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LCRA TRANSMISSION SERVICES CORPORATION

Mountain Home 138-kV Transmission Line Project
Environmental Assessment and Alternative Route Analysis

Gillespie, Kerr, and Kimble Counties, Texas

PROJECT NUMBER:
149772

PROJECT CONTACT:
Lisa Barko Meaux
EMAIL:
lisa.barko@powereng.com
PHONE:
281-765-5507

POWER ENGINEERS

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Mountain Home 138-kV Transmission Line Project

PREPARED FOR: LCRA TRANSMISSION SERVICES CORPORATION

PREPARED BY: POWER ENGINEERS, INC.

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ACRONYMS AND ABBREVIATIONS

AC	alternating-current
amsl	above mean sea level
BEG	Bureau of Economic Geology
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
BP	Before Present
CCN	Certificate of Convenience and Necessity
CFR	Code of Federal Regulations
CLF	civilian labor force
CWA	Clean Water Act
CR	County Road
CRA	Cultural Resources Assessment
CTEC	Central Texas Electric Cooperative
DoD	Department of Defense
EA	Environmental Assessment
EO	element occurrence
ERCOT	Electric Reliability Council of Texas
ESA	Endangered Species Act
ESSS	Ecologically Significant Stream Segments
FAA	Federal Aviation Administration
FCC	Federal Communication Commission
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FM	Farm-to-Market Road
FPPA	Farmland Protection Policy Act
GIS	Geographic Information System
GLO	Texas General Land Office
HPA	high probability areas
HTC	Historic Texas Cemeteries
IH	Interstate Highway
IPaC	Information for Planning and Consultation
ISD	Independent School District
kcmil	thousand circular mils
kV	kilovolt
LCRA TSC	LCRA Transmission Services Corporation
MBTA	Migratory Bird Treaty Act
MVA	Megavolt-amperes
MW	megawatt
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NOI	Notice of Intent
NPS	National Park Service

NRA	Natural Resources Assessment
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OPGW	fiber optic ground wire
OTHM	Official Texas Historical Marker
PELA	Pre-Designated Emergency Landing Area
PEM	palustrine emergent
PFO	forested/shrub
POWER	POWER Engineers, Inc.
PUB	ponds
PUC	Public Utility Commission of Texas
PURA	Public Utility Regulatory Act
RIP	Record-Investigate-Protect
ROW	right-of-way
RRC	Railroad Commission of Texas
SAL	State Archeological Landmarks
SH	State Highway
SHPO	State Historic Preservation Office
SWPPP	Storm Water Pollution Prevention Plan
TAC	Texas Administrative Code
TARL	Texas Archeological Research Laboratory
TASA	Texas Archeological Site Atlas
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
THSA	Texas Historical Site Atlas
TNRIS	Texas Natural Resource Information System
TPWD	Texas Parks and Wildlife Department
TSS	Texas Speleological Society
TWDB	Texas Water Development Board
TxDOT	Texas Department of Transportation
TXNDD	Texas Natural Diversity Database
TxSDC	Texas State Data Center
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
US Hwy	United States Highway

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1.0 DESCRIPTION OF THE PROPOSED PROJECT

1.1 SCOPE OF THE PROJECT

LCRA Transmission Services Corporation (LCRA TSC) is proposing to build, own, operate, and maintain a new single-circuit 138-kilovolt (kV) transmission line in Gillespie, Kerr and possibly Kimble counties (the Proposed Project). The Proposed Project will connect the new Mountain Home Substation to the existing transmission system via a looped configuration to either the existing Hunt Substation or Ingram Substation to the south and to the existing Harper Substation to the north. Figure 1-1 shows the location and extent of the Proposed Project.

LCRA TSC requires Public Utility Commission of Texas (PUC) approval to amend its Certificate of Convenience and Necessity (CCN) for the Proposed Project. LCRA TSC will own, operate, and maintain all transmission facilities that are part of the Proposed Project, including conductors, wires, structures, hardware, and easements. The existing Harper Substation will be expanded and converted for 138-kV operation. In addition, LCRA TSC will acquire the substation property, and will also own and operate facilities at the new Mountain Home Substation. Interconnection of the Proposed Project at either the Hunt Substation or Ingram Substation can be accomplished within the existing footprint of each substation, although some modification of the existing facilities will be necessary at each site.

1.2 PURPOSE AND NEED

LCRA TSC and Central Texas Electric Cooperative (CTEC) have an established planning and operating relationship for the delivery of safe, reliable, and cost-effective electric service. As CTEC's Transmission Operator, LCRA TSC assists CTEC in ensuring the electric delivery requirements of its end-use customers. In its responsibility as the retail electric service provider, CTEC provides retail electric service in a broad area of the Texas Hill Country, supporting the growth of communities since 1947. The CTEC retail electric service area is spread across 11 counties, including portions of Gillespie, Kerr, and Kimble counties.

CTEC currently provides retail electric service to the Mountain Home area through distribution feeders extending from the Harper Substation. The existing distribution system will be unable to support the demand for electricity in this area by the winter of 2020/2021 and therefore, CTEC has requested for LCRA TSC to provide transmission service to a new substation in the Mountain Home area.

In addition to the retail electric service and reliability needs in the Mountain Home area, LCRA TSC reviewed the ability of the existing radial 69-kV transmission system to meet the demand for electricity served by the Harper and Doss substations and of the existing 138-kV system that serves the Hunt and Ingram substations. LCRA TSC determined that upgrades to the 69-kV system are needed by the winter of 2020/2021 and that maintenance outages on the 138-kV system connecting the Hunt and Ingram substations would leave up to 100 megawatts (MW) of load served by a single transmission source and therefore vulnerable to service interruption. The end-use customers served by the area transmission system that would be improved by the Proposed Project include, but are not limited to, residential, small and large commercial and industrial, public offices, emergency response, urgent care facilities, hospitals, churches, schools, ranch and farm operations, communications towers and systems, water wells, and water treatment plants.

Based on the need for a new load-serving substation and the limited existing capability of the 69-kV and 138-kV transmission systems in the area, CTEC and LCRA TSC developed and evaluated both distribution and transmission alternatives and then presented the Proposed Project to Electric Reliability Council of Texas (ERCOT) staff and to the ERCOT Regional Planning Group, the stakeholders tasked with reviewing and commenting on proposed transmission projects. All comments received were in support of the Proposed Project. At the conclusion of ERCOT's independent review, ERCOT reclassified the project as a Tier 4 Neutral project and determined that the project as proposed will not result in any violations of the North American Electric Reliability Corporation (NERC) or ERCOT performance requirements after the Proposed Project is constructed and placed in service.

Continuing to serve the area's electric load without the Proposed Project (and conversion of the 69-kV Harper to Live Oak transmission line to 138-kV operation) will result in degradation of electric service reliability to end-use customers and could significantly limit the continued healthy economic development of the broader area. Without the Proposed Project, CTEC customers served by the existing 69-kV radial transmission system providing power to Harper and Doss substations will be exposed to potential long-term interruptions caused by equipment or structural failure and maintenance needs. If the Proposed Project is not constructed, other large transmission line projects will be required to mitigate future transmission issues that impact an even broader area.

Insert Figure 1-1 Project Area Location Map 11 X 17 with a PDF document. Page 3

FRONT

Insert Figure 1-1 Project Area Location Map 11 X 17 with a PDF document. Page 4 Back

1.3 AGENCY ACTIONS

This environmental assessment (EA) in support of LCRA TSC's application to amend its CCN is intended to provide information on certain environmental and land use factors contained in Section 37.056(c)(4) of the Public Utility Regulatory Act (PURA) and PUC Substantive Rule 25.101(b)(3)(B), the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects. This EA may also be used in support of any other local, state, or federal permitting requirements.

If the route ultimately approved by the PUC for the Proposed Project crosses or requires access from a state-maintained road or highway, LCRA TSC will obtain a permit from the Texas Department of Transportation (TxDOT) prior to construction. Where the PUC-approved route for the Proposed Project crosses or is parallel to TxDOT roads, LCRA TSC generally intends to place transmission line structures on adjacent private property and not within the road right-of-way (ROW). In particular, Segments E1, F1, G1, M1 and M4 involve crossing of or paralleling Interstate Highway (IH) 10 ROW, which will require crossing permits or permits allowing limited overhang of TxDOT ROW. Placement of structures in TxDOT ROW is not anticipated. Appropriate permits or licenses will be obtained from TxDOT prior to construction.

LCRA TSC will coordinate with county engineers regarding crossing of county roads as appropriate. LCRA TSC does not propose to place any structures of the transmission line within any county roadway ROW.

Because more than one acre will be disturbed during construction of the Proposed Project, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared, and because more than five acres will be disturbed, LCRA TSC will submit a Notice of Intent (NOI) to the Texas Commission on Environmental Quality (TCEQ). The controls specified in the SWPPP will be monitored in the field.

Upon approval of LCRA TSC's CCN application and prior to construction, a detailed Natural Resources Assessment (NRA) and Cultural Resources Assessment (CRA) will be performed on the approved route. Depending upon the results of these assessments, permits or regulatory approvals may be required from the United States Army Corps of Engineers (USACE) or the United States Fish and Wildlife Service (USFWS). If LCRA TSC encounters previously unassessed artifacts or cultural resources during Proposed Project construction, LCRA TSC intends to stop construction in the immediate vicinity of the

site and notify and consult with the Texas Historical Commission or other appropriate regulatory authority regarding a process for the site before construction continues.

The Texas General Land Office (GLO) requires a miscellaneous easement for ROWs within any state-owned riverbeds or navigable streams or tidally influenced waters. Following PUC approval of a route for the proposed transmission line, LCRA TSC will determine whether state-owned riverbeds or navigable streams are crossed by the approved routing and coordinate with the GLO as necessary.

Similarly, if LCRA TSC identifies other obstacles and engineering constraints along the approved route, LCRA TSC will adjust alignments, adjust structure locations/heights, and/or take other actions consistent with the Final Order approving the Proposed Project.

After all alignments, structure locations, and structure heights are adjusted and set based on the procedures described previously, LCRA TSC will make a final determination of the need for Federal Aviation Administration (FAA) notification, based on structure locations and structure designs. LCRA TSC may use alternative structure types and/or structures of lower-than-typical heights in some areas and add marking and/or lighting to certain structures based on potential impacts within the purview of the FAA, although none are presently anticipated.

LCRA TSC anticipates the potential use of alternative structure types and structures of lower-than-typical heights along Segment A in the vicinity of a private airstrip. Final determinations of structure type and structure heights will be determined during the detailed design phase of the Proposed Project in coordination with landowners in the vicinity of that airstrip along Segment A.

In addition, after all alignments, structure locations, and structure heights are adjusted and set based on the procedures described previously, LCRA TSC will coordinate with owners and operators of natural gas pipelines in the vicinity of the approved route regarding the pipeline owner’s or operator’s assessment of the need to install measures to mitigate the effects of alternating-current (AC) interference on existing natural gas pipelines consistent with the Final Order approving the Proposed Project.

Appropriate measures will be taken during engineering design to ensure compliance with provisions of the PUC’s Final Order regarding environmental and ROW concerns. If necessary, these measures will be added to construction documents, specifications, or other instructions. Following completion of the design, a preconstruction meeting will be held, which will include a review of these regulatory provisions.

A physical inspection of the Proposed Project will be performed following project completion to ensure all appropriate measures have been taken during construction.

LCRA TSC will report the status of the Proposed Project to the PUC on LCRA TSC's Monthly Construction Progress Report, beginning with the first report following the filing of the CCN application, and in each subsequent monthly progress report until construction is completed and actual project costs have been reported. As required by the PUC, LCRA TSC will submit location and attribute data for the approved route after it is constructed.

1.4 DESCRIPTION OF PROPOSED DESIGN AND CONSTRUCTION

1.4.1 Transmission Line Design Considerations

The Proposed Project will be operated as a 138-kV transmission line with 795 thousand circular mils (kcmil) aluminum conductor, steel-reinforced Drake with one conductor per phase and one fiber optic ground wire (OPGW). In most areas, the transmission line will be installed on new structures and within new easements. For Segments X3, B, F and E4, LCRA TSC would rebuild a portion of the existing Hunt to Ingram 138-kV transmission line (T487) along existing easements to include the new 138-kV circuit from Hunt or Ingram to the new Mountain Home Substation. Additional ROW width will be required to accommodate both circuits along some or all of these segments.

The Proposed Project will be rated for operation at 930 Amperes, yielding a nominal 220-Megavolt-amperes (MVA) capacity. The configurations of the conductor and shield wire will provide adequate clearance for operation at 138-kV, considering icing and wind conditions. The Proposed Project will be designed and constructed to meet or exceed the specifications set forth in the current edition of the National Electrical Safety Code (NESC) and will comply with all applicable state and federal statutes and regulations. The results of the NRA and CRA will be considered when designing and placing structures.

1.4.2 Typical Transmission Line Structures and Easements

For most segments of the proposed routing, LCRA TSC proposes to use 138-kV single-circuit pole structures for typical tangent, angle, and deadend structures. The geometries of the proposed typical tangent, angle, and deadend structures are shown on Figures 1-2 through 1-4. All structure geometries are illustrative. In some areas, such as transmission line crossings, highway crossings, and near aviation facilities, shorter than typical, taller than typical, or alternative structure types may be utilized. A

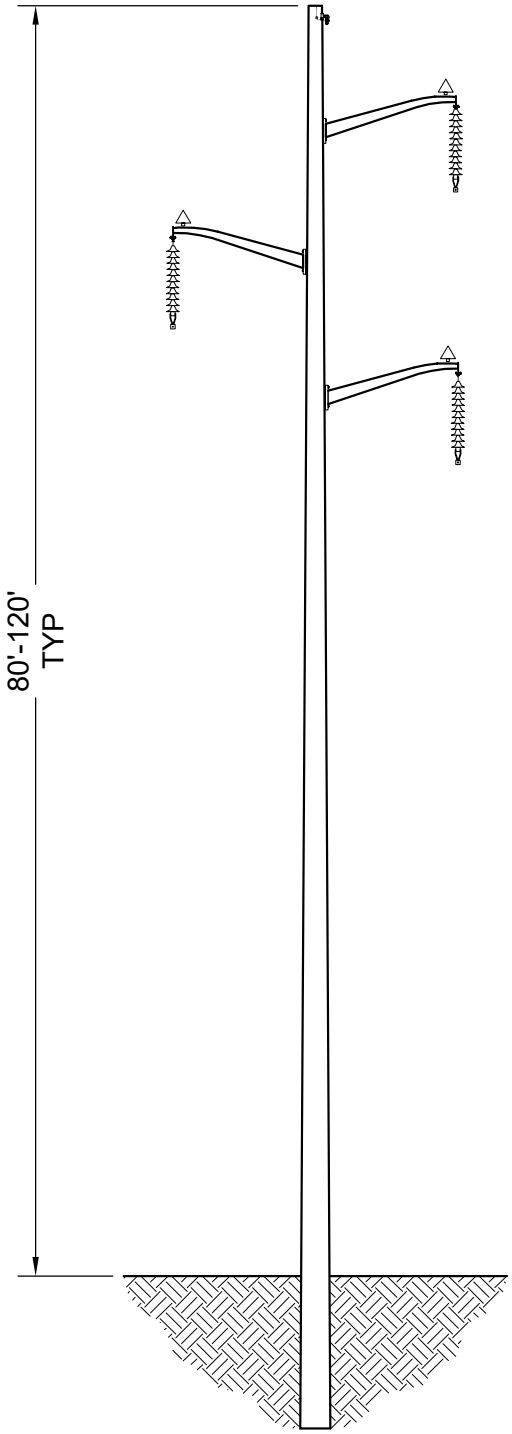
geometry of a potential alternative structure is shown on Figure 1-5. Actual structure types may differ slightly based on newer or different designs available at the time of construction.

The Proposed Project will be constructed in new or expanded ROW, within easements typically ranging from approximately 80 to 100 feet in width, using spans that typically range from approximately 600 to 1,000 feet. In some areas, easement width and span length could be more or less than the typical depending on terrain and other engineering considerations. Access easements and/or temporary construction easements may be needed in some areas.

Segments X3, B, F, and E4 would require rebuilding the existing LCRA TSC 138-kV single-circuit electric transmission line (T487 Hunt to Ingram) with structures capable of holding two 138-kV electric circuits: the existing Hunt to Ingram circuit and the new circuit from Hunt or Ingram to Mountain Home. These segments will require the use of new double-circuit capable single pole structures within a wider ROW than exists today. The total ROW required for these segments is anticipated to be approximately 100 feet but will be finally determined following a formal easement review if one of these segments is utilized in a route approved by the PUC. The geometries of the proposed typical double-circuit tangent and deadend structures are shown on Figures 1-6 through 1-7. All structure geometries are illustrative.

1.4.3 Substations

The Proposed Project will connect the proposed new 138-kV load-serving Mountain Home Substation to the existing electric transmission grid. As proposed, the Mountain Home Substation will connect to the existing grid at (1) either the existing Ingram Substation or Hunt Substation, and (2) the Harper Substation.



NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

Source: LCRA

Figure 1-2

138-kV DELTA TANGENT POLE (STEEL OR CONCRETE)

Mountain Home
138-kV Transmission Line Project

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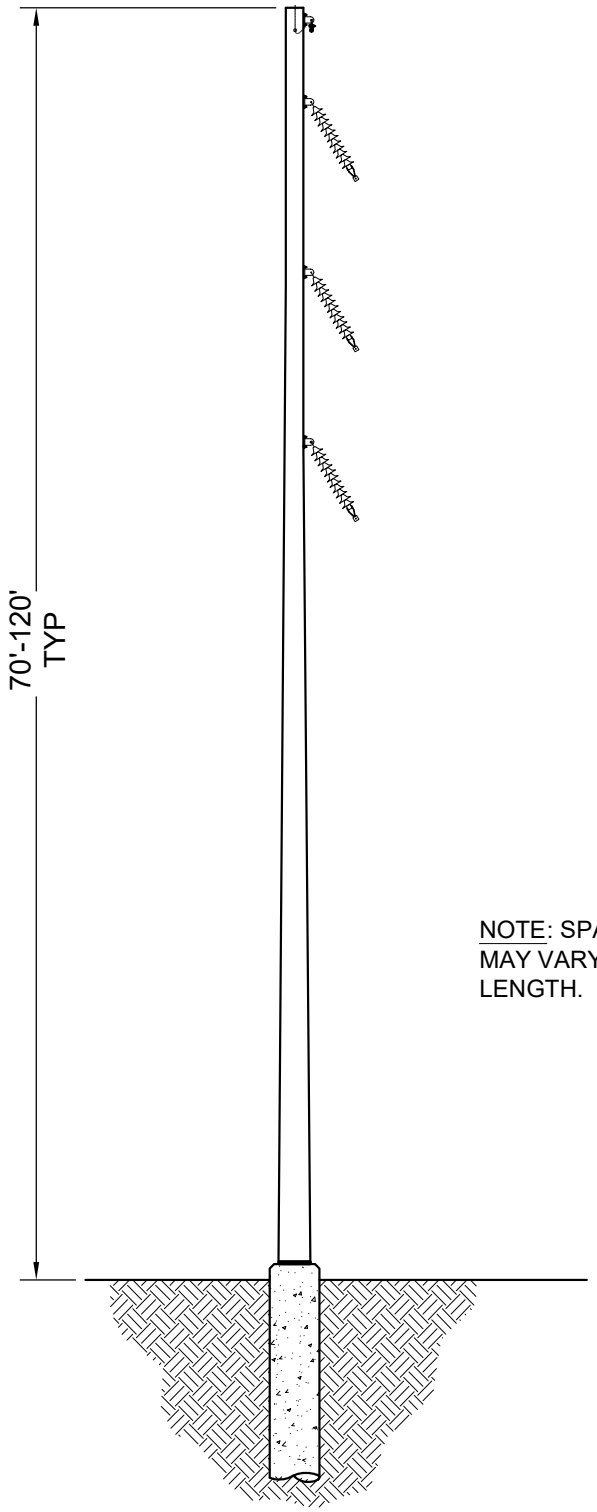


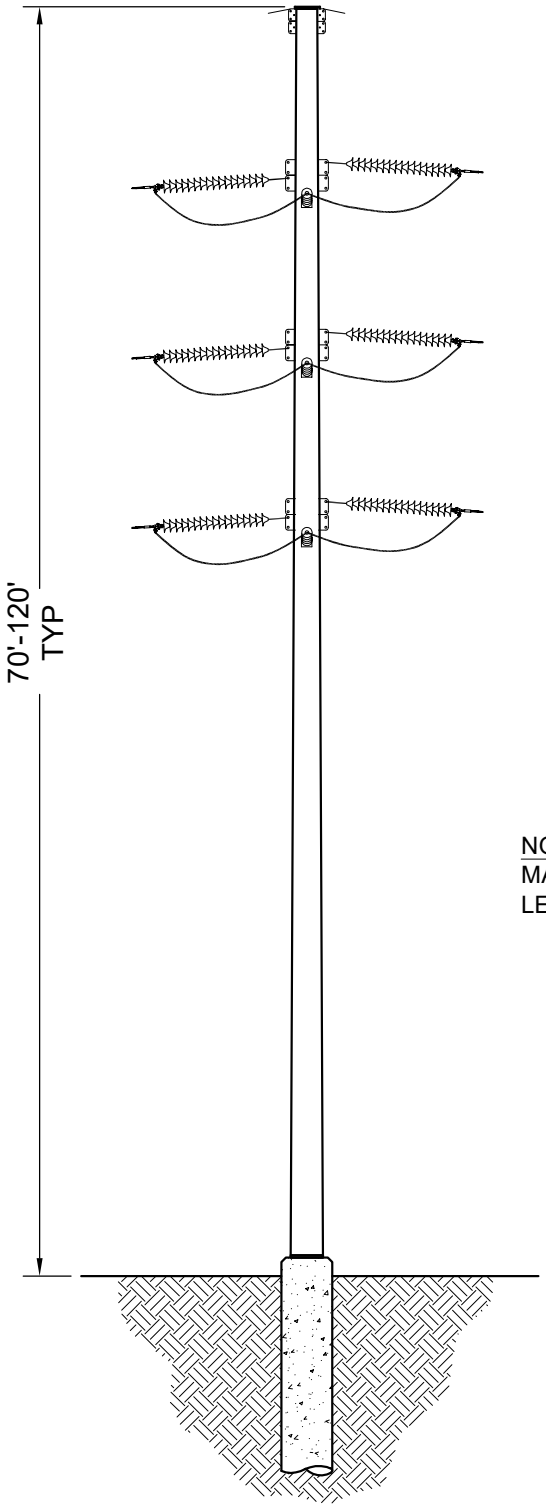
NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

Source: LCRA

Figure 1-3

138-kV STEEL ANGLE POLE

Mountain Home
138-kV Transmission Line Project



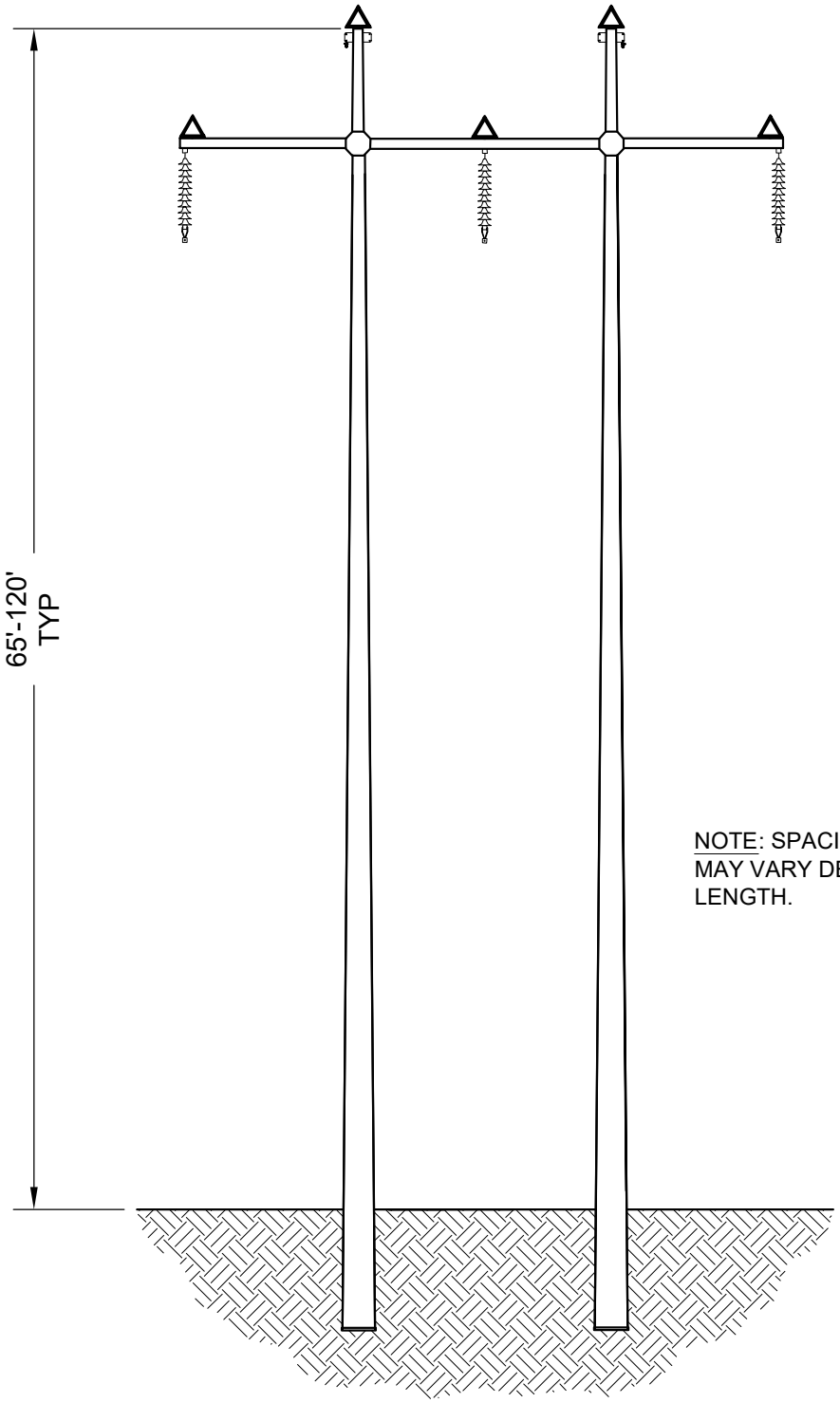
NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

Source: LCRA

Figure 1-4

138-kV STEEL DEAD-END POLE

Mountain Home
138-kV Transmission Line Project



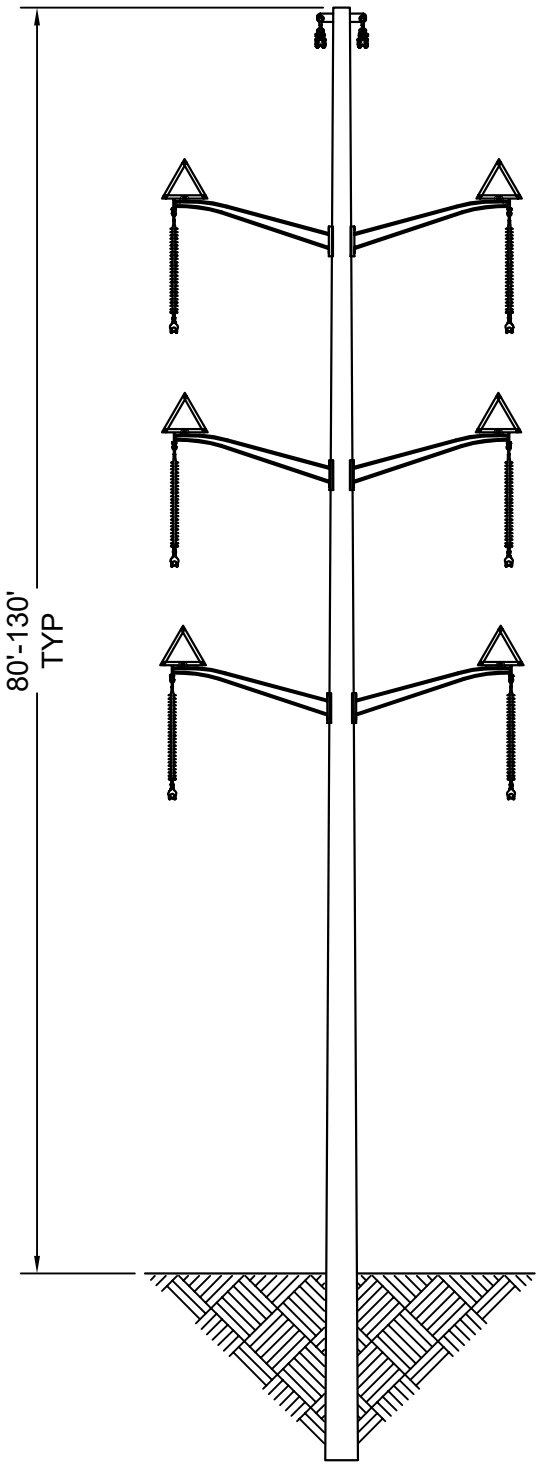
NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

Source: LCRA

Figure 1-5

138-kV TANGENT H-FRAME (STEEL OR CONCRETE)

Mountain Home
138-kV Transmission Line Project



NOTE: SPACING BETWEEN WIRES MAY VARY DEPENDING ON SPAN LENGTH.

