATION
START POINT
STOP POINT
ROUTE NODES

PROPOSED ROUTE SEGMENT
EXISTING ELECTRIC LINES
REFINED PRODUCTS PIPELINES
NATURAL GAS PIPELINES
COUNTY BOUNDARY

LAND OWNERSHIP
U.S. FISH AND WILDLIFE SERVICE (FWS)
JOINT, OTHER, UNKNOWN; JOINT, OTHER, UNKNOWN

BASE MAP: USGS TOPOGRAPHIC MAP ONLINE SERVICE LAYER
DATA SOURCES: TRC, AEIC, USGS, REXTAG

0 1,500 3,000 FEET
1:36,000 1" = 3,000'

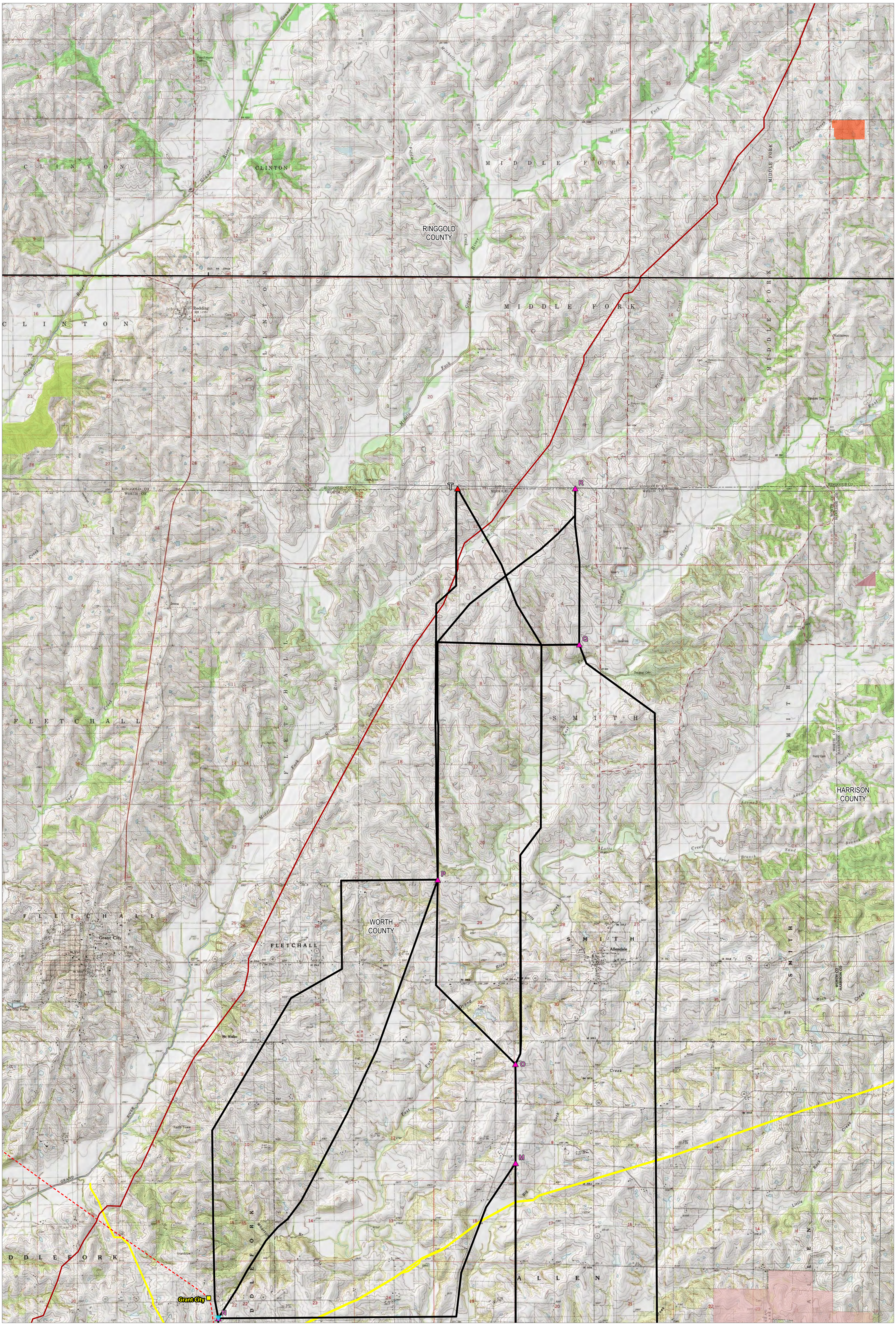
PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
CONSTRAINTS MAP USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	FIGURE 5B SHEET 2 of 3	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: Ameren_Denny_Siting_RS



STUDY AREA
EXISTING SUBSTATION
START POINT
STOP POINT
ROUTE NODES

PROPOSED ROUTE SEGMENT
EXISTING ELECTRIC LINES
REFINED PRODUCTS PIPELINES
NATURAL GAS PIPELINES
COUNTY BOUNDARY

LAND OWNERSHIP
U.S. FISH AND WILDLIFE SERVICE (FWS)
NATURAL RESOURCES CONSERVATION SERVICE (NRCS)
COUNTY / REGIONAL AGENCY LAND; COUNTY / REGIONAL AGENCY LAND
JOINT, OTHER, UNKNOWN; JOINT, OTHER, UNKNOWN

BASE MAP: USGS TOPOGRAPHIC MAP ONLINE SERVICE LAYER
DATA SOURCES: TRC, AEIC, USGS, REXTAG

0 1,500 3,000 FEET
1:36,000 1" = 3,000'

