Filing Receipt

Filing Date - 2023-06-08 10:42:05 AM

Control Number - 55067

Item Number - 5

STANDARD APPLICATION FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR A PROPOSED TRANSMISSION LINE

DOCKET NO. 55067

Submit seven (7) copies of the application and all attachments supporting the application. If the application is being filed pursuant to 16 Tex. Admin. Code §25.101(b)(3)(D) (TAC) or 16 TAC §25.174, include in the application all direct testimony. The application and other necessary documents shall be submitted to:

Public Utility Commission of Texas
Attn: Filing Clerk
1701 N. Congress Ave.
Austin, Texas 78711-3326

June 8, 2023

Standard Application for a Certificate of Convenience and Necessity for a Proposed Transmission Line
and
Application for a Certificate of Convenience and Necessity for a Proposed Transmission Line Pursuant To 16 TAC §25.174

Note: As used herein, the term "joint application" refers to an application for proposed transmission facilities for which ownership will be divided. All applications for such facilities should be filed jointly by the proposed owners of the facilities.

1. Applicant (Utility) Name:

For joint applications, provide all information for each applicant.

Applicant (Utility) Name:	Oncor Electric Delivery Company LLC ("Oncor")
Certificate Number:	30043
Street Address:	1616 Woodall Rodgers Freeway Dallas, Texas 75202
Mailing Address:	1616 Woodall Rodgers Freeway Dallas, Texas 75202-1234

2. Please identify all entities that will hold an ownership interest or an investment interest in the proposed project but which are not subject to the Commission's jurisdiction.

Oncor will hold the sole ownership interest in the Ramhorn Hill Switch – Dunham Switch 345 kilovolt ("kV") Transmission Line Project (the "Proposed Transmission Line Project").

3.	**Person to Contact:**	Chris Reily
	Title/Position:	Regulatory Manager
	Phone Number:	(214) 486-4717
	Mailing Address:	1616 Woodall Rodgers Fwy, Suite 6A-012 Dallas, Texas 75202-1234
	Email Address:	Chris.Reily@oncor.com

3a.	**Alternate Contact:**	Thomas Yamin
	Title/Position:	Director of Regulatory, Transmission & Planning
	Phone Number:	(214) 486-3512
	Mailing Address:	1616 Woodall Rodgers Fwy, Suite 6B-005 Dallas, Texas 75202-1234

	Email Address:	Thomas.Yamin@oncor.com

3b.	**Legal Counsel:**	Jaren A. Taylor
		Jared M. Jones
	Phone Number:	(214) 220-7754
	Mailing Address:	Vinson & Elkins LLP
		Trammell Crow Center
		2001 Ross Avenue, Suite 3900
		Dallas, Texas 75201
	Email Address:	jarentaylor@velaw.com
		jjones@velaw.com

Please contact Jaren Taylor with any inquiries regarding the project.

4. Project Description:

Provide a general description of the project, including the design voltage rating (kV), the operating voltage (kV), the CREZ Zone(s) (if any) where the project is located (all or in part), any substations and/or substation reactive compensation constructed as part of the project, and any series elements such as sectionalizing switching devices, series line compensation, etc. For HVDC transmission lines, the converter stations should be considered to be project components and should be addressed in the project description.

If the project will be owned by more than one party, briefly explain the ownership arrangements between the parties and provide a description of the portion(s) that will be owned by each party. Provide a description of the responsibilities of each party for implementing the project (design, Right-Of-Way acquisition, material procurement, construction, etc.).

If applicable, identify and explain any deviation in transmission project components from the original transmission specifications as previously approved by the Commission or recommended by a PURA §39.151 organization.

Name or Designation of Project:	Ramhorn Hill Switch – Dunham Switch 345 kV Transmission Line Project
Design Voltage Rating (kV):	345 kV
Operating Voltage Rating (kV):	345 kV
Normal Peak Operating Current (A):	5,138 A

The Proposed Transmission Line Project is a new double-circuit 345 kV transmission line to be built on triple-circuit capable structures between the proposed Ramhorn Hill Switch and the proposed Dunham Switch. The structures will have two 345 kV circuits initially installed with a vacant third circuit position capable of accommodating a future 138 kV circuit.

The proposed Ramhorn Hill Switch will be located approximately 2 miles south of the intersection of United States Highway ("US") 287 and State Highway ("SH") 114 near Rhome, Texas. The proposed Dunham Switch will be located approximately 1.4 miles southeast of the intersection of US 377 and Farm-to-Market Road ("FM") 1171 (regionally known as Cross Timbers Road) in Flower Mound, Texas.

The length of the Proposed Transmission Line Project is approximately 20 to 23 miles, depending on which route is selected by the Public Utility Commission of Texas ("PUCT" or "Commission").

The Proposed Transmission Line Project includes the construction of the proposed Ramhorn Hill Switch and the proposed Dunham Switch.

5. Conductor and Structures:

Conductor Size and Type:	1926.9 kcmil Aluminum Conductor Steel Supported Trapezoidal-Shaped Wire ("ACSS/TW")
Number of conductors per phase:	2
Continuous Summer Static Current Rating (A):	5,138 A
Continuous Summer Static Line Capacity at Operating Voltage (MVA):	3,070 MVA
Continuous Summer Static Line Capacity at Design Voltage (MVA):	3,070 MVA
Type and composition of Structures:	Triple-Circuit Steel Monopole
Height of Typical Structures:	120 – 175 feet*

*This number reflects the approximate visible height of the structure from ground to structure top. Please see the drawing of the typical structures in Figure 1-2, page 1-7, of the *Environmental Assessment and Alternative Route Analysis for the proposed Ramhorn Hill Switch Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas for Oncor Electric Delivery Company LLC* ("Environmental Assessment and Routing Study"), prepared by Halff Associates, Inc. ("Halff") and included as Attachment No. 1.

Explain why these structures were selected; include such factors as landowner preference, engineering considerations, and costs comparisons to alternate structures that were considered.

For joint applications, provide and separately identify the above-required information regarding structures for the portion(s) of the project owned by each applicant.

Oncor selected the triple-circuit capable 345 kV steel monopole for numerous reasons including technical specifications, the compact structure footprint, reduced right-of-way ("ROW") width requirements, the specific characteristics of the study area, the ability to accommodate a future 138 kV circuit, and other engineering-related reasons.

Provide dimensional drawings of the typical structures to be used in the project.

A drawing of the typical structure is shown in Figure 1-2, page 1-7, of the Environmental Assessment and Routing Study included as Attachment No. 1.

6. **Right-of-way:**

For joint applications, provide and separately identify the above-required information for each route for the portion(s) of the project owned by each applicant.

Miles of Right-of-Way	Approximately 19.9 to 22.9 miles
Miles of Circuit	Approximately 39.8 to 45.8 miles
Width of Right-of-Way	100 feet
Percent of Right-of-Way Acquired	0%

Provide a brief description of the area traversed by the transmission line. Include a description of the general land uses in the area and the type of terrain crossed by the line.

The project area is situated within Denton and Wise Counties and has numerous incorporated cities contained within, or extending into, the project area. A great proportion of the project area is currently vacant land, consisting primarily of grassland and agricultural areas, yet the area is developing rapidly. Urbanized areas are generally clustered along major transportation corridors such as Interstate Highway ("IH") 35W, US 377, US 287, FM 156 and SH 114. Much of the existing vacant property in the project area is being converted to master planned residential communities and for commercial and industrial uses. Existing residential communities and subdivisions are located in pockets throughout the project area. Existing commercial and industrial development is also spread throughout the project area, but is mostly concentrated near the IH 35W, US 377, and SH 114 corridors in the southern portion of the project area.

Several federal recreational areas associated with Lake Grapevine, the Denton Creek floodplain, and the Denton Creek's tributaries extend into the eastern third of the project area. The United States Army Corps of Engineers ("USACE") owns and manages Lake Grapevine and the surrounding federal management areas. The Denton Creek

"Environmentally Sensitive Area," as identified by the USACE, comprises most of the USACE recreational area in the eastern third of the project area. This area is a large contiguous band of high-quality habitat for numerous species of wildlife.

South and west of the USACE property, in the area surrounding the intersection of IH 35W and SH 114, the project area contains dense urban/suburban development, including numerous residential subdivisions, commercial and industrial business parks, transportation/logistics operations, recreational facilities, the Texas Motor Speedway, Fort Worth Alliance Airport, and the BNSF Railway Company Intermodal Rail Yard.

Specific discussion regarding natural, human, and cultural resources in the project area is set forth in Sections 3.1 through 3.8, pages 3-1 through 3-92, of the Environmental Assessment and Routing Study, included as Attachment No. 1.

7. Substations or Switching Stations:

List the name of all existing HVDC converter stations, substations or switching stations that will be associated with the new transmission line. Provide documentation showing that the owner(s) of the existing HVDC converter stations, substations and/or switching stations have agreed to the installation of the required project facilities.

Not Applicable.

List the name of all new HVDC converter stations, substations or switching stations that will be associated with the new transmission line. Provide documentation showing that the owner(s) of the new HVDC converter stations, substations and/or switching stations have agreed to the installation of the required project facilities.

Oncor Proposed Ramhorn Hill Switch

The proposed Ramhorn Hill Switch will be located approximately 2 miles south of the intersection of US 287 and SH 114 near Rhome, Texas. In order to establish the new 345 kV switchyard as part of the Proposed Transmission Line Project, Oncor will terminate the existing double-circuit Hicks to Willow Creek 345 kV transmission line into the proposed switch station. The switchyard will initially be constructed in a 12-breaker, breaker-and-a-half bus arrangement. Relay panels, SCADA and controls for the 345 kV switchyard equipment will be housed in a control center. The dimensions of the proposed Ramhorn Hill Switch station will be approximately 700 feet by 750 feet. Ultimately, the proposed Ramhorn Hill Switch station site could be expanded to accommodate an 18-breaker, 345 kV ring bus arrangement and a potential 138 kV switchyard. The dimensions and additional details regarding the proposed preliminary layout of the Ramhorn Hill Switch station are illustrated in Attachment No. 2.

Oncor Proposed Dunham Switch

The proposed Dunham Switch will be located approximately 1.4 miles southeast of the intersection of US 377 and FM 1171 (regionally known as Cross Timbers Road) in Flower Mound, Texas. In order to establish the new 345 kV switchyard as part of the Proposed Transmission Line Project, Oncor will terminate the existing Lewisville to Krum West and Lewisville to Roanoke 345 kV transmission lines into the proposed switch station. The switchyard will initially be constructed in a 12-breaker, breaker-and-a-half bus arrangement. Relay panels, SCADA, and controls for the 345 kV switchyard equipment will be housed in a control center. The dimensions of the proposed Dunham Switch station will be approximately 700 feet by 600 feet. Ultimately, the proposed Dunham Switch station site could be expanded to accommodate an 18-breaker, 345 kV ring bus arrangement and a potential 138 kV switchyard. The dimensions and additional details regarding the proposed preliminary layout of the Dunham Switch station are illustrated in Attachment No. 2.

8. Estimated Schedule:

Estimated Dates of:	Start*	Completion*
Right-of-way and Land Acquisition	12/2023	12/2024
Engineering and Design	01/2024	10/2024
Material and Equipment Procurement	2/2024	10/2024
Construction of Facilities	12/2024	12/2025
Energize Facilities	12/2025	12/2025

*Dates are based on 180-day CCN process due to ERCOT critical designation.

9. Counties:

For each route, list all counties in which the route is to be constructed.

Wise County
Denton County

10. Municipalities:

For each route, list all municipalities in which the route is to be constructed.

Portions of the proposed alternative routes will be constructed within the city limits of the following municipalities:

Cities (East to West)	Routes
Flower Mound	All Filed Routes
Northlake	All Filed Routes
Justin	1, 19, 29, 33, 36, 41, 42, 54, 65, 67, 68, 69, 71, 72, 86, 92, 94, 96, 103, 108, 116, 130, 132, 137, 138, 142, 143, 146, 154, 170, 175, 176, 178, 179, 184, 185, 186, 187, 191, 192, 207, 216, 217, 218, 219, 221
Fort Worth	3, 5, 10, 11, 13, 14, 15, 16, 18, 22, 23, 24, 25, 26, 28, 29, 43, 44, 58, 61, 63, 70, 78, 87, 116, 117, 119, 130, 132, 164, 179, 199, 200
New Fairview	67, 68, 69
Rhome	1, 11, 26, 33, 41, 42, 65, 67, 68, 69, 71, 72, 86, 92, 94, 96, 103, 117, 138, 142, 143, 154, 175, 176, 178, 184, 185, 192, 207, 216, 218

For each applicant, attach a copy of the franchise, permit or other evidence of the city's consent held by the utility, if necessary or applicable. If franchise, permit, or other evidence of the city's consent has been previously filed, provide only the docket number of the application in which the consent was filed. Each applicant should provide this information only for the portion(s) of the project which will be owned by the applicant.

To the extent necessary or appropriate, evidence of consent for service in this area is publicly available and previously filed in PUCT Docket No. 45.

11. Affected Utilities:

Identify any other electric utility served by or connected to facilities in this application.

No other electric utility will be served by or connected to the Proposed Transmission Line Project.

Describe how any other electric utility will be affected and the extent of the other utilities' involvement in the construction of this project. Include any other electric utilities whose existing facilities will be utilized for the project (vacant circuit positions, ROW, substation sites and/or equipment, etc.) and provide documentation showing that the owner(s) of the existing facilities have agreed to the installation of the required project facilities.

No other electric utility will be involved in the construction of the Proposed Transmission Line Project, and no other electric utility's facilities will be utilized.

12. Financing:

Describe the method of financing this project. For each applicant that is to be reimbursed for all or a portion of this project, identify the source and amount of the reimbursement

(actual amount if known, estimated amount otherwise) and the portion(s) of the project for which the reimbursement will be made.

Oncor proposes to finance the facilities included in the Proposed Transmission Line Project with a combination of debt and equity in compliance with its authorized capital structure, which is similar to the means used for previous construction projects. Oncor plans to utilize internally generated funds (equity) and proceeds received from the issuance of securities. Oncor will typically obtain short-term borrowings as needed for interim financing of its construction expenditures in excess of funds generated internally. These borrowings are then repaid through the issuance of long-term debt securities, the type and amount of which are as of yet undetermined.

Oncor is the sole applicant and, therefore, no other party will be reimbursed for any portion of the Proposed Transmission Line Project.

13. Estimated Costs:

Provide cost estimates for each route of the proposed project using the following table. Provide a breakdown of "Other" costs by major cost category and amount. Provide the information for each route in an attachment to this application.

	Transmission Facilities	**Station Facilities**	
		Ramhorn Hill Switch	Dunham Switch
Right-of-way and Land Acquisition	*	$ 8,810,000	$ 16,648,000
Engineering and Design (Utility)	*	$ -	$ -
Engineering and Design (Contract)	*	$ 500,000	$ 500,000
Procurement of Material and Equipment (including stores)	*	$ 11,570,000	$ 11,570,000
Construction of Facilities (Utility)	*	$ 250,000	$ 250,000
Construction of Facilities (Contract)	*	$ 12,380,000	$ 12,380,000
Other (all costs not included in the above categories)	*	$ -	$ -
Estimated Total Cost	*	**$ 33,510,000**	**$ 41,348,000**

*Refer to Attachment No. 3 for cost estimates for each alternative route presented in the Application.

For joint applications, provide and separately identify the above-required information for the portion(s) of the project owned by each applicant.

Not applicable.

14. Need for the Proposed Project:

For a standard application, describe the need for the construction and state how the proposed project will address the need. Describe the existing transmission system and conditions addressed by this application. For projects that are planned to accommodate load growth, provide historical load data and load projections for at least five years. For projects to accommodate load growth or to address reliability issues, provide a description of the steady state load flow analysis that justifies the project. For interconnection projects, provide any documentation from a transmission service customer, generator, transmission service provider, or other entity to establish that the proposed facilities are needed. For projects related to a Competitive Renewable Energy Zone, the foregoing requirements are not necessary; the applicant need only provide a specific reference to the pertinent portion(s) of an appropriate commission order specifying that the facilities are needed. For all projects, provide any documentation of the review and recommendation of a PURA §39.151 organization.

Overview

The Proposed Transmission Line Project is needed to address reliability issues identified in post-contingency conditions. ERCOT designated this project as "critical to reliability" under 16 TAC § 25.101(b)(3)(D).

The Roanoke area, located approximately 15 miles north of Fort Worth, is one of the highest growth areas in the DFW Metroplex. The 345 kV transmission system in this area is part of a high-power transfer corridor connecting generation in the Panhandle to the DFW load center. The power transfer and load-serving capabilities of the system in this area depend on facilities developed as part of the Competitive Renewable Energy Zone, many of which are approaching their operating limits at current demand levels. Capacity limitations in the area are already limiting the development of new large-point loads. In the last 18 months, Oncor received several requests for interconnection in this area that Oncor was limited in its ability to fulfill due to prospective autotransformer and line overloads. Growth in the area will continue to increase demand and strain the transmission system. This necessitates additional transmission capacity to preserve reliability without overloading the existing transmission system or causing voltage support issues that could threaten system stability.

Oncor performed power flow studies and contingency analysis in accordance with NERC Reliability Standard TPL-001-4 and the ERCOT Planning Guide. This analysis

identified post-contingency system performance issues beginning in summer 2023, including thermal overloads, loading limitations, and voltage criteria exceedances.

The Proposed Transmission Line Project is the second in a series of projects, collectively called the "Roanoke Area Upgrades Project," that will address the identified reliability issues and provide additional operational flexibility on the transmission system in the Roanoke area. ERCOT reviewed the Roanoke Area Upgrades Project, including the Proposed Transmission Line Project, and endorsed it as a Tier 1 transmission project that is critical to the reliability of the ERCOT system.

Thermal Overloads

Starting in summer 2023, the 345/138 kV autotransformers at Hicks and Roanoke and the Roanoke – Hicks 345 kV transmission line will exceed their emergency ratings under contingency conditions. Tables 1 and 2 below summarize the current configuration and resulting thermal overloads under N-1 (loss of a single generator or transmission element) and N-1-1 (loss of a generator or transmission element following an N-1 event) contingency events, as respectively defined in NERC TPL-001-4 Reliability Standard and the ERCOT Planning Guide. Overloading is shown as a percentage of an element's emergency rating. These tables were created using ERCOT's 2021 Regional Transmission Plan for the North and North Central weather zones ("2021 RTP NNC Cases") and 2021 Steady State Working Group ("SSWG") cases.

Monitored Element	**Worst Contingency (N-1)**	**Worst Contingency Loading (% of Emergency Rating)**					
		2021 RTP NNC Cases			**2021 SSWG Cases**		
		2023	**2024**	**2026**	**2027**	**2024**	**2028**
Roanoke 345/138 kV Autotransformer #1	Roanoke 345/138 kV Autotransformer #2 (P1.3)	92	94	96	96	101	110
Roanoke 345/138 kV Autotransformer #2	Roanoke 345/138 kV Autotransformer #1 (P1.3)	94	95	98	98	101	110
Roanoke – Hicks 345 kV double-circuit line	Loss of either Roanoke – Hicks 345 kV circuit (P1.2)	89	87	91	93	99	107

Table 1 – Pre-project post N-1 contingency loading

Monitored Element	**Worst Contingency (N-1-1)**	**Worst Contingency Loading (% of Emergency Rating)**					
		2021 RTP NNC Cases			**2021 SSWG Cases**		
		2023	**2024**	**2026**	**2027**	**2024**	**2028**

Roanoke 345/138 kV Autotransformer #1	Roanoke 345/138 kV Autotransformer + Roanoke – West Denton/Lewisville 345 kV double-circuit line (ERCOT Requirement)	111	110	114	114	124	135
Roanoke 345/138 kV Autotransformer #2		111	110	114	114	124	135
Hicks 345/138 kV Autotransformer #1	Hicks 345/138 kV Autotransformer + Hicks – Alliance/Roanoke 345 kV double-circuit line (ERCOT Requirement)	99	98	101	102	113	123
Hicks 345/138 kV Autotransformer #2		100	99	102	104	113	123
Hicks – Roanoke 345 kV line	Panda Sherman Train and either Hicks – Roanoke 345 kV circuit (P3.2)	95	93	97	99	104	113

Table 2 – Pre-project post N-1-1 contingency loading

Line Loading Limitations

Under peak load conditions, the Roanoke – Deen/Euless 138 kV double-circuit transmission line currently serves nearly 1,000 MW of load, as shown in Table 3. Planning criteria exceedances were observed following a NERC P2.1 contingency, where (1) the loss of the Euless Switch – Bedford Woodson Tap 138 kV line (one section of the overall Roanoke – Deen/Euless transmission line) results in the Roanoke – Park Vista line section (east circuit) loading to 102% of its operating limit in the 2021 SSWG 2024 summer peak case, and (2) the loss of the Deen Switch – Watauga 138 kV line (also a section of the overall Roanoke – Deen/Euless transmission line) results in Roanoke – Park Vista line section (west circuit) loading to 102% of its operating limit in the 2021 SSWG 2027 summer peak case. The Roanoke – Deen/Euless double circuit transmission line is approaching its loading limit, which will restrict Oncor's ability to serve projected load growth in this area in the coming years. The coincident peak load in the Roanoke area between 2017 and 2020 has grown at an annual rate of ~3.1%, which is about double the annual growth rate of Oncor's overall coincident peak during this same period. Table 3 lists forecasted load on the Roanoke – Deen/Euless double circuit transmission line through 2028.