Source: LCRA

Figure 1-6

138-kV DOUBLE CIRCUIT DAVIT ARM TANGENT (STEEL OR CONCRETE)

Mountain Home
138-kV Transmission Line Project

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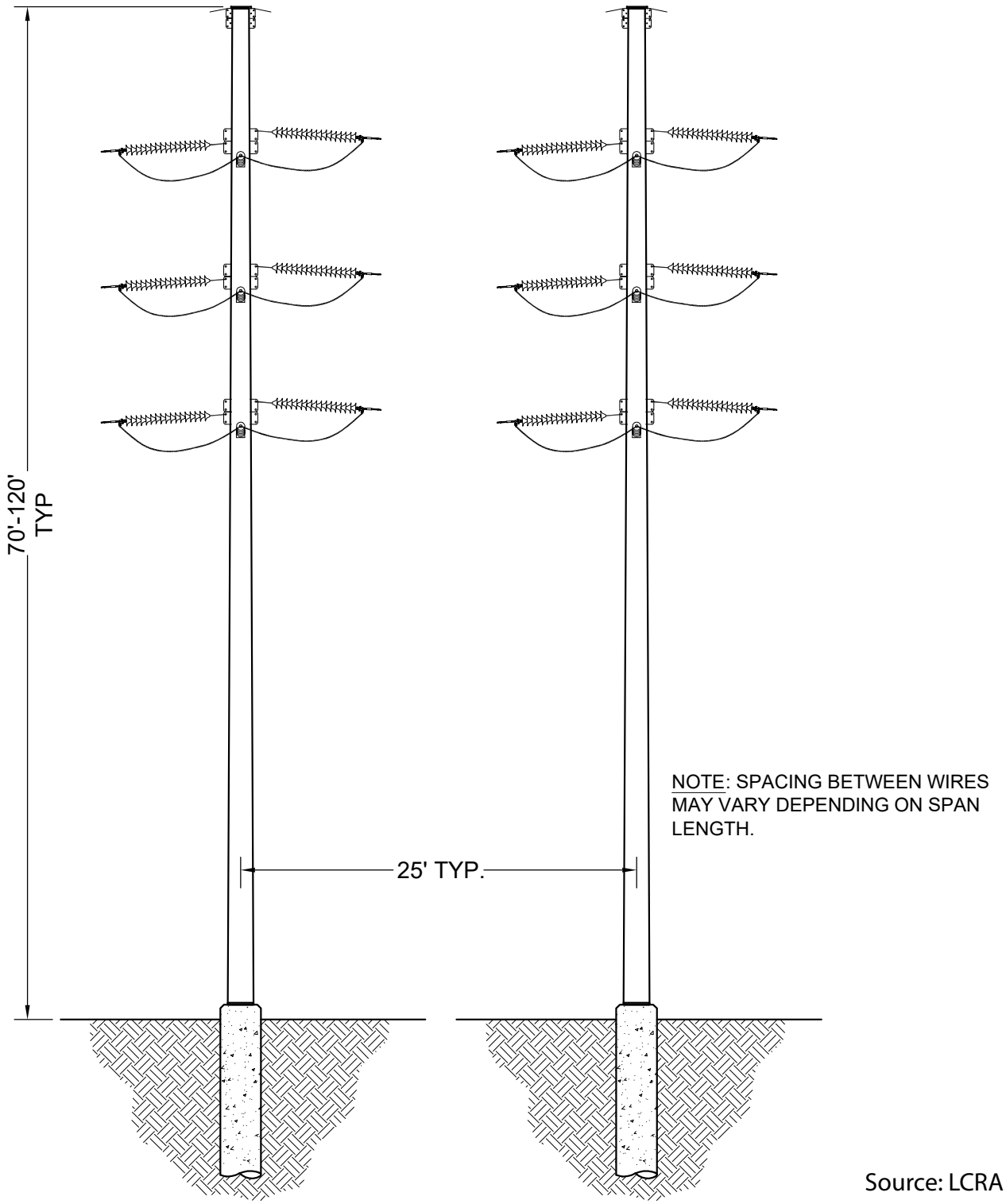

Figure 1-7

138-kV STEEL DOUBLE CIRCUIT DEAD-END POLE

Mountain Home
138-kV Transmission Line Project

1.5 PROPOSED PROJECT CONSTRUCTION CONSIDERATIONS

Construction of the Proposed Project will require removal of vegetation, excavating for installation of foundations, structure assembly and erection, conductor and shield wire installation, and cleanup when construction is complete.

Construction of the Proposed Project includes the installation of one new electric load-serving substation (Mountain Home), expansion and conversion of the existing Harper Substation for 138-kV operation, and interconnection and some reconfiguration of existing facilities at either Ingram Substation or Hunt Substation. The new Mountain Home Substation will require a graded site pad and an access road with construction consisting of vegetation removal, cut and fill of existing soils, and the addition of select fill and compacted crushed limestone. Following site preparation, a perimeter fence, foundations, ground grid, electrical equipment, support structures, and a control building will be installed. After all substation facilities are installed, a final surface layer of gravel will be added, and cleanup will occur when construction is complete. Expansion of the Harper Substation will involve similar activities. Interconnection into either the Ingram Substation or Hunt Substation is anticipated to occur within the existing area of either substation with some reconfiguration of existing facilities to accommodate the interconnection.

Following approval of a location for the Mountain Home substation site as part of the PUC's approved routing for the Proposed Project, construction documents will be prepared for the Mountain Home Substation, the Harper Substation expansion, and either the Ingram Substation or Hunt Substation interconnection, and construction will be conducted with attention to the conservation of natural and cultural resources.

After alignments and structure locations/heights for the transmission line are designed, transmission line and substation construction drawings and specifications will be prepared, and construction will be conducted with attention to the conservation of natural and cultural resources. The following criteria will guide LCRA TSC's conservation of natural and cultural resources:

- Efforts will be made to avoid oil spills and other types of pollution, particularly while performing work in the vicinity of streams, ponds, and other water bodies.
- Water used for construction purposes will not typically be taken from streams or other bodies of water. Should water from streams be necessary, its use will be limited to volumes that will not cause harm to the ecology or aesthetics of the area.

- Precautions will be taken to prevent the possibility of accidentally starting range fires, in compliance with local fire laws and applicable regulations.
- Tension stringing of conductors will be employed where possible to reduce the amount of vegetation removal. Helicopters may be considered for use in some areas, potentially including areas where clearing may be difficult or particularly impactful to the environment.
- Precautions will be taken to prevent the spread of oak wilt. ROW preparation will adhere to LCRA's Corporate Oak Wilt Policy (see Appendix F).
- When practical, in areas of known endangered or threatened species habitat and in consultation with the USFWS, construction will be performed during seasons of low occurrence or during the non-breeding season (species dependent).
- The Proposed Project will comply with the TCEQ construction general permit for storm water discharges.
- If any previously unassessed archeological materials are uncovered during construction, construction will cease in the immediate area of the discovery, and LCRA TSC will take appropriate actions consistent with those previously described in Section 1.3.
- ROW preparation will be performed in accordance with the provisions discussed below, in order to diminish soil disturbance during construction.

1.5.1 Right-of-Way Preparation

Trees and brush in the transmission line ROW are removed where necessary to ensure safe operation of and access to the line.

Existing and new transmission line ROW will be used for access during construction operations. Ingress and egress through private property may be required in limited circumstances to reduce construction impacts. In the event ingress and egress through private property is necessary, existing private roads will be used where practical. In some cases, culverts may be used to cross creeks and tributaries. Where culverts are not used, creek crossings may consist of rock or cobble placed on the stream bottom. The following factors, thoughtfully implemented and applicable to the Proposed Project, will minimize the potential adverse effects of the Proposed Project on the natural environment:

- Preparation of the ROW for construction of the transmission line facilities will consider soil stability, the prevention of silt deposition in water courses, and practical measures for the protection of natural vegetation and protection of adjacent resources, such as natural habitat for wildlife.

- A flail mower may be used instead of bulldozers with dirt blades, where such use will preserve the cover crop of grass, low-growing brush, and similar vegetation.
- Vegetation will typically be removed in a straight path.
- Removal of vegetation and grading of construction areas, such as storage areas or setup sites, will be performed in a manner that will minimize erosion and conform to the natural topography.
- Vegetation removal will be performed in accordance with construction plans, which will be developed in accordance with natural and cultural resource regulations applicable to the area of construction and in a manner that will diminish scarring of the landscape or silting of streams, while ensuring that the transmission line facilities can be constructed, operated, and maintained safely and in accordance with appropriate construction codes.
- Vegetation removal will be performed in a manner that diminishes the amount of flora and fauna disturbed during construction of the transmission line, except to the extent necessary to establish appropriate clearance, operation, and maintenance of the transmission line.
- Vegetation removal and construction activities, including temporary or permanent access roads in the Waters of the United States or in the vicinity of streambeds, will be performed in a manner to minimize damage to the natural condition of the area and in accordance with USACE requirements.
- Vegetation removal will not be performed until a SWPPP has been prepared and an NOI has been submitted to the TCEQ for the Proposed Project.
- Erosion control devices will be constructed where necessary to prevent soil erosion in the ROW, in accordance with the SWPPP. Erosion control devices will be maintained, and inspections conducted until the site is sufficiently revegetated, as required by the SWPPP.
- Roads will be provided with erosion-control measures, which may include side drainage ditches or culverts in accordance with the SWPPP.
- Roads will be stabilized if constructed on steep slopes. Where feasible, service and access roads will be constructed jointly.
- In or near areas where ROW enters dense vegetation and crosses major highways or rivers of high scenic value, a screen of natural vegetation may be left in the ROW while still allowing for access to the ROW.

1.5.2 Structure Assembly and Erection

Survey crews will stake or otherwise mark structure locations. Soil borings and soils testing will provide the parameters for foundation designs for new structures. Construction crews will install structures by excavating circular holes and placing in them a reinforced, concrete foundation or a direct-embed pole. Where direct-embedded poles are used, crews will install them by excavating oversized holes, lifting and setting the structure, and backfilling with native soils, select fill, or concrete, depending on soil conditions at the site. Where structures with foundations are used, after foundations have cured sufficiently, crews will set structures. Following structure erection, crews will install the conductor and shield wire suspension assemblies. Conductor suspension assemblies may include glass, porcelain, or polymer insulators. Structure grounds will be installed using external grounding systems such as rods or loops. In some areas, avian-perching deterrents may be installed above suspension assemblies.

Although vehicular traffic is a very large part of this operation, construction crews will take care to limit damage to the ROW by minimizing the number of pathways traveled.

1.5.3 Conductor and Shield Wire Installation

Conductor, also referred to as wire, and shield wires (for lightning protection) will be installed via a tensioning system. Tensioning systems typically use ropes threaded through stringing blocks or dollies for each conductor and shield wire. Conductor and shield wires will be pulled by the ropes and held tight by a tensioner to keep the wires from coming in contact with the ground and other objects that could damage the wire. In addition, guard structures (temporary wood-pole structures) will be installed where the transmission line crosses overhead electric power lines, overhead telephone lines, roadways, or other areas requiring an additional margin of safety during wire installation. After the wire is tensioned to the required sag, the wire will be taken out of the blocks and placed in the suspension and deadend clamps for permanent attachment.

1.5.4 Cleanup

The cleanup operation involves stabilizing disturbed areas, removal of debris, and the restoration of areas damaged by construction of the Proposed Project. The following criteria will guide the cleanup of construction debris and restoration of the area's natural setting. Further requirements may be imposed by land management agencies.

- Construction equipment, supplies, and LCRA TSC or contractor property will be dismantled and removed from the ROW when construction is complete.

- Construction waste, with the possible exception of cleared vegetation, will be removed prior to completion of the Proposed Project.
- If cleared vegetation is mulched, it may be spread out over the ROW, given to the landowner or a nursery as a product for beneficial use, or picked up and taken to a landfill.
- Burning is not typically conducted but may be used as a means of disposal if no practical alternative exists. Any material to be burned will be piled in a manner and in locations that will cause the least fire risk. Care will be taken to prevent fire or heat damage to trees, shrubs, and structures adjacent to the ROW and substation. Burning will conform to local fire and air quality regulations.
- Soil that has been excavated during construction and not used will be evenly backfilled onto a cleared area, spread to conform to the terrain and the adjacent land, or removed from the site.
- Replacement of soil adjacent to water crossings for access roads will be at slopes less than the normal angle of repose for the soil type involved.
- If temporary roads are used they will be removed, and the original slopes restored and revegetated as required by the SWPPP.
- If natural revegetation will not provide ground cover in a reasonable length of time, seeding, sprigging, or hydro-seeding of restored areas may be used to encourage growth of grasses and other vegetation that is ecologically desirable.
- Where site factors make it unusually difficult to establish a protective vegetative cover, other restoration procedures may be advisable to prevent erosion, such as the use of gravel, rocks, or concrete.
- LCRA TSC will return each affected landowner's property to its original contours and grades unless otherwise agreed to by the landowners' representatives or if doing so will affect the safety or stability of the Proposed Project's structures or the safe operation and maintenance of the line.

1.6 PROPOSED PROJECT MAINTENANCE

Periodic inspection of the transmission line ROW, structures, line, and substations will be performed by LCRA TSC in order to provide for the safe and reliable operation of the transmission line and substations. A major maintenance item will be the necessary removal of trees and other vegetation that have the potential to interfere with the safe and reliable operation of the transmission line and substations. Preservation of the environmental, natural, and cultural resource conservation factors, designed and built into transmission system siting, require a thoughtful, comprehensive program for maintaining the

facilities. The following factors will be incorporated into LCRA TSC's maintenance program for this project.

- Native vegetation, particularly that of value to fish and wildlife, that has been preserved during the construction process and that does not impede access nor have the potential to grow close enough to the transmission line to pose a hazard to the safe operation and maintenance of the transmission line will be allowed to grow in selected parts of the ROW.
- Once a cover of vegetation has been established, it will be properly maintained to ensure public safety and a reliable, functioning transmission system.
- Access roads and service roads, where practical, will be maintained with native grass cover. Substation access roads will be constructed using crushed gravel, asphalt, or concrete as determined by site and regulatory requirements. Gravel roads will employ anti-dusting agents as required. Where grading is necessary, access and service roads will be graded to the proper slope in order to prevent or diminish soil erosion.
- If used, United States Environmental Protection Agency (USEPA) approved herbicides will be carefully selected and carefully applied in a manner that will diminish effects on desirable indigenous plant life, and selective application will be used whenever appropriate. To preserve the natural environment, it is essential that herbicides be applied in a manner fully consistent with the protection of the entire environment, particularly the health of humans and wildlife.
- Maintenance inspection intervals will be established by LCRA TSC and routine maintenance will be conducted, when possible, while access roads are firm or dry.
- Aerial and ground maintenance inspection activities of the transmission line facility will include observation of soil erosion problems, fallen timber, and conditions of the vegetation that require attention. As an erosion-control measure, native shrubs, forbs, or grasses may be planted.
- Transmission line ROW can be used for appropriate types of multiple-use concepts, such as trails suitable for hiking, biking, bird watching, farming, ranching and livestock grazing, wildlife production, and recreational or commercial hunting operations, as long as the activity does not impact public safety or inhibit safe operation and maintenance of the electrical system.

2.0 DESCRIPTION OF THE STUDY AREA

The study approach utilized by POWER Engineers, Inc. (POWER) for this EA included the characterization and identification of environmental constraints and potential routing opportunities for the Proposed Project. To accomplish this task, once the Proposed Project endpoints were provided and the study area boundaries established, a base map was developed, and several methods were then incorporated to collect pertinent environmental and land use data. Methods utilized for the development and identification for preliminary and proposed alternative routes are provided in Section 4.0.

The original two endpoints for the Proposed Project were the existing Hunt Substation and the existing Harper Substation. The project will also extend through a proposed new substation (Mountain Home) in the vicinity of the IH 10 and Farm-to-Market Road (FM) 479 intersection, the IH 10 and State Highway (SH) 41 intersection, or the SH 41 and SH 27 intersection. The initial study area boundary, which was developed in February 2018, is depicted in Figure 2-1.

In August 2018, LCRA TSC modified the initial study area boundary to include the Ingram Substation as a potential project endpoint. The southeastern portion of the study area was modified to allow for the inclusion of additional alternative route segments that would provide for a new transmission line between the existing Ingram and Harper substations while also extending through one of the three proposed Mountain Home Substation sites along FM 479. In December 2018, the study area boundary was further modified as a result of the public involvement phase of the Proposed Project. The revised (final) study area boundary is depicted in Figure 2-2. The study area boundaries were defined to include feasible, geographically diverse alternatives for the location of a new 138-kV transmission line and a new substation in the Mountain Home area. In addition to the technical requirements associated with the location of the Proposed Project, major physiographic features, jurisdictional boundaries, sensitive resources, land uses, and existing linear corridors (roadways and utilities) helped to define the study area boundaries (Figures 2-1 and 2-2). The final study area covers approximately 157 square miles in Gillespie, Kerr, and Kimble counties.

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Insert Figure 2-1 Initial Study Area in PDF format.

FRONT

Insert Figure 2-1 Initial Study Area in PDF format.

BACK

Insert Figure 2-2 Final Study Area in PDF format.

FRONT

Insert Figure 2-2 Final Study Area in PDF format.

BACK

After delineation of the study area, a Proposed Project base map was prepared and used to display resource data for the project area. Resource data categories and factors that were determined appropriate for evaluation based on the applicable PUC routing requirements, including PURA, the PUC rules, the PUC's CCN application form, and PUC precedent, were selected and mapped for interpretation and analysis. The base map provides a broad overview of various resource locations indicating routing constraints and areas of potential routing opportunities.

Data displayed on the base map includes but is not limited to:

- Major land jurisdictions and uses
- Major roads (including county roads [CR], FM roads, SHs, and IHs)
- Existing transmission line and pipeline corridors
- Parks and recreation areas
- Major political subdivision boundaries
- Rivers, streams, and ponds

Several methods were used to collect and review environmental and land use data including incorporation of readily available Geographic Information System (GIS) coverage with associated metadata, review of maps and published literature, review of files and records from numerous federal, state, and local regulatory agencies, and reconnaissance surveys of the study area. Inventory data for each resource area were collected and mapped within the study area using GIS programs and software.

Maps and/or data layers reviewed include, but were not limited to, the United States Geological Survey (USGS) 7.5 minute topographic maps, National Wetland Inventory (NWI) maps, TxDOT county highway maps, Gillespie, Kerr, and Kimble counties appraisal districts land parcel boundary data layers (Gillespie, Kerr, and Kimble Counties Appraisal Districts 2019), and recent aerial imagery flown in March 2018 and November 2018 (Photo Science 2018).

Various federal, state, and local agencies and officials that may have potential concerns and/or regulatory permitting requirements for the Proposed Project were contacted. A list of federal, state, and local regulatory agencies was developed to receive a consultation letter regarding the Proposed Project. The purpose of the letter was to inform the various agencies of the Proposed Project and to provide them with an opportunity to disseminate information regarding resources and potential issues within the study area.

Copies of correspondence with local/county departments and federal, state, and local regulatory agencies are included in Appendix A.

Ground reconnaissance surveys of the study area (limited to public viewpoints) were conducted by POWER personnel to confirm the findings of data collection activities, to identify changes in land use occurring after the date of the available aerial photography, and to identify potential constraints that may not have been previously noted in the data. Ground reconnaissance surveys of the study area were conducted between September 2017 and April 2019.

The following sections summarize the data collection methods and describe the environmental setting for each resource within the study area.

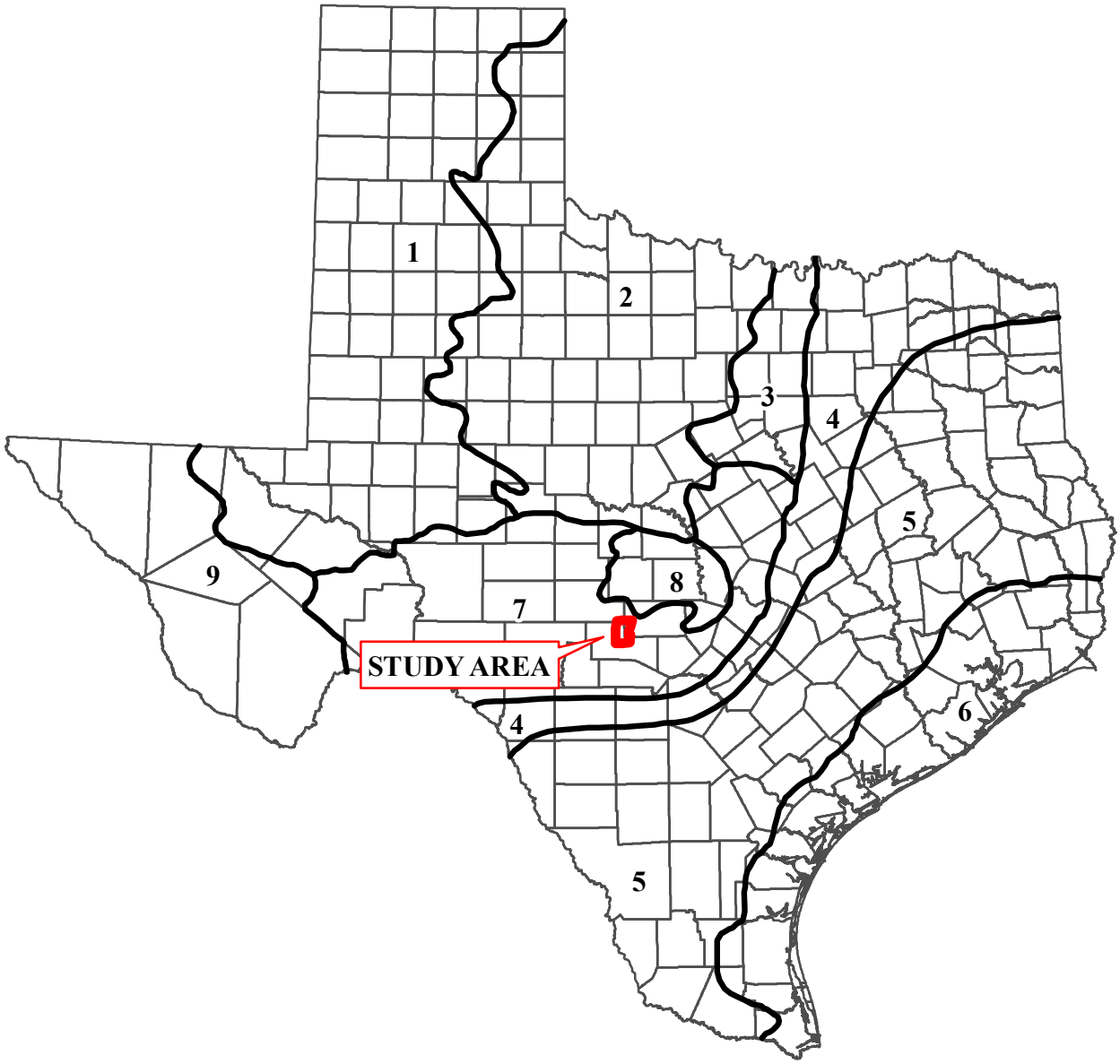
2.1 Physiography

As shown in Figure 2-3, the study area is located within the Edwards Plateau Physiographic Province (Bureau of Economic Geology [BEG] 1996). This area of the Edwards Plateau is characterized by flat upper surfaces, interspersed by drainages that open up into larger draws or box canyons. Bedrock types typically include cretaceous limestone and dolomite. Elevations in the Edwards Plateau range between 3,000 feet above mean sea level (amsl) within the western and northern portions, to 450 feet amsl towards the Gulf coast (BEG 1996). Elevations in the study area generally decrease from northwest to southeast and range between approximately 2,200 feet amsl and 1,750 feet amsl (USGS 2018a).

2.2 Geology

The BEG (1986) geologic atlas map was reviewed for geologic formations that occur within the study area. Underlying formations include Quaternary-aged low terrace deposits and alluvium occurring along streams and creeks, and the Cretaceous-aged Fredericksburg and Trinity groups (USGS 2018c; BEG 1986).

Quaternary aged formations within the study area include alluvium and low terrace deposits. Alluvium deposits are more recent and may be located above the floodplain in areas with frequent flooding along the rivers, creeks, and streams. Alluvium deposits contain clay, silt, sand, gravel, and organic matter. Low terrace deposits occur along entrenched streams and are composed of sand, silt, clay, and organic matter (USGS 2018b and 2018c).



0 25 50 100 150 200 250

Miles

Source: Texas Bureau of Economic Geology, 1996

Legend

Physiographic Region Boundary

1 High Plains
2 North-Central Plains
3 Grand Prairie
4 Blackland Prairies
5 Interior Coastal Plains
6 Gulf Coastal Prairies
7 Edwards Plateau
8 Central Texas Uplift
9 Trans-Pecos Basin and Range

County Boundary

Figure 2-3

LOCATION OF THE STUDY AREA IN RELATION TO THE PHYSIOGRAPHIC REGIONS OF TEXAS

Mountain Home 138-kV Transmission Line Project

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Cretaceous aged formations include the Fredericksburg group (BEG 1986). Within the study area, rock units constituting the Fredericksburg Group include the Segovia and Fort Terrett members. Both rock units are generally comprised of limestone and dolomite. The Fort Terrett member is approximately 230 to 300 feet thick and the Segovia member is approximately 300 feet thick (BEG 1986; USGS 2018b and 2018c).

Significant Geological Features

Several potential significant features affecting construction and operation of the transmission line were reviewed within the study area. Potentially hazardous areas reviewed include karst areas with known karst/cave locations, fault lines, and subsurface contamination.

Karst features and caves form from the erosion and dissolution of limestone, creating underground fissures and caverns (Griffith et al. 2007). Because of the limestone geology of the Edwards Plateau, karst features may be common in this region and may occur within the study area (Texas Speleological Survey [TSS] 2007). Review of TSS data did not indicate any known cave locations in the study area (TSS 1994); however, undocumented cave formations have the potential to occur in the area. Review of the Geologic Atlas of Texas (BEG 1986; USGS 2018c) maps and the Quaternary Fault and Fold Database of the United States (USGS 2006) did not identify any quaternary or normal faults within the study area.

Subsurface contamination (soils or groundwater) from previous commercial activities or dumps/landfills may require additional considerations during routing and/or may create a potential hazard during construction activities. Review of the Superfund/National Priority List (USEPA 2018a), Texas' Index of Superfund sites (TCEQ 2018), and state solid waste facilities data (TCEQ 2017) did not indicate any superfund or active landfill sites within the study area.

2.3 Soils

2.3.1 Soil Associations

Natural Resources Conservation Service (NRCS) Web Soil Survey data was reviewed for Gillespie, Kerr, and Kimble counties. Descriptions of soil associations occurring within the study area are summarized in Table 2-1. A soil association is a group of soils defined as a single unit that is geographically associated in a characteristic repeating pattern (NRCS 2018).

TABLE 2-1 MAPPED SOIL UNITS OCCURRING WITHIN THE STUDY AREA

SOIL MAP UNIT	DOMINANT LANDFORM	HYDRIC STATUS	FARMLAND CLASSIFICATION
Gillespie County			
Denton silty clay, dry, 1 to 3 percent slopes	Hillslopes	No	Farmland of statewide importance, if irrigated
Doss silty clay, 1 to 5 percent slopes	Hillslopes	No	Not prime farmland
Doss soils, 1 to 5 percent slopes, eroded	Plains		Not prime farmland
Oakalla silty clay loam, 0 to 2 percent slopes, occasionally flooded	Floodplains	Yes	Not prime farmland
Boerne and Oakalla soils, channeled, frequently flooded	Floodplains, stream terraces	Yes	Not prime farmland
Krum silty clay, 1 to 3 percent slopes	Stream terraces	No	All areas are prime farmland
Purves soils, undulating	Plains	No	Not prime farmland
Tarpley clay, stony, 1 to 8 percent slopes	Plains	No	Not prime farmland
Tarrant soils, 1 to 8 percent slopes	Ridges	No	Not prime farmland
Tarrant-Rock outcrop complex, 8 to 40 percent slopes	Ridges	No	Not prime farmland
Topia clay, 0 to 3 percent slopes	Ridges	No	Not prime farmland
Topia clay, 3 to 5 percent slopes	Ridges	No	Not prime farmland
Kerr County			
Bonedraw clay, 0 to 5 percent slopes, occasionally flooded	Draws	No	Not prime farmland
Bonedraw occasionally flooded-Mudgedraw complex, 0 to 5 percent slopes	Draws	No	Not prime farmland
Boerne fine sandy loam, 0 to 3 percent slopes, occasionally flooded	Flood plains	No	Farmland of statewide importance, if irrigated
Denton silty clay, dry, 1 to 3 percent slopes	Hillslopes	No	Farmland of statewide importance, if irrigated
Depalt silty clay loam, 0 to 3 percent slopes	Stream terraces	No	All areas are prime farmland
Doss silty clay, 1 to 5 percent slopes	Hillslopes	No	Not prime farmland
Doss-Kerrville association, undulating	Plains	No	Not prime farmland
Eckrant-Comfort association, 1 to 8 percent slopes	Ridges	No	Not prime farmland
Eckrant-Harper complex, 3 to 16 percent slopes	Ridges	No	Not prime farmland
Eckrant-Rock outcrop association, 8 to 30 percent slopes	Ridges	No	Not prime farmland
Harper-Eckrant complex, 2 to 7 percent slopes	Ridges	No	Not prime farmland
Harper-Prade complex, 1 to 8 percent slopes	Plains	No	Not prime farmland
Harper-Eckrant Rock outcrop complex, 7 to 30 percent slopes	Ridges	No	Not prime farmland
Harper-Tarpley-Eckrant complex, 1 to	Ridges	No	Not prime farmland

TABLE 2-1 MAPPED SOIL UNITS OCCURRING WITHIN THE STUDY AREA

SOIL MAP UNIT	DOMINANT LANDFORM	HYDRIC STATUS	FARMLAND CLASSIFICATION
5 percent slopes			
Kerrville gravelly clay loam, 1 to 8 percent slopes	Ridges	No	Not prime farmland
Kerrville-Real association, 8 to 30 percent slopes	Ridges	No	Not prime farmland
Krum silty clay, 1 to 3 percent slopes	Stream terraces	No	All areas are prime farmland
Krum silty clay, 3 to 5 percent slopes	Stream terraces	No	All areas are prime farmland
Nuvalde silty clay, moist, 0 to 1 percent slopes	Stream terraces	No	All areas are prime farmland
Nuvalde silty clay, moist, 1 to 3 percent slopes	Stream terraces	No	All areas are prime farmland
Noxville-Harper complex, 0 to 5 percent slopes	Plains	No	Not prime farmland
Oakalla silty clay loam, 0 to 2 percent slopes, occasionally flooded	Flood plains	Yes	Not prime farmland
Orif-Boerne association, 0 to 5 percent slopes, frequently flooded	Floodplains on river valleys	Yes	Not prime farmland
Purves-Tarrant association, 1 to 8 percent slopes	Ridges	Yes	Not prime farmland
Spires-Tarpley complex, 1 to 5 percent slopes	Ridges	No	Not prime farmland
Tarpley clay, 1 to 3 percent slopes	Hillslopes	No	Not prime farmland
Tarrant-Eckrant association, gently undulating	Plains	Yes	Not prime farmland
Tarpley-Eckrant complex, 1 to 5 percent slopes	Hillslopes	No	N/A
Tarpley-Roughcreek association, gently undulating	Plains	No	Not prime farmland
Tarrant-Eckrant association, gently undulating	Plains	Yes	Not prime farmland
Kimble County			
Eckrant-Tarrant complex, undulating	Ridges	No	Not prime farmland
Purves-Tarrant association, 1 to 8 percent slopes	Ridges	Yes	Not prime farmland
Speck clay loam, 1 to 3 percent slopes	Ridges	No	Not prime farmland
Tarrant soils, 1 to 8 percent slopes	Ridges	No	Not prime farmland
Valera clay, 1 to 3 percent slopes	Hillslopes	Yes	Prime farmland if irrigated

Source: NRCS 2018.