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

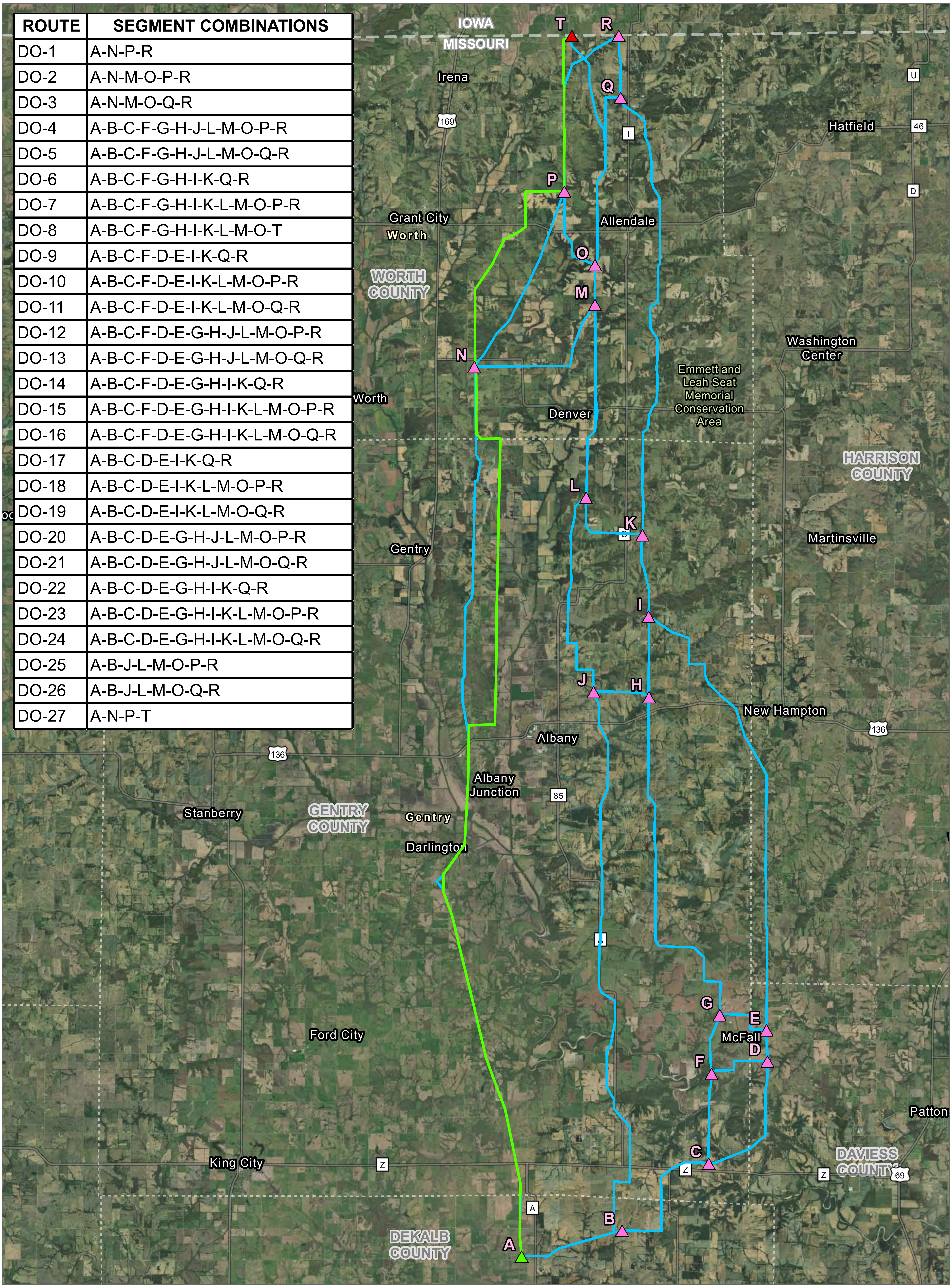
TITLE:
CONSTRAINTS MAP USGS TOPOGRAPHIC

DRAWN BY:	R. SPRING	PROJ. NO.:	510324
CHECKED BY:	D. SWEENEY	**FIGURE 5B SHEET 3 of 3**	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: Ameren_Denny_Siting_RS

ROUTE	SEGMENT COMBINATIONS
DO-1	A-N-P-R
DO-2	A-N-M-O-P-R
DO-3	A-N-M-O-Q-R
DO-4	A-B-C-F-G-H-J-L-M-O-P-R
DO-5	A-B-C-F-G-H-J-L-M-O-Q-R
DO-6	A-B-C-F-G-H-I-K-Q-R
DO-7	A-B-C-F-G-H-I-K-L-M-O-P-R
DO-8	A-B-C-F-G-H-I-K-L-M-O-T
DO-9	A-B-C-F-D-E-I-K-Q-R
DO-10	A-B-C-F-D-E-I-K-L-M-O-P-R
DO-11	A-B-C-F-D-E-I-K-L-M-O-Q-R
DO-12	A-B-C-F-D-E-G-H-J-L-M-O-P-R
DO-13	A-B-C-F-D-E-G-H-J-L-M-O-Q-R
DO-14	A-B-C-F-D-E-G-H-I-K-Q-R
DO-15	A-B-C-F-D-E-G-H-I-K-L-M-O-P-R
DO-16	A-B-C-F-D-E-G-H-I-K-L-M-O-Q-R
DO-17	A-B-C-D-E-I-K-Q-R
DO-18	A-B-C-D-E-I-K-L-M-O-P-R
DO-19	A-B-C-D-E-I-K-L-M-O-Q-R
DO-20	A-B-C-D-E-G-H-J-L-M-O-P-R
DO-21	A-B-C-D-E-G-H-J-L-M-O-Q-R
DO-22	A-B-C-D-E-G-H-I-K-Q-R
DO-23	A-B-C-D-E-G-H-I-K-L-M-O-P-R
DO-24	A-B-C-D-E-G-H-I-K-L-M-O-Q-R
DO-25	A-B-J-L-M-O-P-R
DO-26	A-B-J-L-M-O-Q-R
DO-27	A-N-P-T



START POINT
END POINT
ROUTE NODES
PREFERRED ROUTE DO-27
ALTERNATIVE ROUTES
COUNTY BOUNDARY
STATE BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PREFERRED AND ALTERNATIVE ROUTES AERIAL MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	M. CARACHURE	**FIGURE 7a**	
APPROVED BY:	J. NICHOLAS		
DATE:	MARCH 2023		

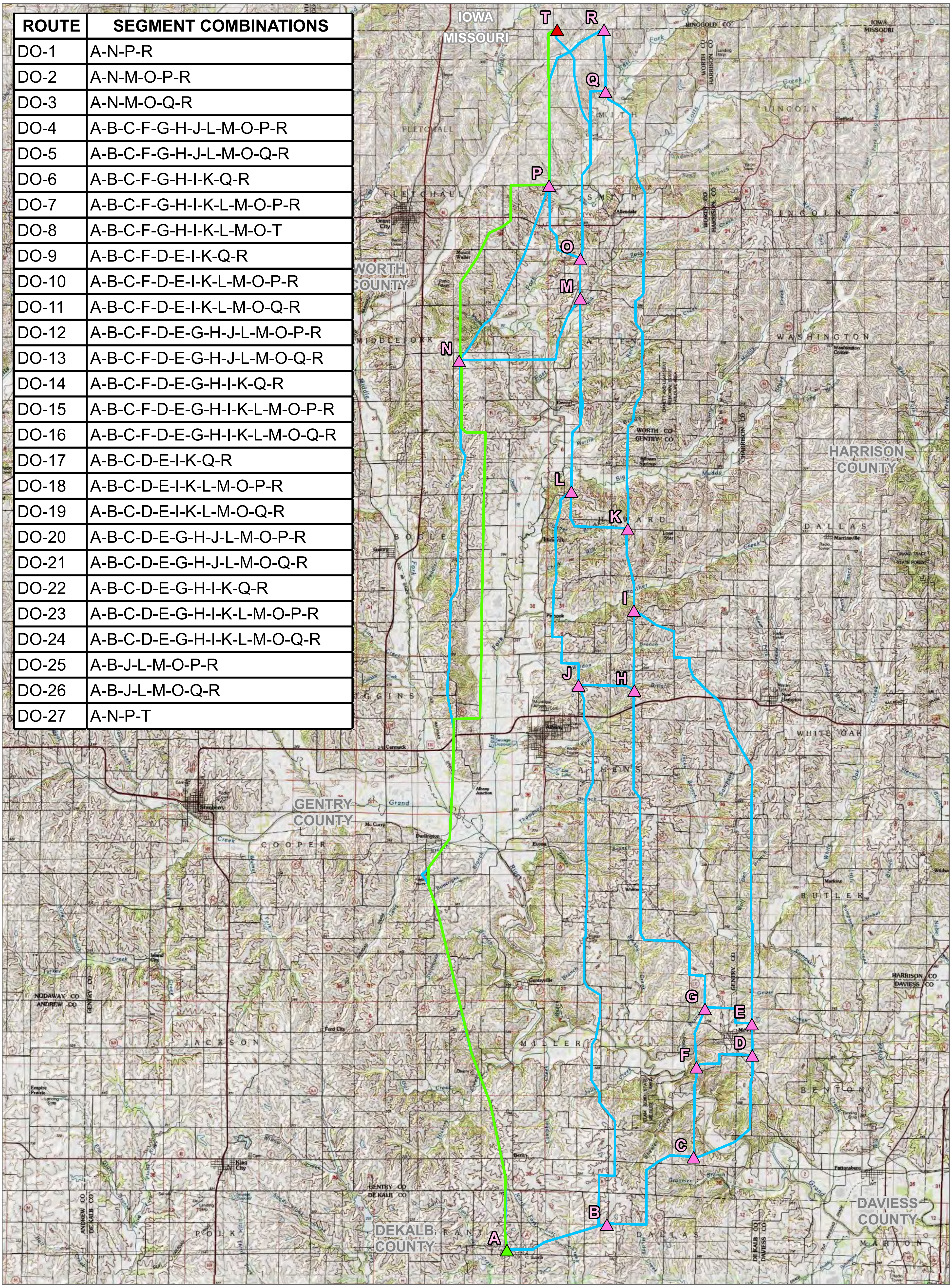
BASE MAP: ESRI WORLD IMAGERY
DATA SOURCES: TRC