Line	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**
Roanoke – Deen	471	478	494	500	504	517	527
Roanoke – Euless	474	481	509	516	523	536	546
Total	945	959	1003	1016	1027	1053	1073

Table 3 – Forecasted load on Roanoke – Deen/Euless double-circuit line (MW)

Voltage Criteria Exceedances

Starting in 2028, with the loss of Handley Unit #5 followed by the Roanoke – Park Vista 138 kV line section, several buses on the Roanoke – Deen 138 kV transmission line

experience voltages are nearing or outside their emergency limits as shown in Table 4 (emergency limits for all listed elements are <0.90 or <0.92).

Bus Number	Bus Name	Post Contingency Voltage (in p.u.)	Voltage Limit
15100	PARKVISTA1_8	0.890	0.9
2058	CIRCLET_P8	0.892	0.9
559	HERITAGE	0.893	0.92
12033	HRTAG1_T8	0.893	0.9
2036	KELLER2_T8	0.894	0.9
33565	KELLER2	0.894	0.9
2033	KLR_MAG1_T8	0.895	0.9
2037	WPKELLR1_8	0.899	0.9
566	CHERRYGROV	0.900	0.92
2035	BEARCK3_8	0.902	0.9
12028	CLYVIL2_8	0.905	0.9
2028	CLYVIL2_T8	0.906	0.9

Table 4 – Post Contingency Voltage Criteria Exceedances

To address these reliability issues, Oncor recommended the Roanoke Area Upgrades Project to the ERCOT Regional Planning Group ("RPG"). ERCOT conducted an independent review, which also identified reliability issues in the area, including thermal overloads and voltage violations. Tables 5 and 6 below summarize ERCOT's findings.

NERC Contingency Category	Overloaded Element	Voltage Level (kV)	Length (miles)	Loading %
P1: N-1	Roanoke Transformer #1 and #2	345/138	-	101.68
P6: (X-1 + N-1)	Roanoke Transformer #1 and #2	345/138	-	117.27
P6: (X-1 + N-1)	Hicks Transformer #1 and #2	345/138	-	100.00
P3: (G-1 + N-1)	Hicks to Roanoke	345	9.6	100.73
P3: (G-1 + N-1)	Hicks to Alliance	345	5.8	100.28
P6: (X-1 + N-1)	Kennedale to Century	345	10.5	100.69
P6: (X-1 + N-1)	Randol Mill Tap East to Randol Mill	138	2.2	100.63
P6: (X-1 + N-1)	Liggett Switch to DFW E East	138	3.0	100.96
P6: (X-1 + N-1)	Liggett Switch to Irving Valley View	138	1.5	104.96

Table 5 – Thermal Overloads Observed in the Study Area for 2026 Summer Peak

NERC Contingency Category	Substation	Voltage Level (kV)	Post-Contingency Voltage (pu)
P3: (G-1 + N-1)	Park Vista	138	0.89
P3: (G-1 + N-1)	Keller Tap	138	0.90
P3: (G-1 + N-1)	Keller Magnolia Tap	138	0.90
P6: (X-1 + N-1)	Heritage	138	0.90
P3: (G-1 + N-1)	Cherry Grove	138	0.90

Table 6 – Voltage Violations Observed in the Study Area for 2026 Summer Peak

After conducting an independent review, ERCOT's RPG, Technical Advisory Committee, and Board of Directors approved the Roanoke Area Upgrades Project, which included the following:

1. Construct a new Ramhorn Hill 345 kV switching station in a 10-breaker, breaker-and-a-half arrangement tapped into the existing double-circuit Hicks to Willow Creek 345 kV line. The existing Hicks and Willow Creek substations are owned by Oncor.

2. Construct a new Dunham 345 kV switching station in a 10-breaker, breaker-and-a-half arrangement tapped into the existing Lewisville to Krum West and Lewisville to Roanoke 345 kV lines. The existing Lewisville Substation is owned by Brazos Electric Cooperative. The existing Krum West and Roanoke Substations are owned by Oncor.

3. Construct two new Ramhorn Hill to Dunham 345 kV transmission lines, with conductor rated to at least 2987 MVA, in a new (estimated 18.4-mile) right-of-way, installed on new triple-circuit towers leaving one vacant 138 kV position.

4. Rebuild Exchange to Roanoke 345 kV double-circuit lines, upgrading both with conductors rated to at least 2987 MVA, using separate double-circuit capable structures for each line. The line ratings will be 1912/1912 MVA, limited by terminal equipment at Roanoke.

5. Construct a new Exchange to Roanoke 138 kV circuit, with conductor rated to at least 764 MVA, using one of the Exchange to Roanoke 345 kV line double-circuit capable structures.

6. Construct a new Exchange 345/138 kV Switching Station, adjacent to the Alliance 345 kV substation, with two new 600 MVA (nameplate) transformers in an 8-breaker, 345 kV breaker-and-a-half bus arrangement and a 9-breaker, 138 kV breaker-and-a-half arrangement. The normal/emergency ratings of the new transformers will be 700/750 MVA. Exchange will be connected to Hicks and

Roanoke with 345 kV lines and connected to the converted Alliance Substation with 138 kV lines. The existing Alliance and Hicks Substations are owned by Oncor.

7. Convert the existing Alliance 345 kV load-serving substation to 138 kV load-serving operation.

8. Construct a new Exchange to Alliance 138 kV double-circuit line with conductors rated to at least 746 MVA.

9. Construct a new Alliance to Keller Magnolia and Alliance to Heritage 138 kV double-circuit line with conductors rated to at least 746 MVA in a new (estimated 1.4-mile) right-of-way. The existing Keller Magnolia and Heritage Substations are owned by Oncor.

10. Upgrade the existing Keller Magnolia to Heritage 138 kV line with conductor rated to at least 746 MVA to be installed on the Alliance to Keller Magnolia and Alliance to Heritage 138 kV double-circuit structures.

11. Upgrade the existing Heritage to Keller Magnolia Tap double-circuit lines with conductors rated to at least 746 MVA.

12. Construct a new 138 kV switching station at Keller Wall Price in a 6-breaker ring bus arrangement.

13. Disconnect the double-circuit Heritage to Keller Magnolia Tap lines at Keller Magnolia Tap and terminate both at Keller Wall Price by constructing two new 0.3-mile, 138 kV transmission lines added to the existing Keller Magnolia Tap to Keller Wall Price right-of-way with both new line conductors rated to at least 746 MVA. The existing Keller Magnolia Tap and Keller Wall Price Substation are owned by Oncor.

14. Retire the Keller Magnolia Tap.

The Proposed Transmission Line Project includes components 1, 2, and 3 of the overall Roanoke Area Upgrades Project, as listed above. Both the Ramhorn Hill and Dunham switching stations were conceptualized and proposed to have 10 breakers as an initial configuration. However, after finalizing property locations and station layouts, Oncor is proposing to install 12 breakers as an initial configuration at both switching stations. A 12-breaker initial configuration at Ramhorn Hill and Dunham is better suited to accommodate future system growth while avoiding future line rework, congested 345 kV crossings, and extended outages when the switching stations are expanded to accommodate additional transmission lines in the future.

Oncor filed Commission Docket No. 54733 to amend its CCN for components 12, 13, and 14. Oncor will file separate CCN applications for the remaining components of the Roanoke Area Upgrades Project as required by the Commission.

The complete ERCOT Independent Review, dated July 19, 2022, is included as Attachment No. 4 to the Application. A system map showing all of the recommended Roanoke upgrades is included as Attachment No. 5.

15. Alternatives to Project:

For a standard application, describe alternatives to the construction of this project (not routing options). Include an analysis of distribution alternatives, upgrading voltage or bundling of conductors of existing facilities, adding transformers, and for utilities that have not unbundled, distributed generation as alternatives to the project. Explain how the project overcomes the insufficiencies of the other options that were considered.

Oncor Review

Oncor evaluated 3 alternatives to address the identified reliability concerns described in response to Question No. 14:

Oncor Option #1 (O1):

- Establish the Exchange 345/138 kV Switching Station, adjacent to Alliance 345 kV Substation, with two 600 MVA Autotransformers in a 8-breaker 345 kV breaker-and-a-half bus arrangement and a 9-breaker 138 kV breaker-and-a-half arrangement
- Convert the existing Alliance 345 kV load-serving substation to 138 kV operation
- Establish the Exchange – Keller Wall Price 138 kV double-circuit line using a conductor rated at least 3121 A or greater with the following upgrades:
- Construct the Exchange – Keller Magnolia 138 kV double-circuit line
- Upgrade the Keller Magnolia – Keller Wall Price Switch 138 kV line using double-circuit capable structures
- Establish a new 138 kV switching station at Keller Wall Price in a 6-breaker ring bus arrangement
- Disconnect the Keller Magnolia Tap – Heritage/Keller Magnolia line at Keller Magnolia Tap and terminate at Keller Wall Price by constructing a new 0.3-mile double-circuit 138 kV transmission line
- Establish the Ramhorn Hill 345 kV switching station in a 10-breaker, breaker-and-a-half arrangement
- Establish Dunham 345 kV switching station with in a 10-breaker, breaker-and-a-half arrangement

- Construct an estimated 18.4-mile triple-circuit line between Ramhorn Hill and Dunham with:
  - Two 345 kV circuits using conductor rated at least 5000 A
  - A vacant position for a future 138 kV circuit to support future load serving substations in growth areas
- Rebuild Exchange – Roanoke 345 kV double-circuit line using separate double-circuit capable structures for each line with conductor rated at least 5000 A and establish the Exchange – Roanoke 138 kV circuit using one of the Exchange – Roanoke 345 kV line double-circuit capable structures rated at least 3200 A
- Ensure all new 345 kV terminals at Exchange, Ramhorn Hill, and Dunham are rated 5000 A and 138 kV terminals at Exchange, Keller Wall Price, and Roanoke are rated 3200 A

Oncor Option #2 (O2):

- Establish Dunham 345 kV switching station in an 8-breaker, breaker-and-a-half arrangement
- Establish Dunham 138 kV switching station in a 5-breaker, breaker-and-a-half arrangement
- Establish two new 345/138 kV autotransformers at the proposed Dunham 345 kV switching station
- Construct an estimated 1-mile, 138 kV double-circuit line from Dunham to Cross Timbers with conductor rated 3200 A or greater

Oncor Option #3 (O3):

- Establish the Ramhorn Hill 345 kV switching station in a 10-breaker, breaker-and-a-half arrangement
- Establish Dunham 345 kV switching station in an 11-breaker, breaker-and-a-half arrangement
- Construct an estimated 18.4-mile, 345 kV double-circuit line from Ramhorn Hill to Dunham with conductor rated 5000 A or greater
- Establish Dunham 138 kV switching station in a 5-breaker, breaker-and-a-half arrangement
- Establish two new 345/138 kV autotransformers at the proposed Dunham 345 kV switching station
- Construct an estimated 1-mile, 138 kV double-circuit line from Dunham to Cross Timbers with conductor rated 3200 A or greater

Of the three alternatives Oncor reviewed, Option #1 best addressed the identified reliability issues. While both Option #2 and Option #3 would reduce some post-contingency thermal overloads, the steady-state analysis clearly demonstrates that Option

#1 would more effectively address thermal overloads, resolving overloads across all case years. Option #1 also resolves load-serving limitations and voltage criteria exceedances on the Roanoke – Euless/Deen double-circuit transmission line, whereas Options #2 and #3 do not. The results of Oncor's analysis are summarized in Tables 7, 8, and 9 below.

Element	Worst Contingency Loading (% of Emergency Rating)															
	2021 RTP NNC Cases															
	2023 Summer				2024 Summer				2026 Summer				2027 Summer			
	Base	O1	O2	O3	Base	O1	O2	O3	Base	O1	O2	O3	Base	O1	O2	O3
Roanoke 345/138 kV Autotransformer #1	111	74	107	84	110	73	106	88	114	75	109	91	114	75	109	91
Roanoke 345/138 kV Autotransformer #2	111	74	108	84	110	73	106	88	114	75	109	91	114	75	109	91
Hicks 345/138 kV Autotransformer #1	99	66	96	72	98	65	95	71	101	66	98	72	102	66	99	72
Hicks 345/138 kV Autotransformer #2	100	66	98	72	99	66	96	72	102	67	99	73	104	67	101	73
Roanoke – Hicks 345 kV line	95	71	97	57	93	71	95	56	97	73	98	58	99	75	100	59
Performance Requirements Met		Yes	No	Yes		Yes	No	Yes		Yes	No	Yes		Yes	No	Yes

Table 7 – Post Contingency Loading Comparison using RTP NNC Cases

Element	Worst Contingency Loading (% of Emergency Rating) in 2021 SSWG Cases							
	2024 Summer				2028 Summer			
	Base	O1	O2	O3	Base	O1	O2	O3
Roanoke 345/138 kV Autotransformer #1	124	82	121	95	135	89	131	103
Roanoke 345/138 kV Autotransformer #2	124	82	121	95	135	89	131	103
Hicks 345/138 kV Autotransformer #1	113	74	110	80	123	79	120	85
Hicks 345/138 kV Autotransformer #2	113	74	110	80	123	79	120	85
Roanoke – Hicks 345 kV line	104	79	105	62	113	86	114	67
Performance Requirements Met		Yes	No	Yes		Yes	No	No

Table 8 – Post Contingency Loading Comparison using 2021 SSWG Cases

Bus Number	Bus Name	Worst Contingency Voltage Results (in p.u.) 2028 Summer (2021 SSWG Case)			
		Base	O1	O2	O3
15100	PARKVISTA1_8	0.890	>0.95	0.893	0.897
2058	CIRCLET_P8	0.892	>0.95	0.895	0.898
559	HERITAGE	0.893	>0.95	0.896	0.900
12033	HRTAG1_T8	0.893	>0.95	0.896	0.900
2036	KELLER2_T8	0.894	>0.95	0.897	0.901
33565	KELLER2	0.894	>0.95	0.897	0.901
2033	KLR_MAG1_T8	0.895	>0.95	0.899	0.902
2037	WPKELLR1_8	0.899	>0.95	0.903	0.906
566	CHERRYGROV	0.900	>0.95	0.903	0.906
2035	BEARCK3_8	0.902	>0.95	0.905	0.909
12028	CLYVIL2_8	0.905	>0.95	0.908	0.911
2028	CLYVIL2_T8	0.906	>0.95	0.909	0.912
Performance Requirements Met			Yes	No	No

Table 9 – Post Contingency Voltage Comparison using 2021 SSWG Case

After identifying Option #1 as the superior option, Oncor prepared a submittal to ERCOT RPG recommending Option #1 as its preferred alternative.

ERCOT Review

In connection with evaluating Oncor's submittal, ERCOT's independent review initially evaluated four system improvement options to address the observed reliability issues. Table 10 shows the components of the four initial options.

Note that the numbering of the options reviewed by ERCOT does not correspond to the numbering of the options reviewed by Oncor. Oncor Option #1 largely corresponds to ERCOT Option 2, as explained below.

Transmission Upgrade	Approx. Length of Line (miles)	Normal / Emergency Rating (MVA)	*Options*			
			1	2*	3	4
Construct a new Ramhorn Hill 345-kV switching station in a 10-breaker breaker-and-a-half arrangement tapped into existing double-circuit Hicks to Willow Creek 345-kV lines				✓	✓	✓
Construct a new Dunham 345-kV switching station in a 10-breaker breaker-and-a-half arrangement tapped into existing Lewisville to Krum West and Lewisville to Roanoke 345-kV lines				✓	✓	✓
Construct two new Ramhorn Hill to Dunham 345-kV transmission lines, with conductor rated to at least 2987 MVA, in a new (estimated 18.4-mile) right-of-way installed on new triple-circuit towers leaving one 138-kV vacant position	18.4	2987/2987		✓	✓	✓
Upgrade Hicks to Exchange 345-kV double-circuit line with conductors rated to at least 2987 MVA	5.8	2987/2987	✓			
Rebuild Exchange to Roanoke 345-kV double-circuit lines, upgrading both with conductors rated to at least 2987 MVA, using separate double-circuit capable structures for each line	3.6	1912/1912**		✓		
Construct a new Exchange to Roanoke 138-kV circuit, with conductor rated to at least 764 MVA, using one of the Exchange to Roanoke 345-kV line double-circuit capable structures	3.8	764/764		✓		
Upgrade Exchange to Roanoke 345-kV double-circuit lines with conductor rating to at least 2987 MVA	3.6	1912/1912**	✓		✓	
Construct a new Exchange 345/138-kV Switching Station, adjacent to Alliance 345-kV substation, with two new 600 MVA transformers (nameplate) in an 8-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half arrangement		700/750	✓	✓	✓	✓
Convert the existing Alliance 345-kV load serving substation to 138-kV load serving operation			✓	✓	✓	✓
Construct a new Exchange to Alliance 138-kV double-circuit line with conductors rated to at least 746 MVA	0.1	746/746	✓	✓	✓	✓
Construct a new Alliance to Keller Magnolia and Alliance to Heritage 138-kV double-circuit line with conductors rated to at least 746 MVA	1.4 Keller Magnolia 2.5 Heritage	746/746	✓	✓	✓	✓
Upgrade the existing Keller Magnolia to Heritage 138-kV line with conductor rated to at least 746 MVA to be installed on the Alliance to Keller Magnolia and Alliance to Heritage 138-kV double-circuit towers	1.0	746/746	✓	✓	✓	✓
Upgrade the existing Heritage to Keller Magnolia Tap double-circuit lines with conductors rated to at least 746 MVA	1.3	746/746	✓	✓	✓	✓

Construct a new 138-kV switching station at Keller Wall Price in a 6-breaker ring bus arrangement			✓	✓	✓	✓
Disconnect the double-circuit Heritage to Keller Magnolia Tap lines at Keller Magnolia Tap and terminate both at Keller Wall Price by constructing two new 0.3-mile 138-kV transmission lines added to the existing Keller Magnolia Tap to Keller Wall Price right-of-way with both new line conductors rated to at least 746 MVA	0.3	746/746	✓	✓	✓	✓
Retire the Keller Magnolia Tap			✓	✓	✓	✓

Table 10 – Components of the Four Initial Options Studied by ERCOT

*ERCOT's Option 2 is substantially the same as Oncor Option #1.

**Exchange to Roanoke 345-kV conductor will be capable of 2987/2987 MVA, however terminal equipment at Roanoke will limit the line ratings to 1912/1912 MVA.

ERCOT performed reliability assessments on the four initial options based on NERC Reliability Standard TPL-001-4, the applicable ERCOT Nodal Protocols, and Planning Criteria. ERCOT's initial reliability assessment identified thermal overload violations under ERCOT Option 1, resulting in its being eliminated from further evaluation. No reliability criteria violations were identified for ERCOT Options 2, 3, and 4, so ERCOT short-listed these options for further assessment.

To evaluate the operational flexibility of the short-listed options, ERCOT developed an off-peak scenario for planned maintenance outage (N-1-1) analysis. ERCOT first conducted an N-1-1 contingency analysis based on selected single-circuit prior outages, as well as based on selected double-circuit common tower prior outages for each short-listed option. As shown in Table 11 below, the performance was similar for each of the three short-listed options.

	Planned Maintenance Single Circuit Prior Outage		**Planned Maintenance Double Circuit Common Tower Prior Outage**	
	Thermal Overloads	**Voltage Instability**	**Thermal Overloads**	**Voltage Instability**
Option 2	No	No	No	No
Option 3	No	No	No	No
Option 4	No	No	No	No

Table 11 – Results of Planned Maintenance N-1-1 Outage Analysis

To further evaluate the operational flexibility provided by the short-listed options, ERCOT conducted an additional prior outage maintenance scenario based on input from Oncor. As shown in Table 12 below, ERCOT's Option 2 performed better under this scenario as it was the only short-listed option that did not show a Roanoke 345/138 kV transformer overload.

	Planned Maintenance TSP Requested Scenario (X-1 + Double-Circuit Line Segment)	
	Thermal Overloads	**Voltage Stability**
Option 2	No	Ok
Option 3	Yes	Ok
Option 4	Yes	Ok

Table 12 – Results of TSP Requested Planned Maintenance Outage Analysis

To estimate and compare the long-term load-serving capabilities of the three short-listed options, ERCOT adjusted load-up in the substations identified in the Roanoke area in Oncor's submittal to RPG. To balance power, ERCOT adjusted down conforming load outside of the North Central weather zone and simulated N-1 contingencies.

Because ERCOT Option 2 offered better long-term load-serving capability, better operational flexibility during transformer prior outage conditions, and better flexibility for future utilization associated with transmission between Exchange and Roanoke, ERCOT selected Option 2 as its preferred option.

ERCOT's analysis revealed that six 138 kV and one 345 kV transmission line thermal overloads would need to be addressed for all three of the short-listed options to increase long-term load-serving capability. In addition, Options 3 and 4 would require additional transmission improvements to address overloading on the two existing 345/138 kV transformers at Roanoke to further increase load serving capability. Because Option 2 did not require these additional major transmission improvements, ERCOT selected Option 2 as the most favorable option for increasing long-term load serving capability.

A comparison of the three short listed options is shown in Table 13 below.

	Option 2	**Option 3**	**Option 4**
Met ERCOT and NERC Reliability Criteria	Yes	Yes	Yes
Improved Operational Flexibility	Better	Yes	Yes
Long-term Load Serving Performance	Better	Yes	Yes
Capital Cost Estimates	$286 M	$264 M	$254 M

Table 13 - Comparison of Short-Listed Options

ERCOT endorsed Option 2, including the Proposed Transmission Line Project, as a Tier 1 transmission project that is critical to the reliability of the ERCOT system pursuant to 16 TAC § 25.101(b)(3)(D).

Distribution alternatives will not resolve the identified reliability issues on the transmission system.

Bundling or upgrading conductor, adding transformers, or upgrading voltages alone will not address the identified reliability issues or provide the necessary level of service to meet electric demand in the Roanoke-Alliance area.