2.3.2 Prime Farmland Soils

Under 7 United States Code (U.S.C.) § 4201, prime farmland soils are defined as those soils that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Prime farmlands have the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed with acceptable farming

methods. Additional potential prime farmlands contain soils that meet most of the prime farmland requirements but lack the installation of water management facilities or sufficient natural moisture. The United States Department of Agriculture (USDA) would consider these soils as prime farmland if such practices were installed.

The construction of the transmission line is not anticipated to be subject to the requirements of the Farmland Protection Policy Act (FPPA) because the construction will not result in a conversion of farmlands. Areas within the transmission line ROW will still be available to be farmed after construction is complete. Although not anticipated, the construction of the proposed expanded and new substation facilities could result in a conversion of Prime or Important Farmlands. After a substation location is approved, LCRA TSC may need to coordinate with the NRCS to have each of the proposed expanded and new substation sites evaluated under the FPPA. The NRCS responded to POWER's solicitation for information in a letter dated March 14, 2018, stating, "Throughout the project area, the main concerns are depth to bedrock and potential for wind and water erosion. The common bedrock types in this area are limestone or sandstone, which are characterized as having a very strong to indurated cementation class. These areas may require extra equipment or accommodations during and after construction. Additionally, we recommend using approved erosion control activities in these areas to reduce erosion and minimize bare ground or heavily disturbed areas" (see Appendix A).

2.3.3 Hydric Soils

The National Technical Committee for Hydric Soils defines hydric soils as soils formed under conditions of saturation, flooding, or ponding long enough during growing seasons to develop anaerobic conditions in the upper soil horizons. These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support growth and reproduction of hydrophytic vegetation (NRCS 2018).

Map units dominantly comprised of hydric soils might have small inclusions of non-hydric soils in higher areas of the landform. Conversely, map units dominated by non-hydric soils might have small inclusions of hydric soils in lower areas of the landform. Minor soil components within each association were not evaluated for their hydric status. According to NRCS Web Soil Survey data for Kimble, Kerr, and Gillespie counties within the study area, there are minor non-hydric soil components in some soil associations designated as hydric (NRCS 2018). The soil units classified as hydric are listed in Table 2-1.

2.4 Mineral and Energy Resources

Data from the Railroad Commission of Texas (RRC) and BEG was reviewed for gravel quarries/pits, mining activities, oil/gas wells, pipelines, and supporting facilities potentially occurring within the study area. Two existing pipelines and one proposed pipeline were identified within the study area. These pipelines were mapped using GIS and taken into consideration during the routing process (RRC 2018b; BEG 2018; Penwell 2018; Kinder Morgan 2015). No active oil or gas wells were identified within the study area (RRC 2018b; BEG 2018).

No historical or current coal or uranium mining activities were identified within the study area (RRC 2016 and 2018a). Review of aerial maps and topographical maps identified several gravel pits scattered throughout the study area. Three active gravel/rock quarries were identified within the study area, located just off and along IH 10 (USGS 2018a).

2.5 Water Resources

2.5.1 Surface Water

The study area is located within the Colorado and Guadalupe River Basins and within the Llano, Pedernales, and Upper Guadalupe Sub-Basins (USEPA 2018b). The headwaters of the Pedernales River are located in the northeast corner of the study area and generally flow in a northern or eastern direction. Johnson Creek and its tributaries located within the central and southern portions of the study area generally flow in a southern or eastern direction. The North Fork Guadalupe River flows east and meanders into the study area along the south boundary for approximately two miles. Other named surface waters within the study area include Honey Creek, Spring Creek, Byas Branch, Contrary Creek, Fessenden Branch, Klein Branch, Henderson Branch, West Dry Branch, Dry Branch, Fall Branch, Rogers Draw, and Banta Branch. Additional named surface waters within the study area include Cedar Lake and Shelton Ranches Reservoir Number 2, located within the community of Mountain Home. During the public involvement phase, several landowners stated that some of the larger surface water impoundments located within the study area have been used to provide water to fight wildfires via helicopter.

Also, within the community of Mountain Home are multiple research ponds associated with Heart of the Hills Fishery Research Station, operated by Texas Parks and Wildlife Department (TPWD) (USEPA 2018b). Additional unnamed surface waters include stock ponds and ephemera/intermittent streams. Review of the 2017 Texas Water Development Board (TWDB) State Water Plan and the 2016 regional

water plans for the Plateau and Lower Colorado regions did not indicate any proposed surface water developments within the study area (TWDB 2018a and 2018b).

Under 31 Texas Administrative Code (TAC) § 357.43 and 358.2, TPWD has designated Ecologically Significant Stream Segments (ESSS) based on habitat value, threatened and endangered species, species diversity, and aesthetic value criteria (TPWD 2018c). Designated ESSS occurring within the study area include the Pedernales River (TCEQ Segment ID: 1414) for its biological function, designation as a riparian conservation area, and high water quality/exceptional aquatic life/high aesthetic value; Johnson Creek (TCEQ Segment ID: 1816) for its high water quality/exceptional aquatic life/high aesthetic value; and the North Fork Guadalupe River (TCEQ Segment ID: 1817) for its biological function, designation as a riparian conservation area, high water quality/exceptional aquatic life/high aesthetic value, and for presence of threatened or endangered species/unique communities (TPWD 2018c).

In accordance with Sections 303(d) and 304(a) of the Clear Water Act (CWA), the TCEQ identifies surface waters for which effluent limitations are not stringent enough to meet water quality standards and for which the associated pollutants are suitable for measurement by maximum daily load. Review of TCEQ's (2014) Texas Integrated Report of Surface Water Quality did not indicate any surface waters within the study area that do not meet these water quality standards.

2.5.2 Ground Water

The study area lies outside of the Edwards Aquifer recharge, artesian, and contributing zones (TCEQ 2019). Ground water aquifers mapped within the study area include the Edwards-Trinity and Trinity aquifers (major) and Hickory and Ellenburger-San Saba aquifers (minor). The Trinity Aquifer underlies eastern and southern portions of the study area and underlies a large area across central and northeast Texas. It consists primarily of limestone, sand, clay, gravel, and conglomerates. The average freshwater saturated thickness is about 600 feet with total dissolved solids, sulfates, and chloride increasing with the depth of the aquifer (TWDB 2011). The Edwards-Trinity Aquifer underlies a majority of the study area as well as much of southwestern Texas. Water is contained predominantly within limestone and dolomite of the Edwards Group and sands of the Trinity Group. The average freshwater saturated thickness is approximately 433 feet, with a maximum saturated thickness of over 800 feet. Water quality ranges from fresh to slightly saline, with salinity typically increasing westward within the Trinity Group (TWDB 2011).

Other ground water resources, such as public and private water wells and natural springs, were identified as occurring throughout the study area (TWDB 1975 and 2018c). TWDB (2018c) identified approximately 17 natural springs scattered throughout the study area. At the public open house meetings, one landowner provided the location of a previously undocumented private spring and several landowners noted seeing several springs along Johnson Creek within the western portions of the study area.

2.5.3 Floodplains

Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM) and National Flood Hazard Layer were reviewed for the study area. The 100-year floodplains within the study area are primarily associated with the North Fork Guadalupe River, Johnson Creek, and Pedernales River and their associated tributaries. The 100-year flood (one percent flood or base flood) represents a flood event that has a one percent chance of being equaled or exceeded for any given year (FEMA 2018).

2.6 Ecological Resources

Information on sensitive wildlife and vegetation resources within the study area was obtained from a variety of sources, including correspondence with the USFWS and TPWD. Additional information was obtained from published literature and technical reports. All biological resource data for the study area were mapped using GIS.

For the purpose of this EA, emphasis was placed on obtaining known locations of unique vegetation communities and habitat for special status species that have been previously documented within the study area. Special status species include those listed by the USFWS as threatened, endangered, proposed, or candidate, and those listed by TPWD as threatened, endangered, or rare. Spatial data of known occurrences for listed species and/or sensitive vegetation communities was obtained from the TPWD's Texas Natural Diversity Database (TXNDD) on January 23, 2018. Although the TXNDD (2018) was reviewed, these data do not preclude the potential for a species to exist within the study area. Only a thorough review of existing habitats and/or a species-specific survey can determine the presence or absence of a special status species.

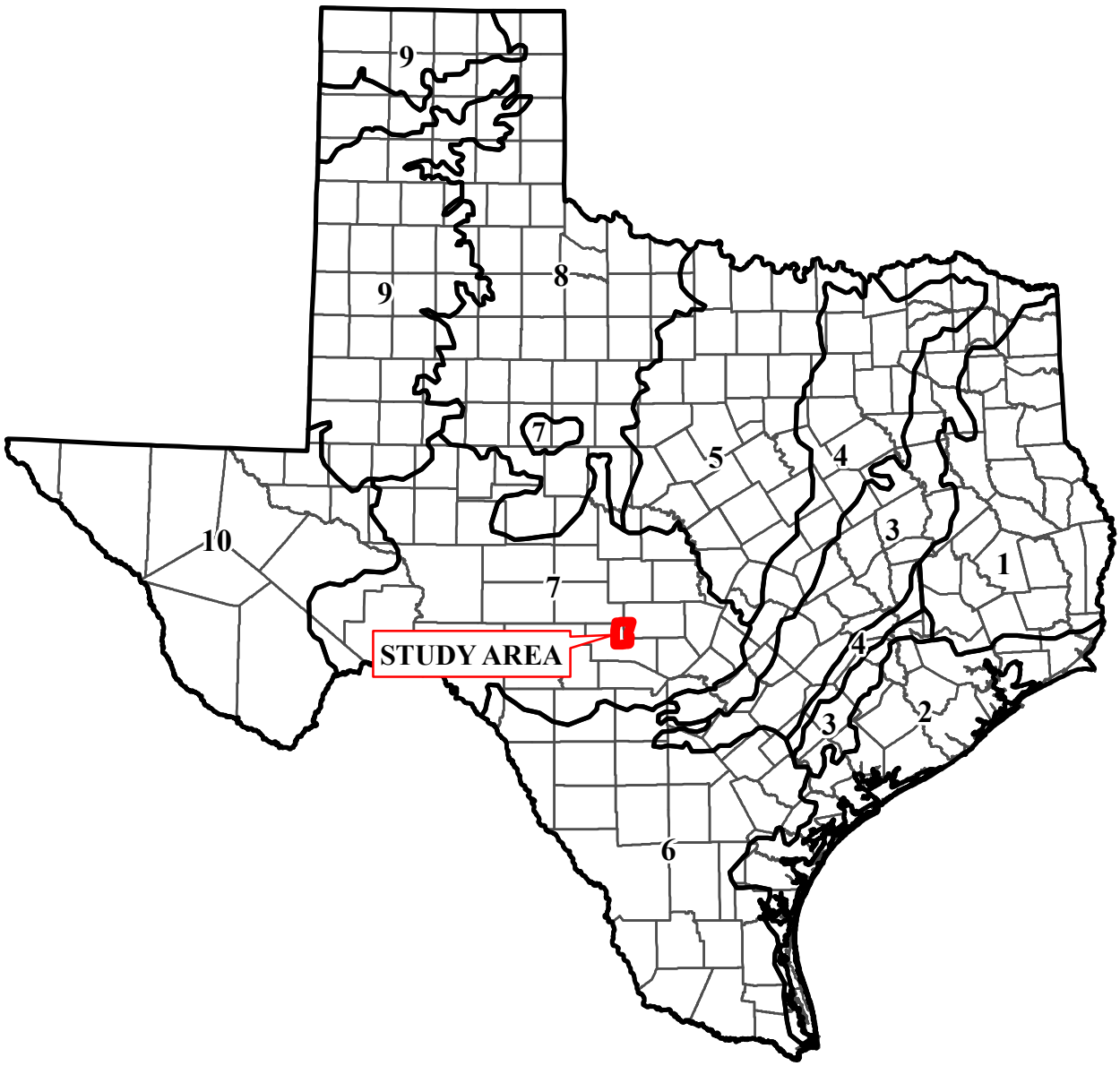
2.6.1 Vegetation

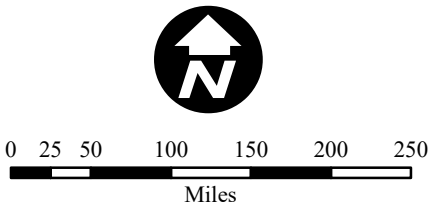
As shown in Figure 2-4, the study area is located within the Edwards Plateau Ecoregion (Gould et al. 1960). The study area is located within the Edwards Plateau Level III Ecoregion and within the Edwards Plateau Woodland and Balcones Canyonlands Level IV Ecoregion (Griffith et al. 2007). General descriptions of the historical climax vegetation communities associated with the Edwards Plateau Woodland and Balcones Canyonlands Ecoregions are included below. For each community type plant species composition and density depends on location, hydrology, soils, and disturbance history or land management activities.

Edwards Plateau Woodland Ecoregion

The Edwards Plateau Woodland Ecoregion (Edwards Plateau) is a limestone plateau with rolling terrain and broad valleys. Because of the nutrient poor and rocky soils, this region is mostly used for livestock grazing, especially goat and sheep. Some croplands occur in alluvial valleys where soil is deeper (Griffith et al. 2007).

Historically, the Edwards Plateau was grass savanna with scattered oak mottes of plateau live oak (*Quercus fusiformis*), Texas oak (*Q. buckleyi*), and Ashe juniper (*Juniperus ashei*). Dominant grasses included little bluestem (*Schizachyrium scoparium*), yellow Indiangrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula*), and Texas cupgrass (*Eriochloa sericea*). Fire is an important factor to the Edwards Plateau ecosystems, and with the absence of regular fire today, woody vegetation has encroached on many native grasslands, forming more dense woodland. Additionally, livestock grazing practices have altered the herbaceous composition of the landscape, which now commonly supports curlymesquite (*Hilaria belangeri*), Texas wintergrass (*Nassella leucotricha*), blue grama (*Bouteloua gracilis*), buffalograss (*Buchloe dactyloides*), and tobosa (*Pleuraphis mutica*). Wildflowers, such as Texas bluebonnets (*Lupinus texensis*), Indian blanket (*Gaillardia aestivalis*), goldenmane tickseed (*Coreopsis basalis*), and winecup (*Callirhoe digitata*) still commonly occur in the spring (Griffith et al. 2007).





Source: Gould, F.W., Hoffman, G.O., and Rechenthin, C.A. 1960, modified

Legend

Vegetational Areas Boundary

1 Pineywoods
2 Gulf Prairies and Marshes
3 Post Oak Savannah
4 Blackland Prairies
5 Cross Timbers and Prairies
6 South Texas Plains
7 Edwards Plateau
8 Rolling Plains
9 High Plains
10 Trans-Pecos

County Boundary

Figure 2-4

LOCATION OF THE STUDY AREA IN RELATION TO THE VEGETATIONAL AREAS OF TEXAS

Mountain Home 138-kV Transmission Line Project

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Balcones Canyonlands Ecoregion

The Balcones Canyonlands Ecoregion (Balcones Canyonlands) forms the southern border of the Edwards Plateau and is distinct due to the extent of the escarpments. This region is highly dissected by streams, springs, and rivers, and serves as an important recharge zone for the Edwards-Trinity Aquifer. The broken topography of the region discourages urban development but is still used for some livestock grazing and farming (Griffith et al. 2007).

Plant communities in the Balcones Canyonlands occur along soil and moisture gradients, from evergreen woodlands on slopes, to deciduous north-slope forest, to mesic riparian forest. Sheltered canyons support slippery elm (*Ulmus rubra*), Ohio buckeye (*Aesculus glabra*), boxelder (*Acer negundo*), bigtooth maple (*Acer grandidentatum*), Carolina basswood (*Tilia americana*), and escarpment black cherry (*Prunus serotina var. eximia*). Species such as bald cypress (*Taxodium distichum*) and black willow (*Salix nigra*) may also occur along major streams and rivers. Westward canyons support more arid species such as Ashe juniper, sumac (*Rhus* spp.), Texas sotol (*Dasylirion texanum*), acacia (*Acacia* spp.), honey mesquite (*Prosopis glandulosa*), and ceniza (*Leucophyllum frutescens*). Oak savannas composed of plateau live oak, Texas oak, Ashe juniper, cedar elm (*Ulmus crassifolia*), and escarpment black cherry occur on ridgetops and benches between canyons and drainages. With the absence of regular fire today, Ashe juniper has invaded much of the savanna, but where these grasslands still persist, grasses such as threeawns (*Aristida* spp.), little bluestem, and gramas (*Bouteloua* ssp.) occur (Griffith et al. 2007).

As shown in Table 2-2, using the TPWD Texas Ecosystem Analytical Mapper, numerous ecological systems were identified as potentially occurring within the study area. Review of TXNDD (2018) data indicates that one element occurrence (EO) record for Texas Red Oak-Ashes Juniper Forest overlaps with the southeast corner of the study area.

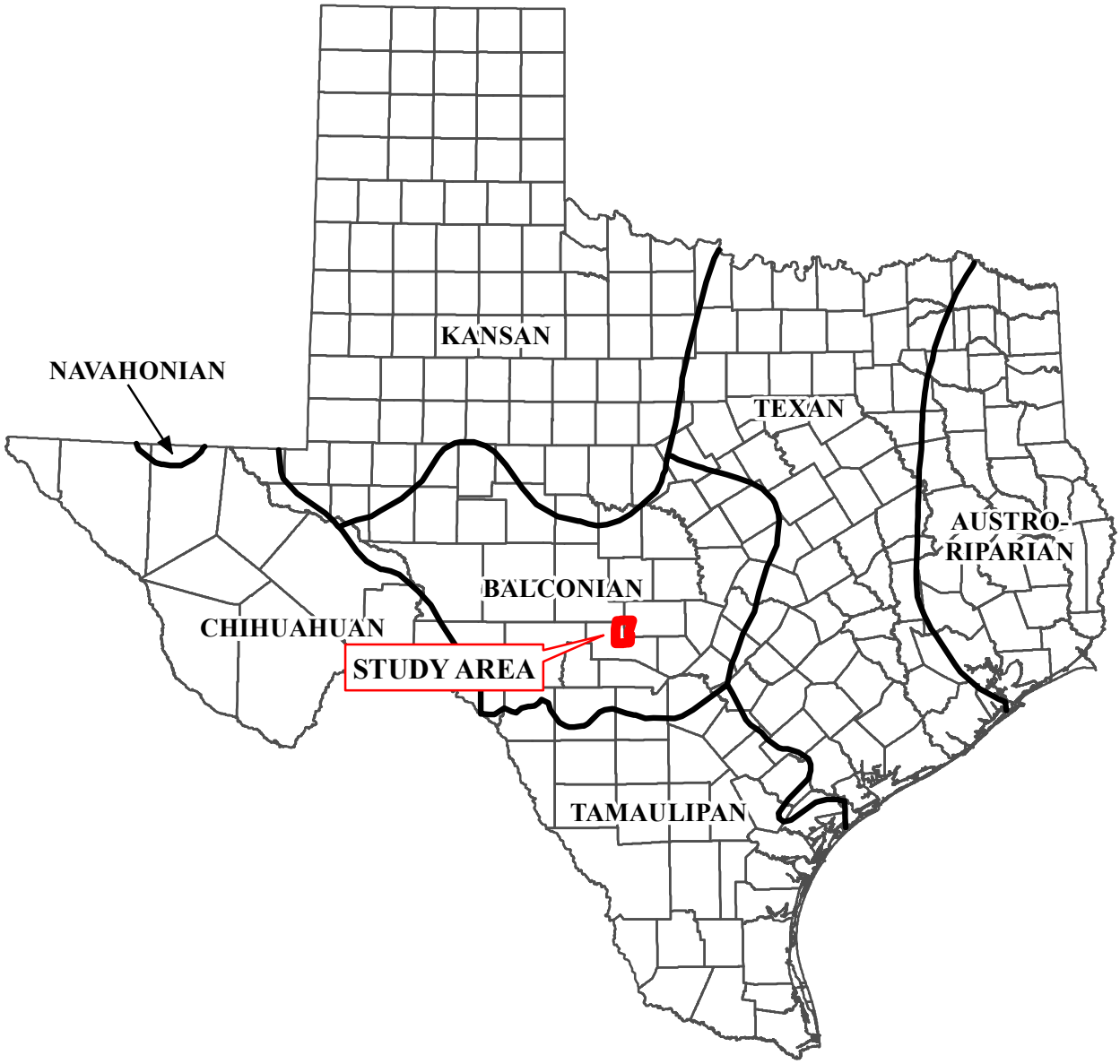
TABLE 2-2 POTENTIALLY OCCURRING ECOLOGICAL SYSTEMS WITHIN THE STUDY AREA

ECOLOGICAL SYSTEMS	
• Barren	• Edwards Plateau: Riparian Herbaceous Vegetation
• Edwards Plateau: Ashe Juniper Motte and Woodland	• Edwards Plateau: Riparian Deciduous Shrubland
• Edwards Plateau: Ashe Juniper Slope Forest	• Edwards Plateau: Riparian Hardwood - Ashe Juniper Forest
• Edwards Plateau: Ashe Juniper-Live Oak Shrubland	• Edwards Plateau: Riparian Live Oak Forest
• Edwards Plateau: Ashe Juniper-Live Oak Slope Shrubland	• Edwards Plateau: Savanna Grassland
• Edwards Plateau: Deciduous Oak - Evergreen Motte and Woodland	• Edwards Plateau: Shin Oak Shrubland
• Edwards Plateau: Floodplain Ashe Juniper Forest	• Edwards Plateau: Shin Oak Slope Shrubland
• Edwards Plateau: Floodplain Ashe Juniper Shrubland	• Edwards Plateau: Texas Red Oak-Ashe's Juniper Forest
• Edwards Plateau: Floodplain Deciduous Shrubland	• Edwards Plateau: Wooded Cliff/Bluff
• Edwards Plateau: Floodplain Hardwood - Ashe Juniper Forest	• Grass Farm
• Edwards Plateau: Floodplain Hardwood Forest	• Llano Uplift: Grassland
• Edwards Plateau: Floodplain Herbaceous Vegetation	• Llano Uplift: Live Oak Woodland
• Edwards Plateau: Floodplain Live Oak Forest	• Llano Uplift: Mesquite - Whitebrush Shrubland
• Edwards Plateau: Live Oak Motte and Woodland	• Llano Uplift: Post Oak Woodland
• Edwards Plateau: Live Oak Slope Forest	• Native Invasive: Juniper Woodland
• Edwards Plateau: Oak - Ashe Juniper Slope Forest	• Native Invasive: Mesquite Shrubland
• Edwards Plateau: Oak - Hardwood Motte and Woodland	• Row Crops
• Edwards Plateau: Oak - Hardwood Slope Forest	• Southwest: Tobosa Grassland
• Edwards Plateau: Post Oak Motte and Woodland	• Swamp
• Edwards Plateau: Riparian Ashe Juniper Forest	• Urban High Intensity
• Edwards Plateau: Riparian Ashe Juniper Shrubland	• Urban Low Intensity
• Edwards Plateau: Riparian Hardwood Forest	

Source: TPWD 2018b.

2.6.2 Terrestrial Wildlife

The study area occurs within the Balconian Biotic Province (see Figure 2-5) as described by Blair (1950). The Balconian province's faunal composition is characterized as an intermixed representation of Austroriparian, Tamaulpian, Chihuahuan, and Kansan province species. At the time of publication, species diversity within the Balconian province was noted to include 15 different anurans (frogs and toads), seven urodeles (salamanders and newts), 36 snake species, 16 lizards, two turtles, and 57 mammal species (Blair 1950).



0 25 50 100 150 200 250

Miles

Source: Blair, 1950, modified

Legend

Biotic Province Boundary

County Boundary

Figure 2-5

LOCATION OF THE STUDY AREA IN RELATION TO THE BIOTIC PROVINCES OF TEXAS

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Amphibians

Amphibian species (frogs, toads, and salamanders) that may typically occur within the study area are listed in Table 2-3. Frogs and toads may occur in all vegetation types, while salamanders are typically restricted to hydric habitats (Tipton et al. 2012).

TABLE 2-3 AMPHIBIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Frogs/Toads	
Acris blanchardi	Blanchard's Cricket Frog
Anaxyrus debilis	Eastern Chihuahuan Green Toad
Anaxyrus punctatus	Red-spotted Toad
Anaxyrus speciosus	Texas Toad
Anaxyrus woodhousii	Woodhouse's Toad
Eleutherodactylus marnockii	Cliff Chirping Frog
Gastrophryne carolinensis	Eastern Narrow-mouthed Toad
Gastrophryne olivacea	Western Narrow-mouthed Toad
Hyla chrysoscelis	Cope's Gray Treefrog
Hyla versicolor	Gray Treefrog
Incilius nebulifer	Gulf Coast Toad
Lithobates berlandieri	Rio Grande Leopard Frog
Lithobates catesbeianus	American Bullfrog
Pseudacris streckeri	Strecker's Chorus Frog
Scaphiopus couchi	Couch's Spadefoot
Salamanders	
Eurycea neotenes	Texas Salamander
Plethodon albagula	Western Slimy Salamander

Source: Dixon 2013.

Reptiles

Reptiles (turtles, lizards, and snakes) that may typically occur in the study area are listed in Table 2-4. These include those species that are more commonly observed near water (i.e., aquatic turtles) and those that are more common in terrestrial habitats (Dixon 2013).

TABLE 2-4 REPTILIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Turtles	
Apalone mutica	Smooth Softshell
Apalone spinifera guadalupensis	Guadalupe Spiny Softshell
Chelydra serpentina	Snapping Turtle
Graptemys versa	Texas Map Turtle

TABLE 2-4 REPTILIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Kinosternon flavescens	Yellow Mud Turtle
Kinosternon subrubrum	Eastern Mud Turtle
Pseudemys texana	Texas Cooter
Sternotherus odoratus	Eastern Musk Turtle
Terrapene carolina	Eastern Box Turtle
Terrapene ornata	Plains Box Turtle
Trachemys scripta elegans	Red-eared Slider
Lizards	
Anolis carolinensis	Green Anole
Cnemidophorus sexlineata	Eastern Six-lined Racerunner
Cnemidophorus gularis	Common Spotted Whiptail
Cophosarus texanus	Texas Greater Earless Lizard
Crotaphytus collaris	Eastern Collared Lizard
Plestiodon obsoletus	Great Plains Skink
Holbrookia lacerata	Northern Spot-tailed Earless Lizard
Ophisaurus attenuatus	Slender Glass Lizard
Phrynosoma cornutum	Texas Horned Lizard
Sceloporus consobrinus	Prairie Lizard
Sceloporus olivaceus	Texas Spiny Lizard
Sceloporus poinsettii	Crevice Spiny Lizard
Scincella lateralis	Little Brown Skink
Urosaurus ornatus	Ornate Tree Lizard
Snakes	
Agkistrodon contortrix laticinctus	Broad-Banded Copperhead
Agkistrodon piscivorus	Cottonmouth
Coluber constrictor flaviventris	Eastern Yellow-bellied Racer
Crotalus atrox	Western Diamond-backed Rattlesnake
Crotalus lepidus	Rock Rattlesnake
Diadophis punctatus arnyi	Prairie Ring-necked Snake
Heterodon platirhinos	Eastern Hog-nosed Snake
Hypsiglena jani	Chihuahuan Nightsnake
Lampropeltis getula	Common Kingsnake
Lampropeltis triangulum	Milksnake
Masticophis flagellum	Western Coachwhip
Masticophis taeniatus	Striped Whipsnake
Micrurus tener	Texas Coralsnake
Nerodia erythrogaster	Plain-bellied Watersnake
Nerodia rhombifer	Diamond-backed Watersnake
Opheodrys aestivus	Rough Greensnake
Pantherophis emoryi	Great Plains Ratsnake

TABLE 2-4 REPTILIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Pantherophis obsoletus	Eastern Ratsnake
Pituophis catenifer sayi	Bullsnake
Rena dulcis	Texas Threadsnake
Rhinocheilus lecontei	Long-nosed Snake
Salvadora grahamiae lineata	Texas Patch-nosed Snake
Sonora semiannulata	Western Groundsnake
Storeria dekayi texana	Texas Brownsnake
Tantilla gracilis	Flat-Headed Snake
Tantilla nigriceps	Plains Black-headed Snake
Thamnophis cyrtopsis ocellatus	Eastern Black-necked Gartersnake
Thamnophis marcianus	Checkered Gartersnake
Thamnophis proximus	Western Ribbonsnake
Virginia striatula	Rough Earthsnake

Source: Dixon 2013.