0 3 6 MILES
1:190,080 1" = 3 MILES

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: AMEREN_DENNY_SITING_DS

ROUTE	SEGMENT COMBINATIONS
DO-1	A-N-P-R
DO-2	A-N-M-O-P-R
DO-3	A-N-M-O-Q-R
DO-4	A-B-C-F-G-H-J-L-M-O-P-R
DO-5	A-B-C-F-G-H-J-L-M-O-Q-R
DO-6	A-B-C-F-G-H-I-K-Q-R
DO-7	A-B-C-F-G-H-I-K-L-M-O-P-R
DO-8	A-B-C-F-G-H-I-K-L-M-O-T
DO-9	A-B-C-F-D-E-I-K-Q-R
DO-10	A-B-C-F-D-E-I-K-L-M-O-P-R
DO-11	A-B-C-F-D-E-I-K-L-M-O-Q-R
DO-12	A-B-C-F-D-E-G-H-J-L-M-O-P-R
DO-13	A-B-C-F-D-E-G-H-J-L-M-O-Q-R
DO-14	A-B-C-F-D-E-G-H-I-K-Q-R
DO-15	A-B-C-F-D-E-G-H-I-K-L-M-O-P-R
DO-16	A-B-C-F-D-E-G-H-I-K-L-M-O-Q-R
DO-17	A-B-C-D-E-I-K-Q-R
DO-18	A-B-C-D-E-I-K-L-M-O-P-R
DO-19	A-B-C-D-E-I-K-L-M-O-Q-R
DO-20	A-B-C-D-E-G-H-J-L-M-O-P-R
DO-21	A-B-C-D-E-G-H-J-L-M-O-Q-R
DO-22	A-B-C-D-E-G-H-I-K-Q-R
DO-23	A-B-C-D-E-G-H-I-K-L-M-O-P-R
DO-24	A-B-C-D-E-G-H-I-K-L-M-O-Q-R
DO-25	A-B-J-L-M-O-P-R
DO-26	A-B-J-L-M-O-Q-R
DO-27	A-N-P-T



START POINT
END POINT
ROUTE NODES
PREFERRED ROUTE DO-27
ALTERNATIVE ROUTES
COUNTY BOUNDARY
STATE BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PREFERRED AND ALTERNATIVE ROUTES TOPOGRAPHIC MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	M. CARACHURE	FIGURE 7b	
APPROVED BY:	J. NICHOLAS		
DATE:	MARCH 2023		

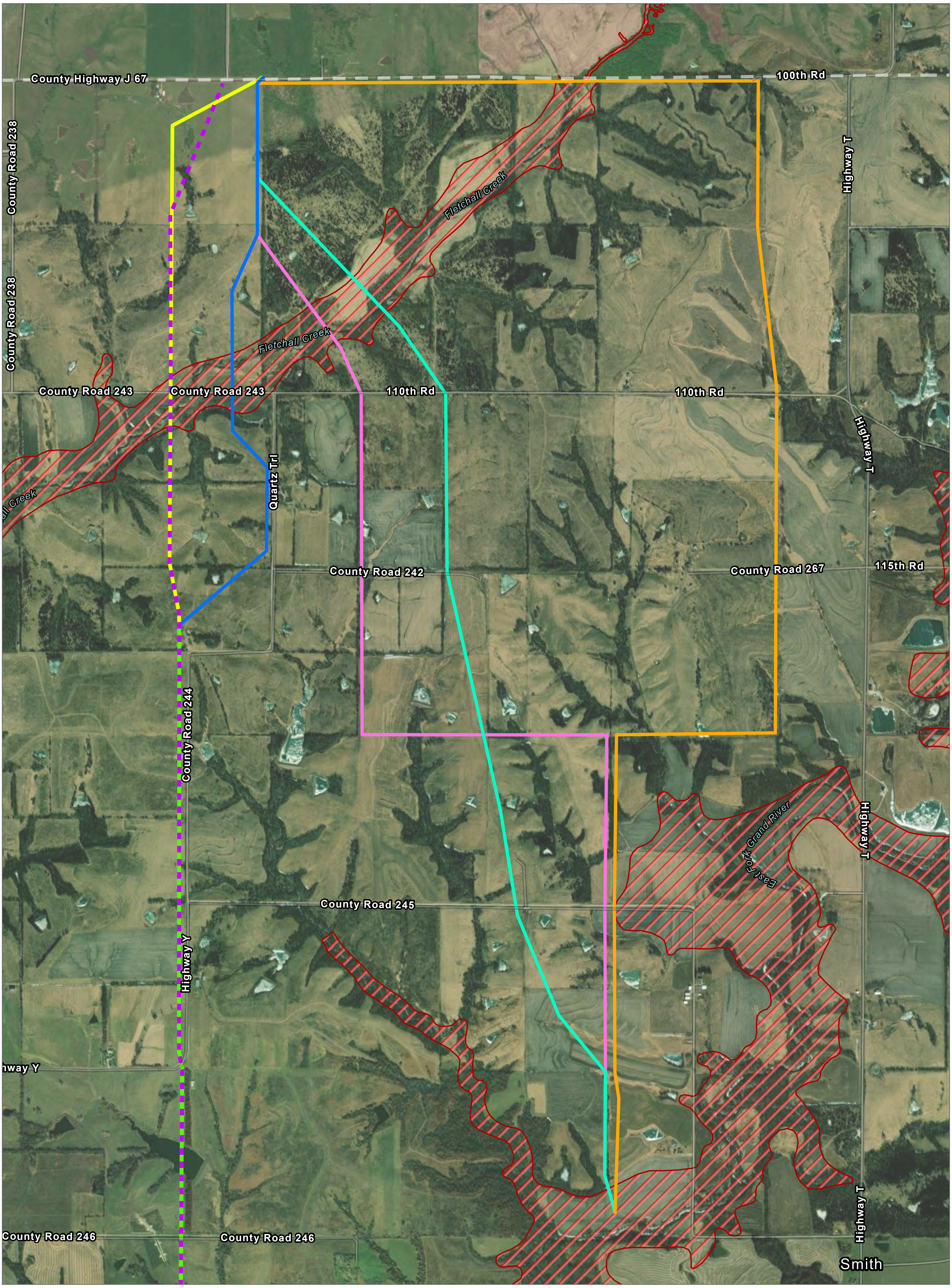
BASE MAP: USGS TOPOGRAPHIC MAP SERVICE
DATA SOURCES: TRC

0 3 6 MILES
1:190,080 1" = 3 MILES

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: AMEREN_DENNY_SITING_DS

COORDINATE SYSTEM: NAD 1983 STATEPLANE MISSOURI WEST FIPS 2403 FEET; MAP ROTATION: 0
-- SAVED BY: DSWEENEY ON 5/28/2024, 09:55:54 AM; FILE PATH: T:\1-PROJECTS\AMEREN\510324_AMEREN_DENNY_SITING\2-APRX\FDIM_REPORT_MAP_UPDATES_MAY_2024\FDIM_REPORT_MAP_UPDATES_MAY_2024.APRX; LAYOUT NAME: FIG 8A_NORTHERN_OPTIONS_AERIAL_11X17P



NEW PROPOSED ROUTE DO-28
ORIGINAL PROPOSED ROUTE DO-27
STATE BOUNDARY
100-YEAR FLOODPLAIN

NORTHERN ROUTING OPTIONS
PREFERRED 1
PREFERRED 2
ALTERNATIVE 1
ALTERNATIVE 2
ALTERNATIVE 3

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
NORTHERN ALTERNATIVE ROUTES AERIAL MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	M. CARACHURE	FIGURE 8a	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