16. Schematic or Diagram:

For a standard application, provide a schematic or diagram of the applicant's transmission system in the proximate area of the project. Show the location and voltage of existing transmission lines and substations, and the location of the construction. Locate any taps, ties, meter points, or other facilities involving other utilities on the system schematic.

A schematic of the transmission system in the proximate area of the Roanoke Area Upgrades Project, including the Proposed Transmission Line Project, is shown in Attachment No. 6. The location and voltage of existing transmission lines, substations, taps, ties, meter points or other facilities involving other utilities in relation to the Proposed Transmission Line Project are included. A map of the project area can be found in Figures 3-1A, 3-1B, 3-1C, and 3-1D of the Environmental Assessment and Alternative Route Analysis in Appendix H included as Attachment No. 1.

17. Routing Study:

Provide a brief summary of the routing study that includes a description of the process of selecting the study area, identifying routing constraints, selecting potential line segments, and the selection of the routes. Provide a copy of the complete routing study conducted by the utility or consultant. State which route the applicant believes best addresses the requirements of PURA and P.U.C. Substantive Rules.

Oncor retained Halff to prepare the Environmental Assessment and Routing Study. The objective of the Environmental Assessment and Routing Study is to provide information in support of this Application in addressing the requirements of § 37.056(c)(4)(A)-(D) of the Texas Utilities Code, the PUCT's CCN Application form, and 16 Texas Administrative Code ("TAC") § 25.101 as these apply to the Proposed Transmission Line Project.

By examining existing environmental conditions, including the human and natural resources that are located in the project area, the Environmental Assessment and Routing Study appraises the environmental effects that could result from the construction, operation, and maintenance of the Proposed Transmission Line Project. The Environmental Assessment and Routing Study may also be used in support of any additional local, state, or federal permitting activities that may be required for the Proposed Transmission Line Project.

To assist Halff in its evaluation, Oncor provided Halff with information regarding the project endpoints, the need for the project, engineering and design requirements,

construction practices, and ROW requirements for the Proposed Transmission Line Project.

After considering environmental and geographical data, Halff defined a study area that encompassed the provided endpoints with a sufficient area to identify a diverse set of potential routing alternatives. *See* Section 3.0 of the Environmental Assessment and Routing Study, included as Attachment No. 1, for a discussion of the study area. Routing constraints were identified after collection of area data from many sources (*e.g.*, governmental agencies, evaluation of aerial photography) and consideration of the criteria established in § 37.056(c)(4)(A)-(D) of the Texas Utilities Code, the PUCT's CCN Application form, and 16 TAC § 25.101.

Potential line segments were identified by evaluating the constraints mapped within the study area and then developing potential pathways, such as existing corridors and other linear features where constraints were minimal. Corridors were identified and developed into potentially viable routes. Potential impacts to both the human and natural environment were evaluated by Halff for each identified preliminary alternative route.

Oncor then evaluated the alternative routes and selected Route 179 as the route that best addresses the requirements of PURA § 37.056(c)(4)(A)-(D) and 16 TAC § 25.101.

Specific discussions regarding the study area, identification of constraints, selection of potential line segments, and alternative route analysis are set forth in the Environmental Assessment and Routing Study. Specific discussion regarding the evaluation and selection of routes filed with the Application and the route that Oncor believes best complies with the requirements of the Texas Utilities Code and the PUCT's Substantive Rules is contained in an office memorandum from Brenda J. Perkins (included as Attachment No. 7).

18. Public Meeting or Public Open House:

Provide the date and location for each public meeting or public open house that was held in accordance with 16 TAC §22.52. Provide a summary of each public meeting or public open house including the approximate number of attendants, and a copy of any survey provided to attendants and a summary of the responses received. For each public meeting or public open house provide a description of the method of notice, a copy of any notices, and the number of notices that were mailed and/or published.

Oncor hosted two public participation meetings in accordance with 16 TAC § 22.52. They were attended by personnel from Oncor, Halff, and Integra Realty Resources, a contractor assisting Oncor in property abstracting. The public participation meetings were held on December 7 and December 8, 2022, from 4:00 p.m. to 7:00 p.m., at the Marriott Hotel & Golf Club Champions Circle in Fort Worth, Texas.

Oncor mailed a total of 2,068 individual written notices of the meetings to all owners of property within 500 feet of the centerline of the preliminary alternative route links for the Proposed Transmission Line Project in accordance with 16 TAC §22.52(a)(4). In consideration of horizontal accuracy limitations as it relates to appraisal district data and aerial photography interpretation when developing preliminary routes, notification to property owners was over-inclusive, including properties crossed by or within 520 feet of preliminary alternative route centerlines. Also, public notices were published on November 26 and November 27, 2022, in the *Denton Record Chronicle* and on November 23, 2022, in the *Wise County Messenger* announcing the location, time, and purpose of the meetings. Oncor provided notice of the public meetings to the Department of Defense Siting Clearinghouse in accordance with 16 TAC § 22.54(a)(4). Oncor also provided courtesy notice of the public meetings to identified pipeline companies within the project area.

The meetings were designed to solicit comments and input from residents, landowners, public officials, and other interested parties concerning the Proposed Transmission Line Project. The objectives of the meetings included promoting an understanding of the Proposed Transmission Line Project, including the purpose, need, and potential benefits and impacts; informing and educating the public with regard to the routing process and schedule; and gathering information about the values and concerns of the public and community leaders.

The meetings were configured in an informal information station format rather than a formal speaker/audience format, with each station assigned to a particular aspect of the project or routing process and staffed with representatives from Oncor and/or Halff. Each station had exhibits, maps, illustrations, aerial photography, or other information describing certain project aspects and subject matter information. Attendees were encouraged at the meeting's outset to visit each station in order, so the entire process could be explained in the general sequence of project development. Oncor has found this meeting format valuable due to its informality and because it allows attendees to gather information most important to them and to spend as much time as necessary with those particular project aspects. Additionally, individual discussions allow for and encourage more interaction from attendees who otherwise might be hesitant to participate in a more formal setting.

At the public participation meeting held on December 7, 2022, 77 people signed in and 27 questionnaires were received. At the public participation meeting held on December 8, 2022, 95 people signed in and 44 questionnaires were received. Numerous questionnaires and/or letters were submitted to Oncor after the public meetings via email.

Additional discussion concerning the public involvement program and specific information regarding the public participation meetings may be found in the

Environmental Assessment and Routing Study, Section 2.5, pages 2-11 through 2-12, Section 5.0, pages 5-1 through 5-22, and Figures 3-0 and 5-1, included as Attachment No. 1. A representative copy of the notice that was provided to property owners and a copy of the questionnaire provided to meeting attendees is included in Appendix B of Attachment No. 1.

19. Routing Maps:

Base maps should be a full scale (one inch = not more than one mile) highway map of the county or counties involved, or other maps of comparable scale denoting sufficient cultural and natural features to permit location of all routes in the field. Provide a map (or maps) showing the study area, routing constraints, and all routes or line segments that were considered prior to the selection of the routes. Identify the routes and any existing facilities to be interconnected or coordinated with the project. Identify any taps, ties, meter points, or other facilities involving other utilities on the routing map. Show all existing transmission facilities located in the study area. Include the locations of radio transmitters and other electronic installations, airstrips, irrigated pasture or cropland, parks and recreational areas, historical and archeological sites (subject to the instructions in Question 27), and any environmentally sensitive areas (subject to the instructions in Question 29).

Figures 3-1A, 3-1B, 3-1C (one inch = 1,000 feet maps), and Figure 3-1D (one inch = 300 feet map), are included in the Appendix H map pockets of the Environmental Assessment and Routing Study, included as Attachment No. 1. These base maps denote sufficient cultural and natural features to permit location of all routes in the field. These maps delineate the study area, routing constraints, and all routes and route links considered in the selection of routes. These maps also depict the approximate locations of radio transmitters and other electronic installations, airstrips, irrigated pasture or cropland, parks and recreational areas, historical and archeological sites, and environmentally sensitive areas, if any. Figures 3-1A-D depict existing transmission facilities in the area of the Proposed Transmission Line Project, including taps, ties, meter points, or other utility facilities, as applicable.

Provide aerial photographs of the study area displaying the date that the photographs were taken or maps that show (1) the location of each route with each route segment identified, (2) the locations of all major public roads including, as a minimum, all federal and state roadways, (3) the locations of all known habitable structures or groups of habitable structures (see Question 19 below) on properties directly affected by any route, and (4) the boundaries (approximate or estimated according to best available information if required) of all properties directly affected by any route.

Figures 3-1A-D of the Environmental Assessment and Routing Study, included as Attachment No. 1, depict on an aerial photograph: (1) the location of each link that is used in the alternative routes filed in this CCN, with each link identified; (2) the locations of all major public roads, including all federal and state roadways; (3) the locations of all known habitable structures on properties directly affected by any link used in the

alternative routes; and (4) the boundaries (approximate or estimated according to available county tax information) of all properties directly affected by any link used in an alternative route. In addition, the locations of radio transmitters and other electronic installations, airstrips, irrigated pasture or cropland, parks and recreational areas, historical and archeological sites, and environmentally sensitive areas, if any, are depicted.

For each route, cross-reference each habitable structure (or group of habitable structures) and directly affected property identified on the maps or photographs with a list of corresponding landowner names and addresses and indicate which route segment affects each structure/group or property.

Attachment No. 8 is a table that cross-references each habitable structure and directly affected property identified in Figures 3-1A-D of Attachment No. 1; the cross-reference table includes corresponding landowner names and addresses and indicates which links and alternative routes affect each structure or property.

20. Permits:

List any and all permits and/or approvals required by other governmental agencies for the construction of the proposed project. Indicate whether each permit has been obtained.

The following permits/approvals will be obtained after PUC approval of the CCN and prior to beginning construction, if necessary:

1. Texas Department of Transportation ("TxDOT") permit(s) for crossing a state-maintained roadway.
2. A Storm Water Pollution Prevention Plan ("SWPPP") will be prepared and a Notice of Intent will be submitted to the Texas Commission on Environmental Quality under the Texas Pollutant Discharge Elimination System ("TPDES") program.
3. A cultural resources survey plan will be developed with the Texas Historical Commission ("THC") for the proposed project.
4. Consultation with the U.S. Army Corps of Engineers will occur following the Commission's approval of this Application to determine appropriate requirements under Section 404/Section 10 Permit criteria.
5. Consultation with the U.S. Fish and Wildlife Service will occur following the Commission's approval of this Application to determine appropriate requirements under the Endangered Species Act.
6. Consultation with the Federal Aviation Administration ("FAA") will occur following the Commission's approval of this Application to determine appropriate requirements and notification under Federal Aviation Regulations (14 CFR Part 77).

21. Habitable structures:

For each route list all single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline if the proposed project will be constructed for operation at 230kV or less, or within 500 feet of the centerline if the proposed project will be constructed for operation at greater than 230kV. Provide a general description of each habitable structure and its distance from the centerline of the route. In cities, towns or rural subdivisions, houses can be identified in groups. Provide the number of habitable structures in each group and list the distance from the centerline of the route to the closest and the farthest habitable structure in the group. Locate all listed habitable structures or groups of structures on the routing map.

A listing of all habitable structures located within 500 feet of each proposed link centerline used in the alternative routes filed in this CCN, along with a general description of each habitable structure and its distance from the centerline of the link and the associated alternative routes, is provided in the table in Attachment No. 9.

Figures 3-1A-D (Appendix H map pockets), located in Attachment No. 1, depict the locations of all known habitable structures directly affected by the links used in the proposed alternative routes.

22. Electronic Installations:

For each route, list all commercial AM radio transmitters located within 10,000 feet of the center line of the route, and all FM radio transmitters, microwave relay stations, or other similar electronic installations located within 2,000 of the center line of the route. Provide a general description of each installation and its distance from the center line of the route. Locate all listed installations on a routing map.

There are no known AM radio transmitters located within 10,000 feet of the centerline of any of the alternative route links and no known FM radio transmitters located within 2,000 feet of the centerline of any of the alternative route links.

There are twelve other communication towers located within 2,000 feet of the centerline of the filed alternative routes. A listing of these communication towers located within 2,000 feet of each proposed link centerline used in the alternative routes filed in this CCN, along with a general description of each tower and its distance from the centerline of the link and the associated alternative routes is provided in the table in Attachment No. 10.

Please refer to Section 3.7.7, page 3-77, and Section 7.7.6, page 7-24, of the Environmental Assessment and Routing Study included as Attachment No. 1.

23. Airstrips:

For each route, list all known private airstrips within 10,000 feet of the center line of the project. List all airports registered with the Federal Aviation Administration (FAA) with at least one runway more than 3,200 feet in length that are located within 20,000 feet of the center line of any route. For each such airport, indicate whether any transmission structures will exceed a 100:1 horizontal slope (one foot in height for each 100 feet in distance) from the closest point of the closest runway. List all listed airports registered with the FAA having no runway more than 3,200 feet in length that are located within 10,000 feet of the center line of any route. For each such airport, indicate whether any transmission structures will exceed a 50:1 horizontal slope from the closest point of the closest runway. List all heliports located within 5,000 feet of the center line of any route. For each such heliport, indicate whether any transmission structures will exceed a 25:1 horizontal slope from the closest point of the closest landing and takeoff area of the heliport. Provide a general description of each listed private airstrip, registered airport, and heliport; and state the distance of each from the center line of each route. Locate and identify all listed airstrips, airports, and heliports on a routing map.

Halff's review of federal and state aviation/airport maps and directories, aerial photo interpretation, and reconnaissance surveys identified: no private airstrips within 10,000 feet of the centerline of the proposed routes; four FAA-registered airports with a runway greater than 3,200 feet in length within 20,000 feet of the proposed routes; six FAA-registered airports without a runway greater than 3,200 feet in length within 10,000 feet of the proposed routes; and three heliports within 5,000 feet of the proposed routes.

A listing of the airstrips, airports and heliports located near the filed alternative routes, along with a general description of each facility and its distance from the centerline of the link and the associated alternative routes is provided in the table in Attachment No. 11.

Please refer to Section 3.7.6, pages 3-74 through 3-77, and Section 7.7.5, pages 7-21 through 7-24, of the Environmental Assessment included as Attachment No. 1.

24. Irrigation Systems:

For each route identify any pasture or cropland irrigated by traveling irrigation systems (rolling or pivot type) that will be traversed by the route. Provide a description of the irrigated land and state how it will be affected by each route (number and type of structures etc.). Locate any such irrigated pasture or cropland on a routing map.

Results of aerial photography interpretation and field reconnaissance surveys did not identify any pasture or cropland irrigated by traveling irrigation systems (rolling or pivot type) that will be traversed by any of the alternative routes of the Proposed Transmission Line Project.

Please refer to Tables 7-2 and 7-3 in Appendix E of the Environmental Assessment and Routing Study included as Attachment No. 1.

25. Notice:

Notice is to be provided in accordance with 16 TAC §22.52.

A. Provide a copy of the written direct notice to owners of directly affected land. Attach a list of the names and addresses of the owners of directly affected land receiving notice.

A copy of the written direct notice, with attached map, that will be provided to the owners of the directly-affected land is included as Attachment No. 12. The names and addresses of the owners of the directly-affected land, to whom notice will be mailed by first-class mail, are included as Attachment No. 8.

B. Provide a copy of the written notice to utilities that are located within five miles of the routes.

A copy of the written direct notice, with attached map, that will be provided to utilities that are located within five miles of the routes is included as Attachment No. 13.

C. Provide a copy of the written notice to county and municipal authorities, and the Department of Defense Siting Clearinghouse. Notice to the DoD Siting Clearinghouse should be provided at the email address found at http://www.acq.osd.mil/dodsc/.

A representative copy of the written notice, with attached map, that will be provided to county authorities is included as Attachment No. 13. The following county authorities will be provided the requisite notice on or before the filing date as required by Commission rules:

Denton County, County Judge
Denton County, County Commissioners – Precincts 1, 2, 3, and 4
Denton County, County Administrator
Denton County, Historical Commission
Wise County, County Judge
Wise County, County Commissioners – Precincts 1, 2, 3, and 4
Wise County, Historical Commission

A representative copy of the written notice, with attached map, that will be provided to municipal authorities is included as Attachment No. 13. The following municipal authorities will be provided the requisite notice on or before the filing date, as required by Commission rules:

- Town of Argyle: Mayor, Town Administrator, Assistant Town Secretary, Council Members, Community Development Director

- City of Aurora: Mayor, Mayor Pro Tem, Interim City Administrator, City Secretary, Council Members
- Town of Bartonville: Mayor, Mayor Pro Tem, Town Administrator, Town Secretary, Council Members
- Town of Corral City (formerly known as Draper): Mayor, Mayor Pro Tem, Aldermen
- City of Denton: Mayor, Mayor Pro Tem, City Manager, City Secretary, Economic Development Director, Council Members
- Town of DISH: Mayor, Commissioners
- Town of Double Oak: Mayor, Mayor Pro Tem, Deputy Mayor Pro Tem, Town Secretary, Council Members
- Town of Flower Mound: Mayor, Mayor Pro Tem, Deputy Mayor Pro Tem, Town Manager, Town Secretary, Economic Development Director, Council Members
- City of Fort Worth: Mayor, City Manager, Assistant City Managers, City Secretary, Development Services Director, Council Members
- City of Haslet: Mayor, Mayor Pro Tem, City Secretary, Council Members
- City of Justin: Mayor, Mayor Pro Tem, Interim City Manager, Assistant City Manager, City Secretary, Council Members
- City of Keller: Mayor, Mayor Pro Tem, City Manager, City Secretary, Economic Development Manager, Council Members
- City of New Fairview: Mayor, Mayor Pro Tem, City Administrator, City Operations Administrator, City Secretary, Council Members
- City of Newark: Mayor, Mayor Pro Tem, City Secretary, Council Members
- Town of Northlake: Mayor, Town Manager, Town Secretary, Council Members
- City of Rhome: Mayor, Mayor Pro Tem, City Administrator, City Secretary, Council Members
- City of Roanoke: Mayor, Mayor Pro Tem, City Manager, City Secretary, Council Members
- City of Southlake: Mayor, Mayor Pro Tem, Deputy Mayor Pro Tem, City Manager, Assistant City Manager, City Secretary, Council Members
- Town of Trophy Club: Mayor, Interim Town Manager, Town Secretary, Community Director, Council Members
- Town of Westlake: Mayor, Mayor Pro Tem, Town Manager, Town Secretary, Council Members

A representative copy of the written notice, with attached map, that will be provided to the Department of Defense Siting Clearinghouse by email at: osd.dod-siting-clearinghouse@mail.mil, and by first-class mail to the address below on the date this Application is filed, is included as Attachment No. 13.

DOD Siting Clearinghouse
3400 Defense Pentagon, Room 5C646
Washington, DC 20301-3400

D. Provide a copy of the notice that is to be published in newspapers of general circulation in the counties in which the facilities are to be constructed. Attach a list of the newspapers that will publish the notice for this application. After the notice is published, provide the publisher's affidavits and tear sheets.

Notice of this Application will be published in the *Denton Record Chronicle*, a newspaper of general circulation in Denton County, and in the *Wise County Messenger*, a newspaper of general circulation in Wise County. A representative copy of the general public notice to be published is included as Attachment No. 14.

Proof of publication will be provided in the form of a publisher`s affidavit and tear sheet following publication of this notice.

For a CREZ application, in addition to the requirements of 16 TAC § 22.52 the applicant shall, not less than twenty-one (21) days before the filing of the application, submit to the Commission staff a "generic" copy of each type of alternative published and written notice for review. Staff's comments, if any, regarding the alternative notices will be provided to the applicant not later than seven days after receipt by Staff of the alternative notices, Applicant may take into consideration any comments made by Commission staff before the notices are published or sent by mail.

Not applicable.

A copy of the application and all attachments will also be provided to the Texas Office of Public Utility Counsel ("OPUC"). A representative copy of the written notice, with attached map, that will be provided to OPUC is included as Attachment No. 13.

26. Parks and Recreation Areas:

For each route, list all parks and recreational areas owned by a governmental body or an organized group, club, or church and located within 1,000 feet of the center line of the route. Provide a general description of each area and its distance from the center line. Identify the owner of the park or recreational area (public agency, church, club, etc.). List the sources used to identify the parks and recreational areas. Locate the listed sites on a routing map.

A review of federal, state, and local websites and maps, as well as field reconnaissance surveys, identified several parks and recreational areas owned by a government body or an organized group, club, or church within 1,000 feet of the centerline of the alternative routes. The table in Attachment No. 16 provides a general description of each area, its distance from the proposed route centerlines and the park or recreational area's ownership.

Please refer to Section 3.7.2, pages 3-66 through 3-68, and Section 7.7.2, pages 7-17 through 7-19, of the Environmental Assessment and Routing Study, included as Attachment No. 1.

27. Historical and Archeological Sites:

For each route, list all historical and archeological sites known to be within 1,000 feet of the center line of the route. Include a description of each site and its distance from the center line. List the sources (national, state or local commission or societies) used to identify the sites. Locate all historical sites on a routing map. For the protection of the sites, archeological sites need not be shown on maps.

Research and a records review were conducted of the Texas Historical Commission ("THC") Historic Sites Atlas and the THC Archaeological Sites Atlas, to locate known cultural resources within 1,000 feet of the centerline of any route for the Proposed Transmission Line Project. THC records indicated two Historic Texas Cemeteries and one historical marker are within 1,000 feet of the alternative route centerlines. Two archeological sites were identified within 1,000 feet of the alternative route centerlines. The distances from these cultural resources to the closest route links and the corresponding routes are provided in the table in Attachment No. 17.