Birds

Texas Ornithological Society (Lockwood and Freeman 2014) data and TPWD ecoregion specific avian check lists (Lockwood 2008) were reviewed for species distribution and life history information. Numerous avian species are present within the study area and may include year-round residents and summer and/or winter migrants as shown in Table 2-5. Additional transient bird species may migrate within or through the study area in the spring and fall and/or use the area to nest (spring/summer) or overwinter. The likelihood for occurrence of each species will depend upon suitable habitat and season. Migratory bird species may be protected under the Migratory Bird Treaty Act (MBTA).

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
ACCIPITRIFORMES: Accipitridae				
Accipiter cooperii	Cooper's Hawk		X	X
Accipiter striatus	Sharp-shinned Hawk			X
Buteo albonotatus	Zone-tailed Hawk		X	
Buteo jamaicensis	Red-tailed Hawk	X		
Buteo lineatus	Red-shouldered Hawk	X		
Buteo swainsoni	Swainson's Hawk		X	X
Circus hudsonius	Northern Harrier			X
ACCIPITRIFORMES: Cathartidae				
Cathartes aura	Turkey Vulture	X		
Coragyps atratus	Black Vulture	X		
ANSERIFORMES: Anatidae				
Aix sponsa	Wood Duck	X		

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
Anas acuta	Northern Pintail			X
Anas crecca	Green-winged Teal			X
Anas platyrhynchos	Mallard			X
Aythya affinis	Lesser Scaup			X
Aythya americana	Redhead			X
Aythya collaris	Ring-necked Duck			X
Aythya valisineria	Canvasback			X
Bucephala albeola	Bufflehead			X
Lophodytes cucullatus	Hooded Merganser			X
Mareca americana	American Wigeon			X
Mareca strepera	Gadwall			X
Oxyura jamaicensis	Ruddy Duck			X
Spatula clypeata	Northern Shoveler			X
Spatula discors	Blue-winged Teal			X
APODIFORMES: Apodidae				
Chaetura pelagica	Chimney Swift		X	
APODIFORMES: Trochilidae				
Archilochus alexandri	Black-chinned Hummingbird		X	
Selasphorus rufus	Rufous Hummingbird			X
CAPRIMULGIFORMES: Caprimulgidae				
Antrostomus carolinensis	Chuck-will's-widow		X	
Chordeiles minor	Common Nighthawk		X	
Phalaenoptilus nuttallii	Common Poorwill		X	
CHARADRIIFORMES: Charadriidae				
Charadrius vociferus	Killdeer	X		
CHARADRIIFORMES: Laridae				
Larus delawarensis	Ring-billed Gull			X
Sterna forsteri	Forster's Tern			X
CHARADRIIFORMES: Scolopacidae				
Actitis macularius	Spotted Sandpiper			X
Bartramia longicauda	Upland Sandpiper		X	X
Calidris mauri	Western Sandpiper			X
Calidris melanotos	Pectoral Sandpiper			X
Calidris minutilla	Least Sandpiper			X
Gallinago delicata	Wilson's Snipe			X
Phalaropus tricolor	Wilson's Phalarope			X
Tringa flavipes	Lesser Yellowlegs			X
Tringa melanoleuca	Greater Yellowlegs			X
COLUMBIFORMES: Columbidae				
Columba livia	Rock Pigeon	X		
Columbina inca	Inca Dove	X		
Streptopelia decaocto	Eurasian Collared-dove	X		
Zenaida asiatica	White-winged Dove	X		
Zenaida macroura	Mourning Dove	X		
CORACIIFORMES: Alcedinidae				
Chloroceryle americana	Green Kingfisher	X		

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
Megaceryle alcyon	Belted Kingfisher			X
CUCULIFORMES: Cuculidae				
Coccyzus americanus	Yellow-billed Cuckoo		X	
Geococcyx californianus	Greater Roadrunner	X		
FALCONIFORMES: Falconidae				
Caracara cheriway	Crested Caracara	X		
Falco sparverius	American Kestrel			X
GALLIFORMES: Odontophoridae				
Colinus virginianus	Northern Bobwhite	X		
GALLIFORMES: Phasianidae				
Meleagris gallopavo	Wild Turkey	X		
GRUIFORMES: Gruidae				
Antigone canadensis	Sandhill Crane			X
GRUIFORMES: Rallidae				
Fulica americana	American Coot	X		
PASSERIFORMES: Aegithalidae				
Psaltriparus minimus	Bushtit	X		
PASSERIFORMES: Alaudidae				
Eremophila alpestris	Horned Lark	X		
PASSERIFORMES: Bombycillidae				
Bombycilla cedrorum	Cedar Waxwing			X
PASSERIFORMES: Cardinalidae				
Cardinalis cardinalis	Northern Cardinal	X		
Cardinalis sinuatus	Pyrrhuloxia	X		
Passerina caerulea	Blue Grosbeak		X	
Passerina ciris	Painted Bunting		X	
Passerina cyanea	Indigo Bunting		X	
Piranga rubra	Summer Tanager		X	
Spiza americana	Dickcissel		X	
PASSERIFORMES: Certhiidae				
Certhia americana	Brown Creeper			X
PASSERIFORMES: Corvidae				
Aphelocoma woodhousei	Woodhouse's Scrub-Jay	X		
Corvus brachyrhynchos	American Crow			X
Corvus corax	Common Raven	X		
Cyanocitta cristata	Blue Jay	X		
PASSERIFORMES: Emberizidae				
Aimophila ruficeps	Rufous-crowned Sparrow	X		
Ammospiza leconteii	LeConte's Sparrow			X
Ammodramus savannarum	Grasshopper Sparrow		X	
Amphispiza bilineata	Black-throated Sparrow	X		
Calamospiza melanocorys	Lark Bunting			X
Chondestes grammacus	Lark Sparrow		X	
Junco hyemalis	Dark-eyed Junco			X
Melospiza lincolnii	Lincoln's Sparrow			X
Melozone fusca	Canyon Towhee	X		

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
Passerculus sandwichensis	Savannah Sparrow			X
Passerella iliaca	Fox Sparrow			X
Peucaea cassinii	Cassin's Sparrow	X		
Pipilo maculatus	Spotted Towhee			X
Pooecetes gramineus	Vesper Sparrow			X
Spizella pallida	Clay-colored Sparrow			X
Spizella passerina	Chipping Sparrow	X		
Spizella pusilla	Field Sparrow	X		
Zonotrichia albicollis	White-throated Sparrow			X
Zonotrichia leucophrys	White-crowned Sparrow			X
PASSERIFORMES: Fringillidae				
Haemorhous mexicanus	House Finch	X		
Spinus pinus	Pine Siskin			X
Spinus psaltria	Lesser Goldfinch		X	
Spinus tristis	American Goldfinch			X
PASSERIFORMES: Hirundinidae				
Hirundo rustica	Barn Swallow		X	
Petrochelidon fulva	Cave Swallow		X	
Petrochelidon pyrrhonota	Cliff Swallow		X	
Progne subis	Purple Martin		X	
Riparia riparia	Bank Swallow			X
Stelgidopteryx serripennis	Northern Rough-winged Swallow		X	X
PASSERIFORMES: Icteridae				
Agelaius phoeniceus	Red-winged Blackbird	X		
Euphagus cyanocephalus	Brewer's Blackbird			X
Icterus bullockii	Bullock's Oriole		X	
Icterus galbula	Baltimore Oriole		X	X
Icterus parisorum	Scott's Oriole		X	
Icterus spurius	Orchard Oriole		X	
Molothrus aeneus	Bronzed Cowbird		X	
Molothrus ater	Brown-headed Cowbird	X		
Quiscalus mexicanus	Great-tailed Grackle	X		
Quiscalus quiscula	Common Grackle	X		
Sturnella magna	Eastern Meadowlark	X		
Sturnella neglecta	Western Meadowlark			X
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	X		X
PASSERIFORMES: Laniidae				
Lanius ludovicianus	Loggerhead Shrike	X		X
PASSERIFORMES: Mimidae				
Dumetella carolinensis	Gray Catbird			X
Mimus polyglottos	Northern Mockingbird	X		
Toxostoma curvirostre	Curve-billed Thrasher	X		
PASSERIFORMES: Motacillidae				
Anthus rubescens	American Pipit			X
PASSERIFORMES: Paridae				
Baeolophus atricristatus	Black-crested Titmouse	X		

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
Poecile carolinensis	Carolina Chickadee	X		
PASSERIFORMES: Parulidae				
Cardellina pusilla	Wilson's Warbler			X
Geothlypis trichas	Common Yellowthroat			X
Icteria virens	Yellow-breasted Chat		X	
Mniotilta varia	Black-and-white Warbler		X	
Oreothlypis celata	Orange-crowned Warbler			X
Oreothlypis ruficapilla	Nashville Warbler			X
Setophaga chrysoparia	Golden-cheeked Warbler		X	
Setophaga coronata	Yellow-rumped Warbler			X
Setophaga dominica	Yellow-throated Warbler		X	X
Setophaga magnolia	Magnolia Warbler			X
Setophaga petechia	Yellow Warbler			X
PASSERIFORMES: Passeridae				
Passer domesticus	House Sparrow	X		
PASSERIFORMES: Polioptilidae				
Polioptila caerulea	Blue-gray Gnatcatcher		X	
PASSERIFORMES: Regulidae				
Regulus calendula	Ruby-crowned Kinglet			X
PASSERIFORMES: Remizidae				
Auriparus flaviceps	Verdin	X		
PASSERIFORMES: Sturnidae				
Sturnus vulgaris	European Starling	X		
PASSERIFORMES: Troglodytidae				
Campylorhynchus brunneicapillus	Cactus Wren	X		
Catherpes mexicanus	Canyon Wren	X		
Salpinctes obsoletus	Rock Wren	X		
Thryomanes bewickii	Bewick's Wren	X		
Thryothorus ludovicianus	Carolina Wren	X		
Troglodytes aedon	House Wren			X
PASSERIFORMES: Turdidae				
Catharus guttatus	Hermit Thrush			X
Sialia sialis	Eastern Bluebird	X		
Turdus migratorius	American Robin		X	
PASSERIFORMES: Tyrannidae				
Contopus cooperi	Olive-sided Flycatcher		X	X
Contopus virens	Eastern Wood-Pewee		X	
Myiarchus cinerascens	Ash-throated Flycatcher		X	
Pyrocephalus rubinus	Vermilion Flycatcher		X	
Sayornis nigricans	Black Phoebe	X		
Sayornis phoebe	Eastern Phoebe		X	
Sayornis saya	Say's Phoebe			X
Tyrannus forficatus	Scissor-tailed Flycatcher		X	
Tyrannus tyrannus	Eastern Kingbird		X	
Tyrannus verticalis	Western Kingbird		X	

TABLE 2-5 AVIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME	RESIDENT	SUMMER	WINTER
PASSERIFORMES: Vireonidae				
Vireo atricapilla	Black-capped Vireo		X	
Vireo bellii	Bell's Vireo		X	
Vireo flavifrons	Yellow-throated Vireo		X	
Vireo griseus	White-eyed Vireo		X	
Vireo olivaceus	Red-eyed Vireo		X	
Vireo solitarius	Blue-headed Vireo			X
PELECANIFORMES: Ardeidae				
Ardea alba	Great Egret		X	
Ardea herodias	Great Blue Heron	X		
Bubulcus ibis	Cattle Egret		X	
Butorides virescens	Green Heron		X	
Nycticorax nycticorax	Black-crowned Night-heron		X	
PICIFORMES: Picidae				
Colaptes auratus	Northern Flicker			X
Melanerpes aurifrons	Golden-fronted Woodpecker	X		
Dryobates pubescens	Downy Woodpecker			X
Dryobates scalaris	Ladder-backed Woodpecker	X		
Sphyrapicus varius	Yellow-bellied Sapsucker			X
PODICIPEDIFORMES: Podicipedidae				
Aechmophorus occidentalis	Western Grebe			X
Podiceps nigricollis	Eared Grebe			X
Podilymbus podiceps	Pied-Billed Grebe			X
STRIGIFORMES: Strigidae				
Bubo virginianus	Great Horned Owl	X		
Megascops asio	Eastern Screech-owl	X		
Megascops kennicottii	Western Screech-owl	X		
STRIGIFORMES: Tytonidae				
Tyto alba	Barn Owl	X		
SULIFORMES: Phalacrocoracidae				
Phalacrocorax auritus	Double-crested Cormorant			X

Source: Lockwood 2008; Lockwood and Freeman 2014; Chesser et al. 2018.

Mammals

Mammals that may typically occur in the study area are listed in Table 2-6. The occurrence of each species within the study area is dependent on available suitable habitat.

TABLE 2-6 MAMMALIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Mammals	
Baiomys taylori	Northern Pygmy Mouse
Bassariscus astutus	Ringtail
Canis latrans	Coyote

TABLE 2-6 MAMMALIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
Mammals	
Chaetodipus hispidus	Hispid Pocket Mouse
Dasypus novemcinctus	Nine-banded Armadillo
Didelphis virginiana	Virginia Opossum
Erethizon dorsatum	North American Porcupine
Lasiurus borealis	Eastern Red Bat
Lasiurus cinereus	Hoary Bat
Lynx rufus	Bobcat
Mephitis mephitis	Striped Skunk
Mus musculus	House Mouse
Myocastor coypus	Nutria
Myotis velifer	Cave Myotis
Neotoma floridana	Eastern Woodrat
Odocoileus virginianus	White-tailed Deer
Perimyotis subflavus	Eastern Pipistrelle
Perognathus merriami	Merriam's Pocket Mouse
Peromyscus attwateri	Texas Mouse
Peromyscus leucopus	White-footed Mouse
Peromyscus maniculatus	Deer Mouse
Peromyscus pectoralis	White-ankled Mouse
Procyon lotor	Common Raccoon
Rattus norvegicus	Norway Rat
Rattus rattus	Roof Rat
Reithrodontomys fulvescens	Fulvous Harvest Mouse
Reithrodontomys montanus	Plains Harvest Mouse
Scalopus aquaticus	Eastern Mole
Sciurus niger	Eastern Fox Squirrel
Sigmodon hispidus	Hispid Cotton Rat
Spermophilus mexicanus	Mexican Ground Squirrel
Spermophilus variegatus	Rock Squirrel
Spilogale putorius	Eastern Spotted Skunk
Sus scrofa	Feral Pig
Sylvilagus floridanus	Eastern Cottontail
Tadarida brasiliensis	Brazilian Free-tailed Bat
Urocyon cinereoargenteus	Common Gray Fox
Vulpes vulpes	Red Fox

Source: Schmidly and Bradley 2016.

In addition to native species, a variety of exotic (non-native) mammals may be present within the study area, including Axis Deer (*Axis axis*), Red Deer (*Cervus elaphus*), Sika Deer (*Cervus nippon*), Blackbuck (*Antilope cervicapra*), Arabian Oryx (*Oryx leucoryx*), and Elk (*Cervus canadensis*).

2.6.3 Aquatic Habitat

Mapped wetlands information was incorporated for the study area from the USFWS' NWI database (USFWS 2018a). NWI maps are based on topography and interpretation of infrared satellite data and color aerial photographs and are classified under the Cowardin System (Cowardin et al. 1979). NWI wetlands types identified within the study area include freshwater palustrine emergent (PEM), forested/shrub (PFO), ponds (PUB), and lacustrine. PEM wetlands are primarily associated with depressional areas and along the margins of open water areas. PFO wetlands exist typically in depressional or riparian woodlands near creeks and rivers, and ponds. Mapped PUB and lacustrine wetlands are typically associated with shallow freshwater stock ponds, retention ponds, Soil Conservation Service site reservoirs, and other small impoundments.

Perennial and intermittent streams and creeks exist in the study area and may be prone to flash flooding after heavy rain storms. Perennial aquatic environments may support species of smartweeds and docks (*Polygonaceae*), pennyworts (*Hydrocotyle* spp.), widgeon-grass (*Ruppia cirrhosa*), pondweed (*Potamogetonaceae*), and duckweeds (*Lemna* spp.). Emergent wetlands may be located along the edges of ponds and streams during wetter periods and may be comprised of such species as rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.). Typical woody plant species in these wetland or riparian areas include elms (*Ulmus* spp.), bald cypress (*Taxodium distichum*), American sycamore (*Platanus occidentalis*), pecan (*Carya illinoinensis*), cottonwood (*Populus deltoides*), black willow, and rattlebush (*Sesbania* spp.) (Chadde 2012a and 2012b).

Intermittent flowing streams support aquatic species primarily adapted to ephemeral pool habitats. Because they consist of small headwater drainages, persistent flow is unlikely to be sufficient to support any substantial lotic assemblage. Species in ephemeral aquatic habitat are typically adapted to rapid dispersal and completion of life cycles. In streams dominated by scoured, sandy-clay bottoms, accumulations of woody debris or leaf pack provide the most important feeding and refuge areas for invertebrates and forage fish. Softer muddy bottoms generally harbor substantial populations of burrowing invertebrates (e.g., larval diptera and oligochaetes), which can be an important food source to higher trophic levels (Hubbs 1957).

Perennial streams and lakes offer relatively stable water levels and the constant pools and flow facilitate stable population growth. Species with flowing water or pooled area habitat requirements will use perennial streams and those adapted for deeper waters will use lake/pond environments. With distance

downstream, especially in pooled areas where sufficient water is present, fish communities tend to be heavily dominated by widely distributed sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and catfish (*Ictalurus* spp.) (Hubbs 1957). Several species of turtles, snakes, and amphibians are also dependent on perennial surface waters for their habitat requirements. Some of these herptile species infrequently use terrestrial habitats to migrate between surface waters, but primarily use impounded and perennial surface waters.

Ponds located in the study area exhibit variability in terms of their age, drainage, use by livestock, past fish stocking, and fertilization history. These aquatic habitats are almost always exposed to full sunlight and do not typically experience the variations in flow as streams and rivers do after heavy rainfall events. Typically, fluctuations in water level are experienced during summer months because of high evaporation rates and repeated heavy rainfall required to fill ponds. Periods of extended drought in the region may reduce these seasonal water level fluctuations or dry ponds completely.

2.6.4 Threatened and Endangered Species

For this EA, emphasis was placed on obtaining documented occurrences of special status species and/or their potential habitat within the study area. The documented occurrences of species of concern and/or other unique vegetative communities within the study area were also reviewed. Special status species include those listed by the USFWS (2018b) as threatened, endangered, proposed, or candidate, and those species listed by TPWD (2018a) as threatened, endangered, or rare. POWER requested a GIS data layer of historical known occurrences for listed species and/or sensitive vegetative communities from the TXNDD (2018). For the purpose of this study, the TXNDD information is not used as a substitute for a presence/absence survey, but as an indication of previous occurrences within suitable habitat for the species.

A USFWS Information for Planning and Consultation (IPaC) Official Species List (USFWS 2018b; Consultation Code: 02ETAU00-2018-SLI-1366) and Resource List was requested and received on August 9, 2018. This USFWS (2018b) report identifies potentially occurring federal listed threatened, endangered, and candidate species and habitats within the study area. By definition, a threatened species is defined as likely to become endangered within the near foreseeable future throughout all or a significant portion of its range. An endangered species is in danger of extinction throughout all or a significant portion of its range. Candidate species are those that have sufficient information regarding

their biological vulnerability and threat(s) to support listing as threatened or endangered and are likely to be proposed for listing in the near foreseeable future (USFWS 2018c).

The Endangered Species Act (ESA) also provides for the conservation of "designated critical habitat," which is defined as the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water, breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior for the species. No designated or proposed critical habitats were identified within the study area (USFWS 2018b).

Threatened and Endangered Plant Species

USFWS (2018b) IPaC species list for the study area and TPWD (2018a) county listings were reviewed for special status plant species potentially occurring within the study area. One federal and state listed endangered plant species was identified as potentially occurring within Kerr and Kimble Counties, the Tobusch fishhook cactus (*Sclerocactus brevihamatus ssp. tobuschii*); and one candidate plant species, the Bracted twist flower (*Streptanthus bracteatus*), was identified as potentially occurring within Kerr County (USFWS 2018b; TPWD 2018a; TXNDD 2018). A brief description of these species' life history, habitat requirements, and documented occurrences within the study area are summarized below.

Tobusch fishhook cactus

Tobusch fishhook cactus is a succulent perennial plant growing only to about six inches tall. It is covered in yellow tinted spines that are occasionally red-tipped. Tobusch fishhook cactus occurs in scattered rocky and herbaceous openings of oak-juniper woodlands, pine-oak woodlands, and sometimes cenizo shrublands or little bluestem grasslands. Some associate plant species include Ashe juniper, plateau live oak, white shin oak (*Q. sinuata var. breviloba*), papershell pinyon (*Pinus remota*), Texas prickly pear (*Opuntia engelmannii var. lindheimeri*), pineapple cactus (*Coryphantha sulcata*), little nipple cactus (*Mammillaria heyderi*), curly mesquite grass, hairy grama (*Bouteloua hirsuta*), red grama (*B. trifida*), and purple threeawn (*Aristida purpurea*). Weevils are the primary cause of population declines for this species. The short-spined fishhook cactus (*Sclerocactus brevihamatus ssp. brevihamatus*) is a similar-looking species and can be difficult to differentiate from Tobusch fishhook cactus. In general, Tobusch fishhook cactus has 7 to 9, sometimes 12, radial spines, while short-spined fishhook cactus has 12 to 22 spines, is larger in size, more cylindrical, and has pinkish, yellowish, greenish, or brownish flowers (Poole et al. 2007). Additionally, short-spined fishhook cactus occurs in alluvium in the Chihuahuan Desert and Tamaulipan Shrublands, while Tobusch fishhook cactus is endemic to the Edwards Plateau on

limestone outcrops with very shallow, gravelly soils classified in the Tarrant, Ector, Eckrant, and similar series (USFWS 2017). Review of TXNDD (2018) data identified two Tobusch fishhook cactus occurrence records overlapping with the study area. This species may occur within the study area if suitable habitat is available.

Bracted twist flower

Bracted twist flower is endemic to the Edwards Plateau. It is a short annual, growing to about eight inches tall. The entire plant is glabrous with pink to purple flowers. Bracted twist flower occurs on shallow, well drained, gravelly clays and clay loams over limestone in openings of oak juniper woodlands, as well as in canyon bottoms. It can be found growing amidst dense shrub areas; however, plants are often more robust in sites with plentiful sunlight. Associate plant species include shrubby boneset (*Ageratina havanensis*), agarita (*Berberis trifoliata*), Texas hog plum (*Colubrina texensis*), bush croton (*Croton fruticulosus*), Texas oak, Mexican buckeye (*Ungnadia speciosa*), featherleaf desertpeony (*Acourtia runcinata*), green milkweed vine (*Matelea reticulata*), blue curls (*Phacelia congesta*), Buckley's fluffgrass (*Tridens buckleyanus*), little bluestem, and sideoats grama. Populations of this species may change extensively between years depending on the amount winter rainfall. The primary causes for its decline are residential development and browsing by white-tailed deer (Poole et al. 2007). This species may occur within the study area if suitable habitat is available.

Threatened and Endangered Animal Species

USFWS (2018b) IPaC species list for the study area and TPWD (2018a) county listings were reviewed for special status animal species potentially occurring within the study area. There are 22 federal and/or state listed, candidate status, and federal delisted animal species known to occur or potentially occur within the study area counties (Table 2-8). Federal status species listed in the TPWD Annotated County Lists of Rare Species have been included in Table 2-8 for consistency. Although only federal listed threatened or endangered species are protected under the ESA, state listed species may receive protection under other federal and/or state laws, such as the MBTA, Bald and Golden Eagle Protection Act (BGEPA), Chapters 67, 68, and 88 of the Texas Parks and Wildlife Code, and Section 65.171–65.184 and 69.01–69.14 of Title 31 of the TAC. Brief descriptions of life history, habitat requirements, and documented occurrences within the study area are summarized below for each species.

TABLE 2-8 LISTED THREATENED AND ENDANGERED ANIMAL SPECIES FOR STUDY AREA COUNTIES

SPECIES		COUNTY LISTED			LEGAL STATUS	
Scientific Name	Common Name	Gillespie	Kerr	Kimble	USFWS[1]	TPWD[2]
Amphibians						
Eurycea latitans complex	Cascade Caverns Salamander		X	X	-	T
Birds						
Buteo albonotatus	Zone-tailed Hawk	X	X	X	-	T
Caladris canatus rufa	Red Knot	X	X	X	T	-
Charadrius melodus	Piping Plover	X	X	X	T	T
Falco peregrinus (2 ssp.)	Peregrine Falcon	X	X	X	DL	T
Grus americana	Whooping Crane	X	X	X	E	E
Haliaeetus leucocephalus	Bald Eagle	X	X	X	DL	T
Setophaga chrysoparia	Golden-cheeked Warbler	X	X	X	E	E
Sterna antillarum athalassos	Interior Least Tern	X	X	X	E	E
Vireo atricapilla	Black-capped Vireo	X	X	X	DL	E
Mammals						
Canis rufus	Red Wolf	X	X	X	E, EXT	E, EXT
Canis lupus	Gray Wolf	X	X	X	E, EXT	E, EXT
Ursus americanus	Black Bear	X	X	X	-	T
Nasua narica	White-nosed Coati		X	X	-	T
Mollusks						
Lampsilis bracteata	Texas Fatmucket	X	X	X	C	T
Quadrula aurea	Golden Orb		X	X	C	T
Quadrula houstonensis	Smooth Pimpleback	X			C	T
Quadrula petrina	Texas Pimpleback	X	X	X	C	T
Quadrula mitchelli	False Spike Mussel			X	-	T
Truncilla macrodon	Texas Fawnsfoot	X	X	X	C	T
Reptiles						
Graptemys caglei	Cagle's Map Turtle		X	X	-	T
Phrynosoma cornutum	Texas Horned Lizard	X	X	X	-	T

[1] USFWS 2018b, [2] TPWD 2018a.
E - Federal and/or State Listed Endangered
T - Federal and/or State Listed Threatened
DL - Federal Delisted
C - Federal Candidate for Listing
EXT – Extirpated from study area

Federal Listed Species

Birds

Golden-cheeked Warbler

The Golden-cheeked Warbler's (*Setophaga chrysoparia*) entire nesting range is confined to habitat in 33 counties located in central Texas, with nesting typically occurring from March to May. The warbler migrates to overwinter in southern Mexico and northern Central America. Populations have declined over the past century because of habitat loss and fragmentation from urban development, land conversion, and commercial harvest of mature juniper trees (Campbell 2003). Nest parasitism from Brown-headed Cowbirds may have also contributed to population declines in some areas (Pulich 1976). The species nests in mature juniper-oak woodland areas with a moderate to high density of mature Ashe juniper trees mixed with deciduous trees creating dense foliage in the upper canopy (Pulich 1976; Campbell 2003). These oak-juniper woodland types are typical in moist areas located along steep-sided slopes, drainages, and bottomlands, but this species will also occur in upland oak-juniper woodlands on flat topography (Pulich 1976). For the Proposed Project, three published habitat models (Diamond 2007; Loomis Partners 2009; and Morrison et al. 2010) were used to identify potential habitat quality and assess the probability of occupied Golden-cheeked Warbler habitat within the study area. The models' output varied in conservativeness and areas where models overlapped were identified as having the highest probability of breeding Golden-cheeked Warbler occurrence (Blanton & Associates, Inc. 2018). Initial field reconnaissance observed that larger tracts and areas where at least two models overlap are more conducive to representing potential warbler nesting habitat. The resulting potential habitat data retrieved were mapped using GIS and taken into consideration while developing potential route segments. Review of TXNDD (2018) data identified two Golden-cheeked Warbler EO records occurring within 5.5 miles of the study area. Pedestrian field surveys may be needed to determine presence or absence of Golden-cheeked Warblers and verify modeled nesting habitat. This species may occur within the study area as a breeding spring/summer resident, where suitable oak-juniper woodland habitat is available (Lockwood 2008).

Interior Least Tern

The Interior Least Tern (*Sterna antillarum athalassos*) is a subspecies that nests inland along sand and gravel bars within braided streams and rivers. It is also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel quarries, etc.). Breeding may begin as early as April and ends by late August. The USFWS recognizes any nesting least tern located 50 miles or greater from a coastline as being an Interior Least Tern (Campbell 2003; TPWD 2014). This species is not anticipated to

occur within the study area except as an occasional wanderer, migrant, or rare winter resident (Lockwood and Freeman 2014) if suitable habitat is available.

Piping Plover

The Piping Plover (*Charadrius melodus*) is a small migratory shorebird that nests within the Great Lakes, Northern Great Plains or Atlantic Coast (TPWD 2018a). Primary fall migration to Texas is from July to early September, while spring migration occurs from March to early May. Piping Plovers are common to locally uncommon winter residents along the Gulf of Mexico coastline. This species is not anticipated to occur within the study area (Lockwood and Freeman 2014).

Red Knot

The Red Knot (*Calidris canutus rufa*) is a migratory bird that nests in the drier arctic tundra areas and overwinters along the Gulf of Mexico coastline and into Central and South America. A spring migratory stopover is located in Delaware Bay where the species gorges on horseshoe crab eggs (USFWS 2013). This species is not anticipated to occur within the study area (Lockwood and Freeman 2014).

Whooping Crane

The study area is located within the Texas portion of the primary central migratory corridor for the Whooping Crane (*Grus americana*). The primary migration path includes a 220-mile wide corridor that begins at their nesting site at Wood Buffalo National Park in Canada and continues south to their wintering grounds at the Aransas National Wildlife Refuge along the Texas coast. The migratory pathway contains 95 percent of all confirmed Whooping Crane stopover sightings, during migration, through spring 2007. Whooping Cranes overwinter in Texas from November through March. During migration, they typically fly at altitudes greater than 1,000 feet but will roost and feed in areas away from human disturbance during nightly stopovers. Stopover areas include large rivers, lakes and associated wetlands, playa lakes, pastureland, and cropland (USFWS 2009). This species may occur in the study area as a rare non-breeding migrant, (Lockwood and Freeman 2014) if suitable stopover habitat is available.

Mammals

Gray Wolf

The Gray Wolf (*Canis lupus*) was formerly known throughout the western two-thirds of the state inhabiting forests, brushlands, and grasslands. However, the species is now considered extirpated from the state of Texas (Schmidly and Bradley 2016). This species is not anticipated to occur within the study area.