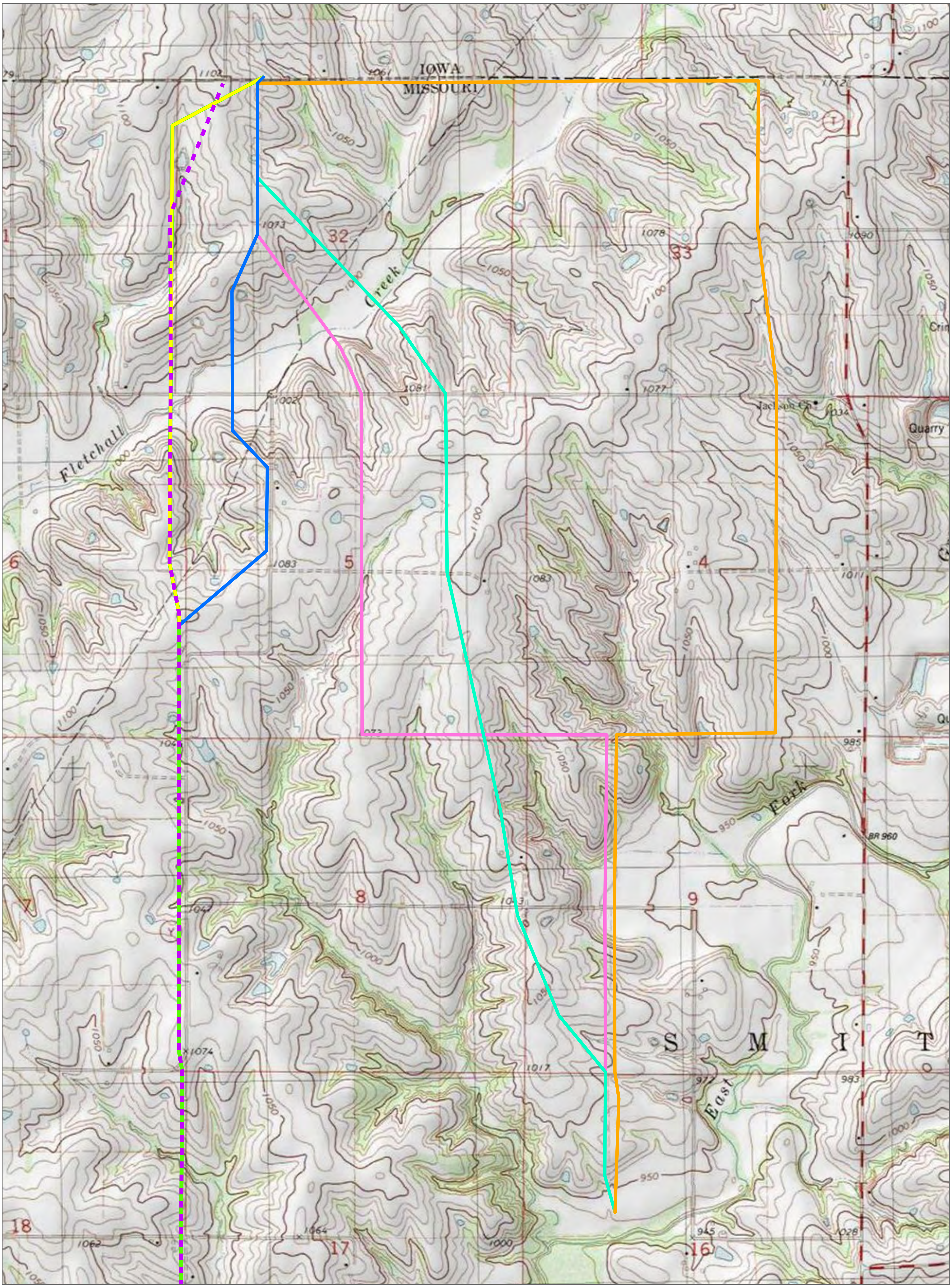
BASE MAP: ESRI WORLD IMAGERY (FEBRUARY 2022)
DATA SOURCES: ESRI, FEMA, TRC

N

0 750 1,500 FEET
1:18,000 1" = 1,500'

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024



- NEW PROPOSED ROUTE DO-28
- ORIGINAL PROPOSED ROUTE DO-27

NORTHERN ROUTING OPTIONS

- PREFERRED 1
- PREFERRED 2
- ALTERNATIVE 1
- ALTERNATIVE 2
- ALTERNATIVE 3

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
NORTHERN ALTERNATIVE ROUTES TOPOGRAPHIC MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	M. CARACHURE	**FIGURE 8b**	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

BASE MAP: USGS TOPOGRAPHIC MAP SERVICE
DATA SOURCES: ESRI, USGS, TRC

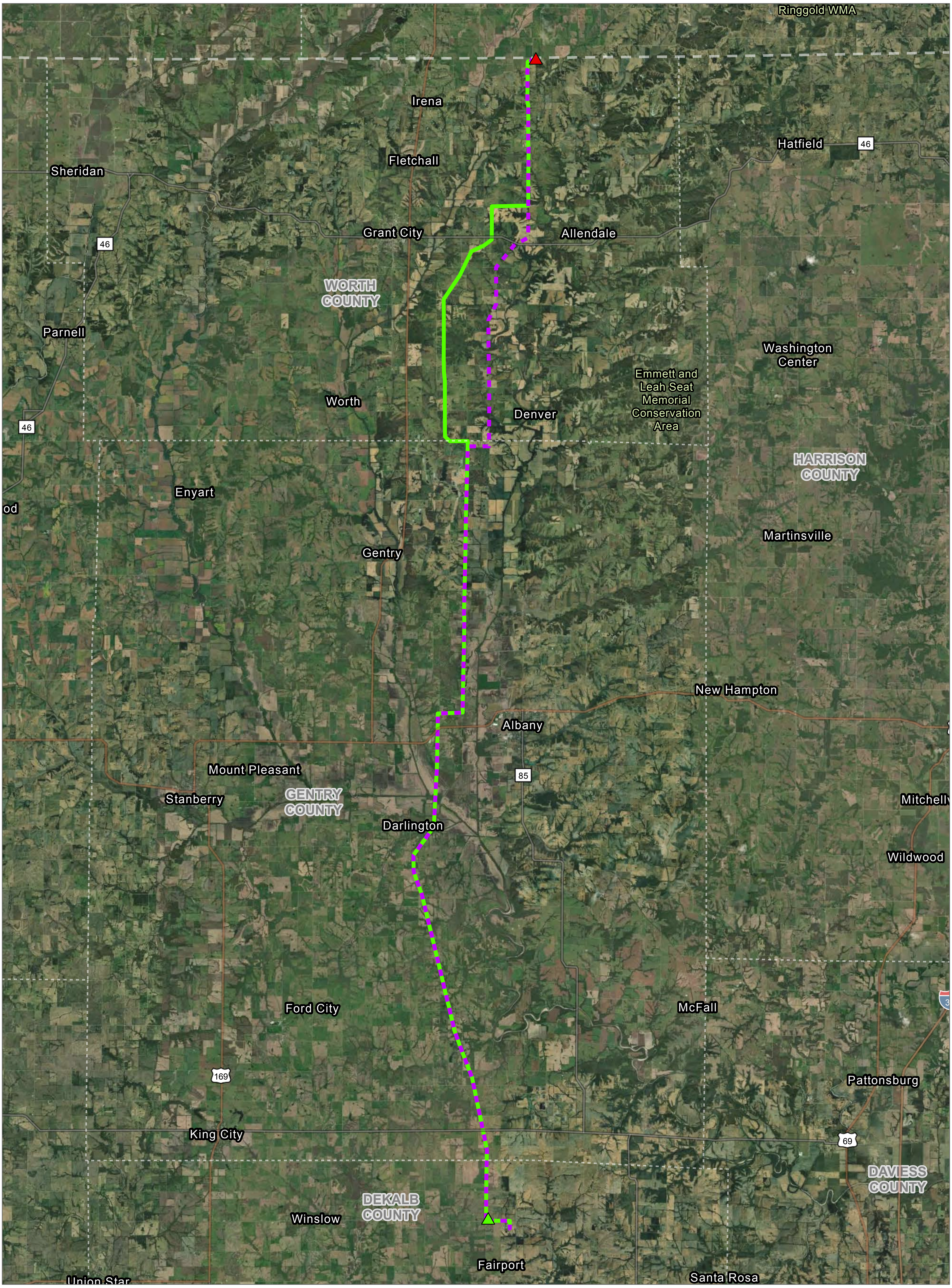
N

0 750 1,500 FEET
1:18,000 1" = 1,500'