Please refer to Section 3.8, pages 3-77 through 3-92, and Section 7.8, pages 7-24 through 7-29, of the Environmental Assessment and Routing Study, included as Attachment No. 1.

28. Coastal Management Program:

For each route, indicate whether the route is located, either in whole or in part, within the coastal management program boundary as defined in 31 T.A.C. §503.1. If any route is, either in whole or in part, within the coastal management program boundary, indicate whether any part of the route is seaward of the Coastal Facilities Designation Line as defined in 31 T.A.C. §19.2(a)(21). Using the designations in 31 T.A.C. §501.3(b), identify the type(s) of Coastal Natural Resource Area(s) impacted by any part of the route and/or facilities.

The Proposed Transmission Line Project is not located, either in whole or in part, within the coastal management program boundary as defined in 31 TAC §503.1.

29. Environmental Impact:

Provide copies of any and all environmental impact studies and/or assessments of the project. If no formal study was conducted for this project, explain how the routing and construction of this project will impact the environment. List the sources used to identify the existence or absence of sensitive environmental areas. Locate any environmentally sensitive areas on a routing map. In some instances, the location of the environmentally sensitive areas or the location of protected or endangered species should not be included on maps to ensure preservation of the areas or species.

The Environmental Assessment and Routing Study prepared by Halff is included as Attachment No. 1.

Within seven days after filing the application for the project, provide a copy of each environmental impact study and/or assessment to the Texas Parks and Wildlife Department (TPWD) for its review at the address below. Include with this application a copy of the letter of transmittal with which the studies/assessments were or will be sent to the TPWD.

Wildlife Habitat Assessment Program
Wildlife Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

The applicant shall file an affidavit confirming that the letter of transmittal and studies/assessments were sent to TPWD.

A copy of the Environmental Assessment and Application will be provided to the Texas Parks and Wildlife Department for review within seven days following the filing of the Application for the Proposed Transmission Line Project. Please refer to Attachment No. 18 for a copy of the transmittal letter with which the Environmental Assessment and Application will be sent to the TPWD.

30. Affidavit

Attach a sworn affidavit from a qualified individual authorized by the applicant to verify and affirm that, to the best of their knowledge, all information provided, statements made, and matters set forth in this application and attachments are true and correct.

31. List of Attachments to the CCN Application

Attachment No. 1:	Environmental Assessment
Attachment No. 2:	Layout of the Proposed Ramhorn Hill Switch and Layout of the Proposed Dunham Switch
Attachment No. 3:	Cost Estimates

Attachment No. 4:	ERCOT's Independent Review of Oncor Roanoke Area Upgrades Project dated July 19, 2022
Attachment No. 5:	Transmission Area Map showing ERCOT's Recommended Roanoke Area Upgrades
Attachment No. 6:	Schematic of Transmission System in Proximate Area of Project
Attachment No. 7:	Routing Memorandum of Brenda J. Perkins
Attachment No. 8:	Listing of Directly Affected Land Owners for Notice
Attachment No. 9:	Habitable Structures within 500 Feet of the Filed Alternative Routes
Attachment No. 10:	Electronic Installations within 2,000 Feet of the Filed Alternative Routes
Attachment No. 11:	Aircraft Landing Facilities Near the Filed Alternative Routes
Attachment No. 12:	Copy of Notice to Directly Affected Land Owners
Attachment No. 13:	Copy of Notice to Utilities, Counties, Municipalities, OPUC, and Department of Defense Siting Clearinghouse
Attachment No. 14:	Copy of Newspaper/Public Notice
Attachment No. 15:	Copy of Courtesy Notice to Pipeline Owners/Operators
Attachment No. 16:	Park and Recreational Areas within 1,000 Feet of the Filed Alternative Routes
Attachment No. 17:	Cultural Resources within 1,000 Feet of the Filed Alternative Routes
Attachment No. 18:	Transmittal Letter to TPWD
Attachment No. 19:	Affidavit

ENVIRONMENTAL ASSESSMENT AND ALTERNATIVE ROUTE ANALYSIS

for the proposed

Ramhorn Hill Switch—Dunham Switch 345 kV Transmission Line Project in Denton and Wise Counties, Texas

Oncor Electric Delivery Company LLC
P.O. Box 970
Fort Worth, Texas 76101

By

HALFF®
1201 North Bowser Road
Richardson, Texas 75081

MAY 2023

ATTACHMENT NO. 1

THIS PAGE LEFT BLANK INTENTIONALLY

TABLE OF CONTENTS

APPENDICES

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS

A	Ampere
AD	*anno Domini* (after Christ)
AM	Amplitude modulation (e.g., AM Tower)
amsl	Above Mean Sea Level
APLIC	Avian Power Line Interaction Committee
BC	Before Christ
BEG	Bureau of Economic Geology
BMP	Best Management Practice
BP	Before Present
BRIT	Botanical Research Institute of Texas
C	Candidate
CATEX	Categorical Exclusion
CCN	Certificate of Convenience and Necessity
CFR	Code of Federal Regulations
Cornell	Cornell Lab of Ornithology
DM	Recovered, Delisted, and Being Monitored
DoD	United States Department of Defense
E	State Listed Endangered Species
e.g.	*exempli gratia* (for example)
EMST	Ecological Mapping Systems of Texas
EOID	Element Occurrence Identification number
EPA	United States Environmental Protection Agency
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
et al.	*et alia* (and others)
etc.	*et cetera* (and the rest or and so forth)
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FM	Farm-to-Market Road (e.g., FM 1171)
FM	Frequency Modulation (e.g., FM Tower)
GBIF	Global Biodiversity Information Facility
GCD	Groundwater Conservation District
GIS	Geographic Information System
GLO	Texas General Land Office
HPA	High Probability Area
i.e.	*id est* (that is)
IH	Interstate Highway
Integra	Integra Realty Resources
ISD	Independent School District
IUCN	International Union for Conservation of Nature and Natural Resources
kV	kilovolt (1,000 Volts)

ACRONYMS AND ABBREVIATIONS

LE	Federally Listed Endangered Species
LRR	Land Resource Region
LT	Federally Listed Threatened Species
LWCF	Land and Water Conservation Fund Act
MBTA	Migratory Bird Treaty Act
MLRA	Major Land Resource Area
NCTCOG	North Central Texas Council of Governments
NDD	Natural Diversity Database
NEPA	National Environmental Policy Act
NETR	Nationwide Environmental Title Research
NGS	National Geographic Society
NHD	National Hydrology Data Set
NPAT	Native Prairies Association of Texas
NRCS	Natural Resources Conservation Service (an agency of the USDA)
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWP	Nationwide Permit
Oncor	Oncor Electric Delivery Company LLC
OTHM	Official Texas Historical Markers
PCN	Pre-construction Notification
PT	Proposed Threatened
PUCT	Public Utility Commission of Texas
ROW	Right-of-Way
RRC	Railroad Commission of Texas
SAL	State Antiquities Landmarks
SCS	Soil Conservation Service (agency was renamed NRCS, see above)
Section 404	Section 404 of the Clean Water Act
SFR	Single-Family Residence
SGCN	Species of Greatest Conservation Need
SH	State Highway
sp.	Species
spp.	Species (plural)
SWPPP	Storm Water Pollution Prevention Plan
T	State Listed Threatened Species
TARL	Texas Archeological Research Laboratory
TASA	Texas Archeological Sites Atlas
TDA	Texas Department of Agriculture
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TNRIS	Texas Natural Resource Information System
TPWD	Texas Parks and Wildlife Department
TSHA	Texas State Historical Association
TWDB	Texas Water Development Board

ACRONYMS AND ABBREVIATIONS

TxDOT	Texas Department of Transportation
U.S.	United States
US	United States Highway
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USNPS	United States National Park Service
var.	Variation

1.0 PROJECT DESCRIPTION

1.1 Scope of the Project

Oncor Electric Delivery Company LLC (Oncor) proposes to construct a 345-kilovolt (kV) transmission line from the proposed Ramhorn Hill Switch, which will be located approximately two miles south of the intersection of United States Highway (US) 287 and State Highway 114 near Rhome, Texas, to the proposed Dunham Switch, which will be located approximately 1.4 miles southeast of the intersection of US 377 and Farm-to-Market Road (FM) 1171 in Flower Mound, Texas. FM 1171 is also regionally known as Cross Timbers Road. The Proposed Transmission Line Project will include a double-circuit 345 kV transmission line that will accommodate a future 138 kV circuit on the same structures. The proposed transmission line project will be approximately 19-23 miles in length. Each of these project endpoints is shown relative to the location of the nearby towns and communities and the state and county boundaries in **Figure 1-1**.

Oncor retained Halff Associates, Inc. (Halff) to identify and evaluate alternative routes and to prepare an Environmental Assessment and Alternative Route Analysis report to support its application for a Certificate of Convenience and Necessity (CCN). The routing study is incorporated into this document. This report has been prepared to provide information and address the requirements of Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, Public Utility Commission of Texas (PUCT) Procedural Rules Section 22.52(a)(4), PUCT Substantive Rules Section 25.101, and the PUCT CCN application form for a proposed transmission line. This report may also be used in support of local, state, or federal permitting activities that may be required for the proposed project.

To assist Halff in the evaluation of the proposed project, Oncor provided information regarding the need, construction practices, and Right-of-Way (ROW) requirements for the proposed project. Oncor also provided information regarding the engineering and design requirements for the routing study.

The following sections include a description of the proposed project (**Section 1.0**), an explanation of the methodology used to select alternative routes (**Section 2.0**), a description of the existing environmental and social conditions in the study area (**Section 3.0**), and a description of the preliminary alternative routes that were developed

by this process (**Section 4.0**). This document further includes a description of the public involvement program (**Section 5.0**) and a discussion of changes to preliminary alternative route links following the receipt of public input (**Section 6.0**). An evaluation of expected environmental impacts is presented in **Section 7.0**, followed by a list of report preparers (**Section 8.0**), and bibliographical references used in preparing this report (**Section 9.0**). The appendices include copies of agency correspondence (**Appendix A**), public participation meeting information (**Appendix B**), preliminary route modifications (**Appendix C**), link composition of alternative routes (**Appendix D**), alternative route environmental data (**Appendix E**), habitable structure, parks and recreational areas, aircraft landing facilities, and electronic installation data (**Appendix F**), a supplemental routing assessment and supplemental routing guidelines for federal lands (**Appendix G**), and environmental and land use constraints maps (**Appendix H**).

1.2 Need for the Project

Oncor will provide support for the purpose and need for the proposed project as a part of the CCN application.

1.3 Description of Proposed Construction

1.3.1 Transmission Line Design

For the proposed project, Oncor anticipates the use of a self-supporting, double-circuit steel pole that will accommodate a future 138 kV circuit (**Figure 1-2**). Design criteria will comply with applicable statutes, the appropriate edition of the National Electrical Safety Code, and Oncor's standard design practices. The typical structure height is anticipated to be 120-175 feet, but pole height will vary depending on terrain. The results of site-specific geotechnical and engineering studies will be used to determine the appropriate design and placement of the structures.

1.3.2 Right-of-Way Requirements

The proposed ROW width for the proposed project will be approximately 100 feet in most circumstances. The ROW normally extends an equal distance on both sides of the transmission line centerline. Additional ROW may be required at line angles or dead ends or for terrain-related constraints. Reduced ROW may also be required in certain constrained areas.

1.3.3 Clearing Requirements

All brush and undergrowth within the ROW will be removed and maintained. For areas requiring hand clearing, vegetation will be cut level with the ground. No stump exceeding two inches above the ground will remain. Any tree located in a fence line having a diameter greater than 4 inches will be cut even with the top of the fence. Stumps located on hillsides or uneven ground will be cut where a mowing machine can pass over the ROW without striking any stumps, roots, or snags.

1.3.4 Monopole Structure Assembly and Erection

Foundations for the monopole structures will be completed before erecting the structures. All monopole structures will have an anchor bolted foundation. A hole will be augered into the ground at each structure location, an anchor bolt cage will be placed in addition to steel rebar to reinforce the foundation, and the hole will be filled with concrete. Depth and diameter of the foundation will vary depending on the design of the structure specific to that location.

1.3.5 Conductor Stringing

Once a series of structures has been erected along the transmission line centerline, the conductor stringing phase can begin. Specialized equipment will be attached to properly support and protect the conductor during the pulling, tensioning, and sagging operations. Once conductors and shield wire are in place and tension and sag have been verified, conductor and shield wire hardware is installed at each suspension point to maintain conductor position. Conductor stringing continues until the transmission line construction is complete. All construction equipment will be removed after construction is completed. All temporary culverts and environmental controls previously installed will be removed once construction is completed.

THIS PAGE LEFT BLANK INTENTIONALLY

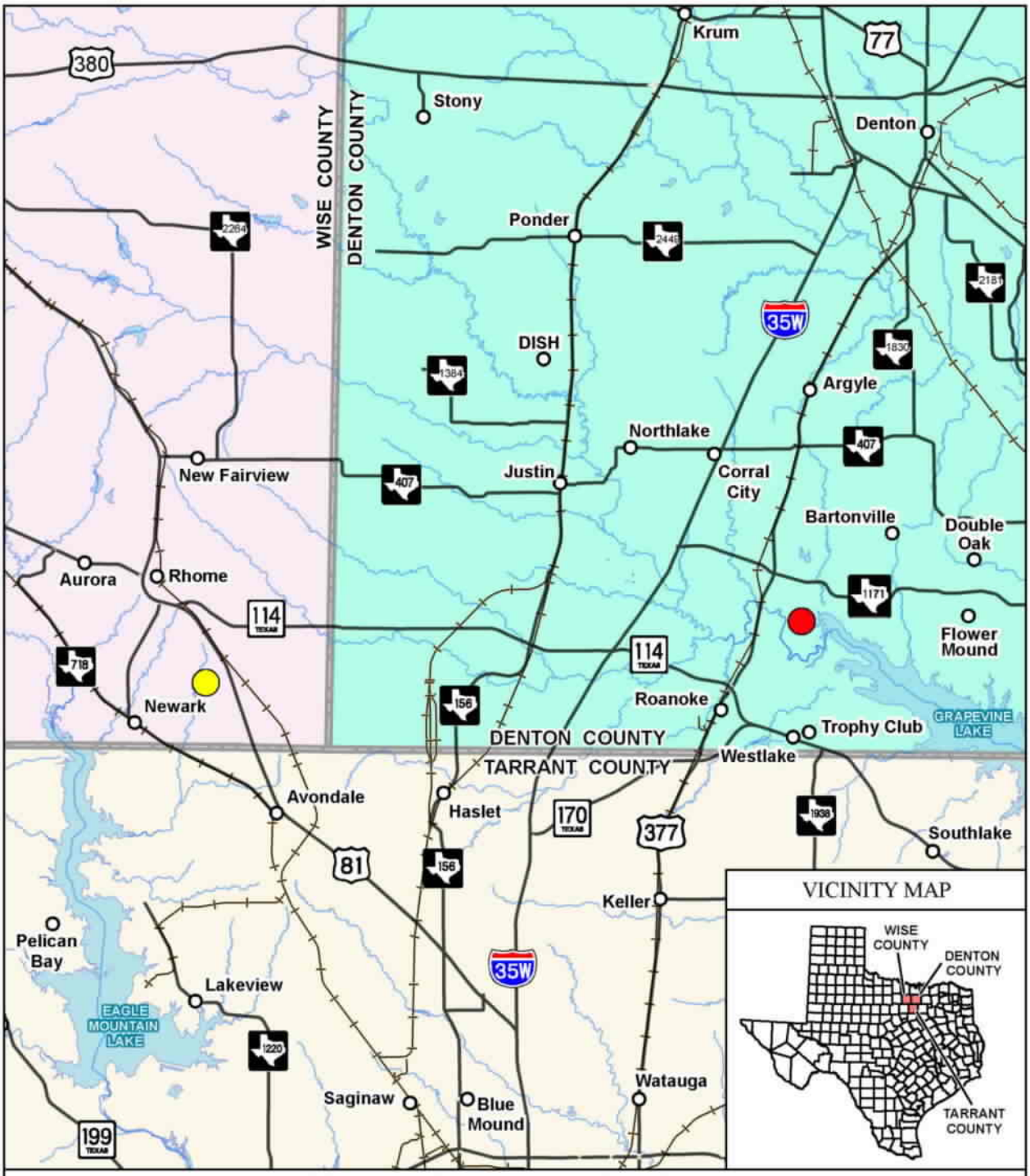


FIGURE 1-1. PROJECT LOCATION MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH

345 kV TRANSMISSION LINE PROJECT

COUNTY BOUNDARY

PROPOSED DUNHAM SWITCH

PROPOSED RAMHORN HILL SWITCH

RAILROAD

MAJOR ROAD

0 2 4 8

SCALE IN MILES

ONCOR

BASE MAP: TEXAS NATURAL RESOURCES INFORMATION SYSTEM (TNRIS), 2023

THIS PAGE LEFT BLANK INTENTIONALLY

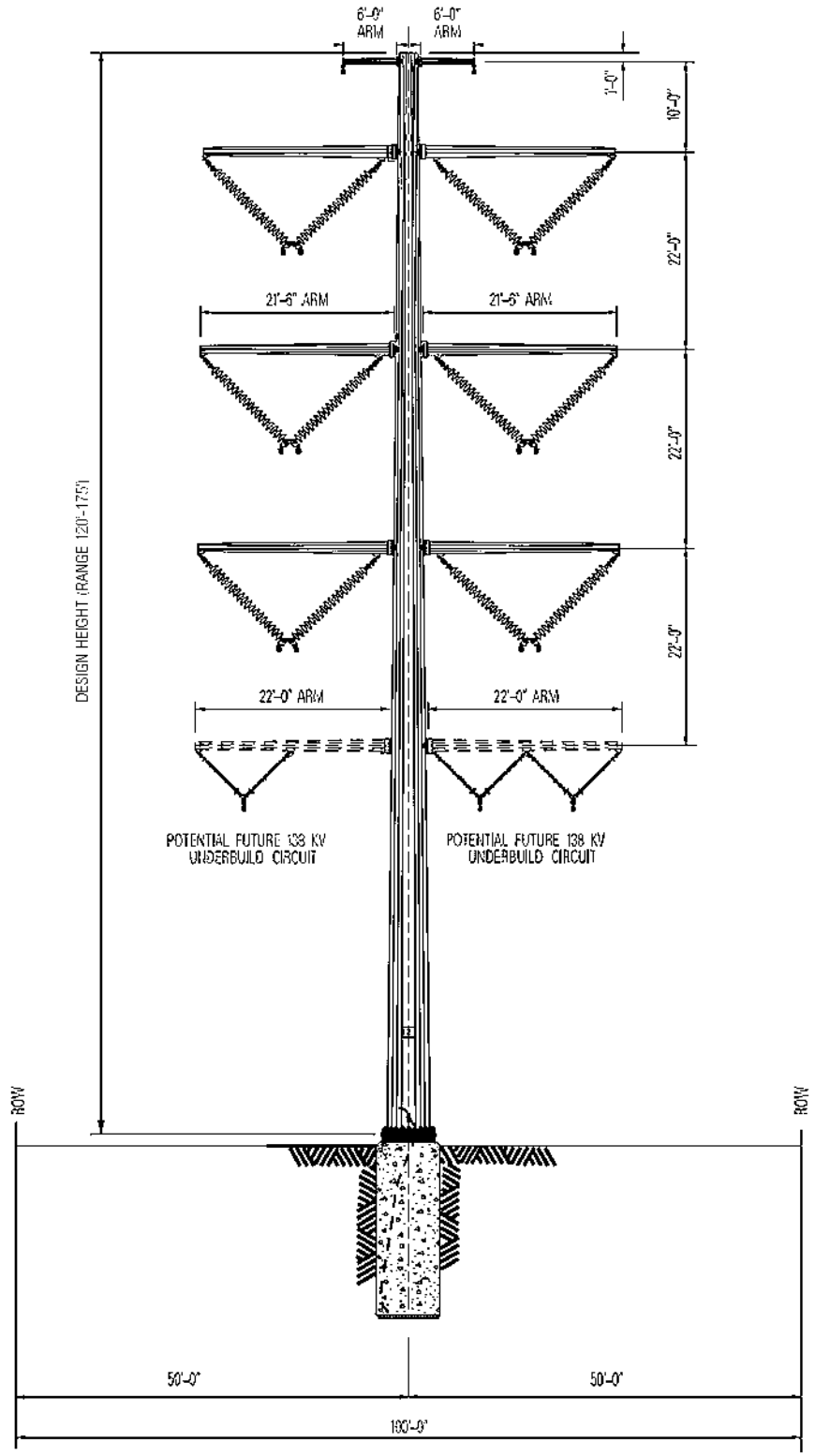


FIGURE 1-2. TYPICAL DOUBLE-CIRCUIT 345 kV STEEL POLE WITH 138 kV UNDERBUILD

Figure not to Scale

THIS PAGE LEFT BLANK INTENTIONALLY

2.0 ROUTE SELECTION METHODOLOGY

The objective of the routing study is to identify and evaluate alternative transmission line routes for the proposed project. Throughout this report, the terms "environment" and "environmental" include the human and natural environment. Halff utilized a comprehensive transmission line routing methodology to identify and evaluate alternative transmission line routes. Potential routes were identified and evaluated in accordance with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, PUCT Substantive Rules Section 25.101 (including the PUCT policy of prudent avoidance), PUCT Procedural Rules Section 22.52(a)(4), and the PUCT CCN Application Form for a Proposed Transmission Line.

The following subsections provide a description of the route selection methodology, which includes study area delineation, data collection, reconnaissance surveys, constraints mapping, identification of preliminary alternative routes, public involvement programming, adjustment of preliminary alternative routes following field review and the input from public participation meetings, and evaluation of the alternative routes.