Red Wolf

The Red Wolf (*Canis rufus*) historically occurred throughout the eastern half of the state in forests, brushlands, and prairies (Schmidly and Bradley 2016). Changes in land use and over hybridization with the Coyote (*Canis latrans*) are thought to have extirpated the Red Wolf from Texas (TPWD 2018a). This species is not anticipated to occur within the study area.

Federal Delisted Species

Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) was delisted in 2007 by the USFWS, because the population has recovered beyond the ESA criteria for listing. The status of the Bald Eagle population is currently monitored by USFWS and the species is still protected under the MBTA and the BGEPA. Bald Eagles may nest and/or winter in Texas. Nests are built in tree tops or on cliffs near rivers or large lakes (Campbell 2003). A landowner at the public open house meeting noted observing Bald Eagles around Johnson Creek in the western portion of the study area. This species may occur within the study area as a breeding or winter migrant (Lockwood and Freeman 2014) where suitable habitat is available.

Black-capped Vireo

The Black-capped Vireo was federally delisted effective May 16, 2018. The Black-capped Vireo (*Vireo atricapilla*) nests from northern Tamaulipas through west and central Texas and isolated portions of Oklahoma (Graber 1961; Campbell 2003). Suitable nesting areas typically consist of a patchy network of dense, low shrubland cover with branches extending to the ground. Shrub sized broad-leaved vegetation will, in general, cover 30 to 60 percent or greater of the area and be approximately six feet tall or more (Campbell 2003). Habitat vegetation is typically within early succession stages or located on shallow, poor, or eroded soils which encourage the growth of patchy low shrublands (Graber 1961). The vireo nests from March to July with the young fledging in three to four weeks (Graber 1961; Campbell 2003). It is not uncommon for Black-capped Vireos to have multiple nesting attempts within one breeding season, building a new nest with each nesting attempt (Graber 1961). Modeling potential Black-capped Vireo habitat is difficult and generally inaccurate because the land-use history, vegetation heights, and vegetation species composition cannot be accurately identified with aerial imagery or topographical imagery. Review of TXNDD (2018) data identified seven Black-capped Vireo EO records scattered throughout with the study area. This species may occur within the study area as a breeding spring/summer resident (Lockwood 2008), where suitable habitat is available.

Peregrine Falcon

The Peregrine Falcon (*Falco peregrinus*) delisting includes two subspecies and are described here together due to their similarity in appearance (TPWD 2018a). The American Peregrine Falcon (*F. p. anatum*) and Arctic Peregrine Falcon (*F. p. tundrius*) were delisted in 1999 due to the recovery of population numbers (USFWS 2006). The American Peregrine Falcon inhabits nests in tall cliff eyries and occupies many kinds of habitats during migration, including urban. Stopover habitat during migration may include lake shores and coastlines and the falcon is also a resident breeder in west Texas (Alsop 2002; TPWD 2018a). This species is not anticipated to occur in the study area except as a rare migrant (Lockwood 2008).

Federal Candidate Species

Golden Orb

The Golden Orb (*Quadrula aurea*) is a freshwater mussel endemic to central and south Texas. The shell is orange, yellow, or yellowish brown with occasionally green rays. This mussel species inhabits sandy, gravely, and muddy bottoms of lentic and lotic water bodies with depths varying from a few centimeters to over three meters. The Golden Orb is currently restricted to five rivers, but is historically known from the Colorado, Brazos, Frio, San Antonio, Guadalupe, and Nueces River systems (NatureServe 2018). Review of TXNDD (2018) data identified one Golden Orb EO record occurring within 10 miles of the study area, in the Guadalupe River within the City of Kerrville. This species may occur within the study area if suitable aquatic habitats are available.

Smooth Pimpleback

The Smooth Pimpleback (*Quadrula houstonensis*) is a freshwater mussel endemic to central Texas. They are currently known to inhabit the Colorado and Brazos river basins. The Smooth Pimpleback has a dark brown to black shell that is subquadrate to nearly round. This species occupies mixed mud, sand, and fine gravel bottoms of streams, rivers, and reservoirs with very slow to moderately flowing waters. It is believed to be intolerant of dramatic water level changes (NatureServe 2018). This species may occur within the study area if suitable aquatic habitats are available.

Texas Fatmucket

The Texas Fatmucket (*Lampsilis bracteata*) is a freshwater mussel endemic to central Texas. They are currently known to inhabit the Colorado and Guadalupe River basins. The Texas Fatmucket has a tan to brown shell with stripes of dark brown, green-brown, or black, that is oval to rhomboidal in shape. It is believed to be intolerant of impoundments and inhabits moderately flowing streams and small rivers of

the Edwards Plateau. Texas Fatmucket primarily occupies water bodies with sandy or gravely substrates but sometimes occurs in muddy substrates (NatureServe 2018). Review of TXNDD (2018) data identified one Texas Fatmucket EO record occurring within one mile of the study area in the North Fork Guadalupe River. Another EO record occurs within 10 miles of the study area, in the Guadalupe River within the City of Kerrville. This species may occur within the study area if suitable aquatic habitats are available.

Texas Fawnsfoot

The Texas Fawnsfoot (*Truncilla macrodon*) is a freshwater mussel currently documented as occurring in Texas but may also occur in Oklahoma. They historically inhabited the Colorado, Trinity, and Brazos River basins. The Texas Fawnsfoot has an oval shell that is gray-green to brown with greenish zig-zag stripes. Little is known about specific habitat requirements for this species, but it is believed to prefer moderately flowing rivers and large streams with sand and gravel substrates. However, Texas Fawnsfoot has been documented in flowing rice irrigation canals and is also thought to be intolerant of impoundments (NatureServe 2018). This species may occur within the study area if suitable aquatic habitats are available.

Texas Pimpleback

The Texas Pimpleback (*Quadrula petrina*) is a freshwater mussel endemic to central Texas in the Colorado and Guadalupe River basins. The Texas Pimpleback has a somewhat glossy tan to brown shell with occasionally occurring bright green and yellow markings. This species inhabits mud, gravel, and sand substrates of rivers with low flow (NatureServe 2018). Review of TXNDD (2018) data identified one Texas Pimpleback EO record occurring within 10 miles of the study area, in the Guadalupe River within the City of Kerrville. This species may occur within the study area if suitable aquatic habitats are available.

State Listed Species

AMPHIBIANS

Cascade Caverns Salamander

The Cascade Caverns Salamander (*Eurycea latitans complex*) is a small, subaquatic salamander that is endemic to Texas. Its range includes springs and caves within the Edwards Aquifer area (TPWD 2018a). The Cascade Caverns Salamander is pale brown to yellowish in color and grows up to four inches in length. Cave forms of the Cascade Caverns Salamander have greatly reduced nonfunctional eyes and little skin pigmentation. Other populations of this species have more skin pigmentation and functional eyes (Powell et al. 2016). This species may occur within the study area if suitable habitat is available.

BIRDS

Zone-tailed Hawk

The Zone-tailed Hawk (*Buteo albonotatus*) inhabits arid open country, including open deciduous or pine-oak woodland, mesa, or mountain country, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains. This species nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions (TPWD 2018a). Zone-tailed Hawks are a rare to very rare summer and winter residents to the southwestern portion of the Edwards Plateau (Lockwood 2008) and may occur within the study area if suitable habitat is available.

MAMMALS

American Black Bear

The American Black Bear (*Ursus americanus*) is listed as threatened due to similarities with the Louisiana Black Bear (*Ursus americanus luteolus*), which has now been federally delisted. The American Black Bear is a stocky, large, omnivore with black to cinnamon brown fur that consumes insects, roots, and tubers. Preferred habitat in Texas includes bottomland hardwood forest and large tracts of inaccessible forested areas (TPWD 2018a). The American Black Bear historically inhabited large tracts of forest and woodland throughout Texas and was once thought to be extirpated from the state. In recent years, sightings have increased near the Chisos Mountains in west Texas and the Texas Panhandle by bears dispersing from Mexico and New Mexico (Schmidly and Bradley 2016). Sightings have also been reported within the Texas Hill Country (TPWD 2012) and there have been confirmed sightings in Kimble County (TPWD 2019). This species may occur within the study area as a rare wanderer, if suitable habitat is available.

White-nosed Coati

The White-nosed Coati (*Nasua narica*) is a member of the raccoon family (*Procyonidae*) that inhabits cropland/hedgerows, mesquite grasslands, oak scrub, riparian corridors, and canyons of south and west Texas. Denning occurs in snags or hollow trees. Adult males are solitary, while females and young males travel in groups of 12 or more. White-nosed Coatis are most active during mornings and evenings at which times they forage canopies and the ground for fruits, insects, birds, and small mammals (Schmidly and Bradley 2016; Nature Serve 2018). Although sightings are rare, this species may occur within the study area if suitable habitat is available.

MOLLUSKS

False Spike Mussel

The False Spike Mussel (*Quadrula mitchelli*) inhabits surface waters in the Rio Grande, Guadalupe, Colorado, and Brazos River systems, in Texas and New Mexico. Little is known about specific habitat requirements for this species, but it likely prefers medium to large rivers with substrates varying from mud through mixtures of sand, gravel, and cobble (Howells et al. 1996). This species may occur within the study area if suitable aquatic habitats are available.

REPTILES

Cagle's Map Turtle

The Cagle's Map Turtle (*Graptemys caglei*) habitat range is limited to the Guadalupe River and San Antonio River basins, inhabiting the Guadalupe, San Antonio, and San Marcos Rivers and affiliated tributaries. Like most other turtles, this turtle can be seen basking in the sun on brush piles along river and stream banks. Being a small turtle, the females are larger than the males, averaging up to seven inches in diameter while the males can grow up to five inches in diameter (Conant and Collins 1991; Dixon 2013). Review of TXNDD (2018) data identified one Cagle's Map Turtle EO record occurring within approximately five miles of the study area, in the South Fork Guadalupe River. This species may occur within the study area if suitable aquatic habitats are available.

Texas Horned Lizard

The Texas Horned Lizard (*Phrynosoma cornutum*) inhabits open, arid to semiarid regions with sparse vegetation including open desert, grasslands, and shrubland containing bunch grasses, cacti and yucca. Preferred soils vary from pure sands and sandy loams to coarse gravels, conglomerates, and desert pavements (Henke and Fair 1998). Texas Horned Lizards are active between early spring to late summer and thermo-regulate by basking or burrowing into the soil. During winter inactivity periods, this species aestivates beneath the soil six to 12 inches under rocks, leaf litter at the bases of trees and bunch grasses, or abandoned animal burrows. Populations are thought to have decreased because of land use conversions, increased pesticide/herbicide use, collection, and increased fire ant populations. The Texas Horned Lizard forages primarily on the red harvester ant (*Pogonomyrmex barbatus*), but also consumes grasshoppers, beetles, and grubs (Dixon 2013; Henke and Fair 1998). This species may occur within the study area if suitable habitat is available.

2.7 Community Values

The term "community values" is included as a factor for the consideration of transmission line route certification under § 37.056(c)(4)(A) of the Texas Utilities Code. The PUC CCN application requires information concerning the following items that may reveal community values:

- Public meeting or public open house.
- Approvals or permits required from other governmental agencies.
- Brief description of the area traversed.
- Habitable structures within 300 feet of the centerline of the Proposed Project.
- FAA registered airports, private airstrips, and heliports located in the area.
- Irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems.

In addition, POWER also evaluated the Proposed Project for community values that might not be specifically listed by the PUC in a rule or the application form, but that might be of importance to the community in the area of the Proposed Project. The term "community values" is not formally defined in the PUC rules. However, in several dockets the PUC Staff and PUC Commissioners have used the following as a working definition: the term "community values" is defined as *a shared appreciation of an area or other natural resource by a national, regional, or local community*. Examples of a community resource would be a park or recreational area, historical or archeological site, or a scenic vista (aesthetics). POWER and LCRA TSC mailed consultation letters to various local elected and appointed officials and hosted two public open house meetings to identify and collect information regarding community values and community resources.

2.8 Human Development

The study area is comprised of numerous political jurisdictions and land uses. Land use data was collected from a variety of federal, state, and local sources and was organized into the following categories:

- Existing Land Use (Urban/Developed and Agricultural)
- Existing Linear Facilities and Other Features
- Transportation Facilities
- Aviation Facilities
- Communication Towers
- Parks and Recreation Areas

2.8.1 Existing Land Use

Existing land uses were placed into the following categories: urban/developed, agriculture, industrial, and transportation features. The primary sources of land use information were obtained from interpretation of aerial photographs, USGS topographical maps, input from the public and local representatives of the public, and reconnaissance surveys.

Habitable Structures - The PUC definition of habitable structures was used for this routing study. Per PUC Substantive Rule § 25.101(a)(3), habitable structures are defined as "structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include, but are not limited to, single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, places of worship, hospitals, nursing homes, and schools." Habitable structures were identified via reconnaissance surveys from public access roads and using aerial photograph interpretation. Locations of the habitable structures are depicted on Figures 4-25a and 4-25b (Appendix D) and 5-1a and 5-1b (Appendix E), and the distance from each route centerline is presented in Tables 5-3 through 5-42.

Urban/Developed – The urban/developed classification represents concentrations of surface-disturbing land uses, which include habitable structures and other developed areas characterized with low, medium, and high intensities. The various levels of development include a mix of residential, commercial, and/or industrial land uses.

Developed low, medium, and high intensity areas were identified using aerial photograph interpretation and reconnaissance surveys. These classifications are described below:

- **Developed Low Intensity** areas typically include rural settings with single-family housing units.
- **Developed Medium Intensity** areas typically include single-family housing units that are grouped in residential subdivisions and may include peripheral commercial structures.
- **Developed High Intensity** includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial parks. Areas with the highest concentration of development are typically located within or near the towns and communities in the study area.

Schools – The study area is located within the following three school districts: Harper Independent School District (ISD), Hunt ISD, and Ingram ISD. Harper ISD has three existing schools located within

the study area. Hunt and Ingram ISDs have no existing schools located within the study area. Two charter schools, the Najim Charter School and the Cailloux Charter School, both associated with Hill Country Youth Ranch, were identified within the study area (TEA 2018).

Agriculture – Agriculture is a significant segment of the economy throughout Texas, and the study area counties have active agricultural sectors. According to the USDA National Agricultural Statistics Service's 2012 Census of Agriculture, the total market value for agricultural products sold for the two counties providing data was $56,943,000, an increase of 36 percent over the 2007 market value. Kerr County experienced a decrease of total market value of agricultural products from 2007 to 2012. Livestock sales accounted for the majority of agricultural sales in both Gillespie and Kerr Counties. Product sales information was not released for Kimble County. The number of farms in the study area counties decreased slightly from 3,718 in 2007 to 3,483 in 2012 (a decrease of six percent) (USDA 2012). Detailed agricultural information for the study area counties is provided in Table 2-9.

TABLE 2-9 AGRICULTURE

COUNTY	TOTAL MARKET VALUE OF AGRICULTURAL PRODUCTS			DISTRIBUTION OF PRODUCTS (2012)		NUMBER OF FARMS		
	2007	2012	Change	Crop Sales	Livestock Sales	2007	2012	Change
Gillespie County	$28,586,000	$46,140,000	61%	25%	75%	1,853	1,847	0%
Kerr County	$13,422,000	$10,803,000	-20%	12%	88%	1,226	1,034	-16%
Kimble County	$8,432,000	D	-	D	-	639	602	-6%

Source: USDA 2012.
(D) Withheld to avoid disclosing data for individual operators.

2.8.2 Existing Linear Facilities and Other Features

Based on PUC Substantive Rule § 25.101(b)(3)(B), paralleling or utilizing existing compatible ROWs and other features are options that should be considered as areas of opportunity when selecting route alternatives for new transmission lines. Existing compatible ROWs include electrical transmission and distribution lines, railroads, and roadways. Other features include property lines or other natural or cultural features. For this study area, existing transmission lines, several roadways, parcel lines, and apparent property boundaries were evaluated as potential paralleling opportunities.

Data sources used to identify existing electrical transmission lines include utility company and regional system maps, PLATTS data (2016), aerial imagery (Photo Science 2018), USGS topographical maps, additional available planning documents, and field reconnaissance. Transmission lines identified include one 345-kV transmission line in the central portion of the study area, one 138-kV transmission line in the

southern portion of the study area, and one 69-kV transmission line along a portion of the northern study area boundary. Distribution lines are prevalent throughout the developed portions of the study area and were utilized as a paralleling opportunity in some locations.

Two active, operating metallic oil or gas pipelines were identified in the northern portion of the study area (RRC 2017). Kinder Morgan, Inc. has announced the 430-mile 42-inch metallic Permian Highway Pipeline project that is currently proposed to cross through the study area from the Waha, Texas area to the Gulf Coast. The Kinder Morgan project is proposed to be in service in late 2020, pending regulatory approvals (Kinder Morgan 2015). Metallic oil or gas pipelines were not considered as positive or negative routing opportunity areas and no routes of the Proposed Project parallel active or proposed metallic oil or gas pipelines for any significant distance.

2.8.3 Transportation Facilities

Federal, state, and local roadways were identified using TxDOT county transportation maps, Texas Natural Resource Information System (TNRIS) data, and field reconnaissance surveys. The roadway transportation system within the study area includes IH 10, United States Highway (US Hwy) 290, SH 27, and SH 41, as major roadways. The roadway transportation within the study area also includes the following FM roads: 385, 479, 783, 1340, and 2093. Numerous county roads, local roads, and streets (paved and unpaved) were also identified.

TxDOT's "Project Tracker" that contains detailed information by county for every road/highway project which is or could be scheduled for construction was reviewed to identify any state roadway projects planned within the study area. The TxDOT Project Tracker indicates that there are four roadway projects located within the study area. The projects include adding seal coat and pavement markers to SH 27, IH 10 and US Hwy 290 and installing a flashing beacon at the intersection of FM 783 and US Hwy 290. (TxDOT 2018).

No railroads were identified within the study area.

2.8.4 Aviation Facilities

POWER reviewed the San Antonio Sectional Aeronautical Chart (FAA 2017) and the Chart Supplement for the South Central United States (formerly the Airport/Facility Directory) (FAA 2018a) to identify FAA registered facilities within the study area subject to notification requirements listed in 14 Code of Federal Regulations (CFR) Part 77.9. Facilities subject to notification requirements listed in 14 CFR Part

77.9 include public-use airports listed in the Airport/Facility Directory (currently the Chart Supplement), public-use or military airports under construction, airports operated by a federal agency or the Department of Defense (DoD), or an airport or heliport with at least one FAA-approved instrument approach procedure.

The Chart Supplement for the South Central United States used in conjunction with the San Antonio Sectional Aeronautical Chart, contains all public-use airports, seaplane bases and public-use heliports, military facilities, and selected private-use facilities specifically requested by the DoD for which a DoD Instrument Approach Procedure has been published in the United States Terminal Procedures Publication.

No public-use or military FAA registered airports were identified within the study area (FAA 2018a). Also, no public-use heliports or heliports with an instrument approach procedure are listed for the study area in the Chart Supplement for the South Central United States (FAA 2018a).

In addition, POWER also reviewed the FAA database (FAA 2018b), USGS topographic maps, recent aerial photography, and conducted field reconnaissance from publicly accessible areas to identify private-use airstrips and private-use heliports not subject to notification requirements listed in 14 CFR Part 77.9. There were six private-use airstrips and three private-use heliports, including a Pre-Designated Emergency Landing Area (PELA), identified within the study area. Locations of the airstrips can be found on Figures 4-25a and 4-25b (Appendix D) and 5-1a and 5-1b (Appendix E), and the distances from each route centerline is presented in Tables 5-3 through 5-42.

2.8.5 Communication Towers

Review of the Federal Communication Commission (FCC) database indicated that no AM radio transmitters are located within the study area (FCC 2018).

There are eight FM radio transmitters/microwave towers/other electronic installations identified by the FCC located within the study area (FCC 2018). These towers are scattered throughout the study area. Locations of the identified communication towers can be found on Figures 4-25a and 4-25b (Appendix D) and 5-1a and 5-1b (Appendix E), and the distances from each route centerline is presented in Tables 5-3 through 5-42.

2.8.6 Parks and Recreation Areas

The PUC Standard Application for a CCN requires reporting of parks and recreational areas owned by a governmental body or an organized group, club, or church. Federal and state databases and county/local maps were reviewed to identify any parks and/or recreational areas within the study area. Field reconnaissance surveys were also conducted to identify any additional park or recreational areas.

National/State/County/Local Parks – No national, state, or county parks were identified within the study area (National Park Service [NPS] 2018a; TPWD 2018d).

Local park and recreation areas (owned by a governmental body or an organized group, club, or church) identified within the study area include:

- Camp Tecaboca is located on SH 27 and offers a summer camp and retreat program owned by the catholic church.
- Harper Community Park is located on Happer Pioneer Park Street and offers covered pavilion, picnic tables, playground and a lighted area.
- Harper Schools are located on West Highway 290 and offers a playground, football field, and track.
- TxDOT rest area is located on SH 27 and offers picnic tables and a view from the overlook.
- TxDOT rest areas are located on both the north and south side IH 10 and offer covered picnic tables.

There are other private camps including but not limited to Camp Honey Creek for Girls located on Honey Creek Road and Camp Waldemar located on FM 1340.

Wildlife Viewing Trails - Review of the TPWD Great Texas Wildlife Trails Heart of Texas – West indicates that there is one driving loop, Heart of the Hills Loop, and three wildlife viewing sites, Mountain Home Bridge, Sunset Cemetery at Heart of the Hills Research Station, and Heart of the Hills Fisheries Center, within the study area (TPWD 2018e).

Additional recreational activities such as hunting and fishing may occur on private properties throughout the study area, but are not considered to be open to the general public. Such activities provide significant recreational opportunities within the study area. Private landowners often lease to the public for these

activities through commercial and private hunting leases, while other are more informal (i.e., landowners and guests hunting on their own property). Game hunted within the study area counties includes white-tailed deer, turkey, quail, dove, feral hog, squirrel, raccoon, bobcat, coyote, fox, and several exotic game species like blackbuck, Arabian oryx, elk, axis deer, sika deer, and red deer.

Locations of the identified parks and recreation areas can be found on Figures 4-25a and 4-25b (Appendix D) and 5-1a and 5-1b (Appendix E), and the distances from each route centerline is presented in Tables 5-3 through 5-42.

2.9 Socioeconomics

This section presents a summary of economic and demographic characteristics for Gillespie, Kerr, and Kimble counties and describes the socioeconomic environment of the study area. Literature sources reviewed include publications of the United States Census Bureau (USCB) and the Texas State Data Center (TxSDC).

2.9.1 Population Trends

Based on TxSDC projections, Gillespie County is projected to experience population growth during the next 30 years. The largest population increase for 2010 to 2020 between the three counties is projected to be in Gillespie County at eight percent. The population increase for 2020 to 2040 in Gillespie County is projected to be at seven percent and five percent, respectively. Kerr County is projected to experience population growth between 2010 and 2040. In Kerr County the population increases for 2010 to 2040 are projected to be at six percent, five percent, and two percent, respectively. In Kimble County the population growth between 2010 and 2030 is projected to be at two percent and one percent, respectively. However, during the decade between 2030 and 2040, the county is projected to experience a population reduction at four percent. By comparison, the population of Texas is expected to experience population increases of 15 percent, 13 percent, and 12 percent over the next three decades, respectively (TxSDC 2014). Table 2-10 presents the past population trends and projections for the study area counties and for the state of Texas.

TABLE 2-10 POPULATION TRENDS

STATE/COUNTY	PAST		PROJECTED		
	2000	2010	2020	2030	2040
Texas	20,851,820	25,145,561	28,813,280	32,680,231	36,550,578
Gillespie County	20,814	24,837	26,702	28,672	30,223
Kerr County	43,653	49,625	52,458	55,039	56,355
Kimble County	4,468	4,607	4,686	4,723	4,551

Source: USCB 2000 and 2010; TxSDC 2014.

2.9.2 Employment

From 2010 to 2016, the civilian labor force (CLF) in Gillespie and Kerr counties increased, while the CLF in Kimble County decreased. Gillespie County saw an increase in its CLF from 2010 to 2016 of two percent (193 people) and Kerr County saw an increase of three percent (712 people). However, Kimble County saw a slight decrease in CLF of one percent (15 people). By comparison, the CLF at the state level grew by 11 percent (1,256,676 people) over the same time period (USCB 2010 and 2016). Table 2-12 presents the CLF for the study area counties and the state of Texas for the years 2010 and 2016.

Between 2010 and 2016, all of the study area counties experienced an increase in their unemployment rates. The Gillespie County unemployment rate increased from a low of 2.5 percent in 2010, to a high of 5.9 percent in 2016. Kerr County experienced an increase in unemployment from 6.0 percent to 8.2 percent during the same timeframe. From 2010 to 2016, Kimble County also experienced an increase in unemployment from 2.5 percent to 6.0 percent. By comparison, the state of Texas experienced a small decrease in the unemployment rate over the same period. The state's unemployment rate decreased from 7.0 percent in 2010, to 6.4 percent in 2016 (USCB 2010 and 2016). Table 2-11 presents the employment and unemployment data for the study area counties and the state of Texas for the years 2010 and 2016.

TABLE 2-11 CIVILIAN LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2010	2016
Texas		
Civilian Labor Force	11,962,847	13,219,523
Employment	11,125,616	12,371,392
Unemployment	837,231	848,131
Unemployment Rate	7.0%	6.4%
Gillespie County		
Civilian Labor Force	11,839	12,032
Employment	11,547	11,319
Unemployment	292	713

TABLE 2-11 CIVILIAN LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2010	2016
Unemployment Rate	2.5%	5.9%
Kerr County		
Civilian Labor Force	22,025	22,737
Employment	20,705	20,873
Unemployment	1,320	1,864
Unemployment Rate	6.0%	8.2%
Kimble County		
Civilian Labor Force	2,278	2,263
Employment	2,221	2,127
Unemployment	57	136
Unemployment Rate	2.5%	6.0%

Source: USCB 2010 and 2016.

2.9.3 Leading Economic Sectors

The major occupations in Gillespie County in 2016 are listed under the category of management, business, science, and arts occupations, followed by the category of service occupations. The major occupations in Kerr County in 2016 are listed under the category of management, business, science, and arts occupations, followed by the category of sales and office occupations. The major occupations in Kimble County in 2016 are also listed under the category of management, business, science, and arts occupations, followed by the category of sales and office occupations (USCB 2016). Table 2-12 presents the number of persons employed in each occupation category during 2016 in the study area counties.

TABLE 2-12 OCCUPATIONS IN THE COUNTIES WITHIN THE STUDY AREA

OCCUPATION	GILLESPIE COUNTY	KERR COUNTY	KIMBLE COUNTY
Management, business, science, and arts occupations	3,944	6,532	561
Service occupations	2,440	4,734	441
Sales and office occupations	2,377	4,967	555
Natural resources, construction, and maintenance occupations	1,668	2,695	356
Production, transportation, and material moving occupations	890	1,945	214

Source: USCB 2016.

In 2000 and 2016, the industry group employing the most people in both Gillespie and Kerr counties was educational services, and health care and social assistance. In 2010, the industry group employing the most people in Kimble County was construction and in 2016 is was educational services, and health care

and social assistance. Table 2-13 presents the number of persons employed in each of the industries in the study area counties for the years 2010 and 2016.

TABLE 2-13 INDUSTRIES IN THE COUNTIES WITHIN THE STUDY AREA

INDUSTRY GROUP	GILLESPIE COUNTY		KERR COUNTY		KIMBLE COUNTY	
	2010	2016	2010	2016	2010	2016
Agriculture, forestry, fishing and hunting, and mining	699	596	657	783	278	191
Construction	1,342	1,247	1,803	2,192	375	198
Manufacturing	747	559	1,095	1,150	125	144
Wholesale trade	344	205	369	272	48	48
Retail trade	1,702	1,352	2,839	2,476	247	307
Transportation and warehousing, and utilities	558	565	673	699	156	142
Information	204	207	339	311	19	32
Finance and insurance, and real estate and rental and leasing	683	594	1,374	1,242	118	55
Professional, scientific and management, and administrative and waste management services	791	1,121	1,732	1,797	100	85
Educational services, and health care and social assistance	2,369	2,373	5,843	4,746	337	432
Arts, entertainment, and recreation, and accommodation and food services	1,281	1,582	1,898	2,576	288	226
Other services, except public administration	590	700	1,264	1,766	78	172
Public administration	237	218	819	863	52	95

Source: USCB 2010 and 2016.

2.10 Aesthetics

Section 37.056(c)(4)(C) of the Texas Utilities Code incorporates aesthetics as a consideration when evaluating proposed electric transmission facilities. There are currently no formal guidelines provided for managing visual resources on private, state, or county owned lands. For the purposes of this study, the term aesthetics is defined by POWER to accommodate the subjective perception of natural beauty in a landscape and measure an area's scenic qualities. The visual analysis was conducted by describing the regional setting and determining a viewer's sensitivity. Related literature, aerial photograph interpretation, and reconnaissance surveys were used to describe the regional setting and to determine the landscape character types for the area.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area) that would help

define a viewer's sensitivity. POWER considered the following aesthetic criteria that combine to give an area its aesthetic identity:

- Topographical variation (hills, valleys, etc.).
- Prominence of water in the landscape (rivers, streams, lakes, etc.).
- Vegetation variety (woodland, meadows).
- Diversity of scenic elements.
- Degree of human development or alteration.
- Overall uniqueness of the scenic environment compared with the larger region.

The study area is primarily rural with some residential and commercial development scattered throughout. The predominant land use within the study area is rangeland and pastureland. The majority of the study area has been impacted by land improvements associated with agriculture, residential/commercial structures, various utility corridors, and roadways. Overall, the study area viewscape consists of open rangeland/ pastureland with gently rolling hills associated with tributaries of the Guadalupe River.