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024

COORDINATE SYSTEM: NAD 1983 STATEPLANE MISSOURI WEST FIPS 2403 FEET; MAP ROTATION: 0
-- SAVED BY: DSWEENEY ON 5/28/2024, 13:28:53 PM; FILE PATH: T:\1-PROJECTS\AMEREN\510324_AMEREN_DENNY_SITING\2-APRX\FDIM_REPORT_MAP_UPDATES_MAY_2024\FDIM_REPORT_MAP_UPDATES_MAY_2024.APRX; LAYOUT NAME: FIG 9A_DO28_AERIAL_11X17P



- START POINT
- END POINT
- NEW PROPOSED ROUTE DO-28
- ORIGINAL PROPOSED ROUTE DO-27
- COUNTY BOUNDARY
- STATE BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PROPOSED ROUTE DO-28 AERIAL MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	J. STONE-LORD	**FIGURE 9a**	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

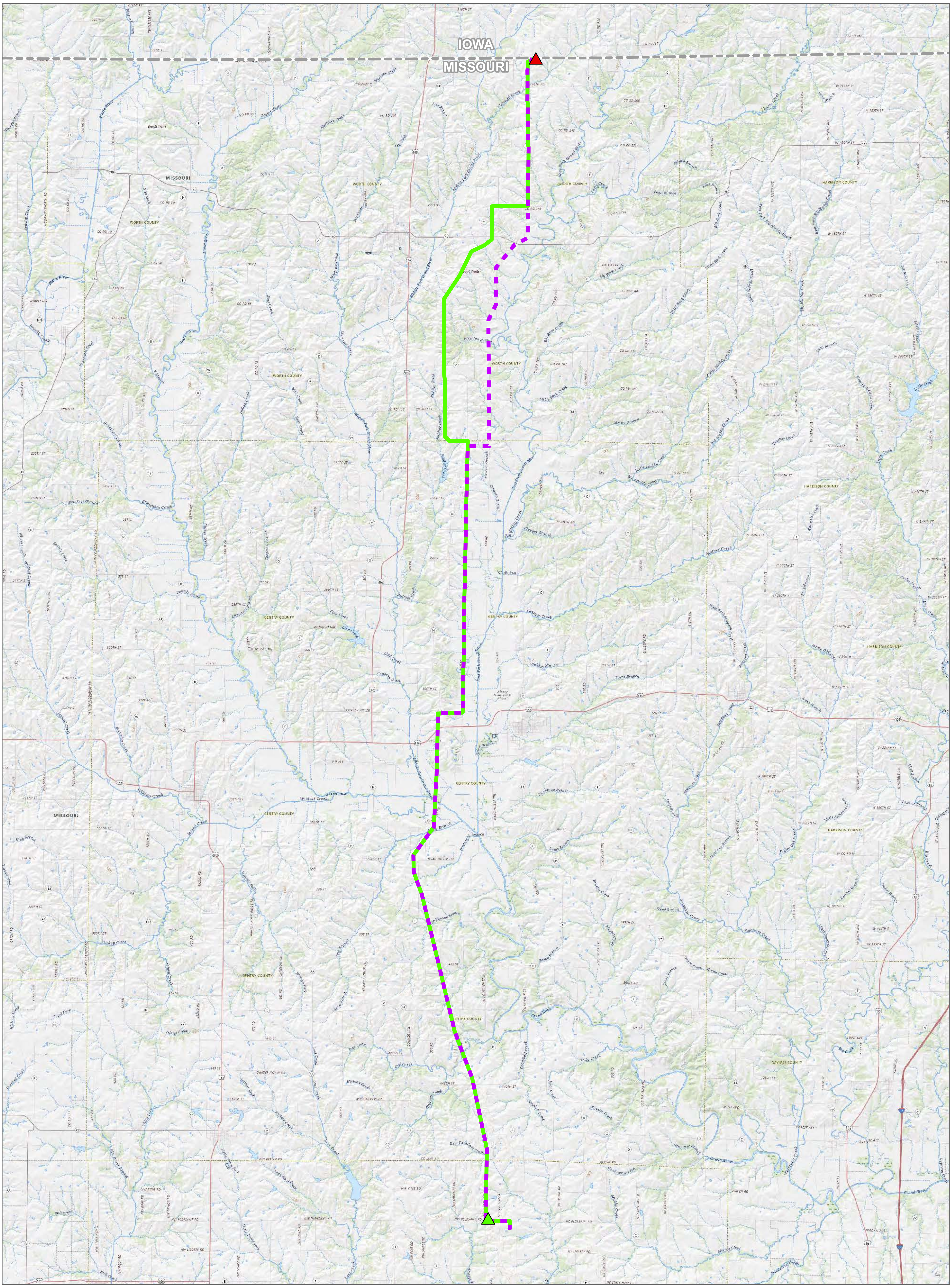
BASE MAP: ESRI WORLD IMAGERY (FEBRUARY 2022)
DATA SOURCES: ESRI, TRC

N
0 3 6 MILES
1:200,000

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024

COORDINATE SYSTEM: NAD 1983 STATEPLANE MISSOURI WEST FIPS 2403 FEET; MAP ROTATION: 0
-- SAVED BY: DSWEENEY ON 5/28/2024, 10:25:29 AM; FILE PATH: T:\1-PROJECTS\AMEREN\510324_AMEREN_DENNY_SITING\2-APRX\FDIM_REPORT_MAP_UPDATES_MAY_2024\FDIM_REPORT_MAP_UPDATES_MAY_2024.APRX; LAYOUT NAME: FIG 9B_DO28_TOPO_11X17P



- START POINT
- END POINT
- NEW PROPOSED ROUTE DO-28
- ORIGINAL PROPOSED ROUTE DO-27
- COUNTY BOUNDARY
- STATE BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PROPOSED ROUTE DO-28 TOPOGRAPHIC MAP