2.1 Study Area Delineation

The first step in the identification of alternative routes was defining a study area. This area needed to encompass the proposed endpoints (i.e., the Ramhorn Hill and Dunham switches), and be large enough that a reasonable number of forward progressing, geographically diverse alternative routes could be investigated and identified. The purpose of delineating the study area for the proposed project was to establish boundaries and limits for the information gathering process (i.e., identifying environmental and land use constraints). The delineation of the study area also allowed Halff to focus its evaluation within a specific area.

Halff reviewed United States Geological Survey (USGS) 1:24,000 scale topographic maps (USGS, 1955-1992) and aerial photography (NearMap, 2023) to develop and refine the study area boundary for the proposed project. Halff located and depicted the project endpoints on the various maps and identified major features in the study area, such as Grapevine Lake, Interstate Highway (IH) 35W, FM 1171, FM 407, State Highway (SH) 114, FM 156, and numerous municipalities. **Figure 2-1** shows the study area boundary

Halff delineated overlaid on aerial photography and general constraints as a result of the above-described process.

Figure 2-2 provides a more detailed map of the study area, including the city limit boundaries for the numerous incorporated communities in Denton and Wise counties. The study area is rectangular in shape and includes the junctions of local US, SH, and FM roads, and the western reaches of Grapevine Lake. The longer axes (i.e., north and south boundaries) traverse approximately 17.6 miles, whereas the shorter axes (i.e., east and west boundaries) traverse approximately 8.5 miles. As shown in **Figure 2-2**, the public road network is expansive given the urban/suburban setting and proximity to several major state and interstate road networks.

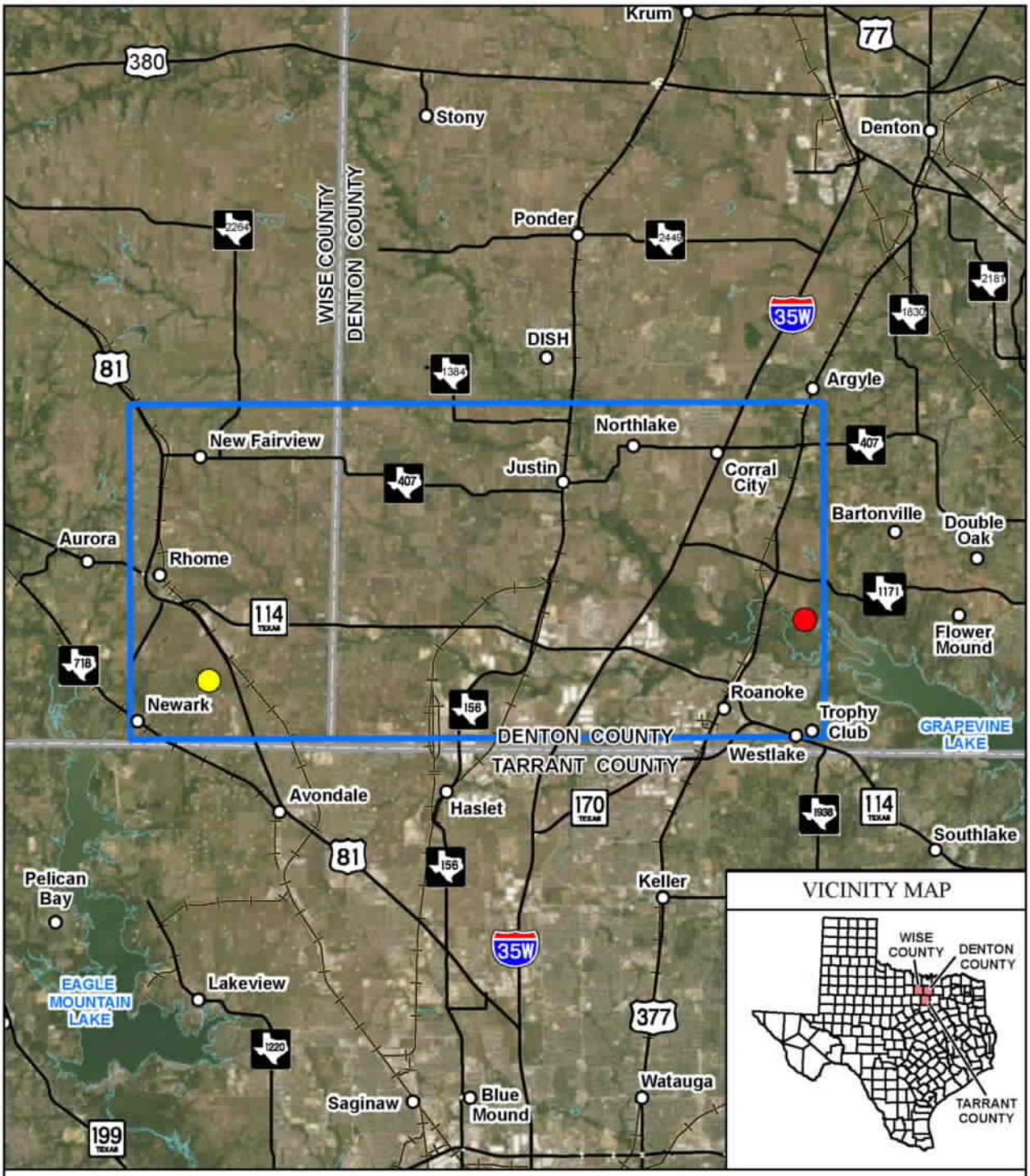


FIGURE 2-1. PROJECT AREA MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH

345 kV TRANSMISSION LINE PROJECT

THIS PAGE LEFT BLANK INTENTIONALLY

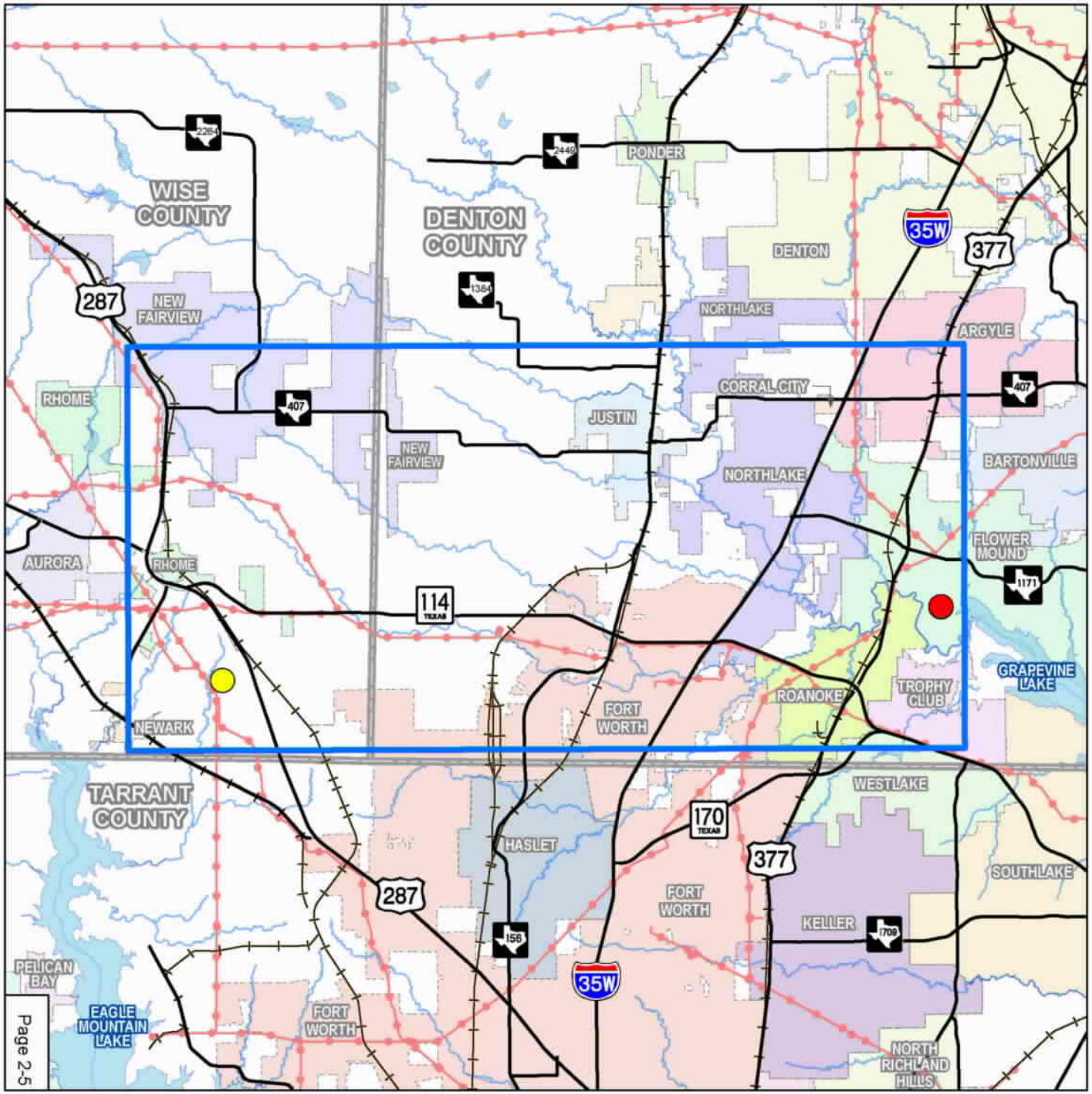


FIGURE 2-2.
STUDY AREA BOUNDARY MAP
RAMHORN HILL SWITCH — DUNHAM SWITCH
345 kV TRANSMISSION LINE PROJECT

LEGEND

- STUDY AREA
- PROPOSED DUNHAM SWITCH
- PROPOSED RAMHORN HILL SWITCH
- RAILROAD
- MAJOR ROAD
- EXISTING TRANSMISSION LINE
- RIVER / STREAM
- MAJOR WATERBODY
- MUNICIPAL AREA BOUNDARIES

SOURCE: TNRIS, 2023

MAP VIEW EXTENT

0 1.5 3 6

SCALE IN MILES

ONCOR

THIS PAGE LEFT BLANK INTENTIONALLY

2.2 Data Collection

2.2.1 Solicitation of Information from Local, State, and Federal Officials and Agencies

Once the study area boundary was identified, Halff initiated a variety of data collection activities. One of the first such activities was the development of a list of officials to whom a consultation letter regarding the proposed project would be mailed. The purpose of the consultation letters was to inform the various officials and agencies of the proposed project and give them the opportunity to provide information and feedback they may have regarding the study area. Halff utilized regional planning websites and confirmation via telephone calls to identify incorporated cities and towns within and near the study area and identify the local officials within each city and town. State and federal agencies that may have potential permitting requirements or other interests in the proposed project were also identified. Correspondence was sent to the following federal agencies or state agencies, and local officials and departments. Copies of all correspondence with these agencies and officials are included in **Appendix A**.

FEDERAL AGENCIES/OFFICIALS

- Federal Aviation Administration (FAA) – Southwest Region
- Federal Emergency Management Agency (FEMA) – Region VI
- Natural Resources Conservation Service (NRCS) – Denton Service Center
- U.S. Army Corps of Engineers (USACE) – Fort Worth District Regulatory Division and Grapevine Lake Project Office
- U.S. Department of Defense (DoD) – Military Aviation and Installation Assurance Siting Clearinghouse
- U.S. Fish and Wildlife Service (USFWS) – Arlington Field Office

STATE AGENCIES/OFFICIALS

- Railroad Commission of Texas (RRC) – Austin Office
- Texas Archeological Research Laboratory (TARL)
- Texas Department of Transportation (TxDOT) – Dallas District, Aviation Division, and Office of Environmental Affairs
- Texas General Land Office (GLO)
- Texas Historical Commission (THC)

- Texas Parks and Wildlife Department (TPWD) – Wildlife Habitat Assessment Program and District Leader
- Texas Water Development Board (TWDB)

REGIONAL OR INDEPENDENT AGENCIES/OFFICIALS

- North Central Texas Council of Governments (NCTCOG)
- Trinity River Authority

COUNTY AGENCIES/OFFICIALS

- Denton County
- Denton County Historical Commission
- Wise County
- Wise County Historical Commission

CITY AGENCIES/OFFICIALS (most include mayor, council members, city staff, and economic development boards)

- Town of Argyle
- Town of Bartonville
- Town of Corral City
- Town of Flower Mound
- City of Fort Worth
- City of Haslet
- City of Justin
- City of New Fairview
- City of Newark
- Town of Northlake
- City of Rhome
- City of Roanoke
- Town of Trophy Club
- Town of Westlake

SCHOOL DISTRICTS/OFFICIALS

- Argyle Independent School District (ISD)
- Decatur ISD
- Northwest ISD

Other data collection activities included a file and record review of various regulatory agency databases, a review of published literature, and a review of various maps, including recent aerial photography (NearMap, 2023), seamless USGS topographic maps (USGS, 1955-1992; National Geographic Society [NGS], 2019), county highway maps, and county appraisal district land parcel boundary maps (Integra Realty Resources [Integra], 2022). Findings of the data collection activities are detailed in **Section 3.0**.

2.2.2 Reconnaissance Surveys

Halff conducted multiple reconnaissance surveys of the study area to develop and confirm the findings of the above-mentioned research and data collection activities and to identify existing conditions or constraints that may not have been previously noted. Results from the site visits were also utilized to assist in the alternative route selection process. Ground reconnaissance surveys were conducted by visual observations of study area characteristics from public roads and public ROW located within the study area. Reconnaissance survey information was noted in the field and geographically referenced to digital aerial photography base maps. Reconnaissance surveys were conducted on the following dates:

- September 4, 2022
- November 23, 2022
- December 7, 2022
- December 8, 2022
- January 14, 2023
- February 16, 2023
- March 4, 2023
- April 25, 2023

The data collection started with gathering information from public sources and continued up to the point of finalization of all alternative routes. Results of the various data collection activities (e.g., solicitation of information from local, state, and federal officials and agencies, file/record review, and visual reconnaissance surveys) are included in **Section 3.0** and **Section 7.0** of this report.

2.3 Constraints Mapping

The data and information collected from the activities outlined above were used to develop an environmental and land use constraints map. The constraints map, public maps, aerial photography, reconnaissance surveys, and other research material were used to identify and select potential preliminary alternative routes within the study area. In this context, constraints are land use or landscape features that may affect or be affected by the location of a transmission line. The goal of this approach is to identify areas where constraints are absent or fewer, or those areas with a lower likelihood of containing existing natural or human resources that could be affected by a transmission line. For linear projects, crossing over or near certain constraints is often unavoidable. In these instances, special considerations or mitigation measures may be used, though there is no law or regulation that would otherwise prohibit the proximity of a transmission line.

2.4 Identification of Preliminary Alternative Route Links

Upon completion of initial data collection activities and the constraint mapping process, the next step was to identify preliminary alternative route links to connect the project endpoints. Halff utilized the following sources of information to identify the preliminary alternative routes:

- input received from correspondence with agencies and local officials, as described in **Section 2.2.1**;
- results from the visual reconnaissance surveys of the study area;
- review of recent aerial photography;
- findings of publicly available data collection activities;
- environmental and land use constraints map;
- apparent property boundaries;
- existing compatible corridors;
- locations of existing developments; and
- other information.

Preliminary alternative route links were identified in accordance with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code and PUCT Substantive Rules Section 25.101, including the PUCT policy of prudent avoidance. The intent was to identify an adequate number of geographically diverse alternative routes, which were environmentally acceptable considering factors such as: community values; park and

recreation areas; historical and aesthetic values; vegetation, wildlife, and water resources; environmental quality; length of route parallel to or utilizing existing compatible corridors; length of route parallel to apparent property boundaries; and the PUCT policy of prudent avoidance. The preliminary alternative route links identified by Halff were presented at two public participation meetings on December 7 and December 8, 2022. A more detailed discussion of the development of alternative route links is presented in **Section 4.0**.

2.5 Public Involvement Program

Once the preliminary alternative routes were identified, two public participation meetings were held on December 7 and December 8, 2022 from 4:00 P.M. to 7:00 P.M. at the Marriott Hotel & Golf Club at Champions Circle in Fort Worth, Texas. The purpose of the public participation meetings was to:

- solicit comments from residents, landowners, public officials, and other interested parties concerning the proposed project, preliminary alternative route links, and the overall transmission line routing process;
- promote a better understanding of the proposed project including need, purpose, potential benefits, potential impacts, and the CCN certification process;
- inform the public of the routing process, the project schedule, and the decision-making process; and
- identify the values and concerns of the public and community leaders.

Oncor mailed a written notice of the public participation meetings to owners of property crossed by or within 500 feet of the centerline of the preliminary alternative routes in accordance with PUCT criteria. In consideration of horizontal accuracy limitations as they relate to appraisal district data and aerial photography interpretation when developing preliminary routes, notification to property owners was overinclusive, including properties crossed by or within 520 feet of preliminary alternative route link centerlines. In addition, the notice was published on November 23, 2022, in the *Wise County Messenger* and on November 26 and 27, 2022, in the *Denton Record Chronicle* announcing the location, time, and purpose of the meetings. A copy of the notice that was sent to the landowners and published in the newspapers can be found in **Appendix B**.

At the public participation meetings, Oncor and Halff set up information stations in the meeting rooms. Each station was devoted to an aspect of the proposed project and was

staffed by Oncor, Integra, and/or Halff representatives. Each station had maps, illustrations, photographs, and/or text explaining each topic. Interested citizens and property owners were encouraged to visit each station so that the entire process could be explained in the general sequence of project development. The information station format is advantageous because it allows attendees a chance to receive the information in a relaxed manner and allows them to focus on their area of interest and ask specific questions. Furthermore, the one-on-one discussions with Oncor, Halff, and the other representatives encouraged more interaction from attendees who might be hesitant to speak out in a speaker/audience forum.

Upon entering, visitors were asked to sign in and were handed an information packet, including an explanation of the proposed project, a map of preliminary alternative route links, and a questionnaire. The information packet also included answers to frequently asked questions, a drawing of the proposed typical transmission structure, and a flow chart that detailed the CCN certification process for new transmission lines. The questionnaire solicited comments on the proposed project and requested an evaluation of the information presented at the public participation meetings. Copies of the information packet and questionnaire can be found in **Appendix B**.

Halff reviewed and evaluated the responses to the questionnaires that were submitted at the meetings. Attendee comments were considered and factored into the overall evaluation of the alternative route links.

2.6 Adjustments of Alternative Route Links Following the Public Participation Meetings

Following the public participation meetings, modifications were made to several of the links presented at the public meetings. The modifications and addition of links were the result of Halff's further evaluation of the preliminary alternative route links in consideration of comments received during and after the public meetings. The modified route links are located throughout the study area and are further described and discussed in **Section 6.0**.

2.7 Evaluation of the Alternative Routes

Possible alternative route combinations were recalculated after making the route link adjustments noted above, and then evaluated in detail. The analysis of the alternative routes presented in **Section 7.0** involved the inventory and tabulation of data related to multiple environmental and land use evaluation factors. Many of these factors relate to natural and man-made features that would be crossed by an alternative route (e.g., number of stream crossings, length across cropland, etc.). Some of the evaluation factors include features that are counted or measured if an alternative route link would be within a specified distance of a feature (e.g., airports or communication towers). Other factors included the length of an alternative route that runs parallel to and/or utilizes existing compatible corridors, such as electric transmission lines and public roads. The number or amount of each factor was determined primarily by reviewing recent aerial photography within a Geographic Information System (GIS) mapping program, and, where possible, verified by visual observations during field reconnaissance.

THIS PAGE LEFT BLANK INTENTIONALLY

3.0 ENVIRONMENTAL SETTING OF THE STUDY AREA

3.1 Constraints Mapping

Halff identified environmental and land use constraints within the study area. A constraints map was developed that identifies the locations of environmentally sensitive areas and other land use constraints, all of which are mapped on an aerial photograph base that is shown on a series of sheets that compose **Figure 3-1** (**Appendix H**). The information obtained and reviewed in completing the routing study, and the environmental and land use constraints depicted in this figure, are described in detail in the following sections.

3.2 Physiography and Geology

The study area lies in the Grand Prairie Western Timbers physiographic region (or 'province'). The Grand Prairie Western Timbers serves as a transition between the Blackland Prairies to the east and the North Central Plains to the west, consisting of low stairstep hills with calcareous bedrock types to the east, and plains with sandier bedrock types to the west. The geologic formation strata of this region dip eastward (Bureau of Economic Geology [BEG], 1996).

Rocks and unconsolidated deposits from the Middle to Late Cretaceous geologic period are represented in the study area. As shown in **Figure 3-2**, the study area consists primarily of the Fort Worth Limestone and Duck Creek Formation undivided, which characteristically incorporates limestone and clay deposits in the Fort Worth Limestone while the Duck Creek Formation incorporates limestone aphanitic that is in part bioclastic and has pyrite nodules and forms topographic benches. Alluvium and terrace deposits from the Denton Creek network and Grapevine Lake are also common in the eastern portion of the study area, including floodplain and channel deposits ranging from silt and clay to gravel with bedrock in the channels. The associated adjacent fluviatile terrace deposits range from gravel to silt in texture with granule to cobble-size clasts of various compositions.

Paluxy Sand incorporates clay deposits that are very fine to fine grained in texture and silty with thin to massive beds that can become crossbedded. The Pawpaw Formation, Weno Limestone, and Denton Clay is part of the Washita Group and is undifferentiated from Denton County and southward. The Goodland Limestone and Walnut Clay is

primarily fine-grained Goodland Limestone that grades to Walnut Clay. Grayson Marl has thin interbeds of limestone that grade from nodular to slightly sandy. Main Street Limestone is thick-bedded and more coarse-grained with interbedded thin marl. The Kiamichi Formation is composed primarily of marl with limestone. The marl is sandy and cabonaceous while the limestone is sandy, platy, and fossiliferous with thin beds of sandstone. Woodbine outcroppings generally consist of thin bedded sands (BEG, 1992; BEG, 1996; USGS, 2023a).