No known designated views or designated national or state scenic roads or highways were identified within the study area. The study area is located within the 19-county Texas Hill Country Trail Region and one site of interest was identified within the study area. The town of Ingram, nicknamed Rock Town for the use of flagstone as a building material, offers roadside heritage. Additionally, the Hill Country Arts Foundation is located in Ingram, with facilities that include an outdoor amphitheater, indoor performance stage, and art galleries (Texas Historical Commission [THC] 2018a).

A review of the NPS website did not indicate any Wild and Scenic Rivers, National Monuments, National Historic Sites, National Historic Landmarks, National Historic Trails, or National Battlefields within the study area (National Wild and Scenic Rivers System 2018; NPS 2016 and 2018b).

Based on these criteria, the study area exhibits a moderate to high degree of aesthetic quality for the region. The majority of the study area maintains the feel of a rural community. The study area is visually appealing overall, but the aesthetic quality of the study area is not significantly distinguishable from that of other adjacent areas within the region.

2.11 Cultural Resources

Section 37.056(c)(4)(A-D) of the Texas Utilities Code incorporates historical values as a consideration when evaluating proposed electric transmission facilities. The PUC's Standard Application for a CCN further stipulates that known historical sites within 1,000 feet of an alternative route should be listed, mapped, and their distance from the centerline of the alternative route documented in the application filed for consideration. Archeological sites within 1,000 feet of a route should be listed and their distance from the centerline documented, but they need not be shown on maps for the protection of the site. Sources consulted to identify known sites (national, state, or local commission) should also be listed.

The THC is the state agency responsible for preservation of the state's cultural resources. The THC, working in conjunction with the Texas Archeological Research Laboratory (TARL), maintains records of previously recorded cultural resources as well as records of previous field investigations. Information from the THC's restricted-access Texas Archeological Sites Atlas (TASA) and Texas Historical Sites Atlas (THSA) was acquired in addition to GIS shapefiles acquired from TARL to identify and map locations of previously recorded cultural (archeological and historical) resources within the study area. TxDOT's historic bridges database was also reviewed for bridges that are listed or determined eligible for listing on the National Register of Historic Places (NRHP). At the national level, NPS websites and data centers were reviewed to identify locations and boundaries for nationally designated historic landmarks, trails, and battlefield monuments.

Together, archeological and historical sites are often referred to as cultural resources. Under the NPS standardized definitions, cultural resources include districts, sites, buildings, structures, or objects important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For this study, cultural resources have been divided into three major categories: archeological resources, historical resources, and cemeteries. These three categories correlate with the organization of cultural resource records maintained by the THC and TARL.

Archeological resources are sites where human activity has measurably altered the earth and left deposits of physical remains (e.g., burned rock middens, stone tools, petroglyphs, house foundations, trails, trash scatters). Most archeological sites in Texas are Native American (prehistoric), Euro/African American, or Hispanic in origin. Much of the study area has not been studied intensively for archeological resources. Therefore, high probability areas for prehistoric and historic archeological resources were determined

based on proximity to perennial water sources, certain topographic features, and the presence of structures on historic maps in currently undeveloped areas.

Historical resources include standing buildings or structures (e.g., houses, barns, and out buildings), and may also include dams, canals, bridges, transportation routes, silos, etc., and districts that are non-archeological in nature and generally more than 50 years of age.

Cemeteries are locations of intentional human interment and may include large public burial grounds with multiple individuals, small family plots with only a few burials, or individual grave sites. In some instances, cemeteries may be designated as Historic Texas Cemeteries (HTCs) by the THC or recognized with an Official Texas Historical Marker (OTHM). Cemeteries may also be documented as part of the THC Record-Investigate-Protect (RIP) Program.

2.11.1 Cultural Background

Prehistory

The study area is situated on the Edwards Plateau between the Pedernales River along the northern study area boundary and the North Fork of the Guadalupe River along the southern boundary. The study area is on the southern edge of the central Texas archeological region, as mapped by Perttula (2004) near its interface with South Texas archeological region, and in the Central Planning Region as delineated by the THC (Mercado-Allinger et al. 1996) (Figure 2-6).

The following discussion focuses primarily on the cultural chronology of central Texas as presented by Collins (2004). The prehistoric occupation of central Texas is most often divided into three broad archeological periods spanning at least the last 12,000 years, based primarily on perceived technological changes evident in the archeological record and often correlated with broad changes in the physical and cultural environment. These periods include the Paleoindian period, beginning around 11,500 years ago and lasting approximately 2,700 years. Following the Paleoindian period is the long-lasting Archaic period, which comprises almost two-thirds of the prehistoric occupation of central Texas from about 8,800 years ago until 1,250 years ago. The final period before Euroamerican contact is the Late Prehistoric period, which ended with the first Spanish expedition into the region in the mid-1500s. All dates pertaining to the prehistory of the study area are given as approximate years Before Present (BP).

0 25 50 100 150 200 250

Miles

Source: Mercado- Allinger et. al., 1996

Legend

Cultural Resource Planning Region Boundary

County Boundary

Figure 2-6

LOCATION OF THE STUDY AREA IN RELATION TO THE CULTURAL RESOURCE PLANNING REGIONS OF TEXAS

Mountain Home 138-kV Transmission Line Project

POWER ENGINEERS

LCRA ENERGY • WATER • COMMUNITY SERVICES

Paleoindian Period (12,000 to 8,800 BP)

The Paleoindian period in central Texas is divided into the early and late sub-periods. The early Paleoindian period, also called the Clovis cultural horizon, began about 12,000 years ago and is the earliest known cultural sequence in the region. Corresponding with the waning years of the Pleistocene era, the early period was characterized by a comparatively cooler, wetter environment. Despite the popular misconception that these early populations were primarily hunters, evidence from the Gault Site in central Texas suggests that their diet was more generalized (Collins 2002). Archeological evidence indicates that these early hunting and gathering populations subsisted on a well-diversified resource base that included not only the last of the mammoth, but also smaller animals, fish, and a variety of reptiles. Site types dating to this period are also varied and include kill, quarry/stone-working, cache, camp, ritual, and burial sites. Artifacts associated with early Paleoindian period sites include large, fluted Clovis spear points, bone and ivory points, and stone bolas. The hallmark Clovis spear points of the early Paleoindian period soon gave way to the shorter, fluted Folsom points and a greater variety of smaller dart points. Many of the artifacts were made from exotic stone suggesting a highly mobile, wide-ranging hunting and gathering subsistence strategy. When the Pleistocene era came to an end around 10,900 years ago and the mammoth populations had all but disappeared, prehistoric populations began to focus their hunting efforts on bison, one of the hallmarks of the transition for the early to the late Paleoindian period (Collins 2004).

The late Paleoindian period in central Texas extended from about 10,900 to 8,800 BP. Although the subsistence base now emphasized large game over the more diversified resource base of the early period, small animals, fish, reptiles, and plants remained important food sources. Small groups continued to hunt, gather plants, and obtain raw material for stone tool manufacture over a broad territory. Earlier Clovis and Folsom projectile point types are eventually replaced by a variety of unfluted lanceolate types known as Angostura, Golondrina, and St. Mary's Hall, and early stemmed types such as Wilson or Berclair (Bousman et al. 2004). Ritualistic and intentional burial practices also continued from the early to the late period as evidenced by interments in Williamson and McLennan counties that contained both utilitarian and ornamental objects (Collins 2004).

Archaic Period (8,800 to 1,250 BP)

The Archaic period is subdivided into Early (ca. 8,800 to 6,000 BP), Middle (ca. 6,000 to 4,000 BP), and Late (ca. 4,000 to 1,250 BP) sub-periods. The transition from the late Paleoindian period to the Early Archaic is gradual, but has been characterized as a time when broad territorial hunting and gathering became more localized and the artifact assemblages began to show greater diversity than during the late Paleoindian period. Lanceolate points typical of the Paleoindian period are replaced by notched and

stemmed points in the Early Archaic. Regionally distinctive projectile points develop after 5,000 BP (Hester 1989). Other hallmarks of the Early Archaic include the greater use of groundstone tools and the widespread occurrence of heated-altered rocks, which may have functioned as hearths, ovens, or other features. Clear Fork and Guadalupe tools, possibly woodworking tools, and grooved and notched stones, possibly net sinkers, appear during the Early Archaic (Black and McGraw 1985; Collins 2004). Although there is a paucity of subsistence data for the Early Archaic in central Texas, there is some evidence that deer, various small animals, fish, and roasted plant bulbs were part of the diet. Hester (1989) suggests that Early Archaic inhabitants developed specialized adaptations to the hunting of white-tailed deer and gathering of acorns, in addition to other abundant regional resources. Bison is conspicuously absent from the archeological assemblages dating to this sub-period (Collins 2004).

During the early portion of the Middle Archaic, bison hunting is evident in the archeological record (Collins 2004). Earlier Middle Archaic projectile point styles, such as Bell, Andice, and Calf Creek are thin, triangular forms that represent a shift in lithic technology from the Early Archaic point types. These types could serve equally well as knives or the tips of lances, spears, or darts, and are viewed as part of an adaptation to a moister environment and the return of bison to the region (Black and McGraw 1985; Collins 2004).

By around 5,000 BP, bison are once again absent from the archeological record in central Texas, concomitant with the onset of the driest conditions faced by humans in central Texas. Large burned rock features (hearths and rock ovens) of the early part of the Middle Archaic are replaced in the later Middle Archaic by smaller burned rock middens. Johnson and Goode (1994:26) suggest the middens represent increased reliance on xerophytes such as sotol. The spread of xerophytes during the Middle Archaic is consistent with Collins (1995) and Johnson (1995), both of whom see a period of drying at the end of the Middle Archaic. Thoms (2008 and 2009) posited that a marked increase in the use of hot-rock ovens is an expected signature of land-use intensification, which would be expected during a prolonged nearly catastrophic drought such as seen in the later Middle Archaic (Collins 1995).

The onset of the Late Archaic occurred when central Texas was at its driest, around 4,000 years ago. Despite the continuation of Middle Archaic subsistence strategies, a proliferation of new projectile point types, including Bulverde and Pedernales points, is characteristic of the beginning of the Late Archaic. Prewitt (1981) suggests the proliferation of point types is indicative of a return to small, dispersed, widely ranging bands similar to that of the Early Archaic. Johnson and Goode (1994) include the appearance of

Bulverde dart points and later the Pedernales, Lange, Marshall, Montell, and Castroville points in their Late Archaic I subperiod, which coincides with the hotter, dryer climate. During the Late Archaic I subperiod, burned rock middens continued to be a common site type, even increasing in frequency in the eastern region of central Texas (Collins 2004).

As the desert plants were replaced by plants adapted to a moister climate around 3,500 to 2,500 years ago the number of burned rock middens in east-central Texas decreased but did not entirely disappear. Johnson and Goode's (1994) Late Archaic II subperiod coincides with this more mesic climate. West-central Texas remained dry and burned rock middens continued to be used to process the plant foods at the same intensity as during the Middle Archaic. Trade between central and coastal groups increased. The end of the Late Archaic period appears to be characterized by a broadening in the diet base, perhaps in response to climatic stressors or increasing population density. Projectile points diagnostic of the latter part of the Late Archaic include Darl, Ensor, Frio, and Mahomet types (Collins 1995 and 2004).

Late Prehistoric Period (1,250 to 300 BP)

The onset of the Late Prehistoric period has been arbitrarily set by some archeologists around 1,250 years ago, but may have started as recently as 800 years ago. Little changed in subsistence patterns during the late Prehistoric; the hunting and gathering strategy continued as did the processing of plants in burned rock middens. The most notable shift from the Late Archaic to the Late Prehistoric was the introduction and subsequent prevalence of arrow points over dart and spear points in the archeological record. There also appears to be an increase in intergroup violence, possibly as a result of increasing population pressure, as evidenced by numerous skeletal remains exhibiting fatal arrow wounds. Pottery begins to appear in the archeological assemblages dating to the latter part of the late Prehistoric period (Collins 2004).

The Late Prehistoric is often divided into an earlier Austin Phase, and later Toyah Phase in central Texas (Black 1989; Story 1990; Arnn 2012). The Austin phase occurred between approximately 1,250 years ago and 800 years ago, and is marked by the replacement of dart points with the Scallorn point, a thinner, smaller, and lighter point assumed to be used with a bow (Arnn 2012). Aside from the adoption of the bow and arrow, there appears to be little difference between economy of the Austin phase and the preceding period. The end of the Austin phase is generally marked by the introduction of the Perdiz arrow point and the appearance of ceramics throughout much of Texas (Arnn 2012), although the Scallorn and Perdiz types appear to be contemporaneous at a number of sites.

The Perdiz point is part of an assemblage commonly thought to represent an adaption to the return of bison to central Texas in numbers not seen since the Early Archaic. Arnn (2012: 190-191) suggests the ubiquity of the Perdiz point and its distribution, which approximates the distribution of white-tailed deer in Texas, call into question the long-held association between the Toyah and bison. Mauldin et al. (2013) suggest that carbon and nitrogen isotope analyses of Toyah-aged hunter gatherers at the Coleman site indicate the population did not rely on bison, but, instead, on animals that feed on trees, shrubs, and temperate grasses, such as deer (Mauldin et al. 2013).

Shortly before the arrival of Europeans to central Texas, native groups were living in small band-sized encampments and large, diffuse camps comprised of people with multiple tribal affiliations. Hunting focused on bison, but also included deer and antelope. Group mobility patterns were governed by the seasonal movements of the native animals and availability of resources, and later affected by the newly introduced horse. The presence of Caddoan ceramics at several central Texas sites indicates a long pattern of Hasinai Caddo interaction with groups indigenous to the northern part of central Texas (Collins 2004).

Historic Period (ca. 300 to 50 years ago)

As early as the late seventeenth century, native groups from northern Mexico and south Texas migrated into central Texas to escape forced labor in Spanish mines, missions, and ranches. High Plains groups, mounted nomadic bison hunters, pushed hunting and foraging groups southward into central Texas. In the early eighteenth century, the first documented Europeans arriving in the region would have encountered these relatively recent, fragmented groups (Newcomb 1993), who were later joined by Comanche, Kiowa, and other groups.

There is little documentary evidence of early Spanish and French exploration in the region, but the fact that there was a proposal for a mission on the Pedernales River submitted by a Father Santa Ana, plus the fact that the Marqués de San Miguel de Aguayo named the Blanco River in 1721, suggests that the Spanish knew the area (Ogilvie and Leffler 2018). In 1826, Benjamin R. Milam was given a contract to settle 300 families between the Colorado and Guadalupe Rivers. In 1830, the Mexican Congress prohibited immigration of United States citizens into Texas, hindering Milam's efforts to introduce the required number of settlers specified in his grant contract (Garver 2018).

After gaining independence from Mexico, the Republic of Texas was formed in March 1836. In 1842, the Fisher-Miller Land Grant, made by the Republic of Texas, granted more than three million acres between the Llano and Colorado rivers, including land claimed by the Comanches, to be settled by Dutch, German,

Swiss, Danish, Swedish, and Norwegian families under the auspices of the San Saba Colonization Company, and, in 1844, the Society for the Protection of German Immigrants in Texas (Biesele 2018). John O. Meusebach led 120 Germans to the site of Fredericksburg, in modern day Gillespie County, in 1846 (Kohout 2018), the same year Joshua D. Brown and a small group of men attempted to settle in modern-day Kerr County, but were driven off by Native Americans (Odintz 2018). Despite warnings from the governor of Texas (annexed as a state in 1845), in 1847, Meusebach entered the Comanche territory and made a treaty with head chiefs Buffalo Hump, Santa Anna, and other chiefs allowing Meusebach's settlers to go unharmed into Native American territory and the Native Americans to enter the white settlements (Tetzlaff 2014), after which Fredericksburg grew quickly (Kohout 2018), and Joshua Brown returned to present-day Kerr County and established Brownsborough (Odintz 2018).

German immigrants from Fredericksburg and New Braunfels and newcomers from Tennessee settled in Brownsborough, and established sawmills on various nearby streams (Odintz 2018). Meanwhile, Native American raids increased in the region. Fort Martin Scott was established southeast of Fredericksburg in 1848 to protect Texas settlers in the region and travelers on the Fredericksburg-San Antonio Road (Brooks, Jr. 2018). In 1850, Gillespie County was created from portions of Bexar and Travis Counties, with Fredericksburg as the county seat, originally including parts of Blanco, Burnet, Llano, and Mason counties (Kohout 2018). In 1850, most of the white residents of the county were German immigrants. Cotton raising, and the slavery that frequently accompanied it, was never central to the economy of Gillespie County. By 1850, Gillespie County farms were producing more than 15,000 bushels of Native American corn annually. In another 10 years, the production of wheat climbed from 80 bushels to 18,136 bushels. A sense of community and social responsibility was very important to the Germans of Gillespie County. Churches, and later athletic clubs, reform clubs, reading societies, farmer's associations, political unions, and fraternal organizations played a vital role in the lives of Gillespie County residents. By 1858, there were five free public schools in Gillespie County, and it's parochial and public schools were among the best in the state in the nineteenth century (Kohout 2018).

To counter increased hostilities with Indians the United States Army established a post at Camp Verde in the southern part of present-day Kerr County in 1855 (Odintz 2018). Camp Verde is known for its experimental use of camels as transport. Kerr County was formed in 1856 and Brownsborough changed its name to Kerrville and was established as the county seat. Due to Native American attacks, county residents decided to move the county seat to the more established community of Comfort, where it remained for two years until Comfort became part of the newly established Kendall County, and the Kerr

County seat was moved back to Kerrville. Mountain Home, located in the study area, was settled around 1856 (Oehler 2018).

Secession from the United States was voted down in Gillespie County, due in large part to the number of German immigrants, who for the most part, opposed both slavery and secession (Kohout 2018). Kerr County residents were divided on the issue of secession, with opposition to secession coming from the German population, and the Anglo settlers generally in favor of secession. By 1860, Kerr County had a population of 634, of which 49 were black slaves (Odintz 2018). Twenty-one slaves were owned by a single slave-owner, while the others were scattered among 13 other slave-owners. Those that supported the Union in Kerr, Gillespie, and Kendall counties joined the Union League (Odintz 2018), an organization that was formed in the North to bolster morale (Moneyhon 2018).

During the Civil War, Gillespie and Kerr counties were put under the charge of James Duff after martial law was imposed on Central Texas in 1862 (Kohout 2018). The Union League formed companies by 1862 to protect families from Native American attacks and confrontations with local Confederate forces. Increased tensions led to the Unionist Kerr and the neighboring counties being deemed in rebellion to the state of Texas. Confederate forces began to take measures to quell this “rebellion” (Odintz 2018). Rather than swear allegiance to the Confederacy, Union loyalists attempted to flee to Mexico. Duff and his men caught up with the Union loyalists in Kinney County. The cruelty of Duff’s men in the ensuing battle shocked the people of Gillespie County. Thirty-five of the 61 fleeing Germans were killed. Afterwards, approximately 2,000 Gillespie County citizens fled Duff’s reign of terror.

Harper Texas was first settled in 1863 by the Matthew Taylor and Eli McDonald families. In 1864, the Kiowa tribe killed two McDonald family members, and captured four children and a mother; one witness escaped (Hopf 2018).

After the Civil War, bitterness in Kerr County continued due to the wartime divisions. The economy, however, recovered quickly with the number of farms and ranches doubling, dominated by wheat, corn, cattle, and sheep (Odintz 2018). Native American raids abated, and in Mountain Home in 1878, four children were killed in the last Native American raid in Kerr County, known as the Dowdy Family Tragedy (Oehler 2018). Kerr County’s economic boom was fed by a growing demand in San Antonio for lumber, produce, and craftsmen. The San Antonio and Aransas Pass Railway was built through Kerrville in 1887. The early twentieth century saw a growth in Kerr County’s tourist industry. The area’s weather

was a draw for religious camp meetings, the first being the Presbyterian Westminster Encampment, established in 1906. By 1989, over 30 camps in Kerr County served more than 23,000 children (Odintz 2018).

Similarly, agricultural production in Gillespie County increased dramatically in the late nineteenth and early twentieth centuries. Between 1900 and 1930, Gillespie County farmers diversified and produced peanuts, peaches, pecans, pears, plums, grapes, and figs (Kohout 2018). Modern day Kimble County was part of Gillespie County until 1875, when it was separated from Gillespie County as part of Menard County, and Kimble County was organized the following year. The population and economy of Kimble County grew steadily throughout its first decades. Primarily rolling hills, Kimble County was dominated by sheep and cattle ranching and the growth of wheat, corn, and cotton. By the 1920s, the county was one of the leaders in the Texas wool and mohair industry, and pecans were an increasingly important crop (Thompson 2018).

By 1929, more than 20,000 peach and pecan trees were being harvested in Gillespie County, which was hit hard by the plummeting ranch values and lack of crop production during the Great Depression (Kohout 2018). Kimble County unemployment rose and the number of farms decreased during the 1930s. The New Deal introduced full electric power to the area through the Lower Colorado River Authority and the Pedernales Electric Cooperative (Ogilvie and Leffler 2018). By 1940, the number of farms was rising again, and in 1945 the rural parts of Kimble Country received electricity for the first time (Thompson 2018). By the mid-1940s, a small amount of oil was being produced as well as gas, gravel, and sand (Thompson 2018). By the 1950s, Kerr County had become a manufacturing center, including the manufacture of small aircraft by the Mooney Air Corporation (Odintz 2018).

2.11.2 Literature and Records Review

Historical and archeological data from TARL, TASA, and THSA were reviewed online to identify the locations and descriptions of previously documented archeological sites, State Antiquities Landmarks, NRHP properties, OTHMs, and previously conducted cultural resource investigations within the study area boundary. TARL data with archeological site location information was obtained January 18, 2018 and February 7, 2019. At the national level, NPS websites and data centers were reviewed to identify locations and boundaries for nationally designated historic landmarks, trails, battlefield monuments, and NRHP-listed properties. The results of the review are summarized in Table 2-14.

TABLE 2-14 RECORDED CULTURAL RESOURCES WITHIN THE STUDY AREA

COUNTY	RECORDED ARCHEOLOGICAL SITES	NRHP-LISTED OR DETERMINED ELIGIBLE PROPERTIES	STATE ARCHEOLOGICAL LANDMARKS	CEMETERIES	HTC	OTHM
Gillespie	7	0	0	1	0	1
Kerr	85	0	0	2	0	4
Kimble	0	0	0	0	0	0

Source: THC 2018b and 2018c.

The review of the THSA, TASA (THC 2018b and 2018c), and TARL data indicates that 92 archeological sites have been previously recorded in the study area (see Table 2-15). Of these, 88 are prehistoric in age, three are historic, and one site has both historic and prehistoric components. Most of the prehistoric sites are campsites that contain burned rock middens or scatters of burned rock. Burned rock middens are often highly visible mounds that are easily recognized during surveys and by avocational archeologists and landowners. Lithic procurement sites and lithic scatters are also common. The historic sites include 4KR738, the remains of an historic rock fence; 41KR496, the remains of a homestead; and 41KR730, a cistern and associated rock structure. The multicomponent site, 41KR249, contains a prehistoric campsite and historic concrete-lined water canals. Site 41KR620 and portions of sites 41GL448, 41GL449, and 41GL685 have been determined by the State Historic Preservation Office (SHPO) to be ineligible for listing in the NRHP. None of the remaining sites have been formally evaluated by the SHPO for listing in the NRHP. None of the archeological sites in the study area are designated as State Antiquities Landmarks (SAL).

Three cemeteries and four OTHMS are recorded in the study area (THC 2018b and 2018c). None of the cemeteries are designated HTCs. Two of the cemeteries bear OTHMs, including the Hunt Japonica Cemetery and Sunset Cemetery. The Hunt Japonica Cemetery (THC cemetery number KR-C014) has been the burial location for many pioneers and their descendants. The earliest legible tombstone is dated 1872, and the cemetery is presumed to have several unmarked graves (THC 2018b). The Sunset Cemetery (KR-C016) contains the graves of the four McDonald children killed by the Kiowa tribe in 1878 (THC 2018b), discussed above. In Gillespie County, an unnamed cemetery (GL-C046) is recorded in the study area near Harper.

Additional OTHMs in the study area include the sites of two violent confrontations with Native Americans: in Kerr County, the site where the Dowdy children were killed; and the site in Gillespie County where the Kiowa tribe killed the Eli McDonald family and kidnapped his wife and children (THC

2018a and 2018b), as discussed in the history of the study area above. An OTHM commemorating the Henderson Cemetery, which began as a family cemetery in 1870, is in the study area, approximately two miles from the cemetery, which is not recorded in the study area (THC 2018a).

TABLE 2-15 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41GL25	Undetermined	campsite with burned rock midden with debitage and bifaces
41GL26	Undetermined	campsite with burned rock midden with mano
41GL27	Undetermined	campsite with burned rock midden with debitage
41GL37	Undetermined	campsite with four burned rock middens, projectile points, mano, scrapers, and other materials
41GL112	Undetermined	campsite, lithic procurement site; burial reported from site
41GL448	Ineligible*	lithic procurement site
41GL449	Ineligible*	lithic procurement site
41KR3	Undetermined	campsite with burned rock midden, bone, snail shell, projectile points, stone tools, and charcoal
41KR16	Undetermined	campsite with burned rock midden, projectile points
41KR18	Undetermined	campsite with three burned rock middens, metate, debitage, tools
41KR19	Undetermined	campsite with burned rock middens bisected by road and creek
41KR20	Undetermined	campsite with burned rock middens bisected by road and creek
41KR33	Undetermined	campsite with burned rock midden, debitage, biface fragments
41KR34	Undetermined	lithic procurement site among tabular chert outcrop; debitage and preforms
41KR35	Undetermined	campsite with burned rock midden, debitage, cores, choppers, biface fragments
41KR36	Undetermined	campsite with two burned rock middens, debitage, cores, choppers, snails
41KR37	Undetermined	campsite with burned rock midden, debitage, biface fragment, snails
41KR38	Undetermined	Paleoindian to Late Prehistoric campsite with three burned rock middens, debitage, bifaces, LaJita, Pedernales, Bulverde, Langtry projectile points, snails, ground stone, shell artifacts, incised stone
41KR39	Undetermined	campsite with burned rock midden, debitage and cores
41KR40	Undetermined	campsite with burned rock midden, debitage
41KR41	Undetermined	campsite with burned rock midden, debitage, stone tools
41KR42	Undetermined	campsite with burned rock midden, snail shells, biface fragments, stone tools and debitage
41KR43	Undetermined	campsite with burned rock midden
41KR44	Undetermined	campsite with burned rock midden
41KR45	Undetermined	Middle Archaic campsite with burned rock scatter with Almagre dart point, debitage
41KR46	Undetermined	campsite with burned rock midden, bifaces, cores, debitage
41KR47	Undetermined	campsite with two burned rock middens, stone tools, debitage
41KR48	Undetermined	campsite with burned rock, debitage and cores
41KR49	Undetermined	campsite with two burned rock middens, biface fragments and debitage
41KR50	Undetermined	campsite with burned rock midden, dart points, stone tools, and debitage
41KR51	Undetermined	Middle to Late Archaic campsite with burned rock midden, debitage,

TABLE 2-15 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
		Palmillas and Montell dart points
41KR52	Undetermined	Late Prehistoric campsite with burned rock midden, scallorn point, debitage
41KR53	Undetermined	campsite with burned rock midden, dart point, bifaces, and debitage
41KR55	Undetermined	campsite with burned rock midden
41KR56	Undetermined	campsite with burned rock midden, debitage
41KR57	Undetermined	campsite with burned rock, debitage, biface fragment
41KR58	Undetermined	campsite with burned rock midden, cores, debitage, biface fragments
41KR59	Undetermined	campsite with burned rock midden, cores, debitage, biface fragments
41KR60	Undetermined	campsite with burned rock midden, cores, debitage, biface fragments
41KR61	Undetermined	campsite with burned rock midden, cores, debitage, biface fragments
41KR62	Undetermined	campsite with burned rock midden, debitage, biface fragments
41KR63	Undetermined	campsite with burned rock, biface fragments, debitage
41KR64	Undetermined	campsite with burned rock, biface fragments, debitage
41KR65	Undetermined	campsite with burned rock, biface fragments, cores, debitage
41KR66	Undetermined	lithic procurement site with preforms, cores
41KR67	Undetermined	campsite with burned rock, biface fragments, cores, debitage
41KR68	Undetermined	campsite with burned rock midden, biface fragments, debitage
41KR69	Undetermined	campsite with burned rock midden, stone tools, biface fragments, debitage
41KR70	Undetermined	campsite with burned rock midden, dart points bifaces, debitage
41KR71	Undetermined	campsite with burned rock midden, stone tools, dart points, arrow points, debitage, manos, bone tools, bones and the partial skull of a child
41KR72	Undetermined	campsite with burned rock midden, bifaces, debitage
41KR73	Undetermined	campsite with two burned rock middens, cores, biface fragments, debitage
41KR74	Undetermined	campsite with burned rock midden, cores and debitage
41KR75	Undetermined	campsite with two burned rock middens, biface fragments, debitage, snails
41KR76	Undetermined	campsite with two burned rock middens, biface fragments, debitage, snails
41KR77	Undetermined	campsite with burned rock midden, projectile point fragment, debitage, cores, and bifaces fragments
41KR78	Undetermined	campsite with burned rock, debitage, biface fragments
41KR79	Undetermined	campsite with burned rock, debitage, cores, bifaces, tabular flint cobbles
41KR80	Undetermined	campsite with burned rock midden, debitage
41KR81	Undetermined	campsite with burned rock midden, debitage, cores, mortar, snails
41KR82	Undetermined	heavily pot-hunted campsite with burned rock midden, bifaces, core, debitage, and snails
41KR83	Undetermined	bulldozed campsite with burned rock, debitage, cores, and biface fragments
41KR84	Undetermined	campsite with two burned rock middens, bifaces, projectile point fragments, cores, debitage
41KR85	Undetermined	campsite with burned rock midden, cores, debitage

TABLE 2-15 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41KR86	Undetermined	lithic procurement site at tabular chert outcrop; debitage and crude preforms
41KR89	Undetermined	campsite with burned rock, cores, projectile point fragments, bifaces, and debitage
41KR90	Undetermined	lithic scatter with debitage, cores, biface and biface fragments
41KR91	Undetermined	campsite with burned rock midden, biface fragment, cores, chopper, debitage
41KR92	Undetermined	burned rock midden
41KR235	Undetermined	lithic scatter with stone tools, debitage, cores
41KR236	Undetermined	lithic procurement site
41KR237	Undetermined	lithic procurement site
41KR238	Undetermined	lithic scatter
41KR239	Undetermined	lithic procurement site
41KR240	Undetermined	lithic scatter
41KR244	Undetermined	lithic procurement site and campsite with sparse burned rock, debitage, biface fragments
41KR245	Undetermined	campsite with burned rock, debitage, cores
41KR249	Undetermined	prehistoric campsite with burned rock, debitage, stone tools and historic concrete water canals
41KR496	Undetermined	historic homestead with foundation remains, chimney mound, midden, and scatter of historic ceramics, glass , and metal objects (tobacco can, hole-in-top soldered cans, wire nails, pail handle, horse shoe, iron stove parts)
41KR543	Undetermined	three Middle to Late Archaic burned rock middens with a variety of projectile points, metate, gorget, Waco sinker, other stone tools and debitage
41KR544	Undetermined	Middle Archaic burned rock midden with Pedernales dart points, bifaces, bone fragments, mussel shell f
41KR565	Undetermined	campsite with destroyed burned rock midden, biface fragment,
41KR567	Undetermined	lithic procurement area with tested cobbles, debitage
41KR568	Undetermined	burned rock midden with debitage
41KR586	Undetermined	Middle Archaic to Late Prehistoric camp site with large burned rock midden, dart points, arrow points, manos, metates, bifaces , and debitage
41KR620	Ineligible	lithic scatter with thin biface fragment, debitage, and possible burned rock
41KR623	Undetermined	burned rock midden with debitage, core
41KR647	Undetermined	lithic procurement and workshop site
41KR675	Ineligible	lithic scatter with debitage, cores, tools
41KR685	Ineligible*	lithic scatter
41KR730	Undetermined	ca. 1890s-1940s century cistern and rock structure
41KR738	Undetermined	historic rock fence remnants

Source: THC 2018c.
Note: If the NRHP eligibility is marked with an * then the site has only been partially been determined eligible/ineligible.