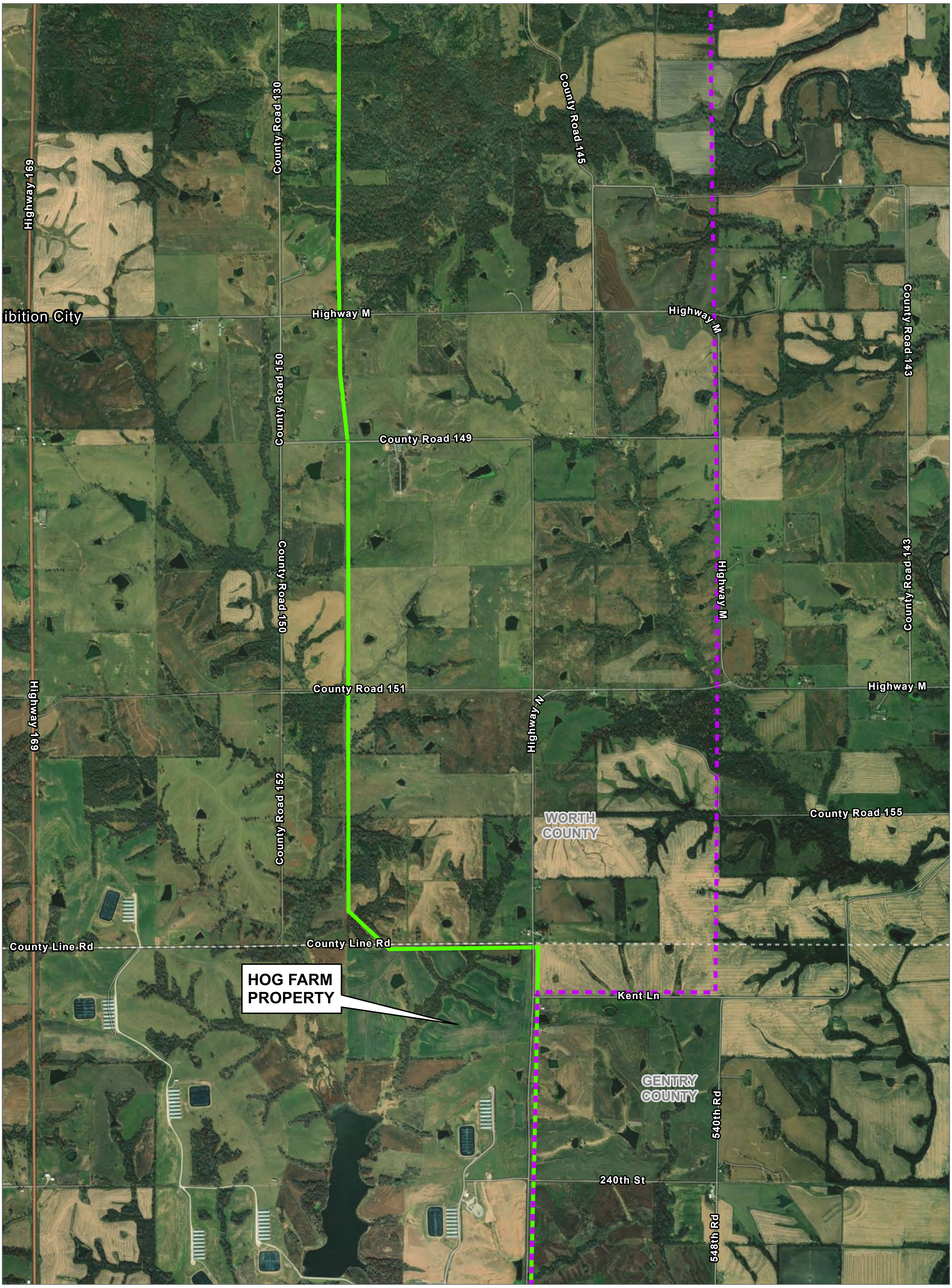
DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	J. STONE-LORD		**FIGURE 9b**
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024		

BASE MAP: USGS TOPOGRAPHIC MAP SERVICE
DATA SOURCES: TRC

0 3 6 MILES
1:200,000

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024



NEW PROPOSED ROUTE DO-28
ORIGINAL PROPOSED ROUTE DO-27
COUNTY BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PROPOSED REROUTE AREA AERIAL MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	J. STONE-LORD	FIGURE 10	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024	PAGE 1 OF 2	

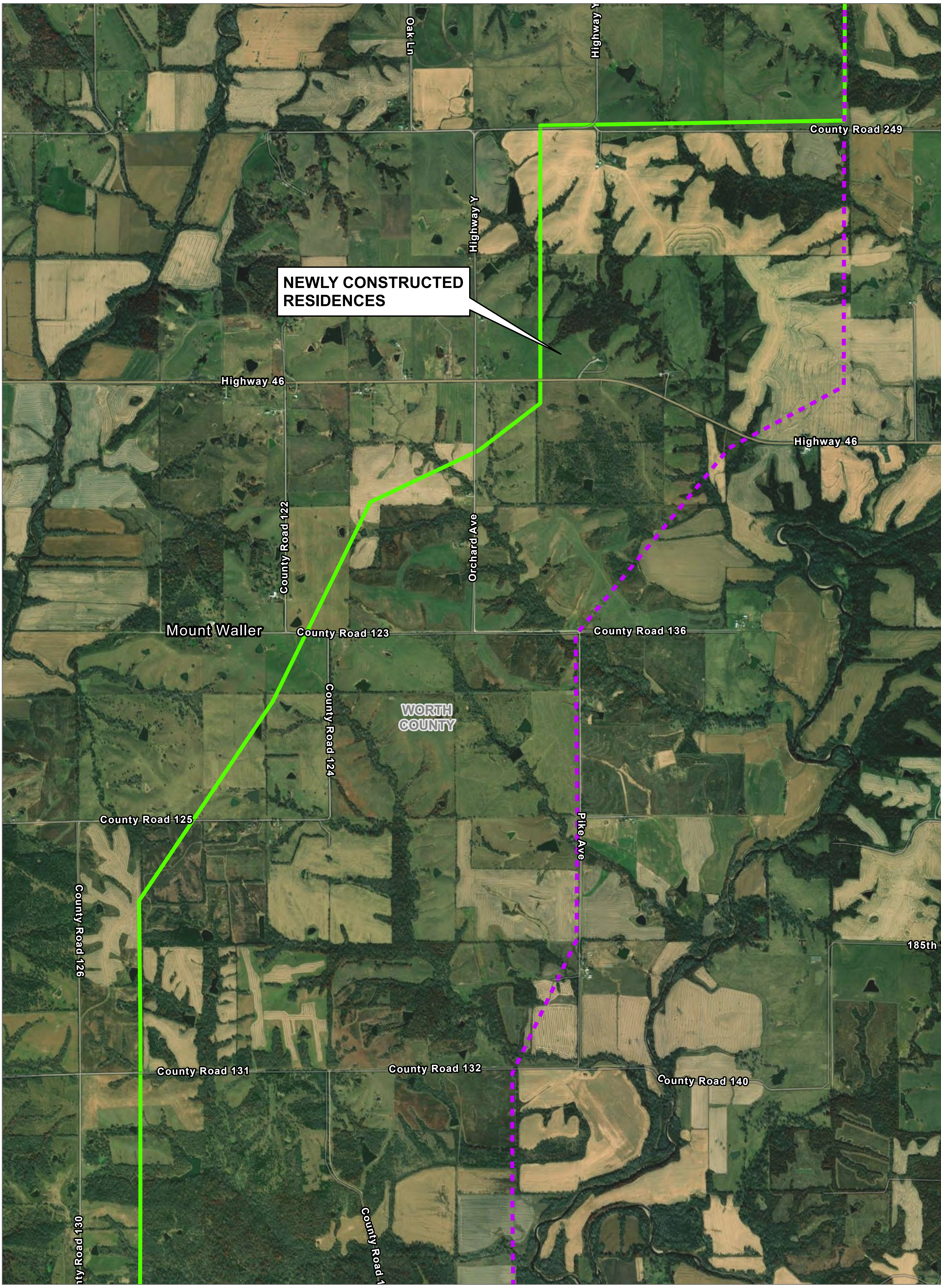
BASE MAP: ESRI WORLD IMAGERY (FEBRUARY 2022)
DATA SOURCES: ESRI, TRC

0 2,000 4,000 FEET
1:24,000

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024

COORDINATE SYSTEM: NAD 1983 STATEPLANE MISSOURI WEST FIPS 2403 FEET; MAP ROTATION: 0
-- SAVED BY: DSWEENEY ON 5/28/2024, 13:28:53 PM; FILE PATH: T:\1-PROJECTS\AMEREN\510324_AMEREN_DENNY_SITING\2-APRX\FDIM_REPORT_MAP_UPDATES_MAY_2024\FDIM_REPORT_MAP_UPDATES_MAY_2024.APRX; LAYOUT NAME: FIG_10_DO28_AERIAL_11X17P