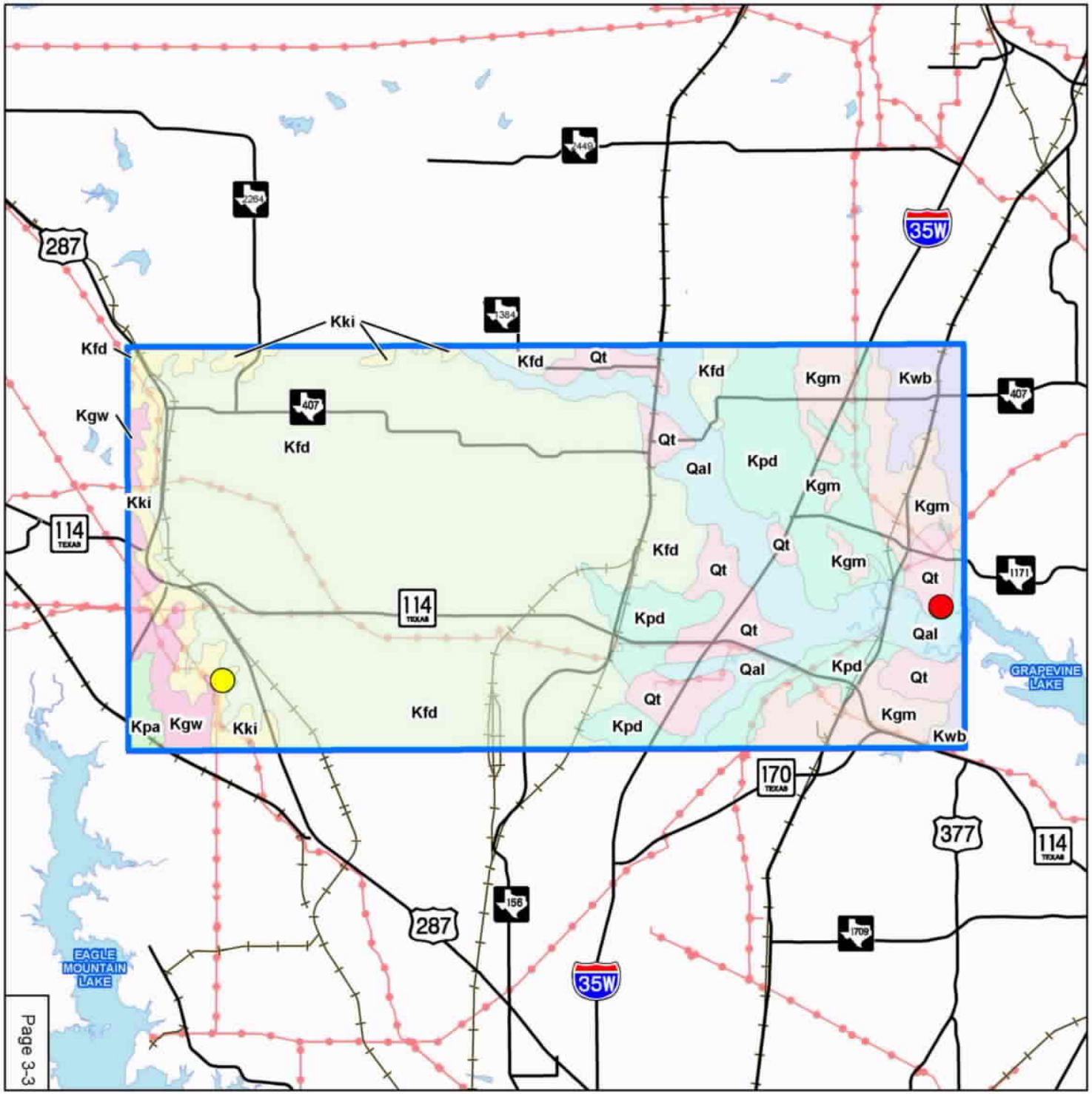


FIGURE 3-2.

GEOLOGIC ATLAS OF TEXAS MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH
345 kV TRANSMISSION LINE PROJECT

LEGEND

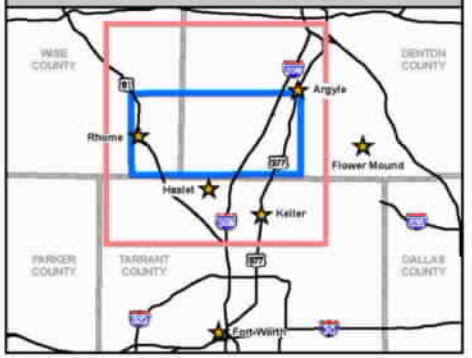
- STUDY AREA
- RAILROAD
- MAJOR ROAD
- RIVER / STREAM
- EXISTING TRANSMISSION LINE
- PROPOSED DUNHAM SWITCH
- PROPOSED RAMHORN HILL SWITCH
- MAJOR WATERBODY

GEOLOGIC UNIT

- Qal — ALLUVIUM
- Kfd — FORT WORTH LIMESTONE AND DUCK CREEK FORMATION, UNDIVIDED
- Kpa — PALUXY SAND
- Kpd — PAWPAW FORMATION, WENO LIMESTONE, AND DENTON CLAY, UNDIVIDED
- Kwb — WOODBINE FORMATION
- Qt — TERRACE DEPOSITS
- Kgw — GOODLAND LIMESTONE AND WALNUT CLAY, UNDIVIDED
- Kgm — GRAYSON MARL AND MAIN STREET LIMESTONE, UNDIVIDED
- Kki — KIAMICHI FORMATION

SOURCE: USGS, 2022a

MAP VIEW EXTENT



0 1.5 3 6

SCALE IN MILES

ONCOR

THIS PAGE LEFT BLANK INTENTIONALLY

3.3 Soils

3.3.1 Soil Associations

Data from the NRCS (formerly the Soil Conservation Service [SCS]) were used to identify and characterize the soils that encompass the study area. The NRCS Digital General Soil Map of the United States provides a broad inventory and mapping of general soil association units. Soil associations are main patterns of soils defined and delineated based on criteria, such as soil texture, parent material, slope, characteristics of horizons in soil profile, and degree of erosion (NRCS, 2019). The NRCS project merged soil association data from the myriad of county soil surveys into a seamless national data set. This soil mapping approach resolved a basic challenge in using individual county soil surveys, which often reflected different soil names for similar soils from one county to the next. A brief description of each soil association's general characteristics is in **Table 3-1**, and **Figure 3-3** shows the NRCS-mapped soil associations within the study area. The soil associations in the seamless NRCS map were compared graphically with the soil associations defined and mapped in the county-level soil surveys for Denton and Wise counties (NRCS, 2019; SCS, 1980; SCS, 1989), and the column on the right side of **Table 3-1** shows the names of the corresponding soil association(s) from each county soil survey, where applicable.

TABLE 3-1. SOIL ASSOCIATIONS WITHIN THE STUDY AREA

Soil Association Map Unit # - Name[1]	Study Area %	Description of Soil Association[2]	County Soil Survey: Soil Association Name[3]
s7159 – Urban Land-Brackett-Bolar-Aledo	1.5	Well drained, gently sloping to sloping, loamy soils that have moderate permeability.	Aledo-Somervell
s7233 – Gasil-Callisburg-Birome-Aubrey	3.2	Well drained, gently sloping to moderately steep, loamy soils that have moderate to slow permeability.	Birome-Gasil-Callisburg
s7575 – Purves-Maloterre-Dugout-Brackett	4.8	Very shallow to deep, loamy, well drained soils underlain by interbedded limestone and marl or loamy material.	Venus-Aledo-Somervell
s7338 - Tinn-Frio	9.5	Well drained and moderately well drained, nearly level, clayey soils that have moderately slow and very slow permeability.	Frio-Ovan
s7630 – Slidell-Sanger-Bolar	18.2	Well drained, gently sloping to moderately steep, clayey soils that have very slow permeability.	Slidell-Sanger
s7558 – Slidell-Sanger-Ponder	62.8	Well drained, gently sloping to moderately steep, clayey and loamy soils that have moderate and very slow permeability.	Sanger-Somervell Ponder-Lindale Sanger-Purves-Somervell

SOURCES: NRCS, 2019; SCS, 1980; SCS, 1989.
NOTES:
1. Map unit # and name correspond with the number and name assigned to each association in the 2016 NRCS Digital General Soil Map of the U.S., as shown for the study area in **Figure 3-3**.
2. The description used for the soil association is a composite of the descriptions for the soil associations from individual county soil surveys that correspond geographically with the 2016 NRCS Digital General Soil Map.
3. This column shows the soil association names from the county soil surveys that corresponds to the 2016 NRCS Digital General Soil Map.

There are six different soil associations within the study area. The surface geology discussed in the previous section is the foundation for the soils found within the study area, and soil maps bear a general similarity with geologic maps of the area. Regardless of the type of underlying bedrock, the upland soils throughout the study area occur in a variety of landscapes, from nearly level, to gently sloping, to moderately steep, consisting predominantly of loamy and clayey textures. The Tinn-Frio association is characteristic of larger floodplains in the study area, associated with Denton Creek and its tributaries. (NRCS, 2019; SCS, 1980; SCS, 1989).

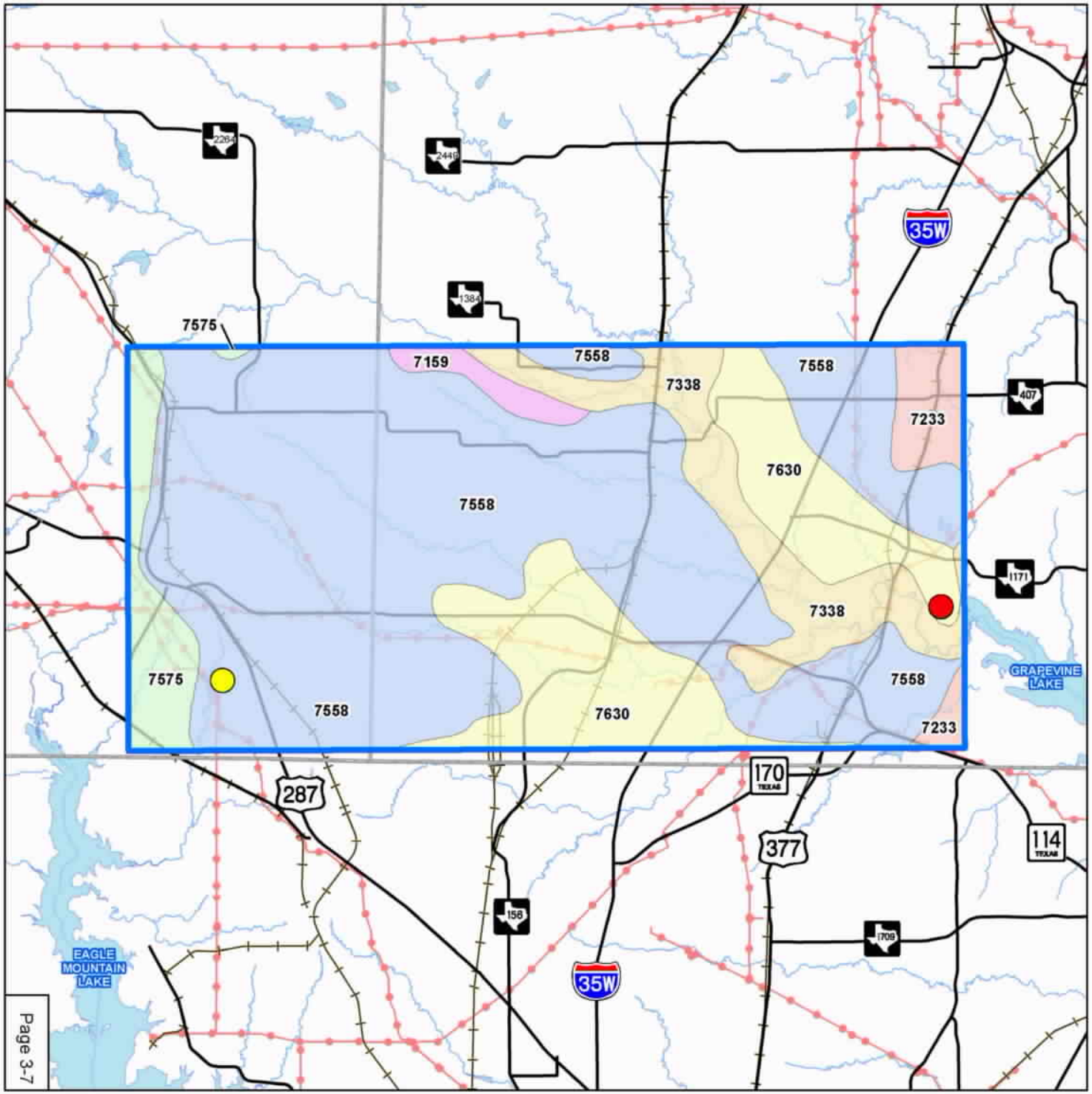


FIGURE 3-3.
SOIL ASSOCIATION MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH
345 kV TRANSMISSION LINE PROJECT

LEGEND

- STUDY AREA
- RAILROAD
- MAJOR ROAD
- EXISTING TRANSMISSION LINE
- RIVER / STREAM
- MAJOR WATERBODY
- PROPOSED DUNHAM SWITCH
- PROPOSED RAMHORN HILL SWITCH

GENERAL SOIL MAP UNIT

- 7159 - URBAN LAND-BRACKETT-BOLAR-ALEDO
- 7233 - GASIL-CALLISBURG-BIROME-AUBREY
- 7338 - TINN-FRIO
- 7558 - SLIDELL-SANGER-PONDER
- 7575 - PURVES-MALOTERRE-DUGOUT-BRACKETT
- 7630 - SLIDELL-SANGER-BOLAR

SOURCE: NRCS, 2022

MAP VIEW EXTENT

0 1.5 3 6

SCALE IN MILES

ONCOR

THIS PAGE LEFT BLANK INTENTIONALLY

3.4 Water Resources

3.4.1 Surface Water and Floodplains

The study area lies within the Denton, Elm Fork Trinity, and Upper West Fork Trinity Sub-basins. Most of the study area is located within the Lower Denton Creek watershed. The southwestern corner of the study area is located within the West Fork Trinity River-Eagle Mountain Lake watershed, and the northeastern portion of the study area is within the Middle Denton Creek and Hickory Creek-Little Elm Reservoir watersheds (TPWD, 2023a; TWDB, 2014). Grapevine Lake is a perennial reservoir to which the predominant streams within the study area flow. In addition to Denton Creek, other larger streams include Elizabeth Creek, Harriet Creek, and Oliver Creek, each of which originate in Wise County and drain a substantial extent of the study area from their western headwaters on their path to Denton Creek and, ultimately, Grapevine Lake. Smaller drainages by comparison, such as Trail Creek, Henrietta Creek, Catherine Branch, and Graham Branch, still show as prominent features in the overall watershed of the study area. As shown on any of the figures in **Section 3.0**, numerous smaller tributaries identified in the National Hydrology Data Set (NHD) are common to the named streams in the study area. Topographic maps and aerial imagery support that many of these stream features in the NHD exhibit support at least a narrow riparian vegetation community (NearMap, 2023; USGS, 1955-1992).

State legislation in 1997 (see Texas Water Code Section 16.051) modified the state-wide water resources planning process by authorizing regional planning groups to recommend ecologically unique river and stream segments to the Texas State Legislature in regional and state water plans (TWDB, 2022). A primary purpose for this approach is to ensure that future water impoundments do not destroy stream segments that are considered unique under specified designation criteria (see 31 Texas Administrative Code Section 357.8), which include biologic functions and habitat for threatened and endangered species. State designation as ecologically unique would also prevent state agencies or municipalities from acquiring property or easements that would destroy the ecological values forming the basis for the designation. Part of the process for designating ecologically unique stream segments requires regional water planning groups to coordinate with TPWD about candidate stream segments (TWDB, 2022). No stream within or immediately adjacent to the study area is designated as ecologically significant under the relevant designation criteria (TPWD, 2002).

One stream within the study area is listed by the Texas Commission on Environmental Quality (TCEQ) under Section 303(d) of the Clean Water Act as being monitored for impairment or having other water quality concerns. Derrett Creek was listed in 2020 as falling within category 5b with bacteria in water (recreation use). Category 5b indicates that before a management strategy is selected, a review of standards for the water body will be conducted (TCEQ, 2020; 2023). In 2011, FEMA prepared Flood Insurance Rate Maps (FIRM) and a detailed floodplain analysis for Denton and Wise counties. Within the study area, the FIRM identifies Grapevine Lake and the numerous named streams and their tributaries as one-percent annual chance flood hazard (i.e., 100-year floodplain) areas, some of which include additional mapped 0.2-percent annual chance flood hazard (i.e., 500-year floodplain) and floodway areas (FEMA, 2023). The mapped 100-year floodplain zone and floodway for Grapevine Lake and the stream features closely correlate with the patterns of woody vegetation observed in the aerial imagery (NearMap, 2023).

Grapevine Lake is the most prominent surface water feature near the study area. Operated by the USACE, Grapevine Lake is managed for the purposes of flood risk management, water supply, recreation, and fish and wildlife management within the Trinity River Basin. The conservation pool elevation of Grapevine Lake is 535 feet above mean sea level (amsl), the extents of which barely overlap the eastern boundary of the study area. However, in addition to the conservation pool, perpetual flowage easements were acquired by the Federal Government on certain private lands that adjoin public land in the Grapevine Lake area. These flowage easements grant to USACE the full, complete, and perpetual right, power, privilege, and easement to occasionally overflow, flood, and submerge lands in connection with the operation and maintenance of the lake. Flowage easement lands around Grapevine Lake are generally defined as those private lands located below the elevation contour of 572 feet amsl. This elevation extends into the study area, with other fee-owned land associated with Grapevine Lake west of IH 35W (USACE, 2022a). Period of record data shows that Grapevine Lake has been above the conservation pool elevation approximately 30-percent of its history, dating back to 1957 (USACE, 2022b). Google Earth aerial imagery (2023) shows flooding up to and west of the US 377 bridge as recent as February 2016 and July 2015, when the lake was in flood stage for an extended period.

3.4.2 Groundwater/Aquifer

A review of the TWDB databases for nine major and twenty-two minor aquifers determined that the Trinity is the only major aquifer, and the Woodbine is the only minor aquifer within the study area (TWDB, 2006; 2017). The Trinity Aquifer extends throughout much of central and northeastern Texas. The Trinity Aquifer consists of limestone, sands, clays, gravels, and conglomerates. The freshwater saturated thickness averages around 600 feet in northern Texas and approximately 1,900 feet in central Texas. Groundwater is fresh with total dissolved solids below 1,000 milligrams per liter in the east and southeast, yet the outcrop region to the west may be very hard with total dissolved solids averaging between 1,000 and 5,000 milligrams per liter (i.e., slightly to moderately saline). Salinity, sulfate, and chloride concentrations generally increase as the depth to the aquifer increases. The Trinity Aquifer discharges to numerous springs throughout the region. In Texas, the Trinity Aquifer is among the most extensive and highly used aquifers, primarily for municipalities, irrigation, livestock, and other domestic purposes. In recent decades, municipalities have relied more on surface water, and the rate of pumping from the Trinity Aquifer has declined (George et al., 2011).

The study area is entirely within the Woodbine Minor Aquifer, which overlays the Trinity Aquifer. The Woodbine Aquifer consists of sandstone interbedded with shale and clay, forming three distinct water bearing zones. The subsurface, including the study area, reaches 600 feet in thickness with a freshwater saturated thickness averaging approximately 160 feet. Deeper zones of the Woodbine Aquifer yield the greatest amounts of water. In contrast, the upper limits yield less water with very high iron levels. Water at a depth of 1,500 feet is considered fresh, consisting of less than 1,000 milligrams per liter of total dissolved solids. Water at depths below 1,500 feet is slightly to moderately saline, consisting of 1,000 to 4,000 milligrams per liter of total dissolved solids. Discharge from the Woodbine Aquifer is used for municipalities, industrial, domestic, livestock, and small irrigation supplies, which has resulted in a steep decline in aquifer water levels (George et al., 2011).

Groundwater resources for the study area are located within the TWDB Groundwater Management Area #8, which encompasses eleven Groundwater Conservation Districts (GCD) (TWDB, 2021). Denton County is within the North Texas GCD and Wise County is located in the Upper Trinity GCD (TWDB, 2019).

3.5 Ecology

3.5.1 Vegetation

The NRCS has studied the characteristics of ecological regions for decades to better understand the biology and management of natural resources. The NRCS published a handbook in 2022 that maps general Land Resource Regions (LRRs) that share similar geology and land physiography, moisture and climate, and soils characteristics. The study area is located within the Southwestern Prairies Cotton and Forage Region LRR. The Southwestern Prairies Cotton and Forage Region LRR extends across much of the southern Great Plains from Kansas to Texas. Within this LRR, annual precipitation ranges from 32 to 44 inches with more frequent rainfall occurring during spring and summer (NRCS, 2022; 2023).

As shown in **Figure 3-4**, NRCS soil scientists have further subdivided the LRR within the Major Land Resource Areas (MLRAs). As the criteria used to define both MLRAs and the larger LRRs focus fundamentally on soils and soil-forming factors, the delineation of MLRAs closely linked to the various soil associations that have been mapped over the past half century. This approach to the study of vegetation focuses on the land's potential for supporting natural vegetation or agricultural practices, rather than simply reporting a snapshot of vegetation as it may exist at a single point in time. The study area is located within the boundary of the East Cross Timbers (MLRA 139) and the Grand Prairie (MLRA 140).