The majority of the prehistoric archeological sites that have been recorded in the study area appear to be open campsites with burned rock middens and lithic scatters in close proximity to streams and river

channels (e.g., Johnson Creek, Contrary Creek, Klein Branch,), uplands adjacent to these channels, and the bluff lines overlooking the major draws. For the few prehistoric sites in the study area that have produced diagnostic artifacts, most would appear to date to the Archaic period, perhaps not unexpected given the preponderance of sites with burned rock middens, conspicuous features that appear in this region beginning in the Middle Archaic Period and continue to appear in the central Texas archeological record into the Late Prehistoric Period.

2.11.3 Previous Investigations

According to the TASA (THC 2018c), there have been 11 previously conducted cultural resource investigations within the study area boundaries. The earliest surveys were undertaken in the late 1960s and early 1970s, along Dry Branch near 41KR16 and 41KR18 (THC 2018c), and along approximately five miles of Johnson Creek and its tributaries in the study area, recording the bulk of the prehistoric sites in the study area (Briggs 1971). The latter survey was undertaken by the TWDB for a proposed reservoir. The TWDB also sponsored a reconnaissance survey near Ingram in 1988 (Fox 1988). Surveys have been undertaken in advance of transmission line projects (Voellinger 1985; Lawrence et al. 2013; Prikryl et al. 2006), a pipeline project (Plog et al. 1989), fiber optics lines (Peyton 2010), along FM 783 for two projects (in 1994 for the Federal Highway Administration and then in 2012 for TxDOT), and by TPWD at the Heart of the Hills Research Station (THC 2018c).

2.11.4 High Probability Areas

Review of the previously recorded cultural resource sites data indicates that the study area has not been entirely examined during previous archeological and historical investigations. Consequently, the records review results do not include all possible cultural resources sites within the study area. To further assess and avoid potential impacts to cultural resources, high probability areas (HPAs) for prehistoric archeological sites were defined during the route analysis process. HPAs were designated based on a review of the site and survey data within the study area, as well as soils and geologic data, and topographic variables. Within the study area, the prehistoric HPAs typically occur near and along streams, and outcroppings of gravels suited to stone tool manufacture (central Texas is rich in sources of chert for raw material). Terraces and topographic high points that would provide flats for camping and expansive landscape views as well as access to fresh water sources are also considered to have a high probability for containing prehistoric archeological sites. Prehistoric sites recorded in the study area are located in close proximity to stream channels, and on gravelly upland soils on level terraces overlooking larger streams, for example. Historic age resources are likely to be found near water sources. However, they will also be

located in proximity to primary and secondary transportation routes (e.g., trails, roads, and railroads) which provided access to the sites. Buildings and cemeteries are also more likely to be located within or near historic communities.

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3.0 ENVIRONMENTAL AND LAND USE CONSTRAINTS

A description of the land use, environmental, and cultural resources within the study area was presented in Section 2.0 of this report. These resources were taken into consideration during the preliminary alternative route and substation development process. The resources that have particular value or are particularly sensitive to potential impacts from this type of project are discussed below. The following sections indicate areas to be avoided, where practicable, or crossed only with care and possible mitigation.

3.1 Natural Resources

Sensitive natural resources identified within the study area include the Pedernales River and Johnson Creek, wetland/riparian habitat associated with the floodplains and tributaries of Johnson Creek, Henderson Branch, Fall Branch, Fessenden Branch, Byas Branch, Dry Branch, West Dry Branch, Klein Branch, Honey Creek, Spring Creek, Contrary Creek, North Fork of the Guadalupe River, as well as other vegetated perennial creeks and tributaries to these creeks, woodland/brushland areas, karst features and caves, and natural springs. Riparian areas along creeks/streams provide a source of water, habitat, and are often corridors for wildlife to move through that area. In addition, these riparian zones are sensitive because of the potential for construction-related impacts to surface waters, and because of the possible presence of associated wetland habitats. The upland woodland/brushland vegetation communities provide valuable wildlife habitat and, in some cases, may provide potential habitat for the Golden-cheeked Warbler (a federally-listed bird species). Karst features, caves, and springs may occur due to the unique geology of the study area. These features have the potential to be habitat for federally-listed invertebrates or salamanders. While the proposed transmission line cannot avoid crossing all of these sensitive areas, routing locations were identified taking these areas into consideration and, upon approval of a route by the PUC, construction should occur within these areas in a manner that both avoids and minimizes impacts where practicable.

3.2 Human Resources

The study area contains several categories of human and cultural resources that should be avoided where practicable to minimize potential adverse impacts. These areas were considered, although in some instances project requirements (i.e., the project endpoints) and/or the predominant urban residential and commercial development with few areas of undeveloped land scattered throughout made it necessary to locate alternatives in proximity to these areas, such as habitable structures, residential subdivisions, parks and recreation areas, and airstrips/heliports. Those areas considered to be particularly sensitive with regard to the location and construction of the Proposed Project are:

- **Habitable Structures** – 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. Routes near habitable structures should be avoided, where practicable.

- **Residential Subdivisions** – Several residential subdivisions are scattered throughout the study area. These areas should be avoided by new ROW, where practicable, or crossed along existing ROW or property lines, where available, because of the number of and density of existing habitable structures.

- **Parks and Recreation Areas** – Several local parks and a school playground area are located within the study area. Because of the recreational, aesthetic, and conservation benefits that parks provide to the public, these areas should be avoided whenever practicable, or crossed along existing ROW or property lines.

- **Airports and Heliports** – No FAA registered public airports or heliports were identified within the study area. FAA regulations require notice of the construction of structures within certain distances of registered public airports and heliports.

3.3 Constraint Areas

For the purpose of routing the proposed transmission line, the resources described above were classified as areas that should be avoided, if practicable, by the alternative routes, or as those areas which should be crossed only with special care and possible mitigation. Constraint areas are shown on Figures 4-25a and 4-25b (Appendix D) and 5-1a and 5-1b (Appendix E). In order to protect recorded cultural resource sites from potential vandalism and protected species habitat, their locations have been omitted from the constraints map. The following areas should be avoided, where practicable, or crossed with care or possible mitigation:

- Habitable structures.
- Developed areas (residential, commercial, industrial, recreational and cultural [churches, schools, etc.]).
- Parks and recreation areas.
- Known habitat of federally-listed endangered/threatened species.

- Potential endangered species habitat, particularly that of the Golden-cheeked Warbler.
- Wildlife preserves, conservation, and mitigation areas.
- Karst features, caves, and springs.
- Cemeteries and graves, for their cultural, social, and historic values.
- Airports and private airstrips, because of potential conflicts with navigable airspace.
- Vegetated floodplains of Pedernales River, Johnson Creek, and other creeks, streams, and riparian areas, and adjacent wetlands for their ecological value as habitat and avian stopover areas and their sensitivity to construction-related impacts.
- Large ponds and associated wetlands, for their ecological value to wildlife and their sensitivity to construction-related impacts.
- Recorded cultural resources sites (historic and prehistoric) for their social and historical value.

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4.0 SELECTION AND EVALUATION OF ALTERNATIVES

4.1 No Action Alternative

As presented in the Application with this EA, LCRA TSC intends to construct and operate the proposed 138-kV transmission line upon approval from the PUC. If the Application is not approved by the PUC, the potential impacts discussed in Section 5.0 would not occur. In addition, continuing to serve the area's electric load without the Proposed Project would result in the degradation of reliable electric service impacting a large number of end-use customers and could significantly limit the continued healthy economic development of the broader area. Furthermore, CTEC's ability to meet its obligations for providing reliable cost-effective electric service and to respond to emergencies would be severely limited without the Proposed Project.

4.2 Alternative Substation Selection and Evaluation

A new 138-kV electric transmission line is required to provide transmission service to a new load-serving substation in the Mountain Home area. POWER and LCRA TSC identified six alternative substation site options for the Mountain Home Substation: Mountain Home Substation Site Options 1-3 in the vicinity of the intersection of IH 10 and FM 479; Mountain Home Substation Site Option 4 in the vicinity of the intersection of IH 10 and SH 41; and Mountain Home Substation Site Options 5 and 6 in the vicinity of the intersection of SH 41 and SH 27. The locations of Mountain Home Substation Site Options 1-6 are depicted on the various maps contained in this EA. POWER conducted environmental studies and prepared a description of the existing environment, Sections 2.0 through 2.11.4, within the study area for the purpose of identifying preliminary alternative transmission line routes for the Proposed Project. This information was also used by LCRA TSC to evaluate the alternative substation locations.

Factors considered in identifying the substation site options include proximity to the electric load growth area, location on a single property or parcel owner with approximately eight to ten acres, costs associated with construction of the substation and distribution infrastructure, proximity to the electric load growth area, proximity to existing distribution facilities, proximity to suitable access roads, topography, and nearby environmental features and land uses. The preliminary alternative substation site locations were presented at the June 26, 2018 and November 7, 2018 open house meetings and are shown on Figures 4-1 and 4-2.

4.3 Alternative Route Selection

The objective of this study was to develop and evaluate numerous alternative transmission line routes that are feasible from an economic, engineering, system planning, and environmental perspective. LCRA TSC

utilizes a multi-phased approach for completing a project: define the study area; obtain environmental information; map environmental and land use constraints; develop preliminary alternative route segments and substation sites; seek public input; identify primary alternative routes and substation sites; conduct environmental, engineering, and cost analyses; evaluate primary alternative routes; seek PUC approval; acquire land and easements; and design and construct the transmission facilities.

4.3.1 Preliminary Alternative Route Segments

The preliminary alternative route segments were identified in accordance with Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, PUC Substantive Rule § 25.101(b)(3)(B), including the PUC's policy of prudent avoidance, the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects, and are consistent with LCRA TSC's standard routing practices. POWER was engaged to identify an adequate number of environmentally acceptable and geographically diverse preliminary alternative route segments while considering factors such as community values, parks and recreational areas, historical and aesthetic values, environmental integrity, length of route paralleling or using existing compatible corridors or paralleling parcel boundaries, and prudent avoidance.

POWER performed environmental and land use data collection and prepared a description of the existing environment within the study area for the Proposed Project (Section 2.0). POWER used information obtained during the data collection process to develop a constraints map (Figures 4-25a and 4-25b, Appendix D) and to identify preliminary alternative route segments. The preliminary route segments were identified by considering the use of and paralleling of existing compatible ROWs (existing transmission lines and their ROWs, roadways, apparent property lines, natural or cultural features), ongoing and proposed land uses, and areas of environmental concern. More detail of the features considered while developing the preliminary alternative route segments and preliminary alternative routes is provided in Sections 5.2.3.2 through 5.2.3.4.

Ground reconnaissance of the study area and computer-based evaluation of digital aerial imagery were utilized for both refinement and evaluation of the preliminary alternative route segments. The data collection effort, although concentrated in the early stages of the Proposed Project, was an ongoing process and continued through the filing of the CCN application.

LCRA TSC reviewed these preliminary alternative route segments and substation sites, taking into consideration additional factors such as engineering, construction, and cost, and made some revisions by modifying individual segments and substation sites. The resulting preliminary alternative route segment

and substation site networks (Figures 4-1 and 4-2) were presented to the public at open house meetings in June 2018 and November 2018.

4.3.2 Public Involvement Program

The purpose of the open house meetings was to solicit input from residents, landowners, public officials, and other interested parties concerning the Proposed Project and the preliminary alternative route segments, and to:

- Promote a better understanding of the Proposed Project, including the purpose, need, potential benefits and impacts, and the PUC certification process.
- Inform the public about the routing procedure, schedule, and route approval process.
- Gather feedback reflecting the values and concerns of the public and community leaders.

4.3.2.1 First Open House Meeting (Mountain Home)

The first open house meeting was held on June 26, 2018, from 5:30 p.m. to 8:00 p.m. at the Mountain Home Volunteer Fire Department in Mountain Home, Texas. LCRA TSC mailed written notices of the meeting to all owners of property within 300 feet of each preliminary alternative route segment centerline (Appendix B). Additional notice letters were sent to the DoD Clearinghouse. In addition, a public notice was published on the listed dates in the following four newspapers having circulation within the project area counties:

- *Fredericksburg Standard – Radio Post* – June 13 and June 20, 2018
- *Junction Eagle* – June 13 and June 20, 2018
- *Kerrville Daily Times* – June 13 and June 20, 2018
- *West Kerr Current* – June 14 and June 21, 2018

The public notices announced the location, time, and purpose of the meeting. A copy of the published newspaper notice is located in Appendix B.

At the Mountain Home open house meeting, personnel from LCRA TSC and POWER staffed information stations with each station devoted to a particular aspect of the Proposed Project. These stations included maps, illustrations, photographs, and text explaining a particular topic. Five GIS stations were available to show the extent of the Proposed Project, the proposed preliminary alternative route segments and substation sites, property ownership parcel boundaries and recent aerial photography of the project area. The GIS stations were available to answer detailed landowner property questions such as the distance

from the proposed alternative route segment centerline to habitable structures. Interested attendees were encouraged to visit each station in order, so that the entire process could be explained in the logical sequence of project development, although attendees were free to circulate throughout the room in any manner they preferred. The information station format is typically advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. Furthermore, the one-to-one discussions with LCRA TSC and/or POWER personnel typically encourage more interaction from those attendees who might be hesitant to participate in a more formal speaker-audience format.

Upon entering, visitors were asked to sign in and were handed an information packet, including a questionnaire. The questionnaire solicited input on the Proposed Project and an evaluation of the information presented at the meeting. Also included in the information packet were answers to frequently asked questions and a map indicating the location of the preliminary alternative route segments and substation locations. The questionnaire and information packet provided to the public at the Mountain Home open house meeting are included in Appendix B.

After the Mountain Home open house meeting, POWER reviewed and evaluated each questionnaire that was submitted at the meeting or that was sent in after the meeting. Of the 238 people who signed in at the Mountain Home open house meeting, a total of 94 submitted questionnaire responses at the meeting.

An additional 78 questionnaire responses, as well as several letters and e-mails, were received from individuals after the meeting, some of whom did not sign in as having attended the Mountain Home open house meeting. A total of 172 questionnaire responses were received by LCRA TSC for the Mountain Home open house meeting.

A review of the questionnaires received at or after the Mountain Home open house meeting indicated that the majority of the respondents agreed that the need for the Proposed Project had been adequately explained (73 percent), and that the exhibits and information presented were helpful to them in understanding the Proposed Project (82 percent).

Respondents were asked if they had a concern with any particular preliminary alternative route segments as they were presented at the first open house meeting (Appendix B and Figure 4-1). They were also asked to describe their concerns. Segment A received the most negative concerns (42), followed by Segments C (18) and T/V/K1 (11 each). Segment G received the most positive comments (27), followed

by Segments B (23) and F (27). Table 4-1 summarizes the segments that received the most responses to this question, both negative and positive.

TABLE 4-1 MOUNTAIN HOME MEETING SEGMENT CONCERNS/COMMENTS

SEGMENT	A	C	T/V/K1	G	B	F
Negative Concerns	42	18	11	8	3	1
Positive Comments	9	20	7/6/7	27	23	27

The questionnaire also solicited comments concerning typical transmission line routing factors, such as land use, paralleling existing corridors, and community values/resources. The questionnaire asked the respondents to rank the factors from one (most important) to 11 (least important) from a list of features that included: reliable electric service; parallel existing transmission line ROW; parallel other existing compatible ROW; parallel property lines; maximize the distance from residences; maximize the distance from schools, churches, nursing homes; maximize the distance from commercial buildings; maximize the distance from historic sites; maximize the distance from parks and recreational areas; minimize visibility of the lines; and minimize environmental impacts or other concerns. The Mountain Home open house meeting questionnaire responses indicated the most important factors regarding routing of the Proposed Project were maximizing the distance from residences (23 percent), using or paralleling existing transmission line ROW (17 percent) and maintaining reliable electric service (15 percent).

Following the Mountain Home open house meeting on June 26, 2018, LCRA TSC modified the initial study area boundary to include the Ingram Substation as a possible project endpoint and to add additional preliminary alternative route segments E4, J4, K4, M4, F4, and G4 (see Figure 4-2). LCRA TSC hosted a second open house meeting for landowners located near the newly added alternative route segments.

4.3.2.2 Second Open House Meeting (Ingram)

A second open house meeting was held on November 7, 2018, from 6:00 p.m. to 8:30 p.m. at Tom Moore High School in Ingram, Texas. LCRA TSC mailed written notices of the meeting to all owners of property within 300 feet of each preliminary alternative route segment centerline that was added after the June 26th Mountain Home open house meeting (Appendix B). Additional notice letters were sent again to elected officials and other interested parties, including the DoD. In addition, a public notice was published on the listed dates in the following three newspapers having circulation within the project area counties:

- *Fredericksburg Standard – Radio Post* – October 31, 2018
- *Kerrville Daily Times* – October 31, 2018

- *West Kerr Current* – November 1, 2018

The public notices announced the location, time, and purpose of the second meeting. A copy of the published newspaper notice is located in Appendix B.

At the Ingram open house meeting, personnel from LCRA TSC and POWER staffed information stations in the same manner as the Mountain Home open house meeting.

Upon entering, visitors were asked to sign in and were handed an information packet, including a questionnaire. The questionnaire solicited input on the Proposed Project and an evaluation of the information presented at the meeting. Also included in the information packet were answers to frequently asked questions and a map indicating the location of the preliminary alternative route segments and substation locations. The questionnaire and information packet provided to the public at the Ingram open house meeting are included in Appendix B.

After the Ingram open house meeting, POWER reviewed and evaluated each questionnaire that was submitted at the meeting or that was sent in after the meeting. Of the 130 people that signed in at the Ingram open house meeting, a total of 29 submitted questionnaire responses at the meeting.

An additional 77 questionnaire responses, as well as several letters and e-mails, were received from individuals after the meeting, some of whom did not sign in as having attended the open house meeting. A total of 106 questionnaire responses were received by LCRA TSC for the Ingram open house meeting.

A review of the questionnaires indicated that the majority of the respondents agreed that the need for the Proposed Project had been adequately explained (51 percent), and that the exhibits and information presented were helpful to them in understanding the Proposed Project (70 percent).

Respondents were asked if they had a concern with any particular preliminary alternative route segments as they were presented at the open house meeting (Appendix B and Figure 4-1). They were also asked to describe their concerns. Segment J4 received the most negative concerns (32), followed by Segments G4 (31) and M4 (14). Segment J4 received the most written positive comments (16), followed by Segments G (15), and E4 (14). Table 4-1 summarizes the segments that received the most responses to this question, both negative and positive.

TABLE 4-2 INGRAM MEETING SEGMENT CONCERNS/COMMENTS

SEGMENT	J4	G4	M4	G	E4
Negative Concerns	32	31	14	0	11
Positive Comments	16	12	13	15	14

For the Ingram open house meeting, the factors with most importance regarding routing the Proposed Project included using or paralleling existing transmission line ROW (25 percent), maximizing the distance from residences (22 percent), and maintaining reliable service (10 percent).

A few months after the Ingram open house meeting, the Hunt Garden Club sent LCRA TSC a petition signed by 114 individuals who oppose the Proposed Project and recommend the installation of storage systems on existing transmission lines as an alternative.

4.3.2.3 Post Open House Meetings

After the open house meetings held in Mountain Home and Ingram, LCRA TSC staff met individually or in groups with more than 40 landowners or their representatives. More than 15 meetings were held on landowners' property, while others were held at LCRA TSC's offices in Austin. The purpose of the meetings was to inform the landowners or their representatives about the Proposed Project, the transmission line routing process, the PUC process, and to gather information from the landowners or their representatives about potential routing constraints on their property and issues/concerns the landowners had about potential route segments or substation locations.

Some of the more common concerns or issues presented by the landowners at the open house meetings and afterward during individual and group meetings held with LCRA TSC staff included, but are not limited to, the following: proximity of the routes and substation locations to homes; potential environmental impacts to wildlife habitat, trees, springs, and streams; aesthetic or visual impacts caused by visibility of the proposed transmission facilities; impacts to property values; and impacts on agricultural, recreational, residential, aviation, or other land uses.

4.3.2.4 Internet Website

To better communicate with the public and provide up-to-date information on the Proposed Project, LCRA TSC created a section on LCRA's main website that included project-specific information (http://www.lcra.org/mountainhome). Project information available on the website included:

- Description of the Project

- Project Questionnaire
- Open house invitations/newspaper ads
- Frequently Asked Questions
- Exhibits from the open house meetings
- Aerial photography and topographic maps depicting the study area, alternative routes, and substation locations
- Property ownership maps
- Interactive mapping tool that allows individuals to zoom in on the preliminary segments/substation sites
- Contact information

4.3.2.5 Comments from Agencies and Officials

The following local, state, and federal agencies and officials were contacted by letter in March, April, and October 2018 by LCRA TSC and/or POWER to solicit comments, concerns, and information regarding potential impacts, permits, or approvals for the construction of the Proposed Project. Maps of the study area were included with each letter. Sample copies of the letters sent, and all of the responses received as of the date of this report are included in Appendix A.

Contacts Made by POWER:

- United States Army Corps of Engineers (USACE) – Fort Worth District
- United States Department of Defense Siting Clearinghouse (DoD)
- United States Environmental Protection Agency (USEPA)
- United States Fish and Wildlife Service (USFWS)
- Federal Aviation Administration (FAA)
- Federal Emergency Management Agency (FEMA)
- National Park Service (NPS)
- Natural Resource Conservation Service (NRCS)
- Railroad Commission of Texas (RRC)
- Texas Commission on Environmental Quality (TCEQ) – San Antonio and San Angelo Regions
- Texas Department of Transportation (TxDOT) – Aviation Division
- TxDOT – District Engineer – Austin, San Antonio, and San Angelo
- TxDOT – Environmental Affairs Division
- TxDOT – Planning and Programming
- Texas General Land Office (GLO)

- Texas Historical Commission (THC)
- Texas Parks and Wildlife Department (TPWD)
- Texas Water Development Board (TWDB)
- Alamo Area Council of Governments
- Concho Valley Council of Governments
- Gillespie, Kerr, and Kimble County Historical Commissions

Contacts Made by LCRA TSC:

- Bandera Electric Cooperative
- Central Texas Electric Cooperative
- City of Fredericksburg Utilities
- Kerrville Public Utility Board
- Pedernales Electric Cooperative Inc.
- Applicable United States Senators
- Applicable United States Congressmen
- Applicable Texas Senators
- Applicable Texas House Members
- Gillespie County Officials
- Kerr County Officials
- Kimble County Officials
- City of Fredericksburg
- City of Ingram
- Divide Independent School District (ISD)
- Fredericksburg ISD
- Harper ISD
- Hunt ISD
- Kerr Economic Development Corp.
- Gillespie County Economic Development Commission
- Fredericksburg Chamber of Commerce
- Kimble County Chamber of Commerce
- West Kerr County Chamber of Commerce

LCRA TSC representatives also held meetings and conversations with both staff and elected officials from Kerr and Gillespie counties. The purpose of these meetings was to inform the staff/officials about the status of the Proposed Project, discuss potential project impacts, better understand community values in the area, and to explain the transmission line routing and PUC CCN process.

LCRA TSC representatives met with KPUB to discuss the proposed Mountain Home Project including the purpose and need for the project and the PUC CCN process.

LCRA TSC representatives met with the Kerrville Area Engineer for TxDOT to discuss areas where the proposed routes would parallel or cross IH 10 and other TxDOT controlled roadways.

All comments received were reviewed, considered, and factored into the overall evaluation of the preliminary alternative route segments and development of the alternative routes and substation site options. POWER and LCRA TSC reviewed and considered the comments received during the routing process. As a result of the input received, some modifications, deletions, and/or additions were made to complete the preliminary alternative route segments.

4.4 Modifications to the Preliminary Alternative Route Segments

Information received by LCRA TSC and POWER from the public, officials, and agencies resulted in modifications and deletions to some of the preliminary alternative route segments as well as the identification of new route segments, which are described in detail below. The preliminary alternative segments shown at the Mountain Home open house meeting are presented in Figure 4-1 and the preliminary alternative segments shown at the Ingram open house meeting are presented in Figure 4-2. The primary alternative route segments resulting from the segment revisions described below are shown in Figure 4-24.

4.4.1 Segment Additions

Segment U3 was added west of SH 27 as an option that would connect Segments J and I. As a result of adding Segment U3, a node was added near the middle of Segment J relabeling the northern portion of the segment as Segment V3. Adding Segment U3 also resulted in adding a node along Segment I, relabeling the northern portion of that segment as Segment H4 (Figure 4-3).

Segment Y3 was added west of SH 27 as an option that would connect Segments K and V3. As a result of adding Segment Y3, a node was added near the middle of Segment K relabeling the northern portion of

the segment as Segment A4. Adding Segment Y3 also resulted in adding a node near the middle of Segment V3 relabeling the northern portion of the segment as Segment Z3 (Figure 4-4).

Segment C4 was added west of SH 27 and north of Byas Springs Road as an option that would connect Segments L and T. As a result of adding Segment C4, a node was added near the end of Segment L relabeling the eastern portion of the segment as Segment B4. Adding Segment C4 also resulted in adding a node near the middle of Segment T relabeling the northern portion of the segment as Segment D4 (Figure 4-5).

Segment R4 was added along Henderson Branch Road as an option that would parallel the existing roadway and connect the Ingram Substation to the segment network. As a result of adding Segment R4, a node was added to the northern portion of Segment J4 relabeling that portion of the segment as Segment Q4. A node was also added to the middle of Segment G4 relabeling that portion of the segment as Segment S4 (Figure 4-6).

4.4.2 Segment Modifications

The southern portion of Segment A along Stewart-Junkin Road was modified by shifting it to the northeast to increase the distance away from habitable structures and to follow a natural feature (tree line). As a result of shifting Segment A, a node was added near the end of Segment B relabeling the southern portion of the segment as Segment X3. The central portion of Segment A was also modified by slightly shifting it to the north to reduce the number of angles (Figures 4-7 and 4-8).

The northern portion of Segment L was modified by shifting it to the east to increase the distance away from habitable structures and to better parallel a property boundary (Figure 4-9).

The northern portion of Segment G1 was modified by shifting it to the west to better parallel a property boundary, and to provide a better crossing of IH 10 and LCRA TSC's existing 345-kV electric transmission line. As a result of shifting Segment G1, a node was added near the end of Segment H1 relabeling the eastern portion of the segment as Segment T4 (Figure 4-10).

The southern portion of Segment X1 was modified by shifting it to the northwest to better parallel a property boundary (Figure 4-11).

Segment N2 was modified by shifting the southern half of the segment to the west side of CR 479 due to public comment from the land owner. Shifting the segment also shifts the node with Segments K2 and L2

to the west side of the road, decreasing the length of Segment K2 and increasing the length of Segment L2 (Figure 4-12).

Segment Z2 was modified by shifting it to the east to better parallel a property boundary. As a result of shifting Segment Z2, the southern node was moved to the east; increasing the length of Segment U2 and decreasing the length of Segment T2 (Figure 4-13).

The northern portion of Segment L3 was modified by shifting it to the west to increase the distance away from habitable structures, better parallel a property boundary, remove a creek crossing, and address landowner comment. As a result of shifting Segment L3, a node was added near the end of Segment O3 relabeling the eastern portion of the segment as Segment W3. Shifting Segment L3 to the west also resulted in removing the node between Segments N3 and M3, relabeling the entire segment as Segment M3 (Figure 4-14).

The southern portion of Segment G3 was modified by shifting it to the west due to engineering reasons (Figure 4-15).

The western portion of Segment H3 was modified by shifting it to the west side of Baker Rodgers Road due to engineering reasons (Figure 4-16).

The central portion of Segment Z3 (formerly Segment J) was modified by shifting it to the west to provide a better creek crossing (Figure 4-17).

The northern portion of Segment A4 (formerly Segment K) was modified by shifting it to the west to provide a better creek crossing and eliminate a significant angle (Figure 4-18).