NEW PROPOSED ROUTE DO-28
ORIGINAL PROPOSED ROUTE DO-27
COUNTY BOUNDARY

PROJECT:
FAIRPORT - DENNY - IA/MO STATE BORDER TRANSMISSION SITING PROJECT

TITLE:
PROPOSED REROUTE AREA AERIAL MAP

DRAWN BY:	D. SWEENEY	PROJ. NO.:	510324.0000
CHECKED BY:	J. STONE-LORD	FIGURE 10	
APPROVED BY:	J. NICHOLAS		
DATE:	MAY 2024	PAGE 2 OF 2	

BASE MAP: ESRI WORLD IMAGERY (FEBRUARY 2022)
DATA SOURCES: ESRI, TRC

N

0 2,000 4,000 FEET
1:24,000

TRC
1526 COLE BOULEVARD
BUILDING 3, SUITE 150
LAKEWOOD, CO 80401
PHONE: 303.792.5555

FILE: FDIM_REPORT_MAP_UPDATES_MAY_2024

Appendix A
Raw and Normalized Data for Proposed Routes

Routing Criteria	+/-	Raw Data Counts by Route																										
		DO-1	DO-2	DO-3	DO-4	DO-5	DO-6	DO-7	DO-8	DO-9	DO-10	DO-11	DO-12	DO-13	DO-14	DO-15	DO-16	DO-17	DO-18	DO-19	DO-20	DO-21	DO-22	DO-23	DO-24	DO-25	DO-26	DO-27
Land Use & Cultural Criteria																												
Number of Parcels Crossed by Centerline	Constraint	138	146	139	158	151	144	152	145	154	162	155	169	162	155	163	156	153	161	154	168	161	154	162	155	133	126	140
Transmission Lines Paralleled (miles)	Opportunity	14	14	14	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	2	2	14
Pipelines Paralleled (miles)	Opportunity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Restricted Access Roads Paralleled (Highways) (miles)	Opportunity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Local Roads Paralleled (miles)	Constraint	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2
Cemeteries within 1000 feet of centerline	Constraint	1	0	0	1	1	1	0	0	1	0	0	1	1	1	0	0	2	1	1	2	2	2	1	1	2	2	0
Agricultural Land (linear mileage)	Constraint	31	35	35	37	37	33	36	36	34	37	38	41	41	36	39	40	33	36	36	39	40	35	38	39	35	36	34
Existing Solar/Wind Farms	Constraint	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Residential Structures within 150 feet of centerline	Constraint	1	1	1	0	0	2	0	0	2	0	0	0	0	2	0	0	2	0	0	0	0	2	0	0	1		1
Non-Residential Structures within 75 feet of centerline	Constraint	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	2	2	0
Non-Residential Structures within 150 feet of centerline	Constraint	3	3	3	2	2	6	2	2	7	3	3	2	2	6	2	2	7	3	3	2	2	6	2	2	6	6	3
Technical/Constructability Criteria																												
Length (miles)	Constraint	41	44	43	48	48	45	47	47	46	49	48	51	51	48	50	50	46	48	48	51	50	47	50	49	44	44	42
Turn Angles > 15 Degrees	Constraint	14	19	22	28	31	21	24	27	19	22	25	35	38	28	31	34	15	18	21	31	34	24	27	30	28	31	17
Turn Angles > 50 Degrees	Constraint	2	5	6	15	16	7	11	12	8	12	13	23	24	15	19	20	4	8	9	19	20	11	15	16	11	12	5
Slope (>20%) (Linear miles of individual segments spanning > 500')	Constraint	1	1	1	1	1	2	1	1	2	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1
Local Roads and Streets Crossed	Constraint	50	54	51	52	49	50	51	48	56	57	54	56	53	54	55	52	54	55	52	54	51	52	53	50	52	49	40
Pipeline Crossings (Transmission)	Constraint	3	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
Oil & Gas Wells (Count within 200')	Constraint	2	2	0	4	2	0	4	2	0	4	2	4	2	0	4	2	0	4	2	4	2	0	4	2	4	2	1
MET towers & Communication Towers (within 1000')	Constraint	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Water Wells (Count within 200')	Constraint	2	2	2	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	2
Ecological & Biological																												
Total Streams Crossed (NHD)	Constraint	56	62	58	83	79	84	88	84	84	88	84	76	72	77	81	77	80	84	80	72	68	73	77	73	63	59	60
Impaired Waters	Constraint	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0
Floodplains 100yr - feet crossed by centerline	Constraint	16,526	17,846	20,222	8,606	10,982	12,461	8,501	10,877	12,038	8,078	10,454	8,554	10,930	12,408	8,448	10,824	15,734	11,774	14,150	12,250	14,678	16,157	12,144	14,520	10,771	13,147	14,045
PFO wetlands in the ROW (NWI) - acres	Constraint	5	10	11	11	13	6	11	13	7	13	14	11	13	6	11	13	6	12	14	11	13	5	11	13	14	15	5
PSS wetlands in the ROW (NWI) - acres	Constraint	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0
PEM wetlands in the ROW (NWI) - acres	Constraint	8	8	9	1	1	3	0	1	4	1	2	1	1	3	0	1	4	2	2	1	2	3	1	1	1	1	8
Hydric Soils crossed by the centerline (length in mi)	Constraint	22	25	25	29	29	25	27	27	26	28	28	33	33	29	31	31	25	28	28	33	33	28	31	31	31	32	23
Federal T&E Species Combined Range (acres)	Constraint	14,694	16,183	15,491	19,261	18,570	17,621	18,922	18,230	18,728	20,025	19,334	20,868	20,176	19,227	20,528	19,836	18,346	19,643	18,952	20,486	19,794	18,845	20,146	19,454	16,475	15,783	15,146
Forested Areas (acres to clear)	Constraint	132	117	110	155	147	163	149	141	165	151	143	150	142	158	144	136	174	160	152	159	151	167	153	145	124	116	111