The East Cross Timbers MLRA is wholly within Texas extending south from the Red River and covering over 1,300 square miles. MLRA 139 has an average annual precipitation of 34 to 41 inches. Of the annual precipitation, approximately 24 to 26 inches occur during the freeze-free period. Most of the rainfall occurs during the spring and fall. The growing season averages 265 days, ranging from 255 to 280 days. The physiography of the MLRA is distinguished by sandstone capped hills and ridges, marking the boundary between the Central Texas section of the Great Plains province of the Interior Plains and the West Gulf Coastal Plains section of the Coastal Plain province of the Atlantic Plain. The geology of this MLRA is underlain by interbedded sandstone and shale of the Woodbine Formation of the Late Cretaceous. Hillslopes and drainage networks were formed by eroded shales and sandstones while interfluves and the crests of ridges were formed by more resistant

sandstone. The dominant soil orders in this MLRA are Alfisols, Entisols, and Mollisols. The soils generally are moderately deep to deep and moderately well-drained to somewhat excessively drained with a medium to coarse texture.

The East Cross Timbers supports post oak-blackjack oak savanna vegetation with an understory of mid and tall grasses. The dominant species include little bluestem (*Schizachyrium scoparium)*, purpletop tridens (*Tridens flavus*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), elm (*Ulmus* spp.), coralberry (*Symphoricarpos orbiculatus*), American beautyberry (*Callicarpa americana*), Bumelia (*Sideroxylon* spp.), greenbriar (*Smilax* spp.), and elbowbush (*Forestiera pubescens*). Common forb vegetation cover (e.g., non-grass species) include Englemann's daisy (*Engelmannia peristenia*), lespedezas (*Lespedeza* spp.), and trailing wildbean (*Strophostyles helvola*). Most of the MLRA is farmland and ranches. At least one-third of this area remains as grassland or pasture. Urban development is rapidly expanding from the central portion of the MLRA and some large tracts of land are being divided into smaller ranches.

The Grand Prairie is one of three divisions of the Cross Timbers ecosystem covering over 8,300 square miles. MLRA 140 has an average annual precipitation of 27 to 41 inches. Of the annual precipitation, approximately 23 to 26 inches occur during the freeze-free period. Most of the rainfall occurs during spring and fall. The growing season averages 260 days, ranging from 235 to 290 days. The physiography of this MLRA is undulating to rolling ridges and hillslopes with steeper slopes along the western margin transition to the West Cross Timbers (MLRA 115). Early Cretaceous limestone and calcareous mudstone define the central geology of the Grand Prairie. The more resistant formations form the summits of ridges and hills, with the less resistant forming hillslopes and valleys. In many areas interbedded limestone and calcareous mudstone (marl) weathered to form hillslopes with a benched or stepped topography. The dominant soil orders in this MLRA are mollisols, vertisols, and inceptisols. The soils are generally shallow to moderately deep or deep to very deep and well drained to moderately well drained with a loamy to clayey texture.

The native vegetation of the Grand Prairie consists of mid and tall grasses interspersed with scattered oaks and oak savanna and tallgrass prairie. Little bluestem (*Schizachyrium*

scoparium), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardii*), and switchgrass (*Panicum virgatum*) are typical species on the deeper soils. Texas wintergrass (*Nassella leucotricha*), little bluestem (*Schizachyrium scoparium*), silver bluestem (*Bothriochloa saccharoides*), and sideoats grama (*Bouteloua curtipendula*), as well as Texas red oak (*Quercus buckleyi*), Texas live oak (*Quercus fusiformis*), elm (*Ulmus* sp.), ash (*Fraxinus* sp.), and juniper (*Juniperus* sp.) are the characteristic plant species on shallow soils and on soils below escarpments. Areas of deteriorated rangeland commonly have increased amounts of cool-season grasses, short grasses, annuals, pricklypear (*Opuntia* sp.), elm, honey mesquite (*Prosopis glandulosa*), or juniper. Most of the MLRA is farmland, ranches, and other private holdings. Over one-third of this area remains as grassland or pasture (NRCS, 2022; 2023).

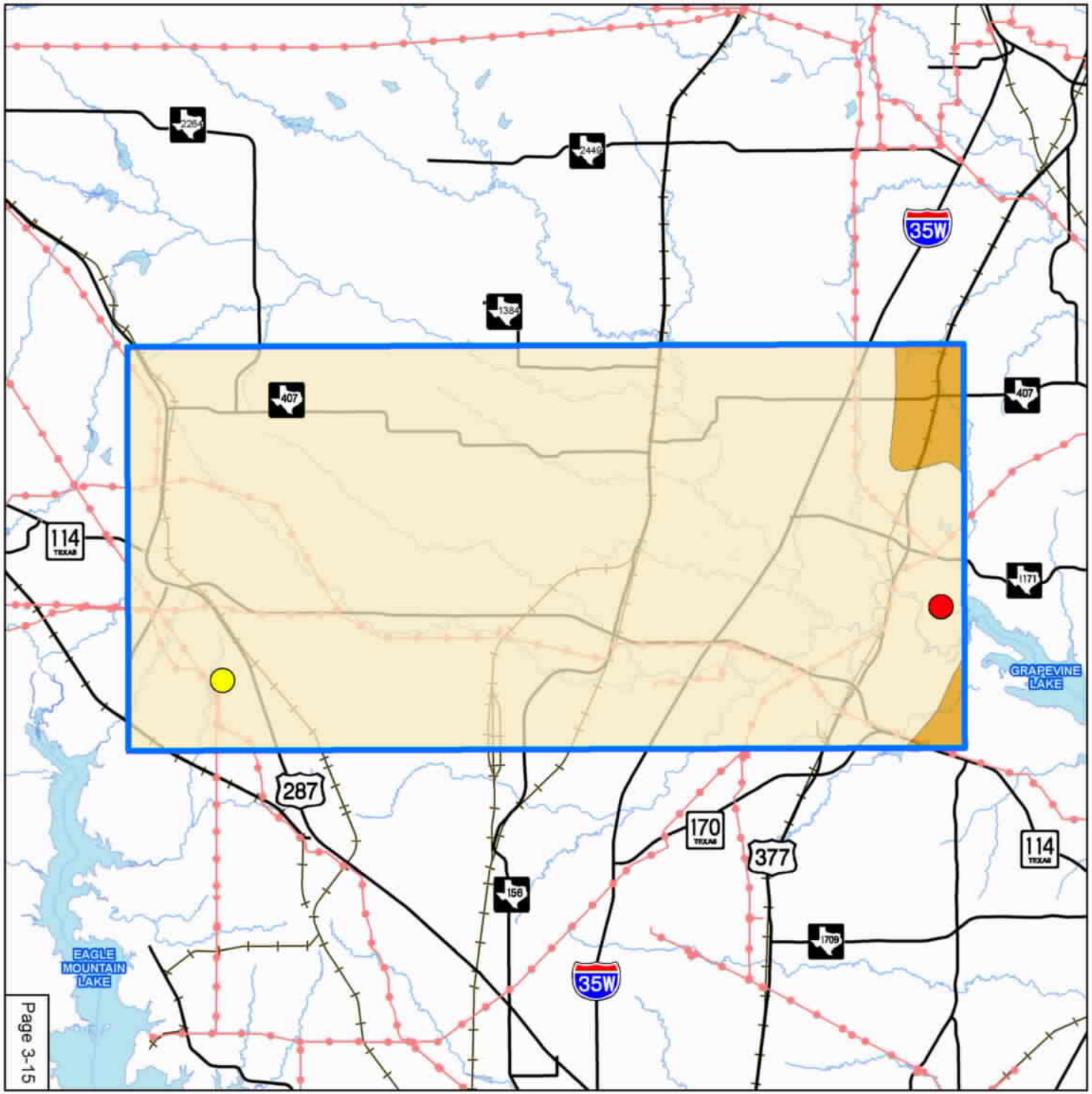


FIGURE 3-4.

MAJOR LAND RESOURCE AREA MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH
345 kV TRANSMISSION LINE PROJECT

LEGEND

- STUDY AREA
- PROPOSED DUNHAM SWITCH
- PROPOSED RAMHORN HILL SWITCH
- RAILROAD
- MAJOR ROAD
- EXISTING TRANSMISSION LINE
- RIVER / STREAM
- MAJOR WATERBODY

MAJOR LAND RESOURCE AREA

- EAST CROSS TIMBERS
- GRAND PRAIRIE

SOURCE: NRCS, 2022

MAP VIEW EXTENT

0 1.5 3 6

SCALE IN MILES

ONCOR

THIS PAGE LEFT BLANK INTENTIONALLY

The Ecoregions of Texas Level III and Level IV maps were prepared by a collaborative effort between the U.S. Environmental Protection Agency (EPA), TCEQ, and the NRCS (Griffith et al., 2007). This classification system analyzes the ecoregions at a finer scale than the MLRAs. While the spatial extent may vary in some areas, this general description of the overall vegetation type based on NRCS research is consistent with other regional descriptions of ecological regions in Texas, including the Ecoregions of Texas maps. Under the Ecoregions of Texas Level III classification, the entire study area is located within the Cross Timbers ecoregion. The Cross Timbers ecoregion is a transition area between the historical prairie, now winter wheat growing regions to the west, and the forested hills of east Texas. The region does not possess the arability and suitability for crops such as corn or soybeans. Transitional Cross Timber communities consist of little bluestem grassland with scattered blackjack oak and post oak as the native vegetation. Rangeland and pastureland comprise the predominant present land cover, with some areas of woodland.

The Grande Prairie is bounded on the east and west by the sandstones of the Cross Timbers, and its open plains contrast with the Cross Timbers oak woodlands. Although the vegetation of the Grand Prairie is similar to the Northern Blackland Prairie, the limestone of the Grand Prairie is more resistant to weathering, which gives the topography a rougher appearance. The Grand Prairie tends to have thinner soil and less precipitation than the Northern Blackland Prairie, serving as a transition between the wetter climates of east Texas and the drier plains to the west. The original vegetation was tallgrass prairie in the upland areas with elm, pecan (*Carya illinoensis*), and hackberry (*Celtis laevigata*) in riparian and floodplain areas. Invasive species Ashe juniper (*Juniperus ashei*) and honey mesquite have increased since European settlement. Grand Prairie grasses under minimally disturbed conditions include big bluestem, yellow Indiangrass, little bluestem, sideoats grama, and Texas cupgrass (*Eriochloa sericea*). Buffalograss (*Buchloe dactyloides*), Texas wintergrass, and other gramas (*Bouteloua* sp.) tend to increase with intensive grazing.

At Level IV, the study area is located within the Eastern Cross Timbers and Grand Prairie ecoregions. The Eastern Cross Timbers ecoregion occurs over gently rolling plains and low hills and generally correlates with Upper Cretaceous sandstone, and the Woodbine Formation. With sandy soils came the potential to support oak woodlands while prairie

plant communities were supported by sandstone-derived substrates. Soils in the Eastern Cross Timbers are more fertile and deeper due to having a higher yearly precipitation compared to the Western Cross Timbers. The woodland overstory is dominated by post oak and blackjack oak. Other woody vegetation includes black hickory (*Carya texana*), plateau live oak (*Quercus fusiformis*), eastern redcedar (*Juniperus virginiana*), sumac (*Rhus* spp.), honey mesquite, and pricklypear. Typical prairie grasses of the understory include little bluestem, big bluestem, yellow Indiangrass, and tall dropseed (*Sporobolus asper*). Fire suppression and heavy grazing reduced the savanna character of the Eastern Cross Timbers ecoregion and was replaced by thickets with occasional prairie openings. Land use is largely cattle grazing with some farming. Urban development is primarily around the Dallas-Fort Worth area which is fragmenting oak forests and prairie inclusions.

3.5.1.1 Terrestrial Vegetation

GIS data from the TPWD Ecological Mapping Systems of Texas (EMST) were used to estimate areas of major types of existing vegetation cover within the study area. Data were developed from satellite imagery with ten-meter by ten-meter mapping resolution collected from 2005 to 2007 and refined with in situ data. Using this refined imagery, TPWD created a statewide land cover data set that includes numerous land cover classes to provide insights for planning and management at a variety of scales (Elliott, 2014; Elliott et al., 2014; TPWD, 2014; TPWD, 2023b). For this study area, the more specific ecological classifications were grouped into nine general land cover classes. **Figure 3-5** displays the TPWD land cover data by different land/vegetation cover types, as it was grouped for the purposes of this study.

Use of these digital data yielded the following estimates of cover as applied to the study area: 53 percent grassland; 15 percent agriculture; 12 percent urban landscape; 7 percent woodland/shrubland; 7 percent riparian woodland/shrubland; and 4 percent riparian grassland. The remaining cover classes (i.e., barren, open water, and marsh/wetland) cumulatively account for less than one percent of the total acreage within the study area. This review of land cover in the study area is clearly dominated with grassland species vegetation types.

The open water cover type is mostly represented by Grapevine Lake, its tributaries, and minor impoundments of those tributaries (e.g., stock ponds). This cover type transitions to

the different riparian cover types. As seen in **Figure 3-5**, the riparian cover types are further divided into riparian woodland or shrubland, grassland, and wetland subtypes. The agriculture cover type includes the cropland, converted previous agricultural land, and maintained greenspaces where Bermuda grass is the dominant ground cover (e.g., golf course fairways, parks, etc.). Agriculture cover types are seen throughout the study area.

The urban landscape cover type includes areas where little or no vegetation cover existed at the time of image data collection. The barren cover type is dominated by predominantly unvegetated development areas associated with towns and cities. Urban landscape in relation to this study area constitutes developed land that has been developed but is not entirely covered with impervious surfaces. Urban landscape incorporates numerous cities and residential neighborhoods located throughout the study area.

The following summary table depiction of terrestrial vegetation cover types shown in **Figure 3-5** is supported by EMST data, field observations, interpretation of recent aerial photography (NearMap, 2023), and a review of reports and maps produced by NRCS (2022; 2023), TPWD (1984; 2011; 2023b), and TCEQ (Griffith et al., 2007).

TABLE 3-2. EMST COVER TYPES

Common Name	Scientific Name	EMST Cover Type[1]			
		Upland Grassland	Upland Woodland / Shrubland	Riparian Woodland / Shrubland	Riparian Grassland
Major Associated Grasses					
American germander	*Teucrium canadense*			X	
Beaksedges	*Rhynchospora* spp.				
Bedstraw	*Galium* spp.			X	
Bermuda grass	*Cynodon dactylon*	X		X	X
Big bluestem	*Andropogon gerardii*	X			
Buffalograss	*Buchloe dactyloides*	X			
Canada snakeroot	*Sanicula canadensis*			X	
Cane bluestem	*Bothriochloa barbinodis*	X			
Cheatgrass	*Bromus tectorum*	X			
Cherokee sedge	*Carex cherokeensis*			X	
Creek oats	*Chasmanthium latifolium*			X	
Curly mesquite	*Hilaria belangeri*	X			
Drummond's aster	*Symphyotrichum drummondii var. texanum*			X	
Eastern gamagrass	*Tripsacum dactyloides*			X	X
Fluffgrass	*Enoneuron pilosum*	X			
Fringeleaf paspalum	*Paspalum setaceum*	X			
Frostweed	*Verbesina virginica*			X	
Giant ragweed	*Ambrosia trifida*			X	

TABLE 3-2. EMST COVER TYPES

Common Name	Scientific Name	EMST Cover Type[1]			
		Upland Grassland	Upland Woodland / Shrubland	Riparian Woodland / Shrubland	Riparian Grassland
Giant reed	*Arundo donax*			X	X
Grama species	*Bouteloua* spp.		X		
Hairy grama	*Bouteloua hirsuta*	X			
Hairy tridens	*Enoneuron pilosum*	X			
Indiangrass	*Sorghastrum nutans*	X		X	X
Japanese brome	*Bromus arvensis*	X			
Johnsongrass	*Sorghum halepense*			X	X
King Ranch bluestem	*Bothriochloa ischaemum var. songarica*	X	X	X	X
Little bluestem	*Schizachyrium scoparium*	X	X	X	X
Marshmillet	*Zizaniopsis miliacea*			X	
Narrowleaf woodoats	*Chasmanthium sessiliflorum*			X	
Purple threehawn	*Anstida purpurea*	X			
Red grama	*Bouteloua trifida*	X			
Rosette grass	*Dichanthelium* spp.		X		
Sedges	*Carex* spp.			X	
Seep muhly	*Muhlenbergia reverchonii*	X			
Sideoats grama	*Bouteloua curtipendula*	X			
Silver bluestem	*Bothriochloa laguroides* ssp. *torreyana*	X	X		
Straggler daisy	*Calyptocarpus vialis*			X	
Switchgrass	*Panicum virgatum*			X	X
Tall dropseed	*Sporobolus compositus*	X			
Tall grama	*Bouteloua hirsuta var. pectinata*	X			
Texas grama	*Bouteloua rigidiseta*	X			
Texas wintergrass	*Nassella leucotricha*	X	X	X	
Threeawn species	*Aristida* spp.	X	X		
Tumble windmillgrass	*Chloris verticillata*	X			
Virginia wildrye	*Elymus virginicus*			X	
White avens	*Geum canadense*			X	
Major Associated Herbaceous and Forbs					
American waterlily	*Nymphaea odorata*			X	
Baby blue-eyes	*Nemophila phacelioides*		X		
Bulrushes	*Scirpoides* spp.			X	
Catnip noseburn	*Tragia ramosa*	X			
Cattails	*Typha* spp.			X	
Common broomweed	*Amphiachyris dracunculoides*	X		X	
Cedar sedge	*Carex planostachys*		X		
Evening primrose	*Oenothera* spp.	X			
Greenthread	*Thelesperma spp.*	X			
Heath aster	*Symphyotrichum ericoides*	X			
Narrowleaf dyschoriste	*Dyschoriste linearis*	X			
Prairie bluets	*Stenaria nigricans var. nigricans*	X			
Prairie clover	*Dalea spp.*	X			
Scurfpea	*Psoralidium spp.*	X			

TABLE 3-2. EMST COVER TYPES

Common Name	Scientific Name	EMST Cover Type[1]			
		Upland Grassland	Upland Woodland / Shrubland	Riparian Woodland / Shrubland	Riparian Grassland
Silverpuff	*Tinantia anomala*		X		
Smartweed	*Polygonum* spp.			X	
Spikerushes	*Eleocharis* spp.			X	
Texas lespedeza	*Lespedeza texana*		X		
Texas sage	*Salvia texana*	X			
Texas star	*Lindheimera texana*	X			
Virginia peltandra	*Peltandra virginica*			X	
Western ragweed	*Ambrosia psilostachya*	X		X	
Widowstears	*Tinantia anomala*		X		
Major Associated Woody Plants					
Agarito	*Mahonia trifoliolata*	X	X		
American beautyberry	*Callicarpa americana*			X	
American elm	*Ulmus americana*			X	
American sycamore	*Platanus occidentalis*			X	
Arizona walnut	*Juglans major*		X		
Ashe juniper	*Juniperus ashei*	X	X		
Ash species	*Fraxinus* spp.		X		
Baldcypress	*Taxodium distichum*			X	
Blackbrush	*Acacia rigidula*		X		
Black hickory	*Carya texana*		X		
Blackjack oak	*Quercus marilandica*		X		
Black walnut	*Juglans nigra*		X		
Black willow	*Salix nigra*			X	
Boxelder	*Acer negundo*			X	
Brasil	*Condalia hookeri*		X	X	
Bur oak	*Quercus macrocarpa*		X	X	
Carolina buckthorn	*Rhamnus caroliniana*		X		
Cedar elm	*Ulmus crassifolia*		X	X	
Chinese tallow	*Triadica sebifera*			X	
Chinquapin oak	*Quercus muehlenbergii*		X		
Coastal live oak	*Quercus virginiana*		X	X	
Colima	*Zanthoxylum fagara*		X		
Common buttonbush	*Cephalanthus occidentalis*			X	
Common persimmon	*Diospyros virginiana*		X	X	
Eastern cottonwood	*Populus deltoides*			X	
Eastern redcedar	*Juniperus virginiana*		X	X	
Elbowbush	*Forestiera pubescens*		X		
Escarpment black cherry	*Prunus serotina* var. *serotina*		X		
Evergreen sumac	*Rhus virens*		X		
Farkleberry	*Vaccinium arboretum*			X	
Granjeno	*Celtis ehrenbergiana*		X		
Green ash	*Fraxinus pennsylvanica*			X	
Guajillo	*Acacia berlandieri*		X		
Gum bumelia	*Sideroxylon lanuginosum*		X	X	
Hackberry species	*Celtis* spp.		X		
Honey locust	*Gleditsia triacanthos*			X	
Honey mesquite	*Prosopis glandulosa*	X	X	X	
Huisache	*Acacia farnesiana*		X	X	
Indigobush	*Amorpha fruticose*			X	
Jersey tea	*Ceanothus herbaceous*		X		
Juniper species	*Juniperus*		X	X	