		Raw Data Counts by Route																										
Routing Criteria	**+/-**	**DO-1**	**DO-2**	**DO-3**	**DO-4**	**DO-5**	**DO-6**	**DO-7**	**DO-8**	**DO-9**	**DO-10**	**DO-11**	**DO-12**	**DO-13**	**DO-14**	**DO-15**	**DO-16**	**DO-17**	**DO-18**	**DO-19**	**DO-20**	**DO-21**	**DO-22**	**DO-23**	**DO-24**	**DO-25**	**DO-26**	**DO-27**
Land Use & Cultural Criteria																												
Number of Parcels Crossed by Centerline	Constraint	138	146	139	158	151	144	152	145	154	162	155	169	162	155	163	156	153	161	154	168	161	154	162	155	133	126	140
Transmission Lines Paralleled (miles)	Opportunity	14	14	14	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	2	2	14
Pipelines Paralleled (miles)	Opportunity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Restricted Access Roads Paralleled (Highways) (miles)	Opportunity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Local Roads Paralleled (miles)	Constraint	1	1	1	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	2	1	1	1	1	1	1	2
Cemeteries within 1000 feet of centerline	Constraint	1	0	0	1	1	1	0	0	1	0	0	1	1	1	0	0	2	1	1	2	2	2	1	1	2	2	0
Agricultural Land (linear mileage)	Constraint	31	35	35	37	37	33	36	36	34	37	38	41	41	36	39	40	33	36	36	39	40	35	38	39	35	36	34
Existing Solar/Wind Farms	Constraint	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Residential Structures within 150 feet of centerline	Constraint	1	1	1	0	0	2	0	0	2	0	0	0	0	2	0	0	2	0	0	0	0	2	0	0	1		1
Non-Residential Structures within 75 feet of centerline	Constraint	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	2	2	0
Non-Residential Structures within 150 feet of centerline	Constraint	3	3	3	2	2	6	2	2	7	3	3	2	2	6	2	2	7	3	3	2	2	6	2	2	6	6	3
Technical/Constructability Criteria																												
Length (miles)	Constraint	41	44	43	48	48	45	47	47	46	49	48	51	51	48	50	50	46	48	48	51	50	47	50	49	44	44	42
Turn Angles > 15 Degrees	Constraint	14	19	22	28	31	21	24	27	19	22	25	35	38	28	31	34	15	18	21	31	34	24	27	30	28	31	17
Turn Angles > 50 Degrees	Constraint	2	5	6	15	16	7	11	12	8	12	13	23	24	15	19	20	4	8	9	19	20	11	15	16	11	12	5
Slope (>20%) (Linear miles of individual segments spanning > 500')	Constraint	1	1	1	1	1	2	1	1	2	1	2	1	1	2	1	1	2	1	1	1	1	1	1	1	1	1	1
Local Roads and Streets Crossed	Constraint	50	54	51	52	49	50	51	48	56	57	54	56	53	54	55	52	54	55	52	54	51	52	53	50	52	49	40
Pipeline Crossings (Transmission)	Constraint	3	7	7	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
Oil & Gas Wells (Count within 200')	Constraint	2	2	0	4	2	0	4	2	0	4	2	4	2	0	4	2	0	4	2	4	2	0	4	2	4	2	1
MET towers & Communication Towers (within 1000')	Constraint	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Water Wells (Count within 200')	Constraint	2	2	2	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	2
Ecological & Biological																												
Total Streams Crossed (NHD)	Constraint	56	62	58	83	79	84	88	84	84	88	84	76	72	77	81	77	80	84	80	72	68	73	77	73	63	59	60
Impaired Waters	Constraint	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	0	0	0
Floodplains 100yr - feet crossed by centerline	Constraint	16,526	17,846	20,222	8,606	10,982	12,461	8,501	10,877	12,038	8,078	10,454	8,554	10,930	12,408	8,448	10,824	15,734	11,774	14,150	12,250	14,678	16,157	12,144	14,520	10,771	13,147	14,045
PFO wetlands in the ROW (NWI) - acres	Constraint	5	10	11	11	13	6	11	13	7	13	14	11	13	6	11	13	6	12	14	11	13	5	11	13	14	15	5
PSS wetlands in the ROW (NWI) - acres	Constraint	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0
PEM wetlands in the ROW (NWI) - acres	Constraint	8	8	9	1	1	3	0	1	4	1	2	1	1	3	0	1	4	2	2	1	2	3	1	1	1	1	8
Hydric Soils crossed by the centerline (length in mi)	Constraint	22	25	25	29	29	25	27	27	26	28	28	33	33	29	31	31	25	28	28	33	33	28	31	31	31	32	23
Federal T&E Species Combined Range (acres)	Constraint	14,694	16,183	15,491	19,261	18,570	17,621	18,922	18,230	18,728	20,025	19,334	20,868	20,176	19,227	20,528	19,836	18,346	19,643	18,952	20,486	19,794	18,845	20,146	19,454	16,475	15,783	15,146
Forested Areas (acres to clear)	Constraint	132	117	110	155	147	163	149	141	165	151	143	150	142	158	144	136	174	160	152	159	151	167	153	145	124	116	111

Appendix B
Sources for Table 1 – Project Siting Criteria

Criteria	Opportunity or Constraint	Weight	Source
Ecological Constraints and Opportunities			
State Wildlife Management Areas	Constraint	8	Missouri Department of Conservation (MODOC)
Federal threatened & endangered (T&E) Species	Constraint	9	Bureau of Land Management (BLM), United States Department of Agriculture (USDA)
State T&E Species	Constraint	8	Missouri Department of Conservation (MODOC)
Forested Areas	Constraint	6	USGS – National Land Cover Database (NLCD)
Wild and Scenic Rivers	Constraint	8	BLM, USDA
National Wetlands Inventory (NWI) PFO[1] Wetlands	Constraint	9	United States Fish and Wildlife Service (USFWS)
NWI PSS[2] Wetlands	Constraint	6	USFWS
NWI PEM[3] Wetlands	Constraint	5	USFWS
Predominantly Hydric Soils	Constraint	4	USDA Gridded Soils Survey Geographic Data (gSSURGO)
Stream Crossings	Constraint	3	United States Geological Survey (USGS)
Impaired Waters	Constraint	3	Environmental Protection Agency (EPA)

1 Palustrine forested (PFO)
2 Palustrine scrub-shrub (PSS)
3 Palustrine emergent (PEM)

Criteria	Opportunity or Constraint	Weight	Source
Cultural and Land Use Criteria			
National Historic Landmarks	Constraint	9	National Park Service (NPS)
Federal Lands	Constraint	9	USGS Protected Areas Database (PAD-US3.0)
National Register of Historic Places	Constraint	8	National Park Service (NPS)
National Historic Trails and National Historic Sites	Constraint	8	National Park Service (NPS)
Cemeteries	Constraint	8	USGS National Geospatial Data Asset (NGDA)
Recreation Lands	Constraint	7	USGS Protected Areas Database (PAD-US3.0)
USDA NRCS Conservation Easements	Constraint	3	USGS Protected Areas Database (PAD-US3.0)
Quarries, Landfills	Constraint	9	Missouri Department of Natural Resources (MODNR)
Residences within ROW (75 feet of centerline)	Constraint	10	Microsoft Bing Structures + GIS Review
Residential Structures within 150 feet of centerline	Constraint	7	Microsoft Bing Structures + GIS Review
Non-Residential Structures within 75 feet of centerline	Constraint	10	Microsoft Bing Structures + GIS Review
Non-Residential Structures within 150 feet of centerline	Constraint	7	Microsoft Bing Structures + GIS Review
Sensitive land uses	Constraint	9	USGS – National Land Cover Database (NLCD)
Commercial Land Use	Constraint	2	USGS – National Land Cover Database (NLCD)
Industrial Land Use	Constraint	1	USGS – National Land Cover Database (NLCD)
Commercial Hunting Parcels	Constraint	6	Dynamo Spatial, Loveland Technologies, ReportAll
Municipal owned parcels	Constraint	10	Dynamo Spatial, Loveland Technologies, ReportAll
Local Roads	Constraint	6	US Census Bureau, TIGER
Parallel Rail Lines	Opportunity	2	US Census Bureau, TIGER
Parallel Highways	Opportunity	7	US Census Bureau, TIGER
Parallel Existing Large Capacity Pipelines	Opportunity	8	RexTag/Hart Energy
Existing HV Transmission lines	Opportunity	9	RexTag/Hart Energy

Criteria	Opportunity or Constraint	Weight	Source
Technical & Constructability Constraints and Opportunities			
Route Length	Constraint	7	TRC GIS
Floodway	Constraint	8	Federal Emergency Management Agency (FEMA)
Floodplain	Constraint	5	Federal Emergency Management Agency (FEMA)
Transmission Line Crossings	Constraint	8	RexTag/Hart Energy
Pipeline Crossings	Constraint	7	RexTag/Hart Energy
Road Crossings	Constraint	5	US Census Bureau, TIGER
Slope (>20%)	Constraint	6	USGS 3D Elevation Program
Turn Angles > 15 Degrees	Constraint	6	TRC GIS
Turn Angles > 50 Degrees	Constraint	8	TRC GIS
Airports/Navaids	Constraint	10	Federal Aviation Administration (FAA)
State Lands	Constraint	9	USGS Protected Areas Database (PAD-US3.0)
Communication Towers	Constraint	3	Homeland Infrastructure Foundation-Level Data (HIFLD)
Wells	Constraint	3	Missouri Department of Natural Resources (MODNR)