TABLE 3-2. EMST COVER TYPES

Common Name	Scientific Name	EMST Cover Type[1]			
		Upland Grassland	Upland Woodland / Shrubland	Riparian Woodland / Shrubland	Riparian Grassland
Lacey oak	*Quercus laceyi*		X		
Leatherstem	*Jatropha dioica*		X		
Lindheimer's silktassel	*Garrya ovata var. lindheimen*		X		
Live oak	*Quercus fusiformis*		X		
Loblolly pine	*Pinus taeda*		X	X	
Lotebush	*Ziziphus obtusifolia*	X			
Macartney rose	*Rosa bracteata*			X	
Mejorana	*Salvia ballotiflora*		X		
Mexican buckeye	*Ungnadia speciosa*		X		
Mohr's shin oak	*Quercus mohriana*		X		
Netleaf hackberry	*Celtis reticulata*		X		
Overcup oak	*Quercus lyrata*			X	
Papershell pinyon	*Pinus remota*		X		
Pecan	*Carya illinoinensis*			X	
Pine species	*Pinus* spp.			X	
Plateau live oak	*Quercus fusiformis*	X	X	X	
Possumhaw	*Ilex decidua*			X	
Post oak	*Quercus stellata*		X		
Prairie sumac	*Rhus lanceolata*		X		
Privets	*Ligustrum* spp.			X	
Rattlebox sesbania	*Sesbania drummondii*			X	
Redberry juniper	*Juniperus pinchotii*		X		
Red buckeye	*Aesculus pavia*		X		
Red mulberry	*Morus rubra*			X	
River birch	*Betula nigra*			X	
Roemer's acacia	*Acacia roemeriana*		X		
Rough-leaf dogwood	*Cornus drummondii*		X	X	
Rusty blackhaw	*Viburnum rufidulum*		X	X	
Sand post oak	*Quercus margarettae*		X		
Shortleaf pine	*Pinus echinata*			X	
Shrubby blue sage	*Salvia ballotiflora*		X		
Shumard oak	*Quercus shumardii*		X		
Silktassel	*Garrya ovata*		X		
Slippery elm	*Ulmus rubra*		X		
Southern red oak	*Quercus falcata*			X	
Sugar hackberry	*Celtis laevigata*		X	X	
Sumac species	*Rhus* spp.		X		
Swamp privet	*Forestiera acuminata*			X	
Sweetgum	*Liquidambar styraciflua*		X	X	
Texas ash	*Fraxinus texensis*		X		
Texas kidneywood	*Eysenhardtia texana*		X		
Texas mountain-laurel	*Sophora secundiflora*	X	X		
Texas persimmon	*Diospyros texana*	X	X	X	
Texas oak	*Quercus buckleyi*		X		
Texas redbud	*Cercis texensis*		X		
Texas sacahuista	*Nolina texana*		X		
Vasey shin oak	*Quercus vaseyana*		X		
Water oak	*Quercus nigra*		X	X	
Western soapberry	*Sapindus saponaria var. drummondii*			X	
White ash	*Fraxinus americana*			X	
White shin oak	*Quercus sinuata var. breviloba*	X	X		

TABLE 3-2. EMST COVER TYPES

Common Name	Scientific Name	EMST Cover Type[1]			
		Upland Grassland	Upland Woodland / Shrubland	Riparian Woodland / Shrubland	Riparian Grassland
Willow oak	*Quercus phellos*			X	
Winged elm	*Ulmus alata*		X		
Yaupon	*Ilex vomitoria*		X	X	
Major Associated Succulent or Cactus					
Lindheimer pricklypear	*Opuntia engelmannii* var. *lindheimeri*		X		
Prickly pear	*Opuntia engelmannii*		X		
Tasajillo	*Cylindropuntia leptocaulis*		X		
Major Associated Vine					
Common trumpet creeper	*Campsis radicans*			X	
Grapes	*Vitis* spp.		X	X	
Pepper vine	*Ampelopsis arborea*			X	
Poison ivy	*Toxicodendron radicans*			X	
Saw-tooth greenbrier	*Smilax bona-nox*			X	
Virginia creeper	*Parthenocissus quinquefolia*			X	

SOURCES: Elliott, 2014; Griffith et al., 2007; NRCS, 2022; NRCS, 2023; TPWD, 1984; TPWD, 2011; TPWD, 2014; TPWD, 2023b.

NOTES:

1. Potential presence of a species within an EMST cover type is denoted with an 'X'.

Vegetation is categorized by major associations that correlate with either: grass species, forb or herbaceous species (i.e., non-woody plants), woody plant species (e.g., trees or shrubs), vine species, or succulent species. Not all of these major associated plant classes may be present in a given EMST cover type.

THIS PAGE LEFT BLANK INTENTIONALLY

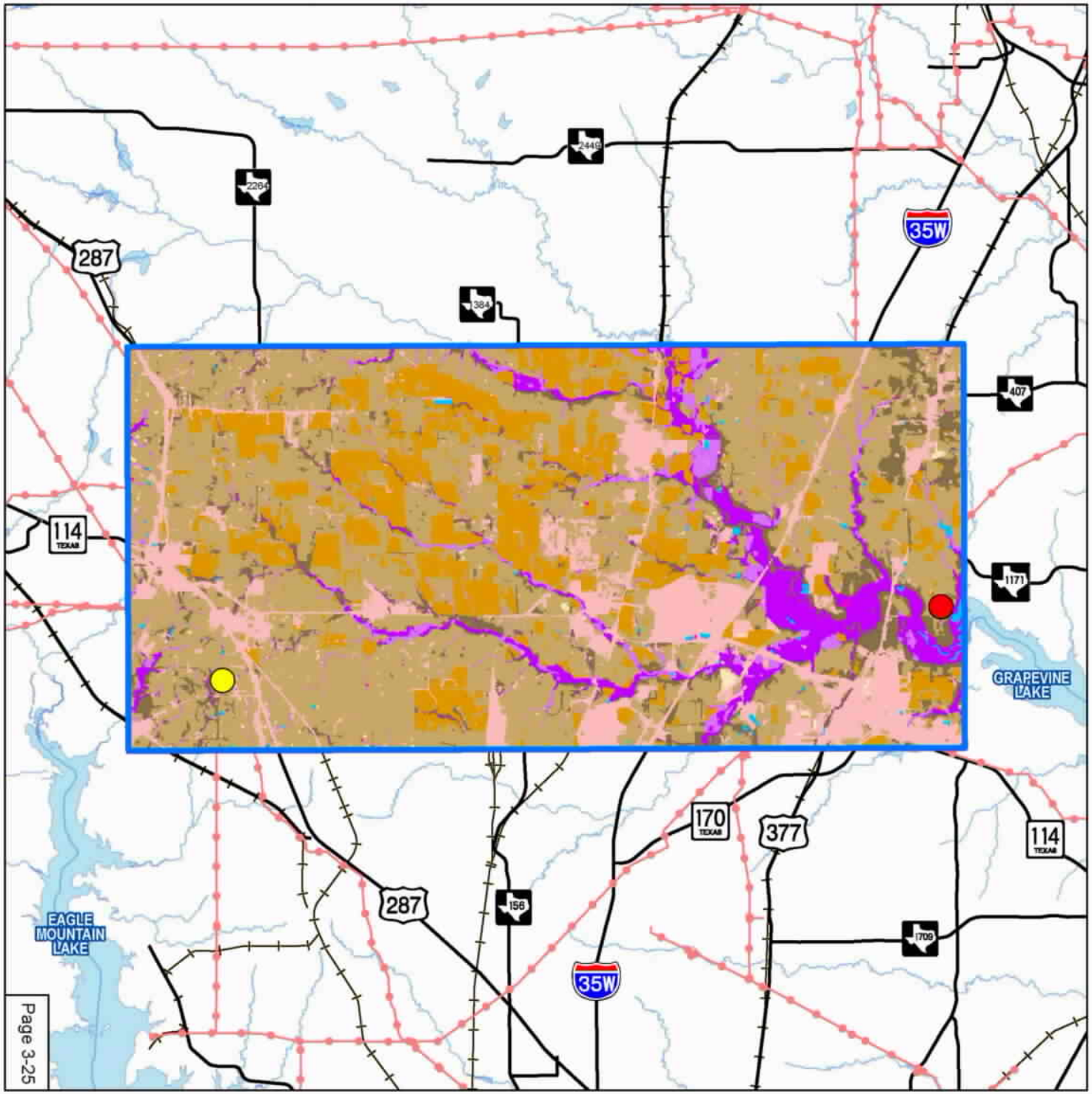


FIGURE 3-5.

LAND COVER MAP

RAMHORN HILL SWITCH — DUNHAM SWITCH
345 kV TRANSMISSION LINE PROJECT

LEGEND

- STUDY AREA
- RAILROAD
- MAJOR ROAD
- EXISTING TRANSMISSION LINE
- RIVER / STREAM
- PROPOSED DUNHAM SWITCH
- PROPOSED RAMHORN HILL SWITCH
- MAJOR WATERBODY

LAND COVER TYPE

UPLAND COVER TYPE

- BARREN (0.3%)
- AGRICULTURE (15.2%)
- GRASSLAND (53.4%)
- WOODLAND / SHRUBLAND (7.2%)

RIPARIAN COVER TYPE

- RIPARIAN GRASSLAND (4.4%)
- RIPARIAN WOODLAND/ SHRUBLAND (6.7%)
- WETLAND - MARSH/ WOODLAND SWAMP (<0.01%)

OTHER COVER TYPE

- URBAN LANDSCAPE (12.4%)
- OPEN WATER (0.3%)

SOURCE: ELLIOTT ET AL., 2014

MAP VIEW EXTENT

0 1.5 3 6

SCALE IN MILES

ONCOR

THIS PAGE LEFT BLANK INTENTIONALLY

3.5.1.2 Aquatic/Hydric Vegetation

Many of the surface water impoundments in this part of northern Texas occur as excavated stock ponds or freshwater ponds for livestock and generally result in either permanent, intermittent, or ephemeral freshwater flat wetlands, marshes, or fringe marshes. In contrast, the hydric habitats in the study area would be expected to be extensive in the littoral transition from the normal pool of Grapevine Lake to adjacent riparian habitats. Riparian classifications shown in **Figure 3-5** near Grapevine Lake are not intended to be a distinct boundary between hydric and non-hydric habitats. Rather, they are a mixture of both in areas where vegetation is influenced by seasonal pool fluctuations of the lake. Plant species common in the understory of these areas might include bulrushes, caric sedges, cattails, smartweeds, and spikerushes.

To identify areas that may potentially contain wetland habitats, National Wetlands Inventory (NWI) maps (on 1:24,000 scale topographic base maps) were examined. These maps highlight areas where potential jurisdictional wetland features may be found, based on aerial photography and ground topography (USFWS, 2023a). The NWI maps indicate wetland areas that range in size and classification are scattered throughout the study area. The highest frequency of NWI mapped features reside within the Grapevine Lake riparian corridor and floodplain. Many of the riparian corridors along the numerous named streams and Grapevine Lake are classified within the NWI database as emergent, forested/scrub-shrub, freshwater pond, lake, or riverine wetland features. The location and shape of these NWI mapped features correspond with the relatively closed contours of the riparian corridor below approximately 550 feet amsl around Grapevine Lake and the contours of the numerous stream features, as previously identified in the USGS topographic maps (USGS, 1955-1992; NGS, 2019). Livestock watering ponds are also frequently mapped water features on the NWI maps, many of which would likely not be considered jurisdictional (e.g., those wetland areas subject to USACE regulations) under current USACE regulations.

3.5.1.3 Commercially or Recreationally Important Vegetation

Large portions of the study area are identified as agriculture, according to the EMST data (**Figure 3-5**), some of which have since been converted to urban land (Elliott, 2014; NearMap, 2023). The production of forage for livestock is the most widespread use of agricultural land throughout the study area, in terms of acreage (United States Department

of Agriculture [USDA], 2019). Forage in the form of hay, pasture, or silage is used principally as feed for cattle and horses. Hay meadows (which may be rotated with pasture) are generally planted with introduced grasses, most commonly Bermuda grass, King Ranch bluestem, Johnsongrass, tall fescue (*Festuca arundinacea*), and legumes such as alfalfa (*Medicago sativa*) (SCS, 1980, 1989).

Habitat, rather than any particular plant species, is important for recreational hunting in the study area. Birds and mammals that prefer open habitat make use of the abundant croplands and rangeland throughout the study area, and edge wildlife species and seasonal waterfowl would make use of the riparian corridors and wetlands in the study area.

3.5.1.4 Endangered and Threatened Plant Species

TPWD maintains the Natural Diversity Database (NDD) to track known occurrences of threatened, endangered, and otherwise rare plant and animal species throughout Texas. TPWD's NDD provides information about the locations and descriptions of rare habitats and areas managed to achieve high species diversity as well as provide quality habitat for common and rare wildlife species. Typically, information obtained from the NDD includes a descriptive record with Element Occurrence Identification (EOID) numbers corresponding with mapped locations of all rare habitats within the study area. Maps and data requested by Halff for download from the NDD in August 2022 indicated there are no recorded observations of state or federally listed plant species within the study area (TPWD, 2022a). It is important to note that, because the NDD is based on the best data available to TPWD regarding rare species, these data cannot provide a definitive statement as to the presence, absence, or condition of special species, natural communities, or other significant features in any area. Given the small proportion of public versus private land in Texas, the NDD does not include a representative inventory of rare resources in the state. Also, the data are not complete, as there are gaps in coverage due to the lack of access to land or data and a lack of staff and resources to collect and process data on all rare and significant resources.

A review of federal and state listed endangered or threatened species was conducted to include both Denton and Wise counties. There are no endangered or threatened plant species under federal listing with the USFWS or state listing with TPWD for either Denton

County or Wise County (USFWS, 2023b; USFWS, 2023c; TPWD, 2023c). Through the Texas Conservation Action Plan, TPWD strives to sustain "species of greatest conservation need" (SGCN), whether terrestrial, freshwater, or marine species, including birds, mammals, reptiles, amphibians, invertebrates, fishes, plants, and plant communities. Species that are uncommon or exhibit declining numbers may be designated as SGCN by TPWD. Often these designations are placed on species for which little is known as a precautionary measure and to focus attention on gaining insight into the species' life histories before they become rare. The goal for the Texas Conservation Action Plan is to identify and classify species as SGCN to develop a plan to prevent future listings under the Endangered Species Act (ESA). This designation indicates the agency's awareness of the species but does not signify a protected regulatory status (TPWD, 2012). Data from the TPWD county lists indicate the following species shown in **Table 3-3** are known to occur in Denton and Wise counties (TPWD, 2023c).

TABLE 3-3. ENDANGERED, THREATENED, OR RARE PLANTS

Common Name	Scientific Name	Listing Status[1, 2]		Species Potential to Occur within Study Area?
		Federal	State	
Comanche Peak prairie clover	*Dalea reverchonii*	--	SGCN	Yes
Earleaf false foxglove	*Agalinis auriculata*	--	SGCN	Yes
Engelmann's bladderpod	*Physaria engelmannii*	--	SGCN	Yes
Glen Rose yucca	*Yucca necopina*	--	SGCN	Yes
Hall's baby bulrush	*Schoenoplectus hallii*	--	SGCN	Yes
Hall's prairie clover	*Dalea hallii*	--	SGCN	Yes
Osage Plains false foxglove	*Agalinis densiflora*	--	SGCN	Yes
Reverchon's scurf-pea	*Pediomelum reverchonii*	--	SGCN	Yes
Shumard's morning glory	*Ipomoea shumardiana*	--	SGCN	Yes
Sutherland hawthorn	*Crataegus viridis var. glabriuscula*	--	SGCN	Yes
Texas milk vetch	*Astragalus reflexus*	--	SGCN	Yes
Topeka purple-coneflower	*Echinacea atrorubens*	--	SGCN	No
Turnip-root scurfpea	*Pediomelum cyphocalyx*	--	SGCN	Yes

SOURCES: USFWS, 2023b; USFWS, 2023c; TPWD, 2022a; TPWD, 2023c.
NOTES:
1. TPWD listing codes: SGCN = Species of Greatest Conservation Need (i.e., rare species with no regulatory listing status)
2. USFWS listing codes: blank = no federal status

Listed Endangered, Threatened, or Rare Species

The discussion that follows describes habitat preferences and other characteristics for the rare species shown in **Table 3-3**. Unless otherwise noted, the information below is drawn primarily from TPWD (2022a; 2023c), USFWS (2023b; 2023c), and NatureServe Explorer (2023) online data and publications.

The Comanche Peak prairie clover is often found in grasslands such as little bluestem-side oats grama prairies, post oak woodland openings, barren or exposed sites, and road ROW. Preferred conditions include shallow, calcareous soils of a clay to sandy texture that overlay limestone, especially Goodland Limestone. This species generally flowers from April to June. The NDD includes three records of the species within the study area, and it is likely the Comanche Peak prairie clover may continue to be found in the study area.

The earleaf false foxglove is an annual plant that is commonly found in grassland and savanna habitats. This species is often found in a variety of prairies including mesic, dry, marl, calcareous, tallgrass, blacklands, and prairie-like glades. It can also occur in fallow fields, upland woodlands, and barren sites. The NDD includes one record in Tarrant County approximately eighteen miles south of the study area. Given the general habitat characteristics for this species, there is potential the earleaf false foxglove may be found in the study area.

Engelmann's bladderpod ranges from the eastern edge of the Edwards Plateau north to the Red River. It prefers grasslands and calcareous rock outcrops. There is potential for this species to occur within the study area where suitable habitat exists.

Glen Rose yucca is an endemic flowering species to Texas. It prefers grasslands that overlay sandy soils and limestone outcrops. Flowering occurs between April and June. The NDD includes a record in Tarrant County approximately six miles southeast of the study area. There is potential for this species to occur within the study area where suitable habitat exists.

Hall's baby bulrush is an annual flowering species. Preferred habitat includes areas with widely fluctuating water levels such as ephemeral ponds, sinkhole ponds, wet places in cultivated fields, pastures, ditches, prairies, or coastal plain marshes. The seeds of this species may survive for years in the seed bank even if its habitat is dry. In Texas, this species is commonly found in the margins of small sandy clay ponds. Flowering occurs in the summer and fall. The NDD includes a record in Wise County approximately sixteen miles northwest of the study area. Given the numerous streams and ponds within the study

area and pond edge habitat provided by Grapevine Lake, there is potential for the Hall's baby bulrush to inhabit the margins around the lake.

Hall's prairie clover is a perennial species endemic to Texas. Preferred habitat includes grasslands, shrublands, and oak scrub. Preferred soil and geology include eroded limestone, eroded chalk and rocky hillsides. The NDD includes two records in Tarrant County, the closest of which is approximately four miles southeast of the study area. It is possible that the Hall's prairie clover may be found in the study area where suitable habitat exists.

The Osage Plains false foxglove is an annual species that flowers between August and October. Preferred habitat includes grasslands and prairies. In grasslands, this species utilizes shallow, gravelly, and well-drained calcareous soils. In prairies, this species utilizes dry limestone soils. In Texas this species is mixed with a diversity of other forbs and graminoids such as tall grama, Hall's prairie clover, roundhead prairie clover (*Dalea multiflora*), false dogfennel (*Dyssodiopsis tagetoides*), diamond flower (*Hedyotis nigricans*), plains gayfeather (*Liatris punctata*), Yellow nailwort (*Paronychia virginica*), Texas sage, white rosinweed (*Silphium albiflorum*), and shiny goldenrod (*Solidago nitida*). Occasionally this species can be found within the margins of post-oak woodlands in sandy loam soils. The NDD includes two records in Tarrant County and one in Wise County, the closest of which is approximately four miles southeast of the study area. It is possible the Osage Plains false foxglove may be found in the study area.

The Reverchon's scurf-pea is a perennial species which flowers from June to September and fruits from June to July. It prefers prairies and is commonly found in shallow, rocky, calcareous soils and limestone outcrops. The NDD includes two records in Wise County, one of which is in the study area and the other which is very near the study area. It is likely the Reverchon's scurfpea may still be found in the study area.

The Shumard's morning glory is perennial species endemic to the southern Great Plains region in Kansas, Oklahoma, and Texas. Preferred habitat includes plains and prairies that overlay sandy or dry clay soils. The NDD includes two records in Wise County, the closest of which is approximately 21 miles northwest of the study area. Due to the

presence of clayey soils in the study area, there is potential for the Shumard's morning glory to utilize preferred habitat in the study area.

Sutherland hawthorn is endemic to Arkansas, Kansas, Oklahoma, and Texas. It is commonly found in riparian habitats, grasslands, woodlands, tree lines or fence lines, or in river bottoms. Preferred soils are blackland prairie soils and soils near streams. This species flowers between March and April, and fruits between May and October. There is potential the Sutherland hawthorn may be present in the riparian corridors of streams within the study area.

The Texas milk vetch is endemic to Texas. Early-successional habitats such as prairie grasslands are the most common habitat in which this species occurs. Blackland prairie, grazed pastures, gravel pits, railroad embankments, and other disturbed sites represent a range of habitats this species has occurred. The NDD includes one record in Tarrant County approximately sixteen miles south of the study area. Given the general habitat characteristics for this species, there is potential Texas milk vetch may be found in the study area.

Topeka purple-coneflower is regionally endemic to the southern Great Plains (i.e., from Kansas to Texas) among tallgrass prairies. Much of its historical range has drastically reduced from cultivation practices and commercial harvesting. This species had a known historical range within the Blackland Prairies, as well as residing over limestone hillslopes. Occasionally, the flower has been observed growing in prairie remnants along roadsides with full sun exposure. This perennial flowers from January to June and fruits from January to May. The NDD includes one record in Wise County approximately twenty-five miles northwest of the study area. Representative habitat characteristics are limited in the study area, and the presence of agriculture and human disturbance support the unlikely possibility the Topeka purple-coneflower would be present in the study area.

The turnip-root scurf-pea is endemic to Texas and frequently found in the Edwards Plateau and in north-central Texas. Preferred habitat includes grasslands and the openings of juniper-oak woodlands. Due to the presence of limestone substrates and juniper-oak woodland, there is potential for the turnip-root scurfpea to occur in the study area.