Segment J4 shifted to the east to parallel a property boundary due to landowner comment (Figure 4-19).

Segment K4 shifted to the south to better parallel a property boundary and move away from a private airstrip that was identified. That revision added a node to the northern portion of the segment, relabeling that portion as Segment P4. As a result of shifting Segment K4, the node between Q4 (formerly Segment J4) and M4 was shifted, reducing the length of Segment Q4 and increasing the length of Segment M4. The addition of a node between Segment K4 and Segment P4 also split the former Segment G4 into Segment S4 and Segment O4 (Figure 4-20).

The central portion of Segment M4 was modified by shifting it to the east to better parallel a property boundary and IH 10, and to address landowner comment. Shifting the segment also extended the study area boundary (Figure 4-21).

4.4.3 Segment Deletions

Segment H was originally proposed to avoid the Canyon Springs Ranch Subdivision. However, based on public comments received following the open house meetings, it was deleted from further consideration. As a result of deleting Segment H, Segment G became part of Segment F (Figure 4-22).

The Harper Substation expansion was modified by shifting it to the southwest due to the landowner's request. As a result of shifting the substation expansion, Segment S3 was no longer necessary and was deleted (Figure 4-23).

Segment N3 was originally proposed to parallel FM 2093. However, shifting Segment L3 to the west resulted in removing the node between Segments N3 and M3, relabeling the entire segment as Segment M3 (Figure 4-14).

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Insert 11x17 Figure 4-1 Preliminary Alternative Route Segments shown at Mt. Home Open House

FRONT Page 1

Insert 11x17 Figure 4-1 Preliminary Alternative Route Segments shown at Mt. Home Open House

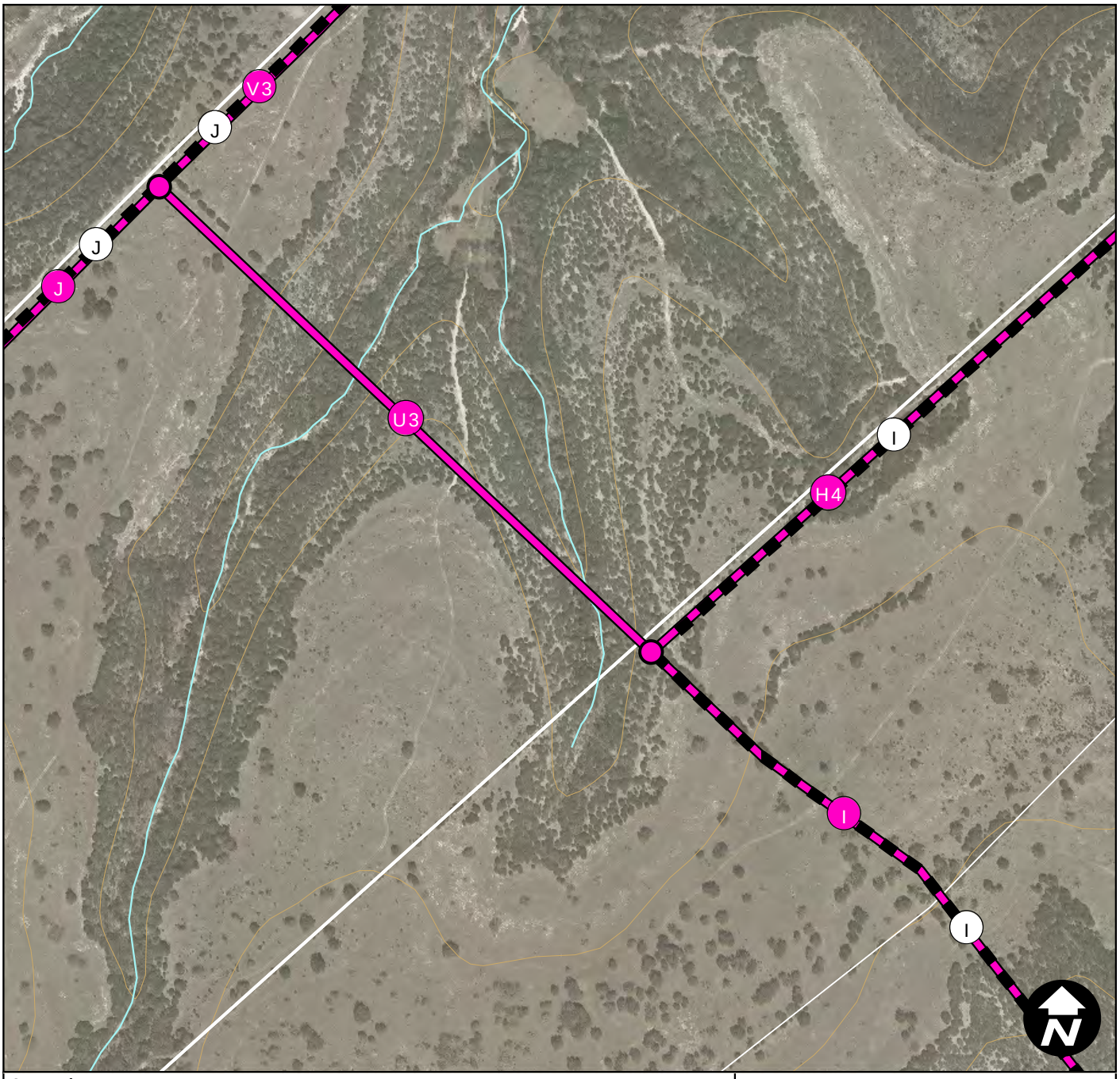
BACK Page 1

Insert 11x17 Figure 4-2 Preliminary Alternative Route Segments shown at Ingram Open House

FRONT Page 1

Insert 11x17 Figure 4-2 Preliminary Alternative Route Segments shown at Ingram Open House

BACK Page 1



Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- River or Stream
- 50 foot Contour

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Mountain Home 138-kV Transmission Line Project

Figure 4-3

Addition of U3; Relabel of Northern Portion of J as V3 and Relabel of Northern Portion of I as H4 Following the Open House Meetings

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Feet

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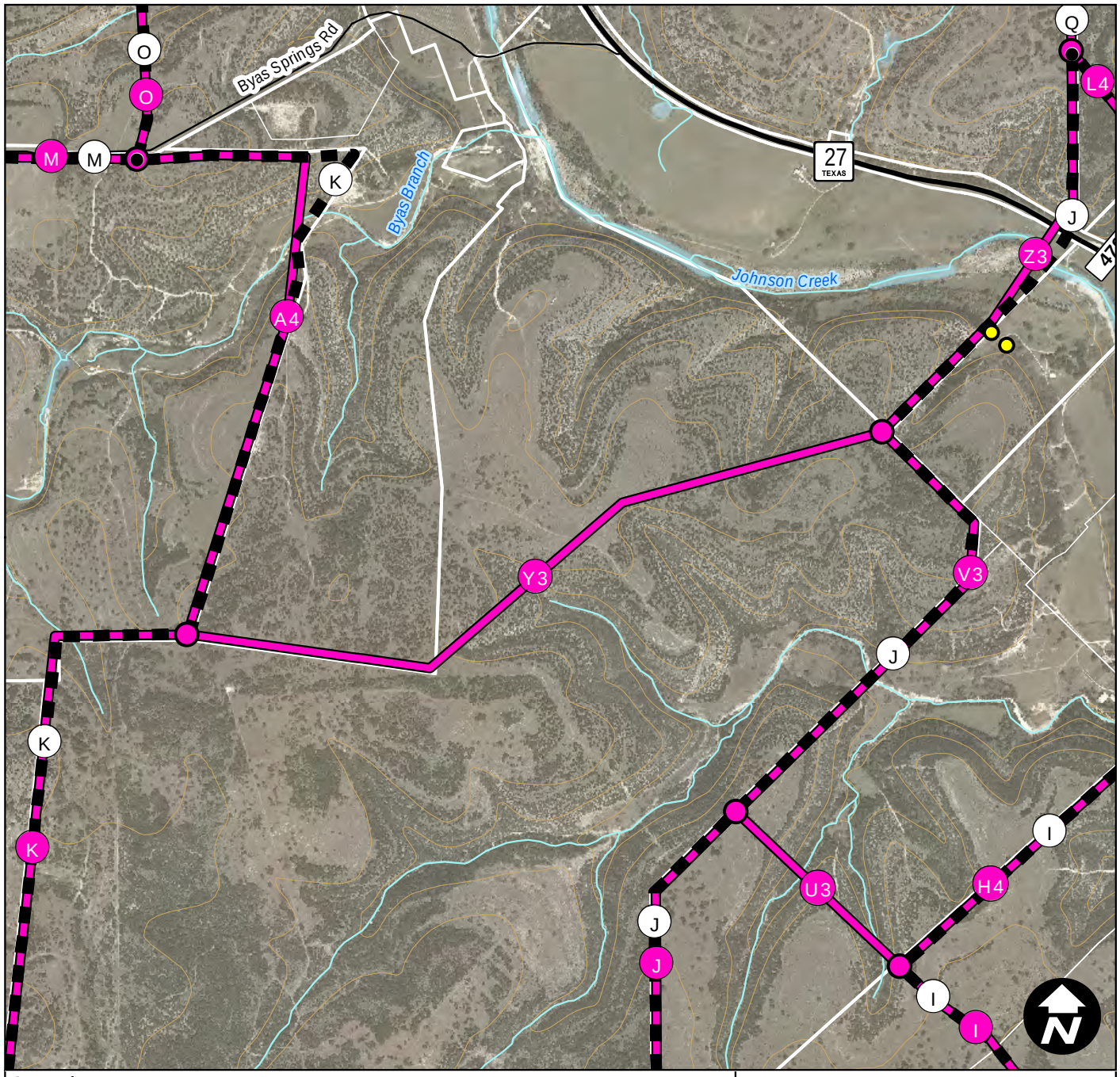

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 27 TEXAS — State or County Highway
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour
- Water Body

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Figure 4-4

Addition of Y3; Relabel of Northern Portion of K as A4 and Relabel of Northern Portion of V3 as Z3 Following the Open House Meetings

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Feet

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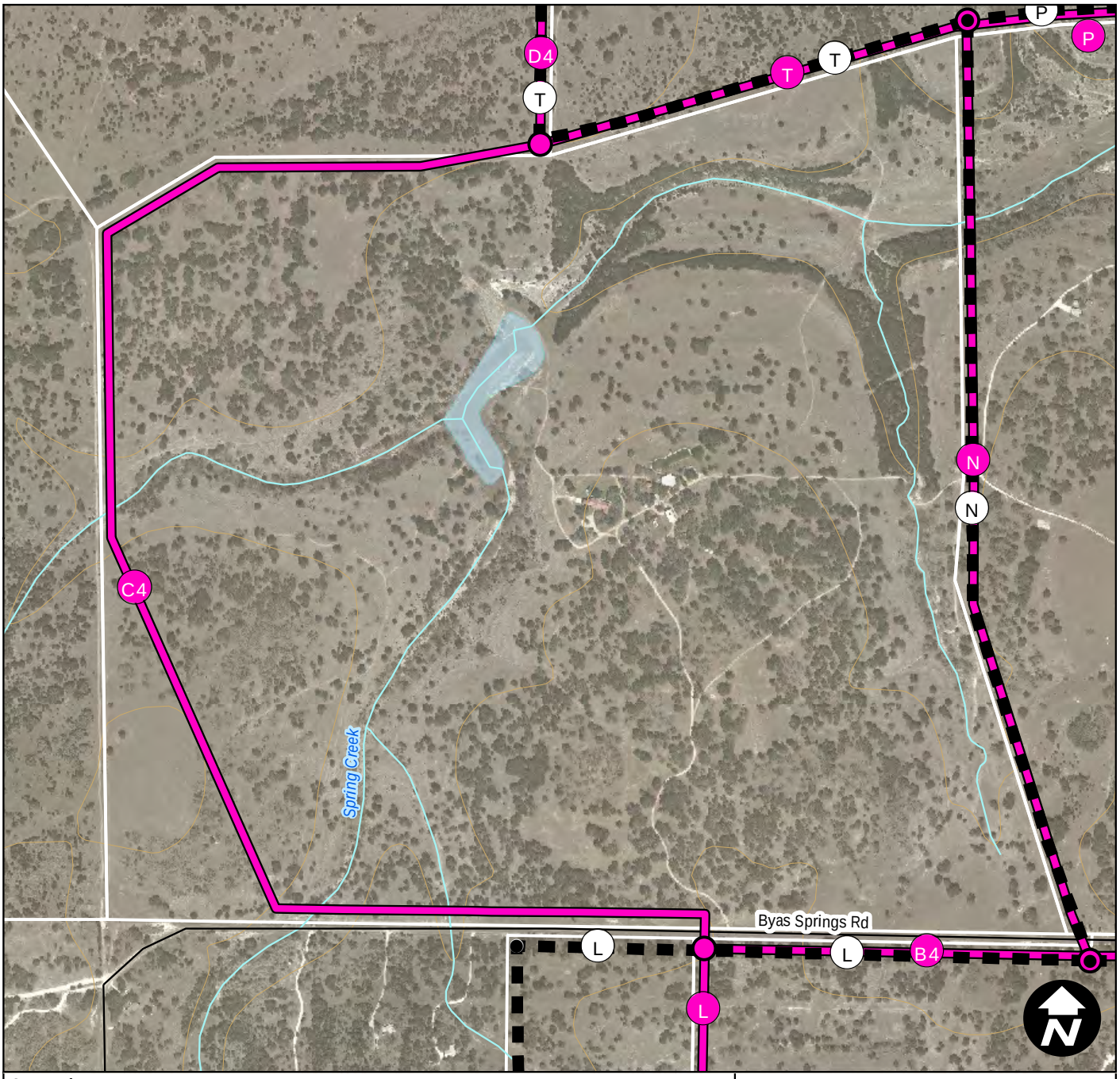

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- Resulting Alternative Route Segment Label
- Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Local or Rural Road
- River or Stream
- 50 foot Contour
- Water Body

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Figure 4-5

Addition of C4; Relabel of Eastern Portion of L as B4 and Relabel of Northern Portion of T as D4 Following the Open House Meetings

Feet

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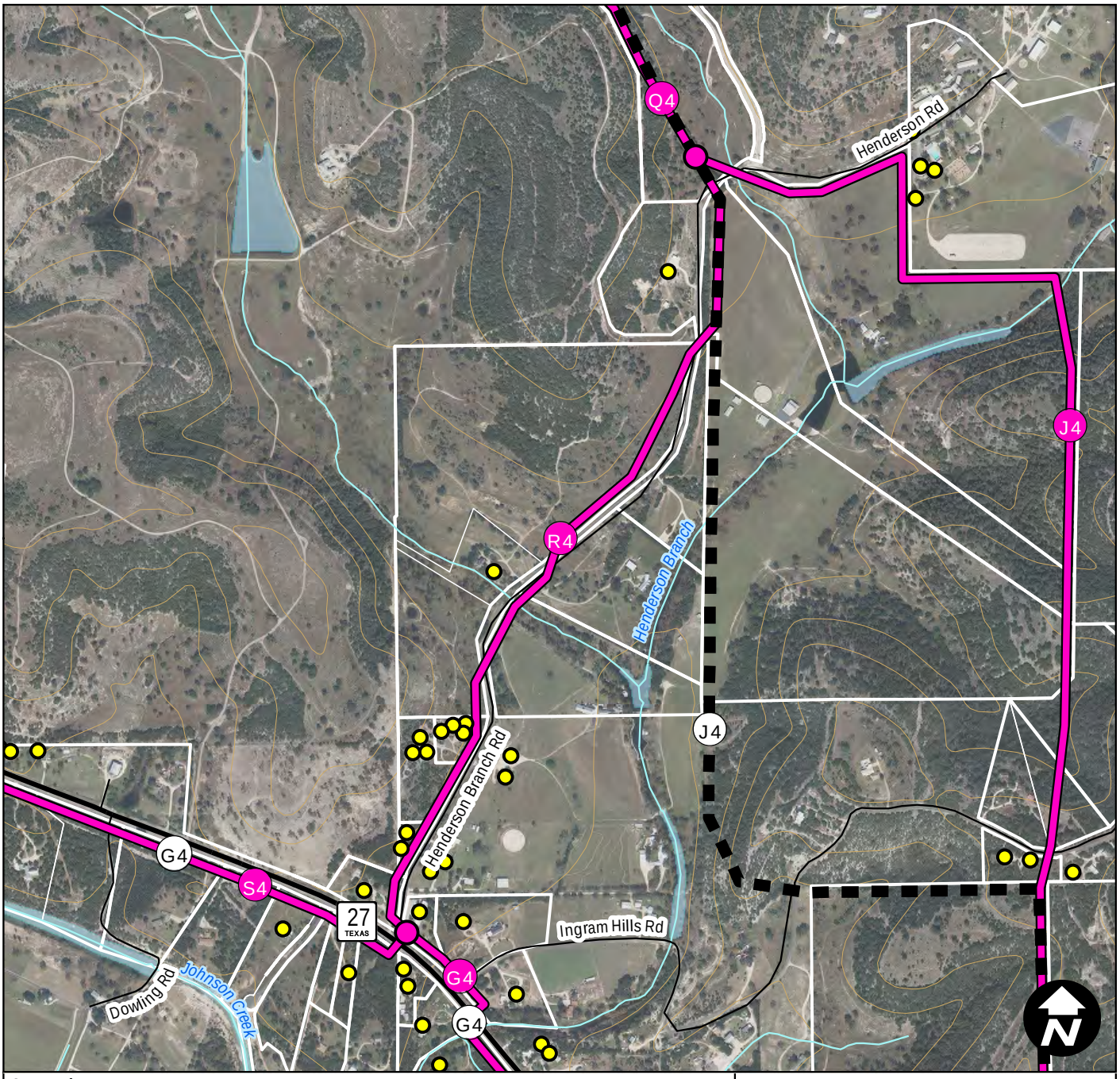

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 27 TEXAS — State or County Highway
- Local or Rural Road
- River or Stream
- 50 foot Contour
- Water Body

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Figure 4-6

Addition of R4; Relabel of Northern Portion of J4 as Q4,Relabel of Central Portion of G4 as S4 Following the Open House Meetings

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Feet

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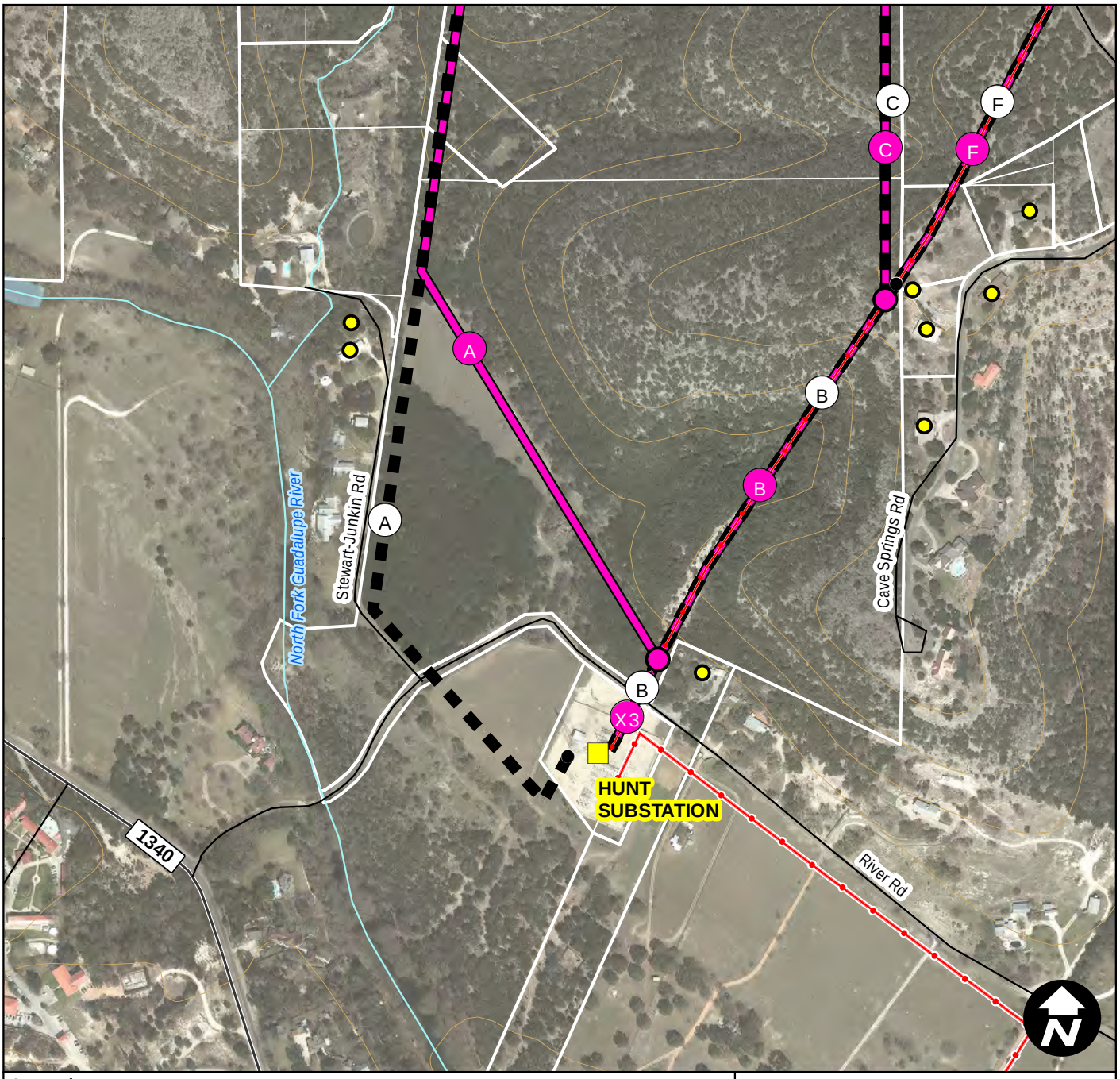

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Project Endpoint
- Property Boundary
- Parcel Boundary
- 138-kV Transmission Line
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour
- Water Body

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Figure 4-7

Realignment of A; Relabel Southern Portion of B as X3 Following the Open House Meetings

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Feet

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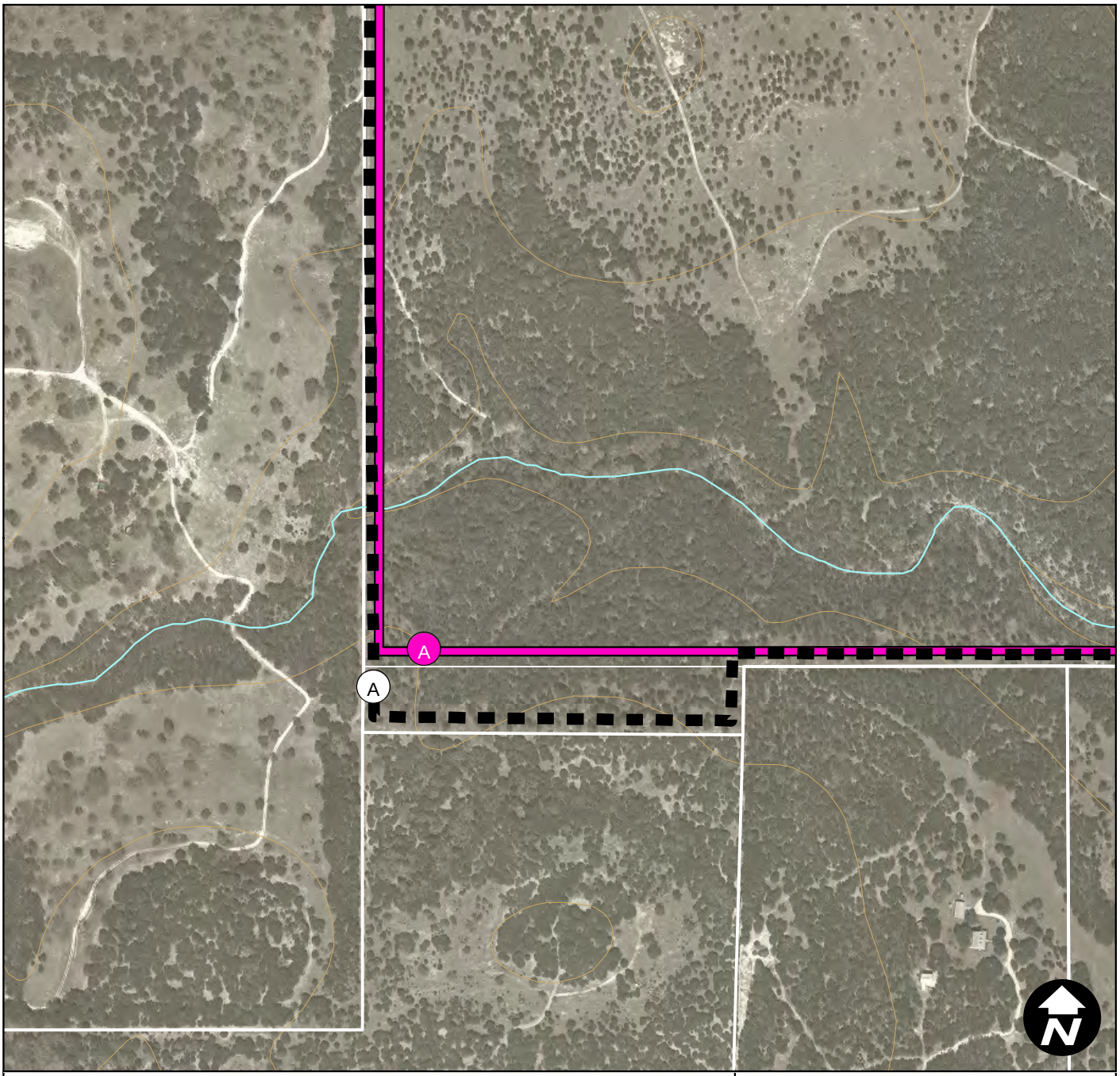

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A Resulting Alternative Route Segment Label
- A Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- River or Stream
- 50 foot Contour

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Mountain Home 138-kV Transmission Line Project

Figure 4-8

Realignment of A Following the Open House Meetings

Feet

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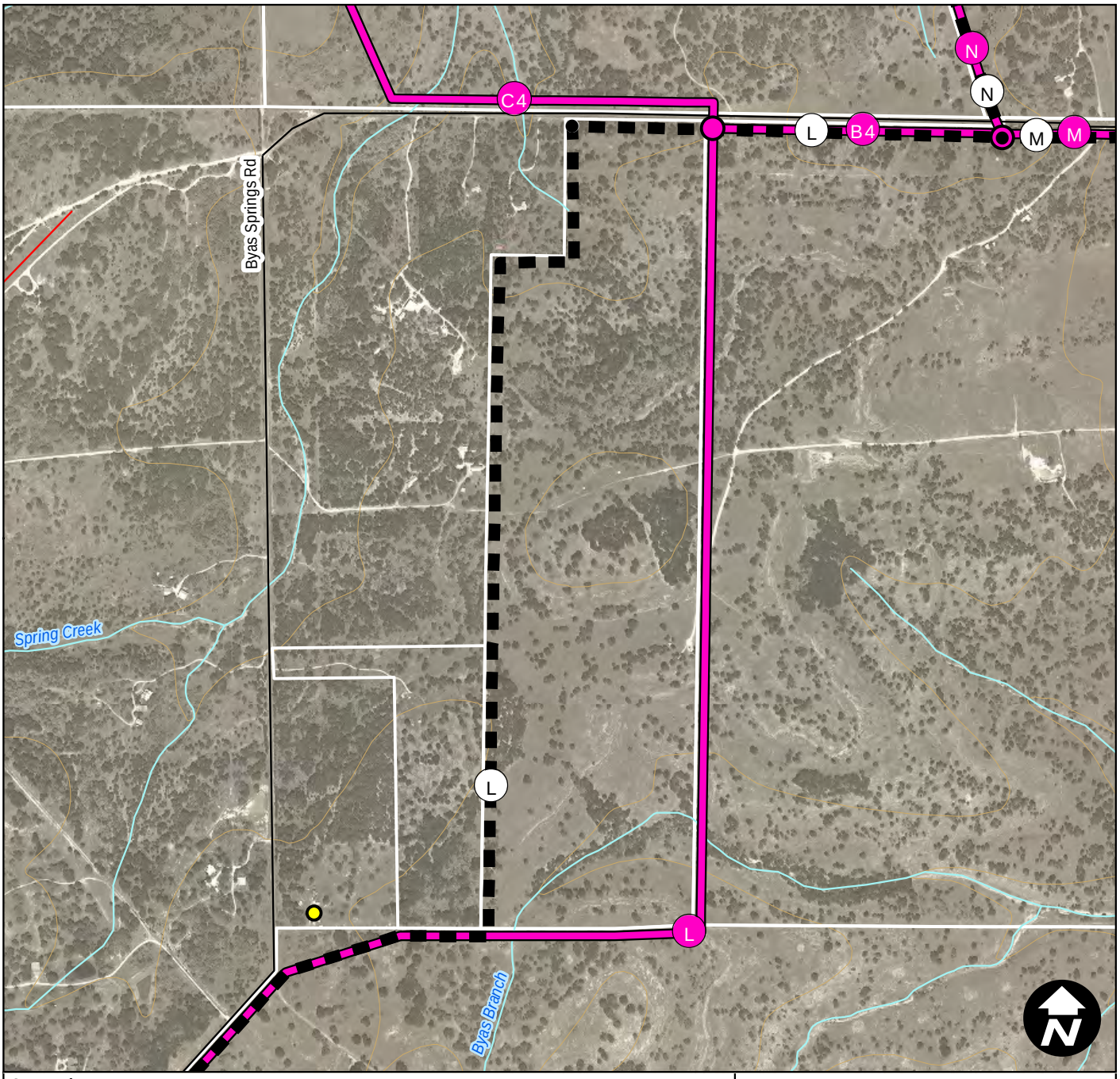

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- Local or Rural Road
- River or Stream
- 50 foot Contour

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Figure 4-9

Realignment of L Following the Open House Meetings

Feet

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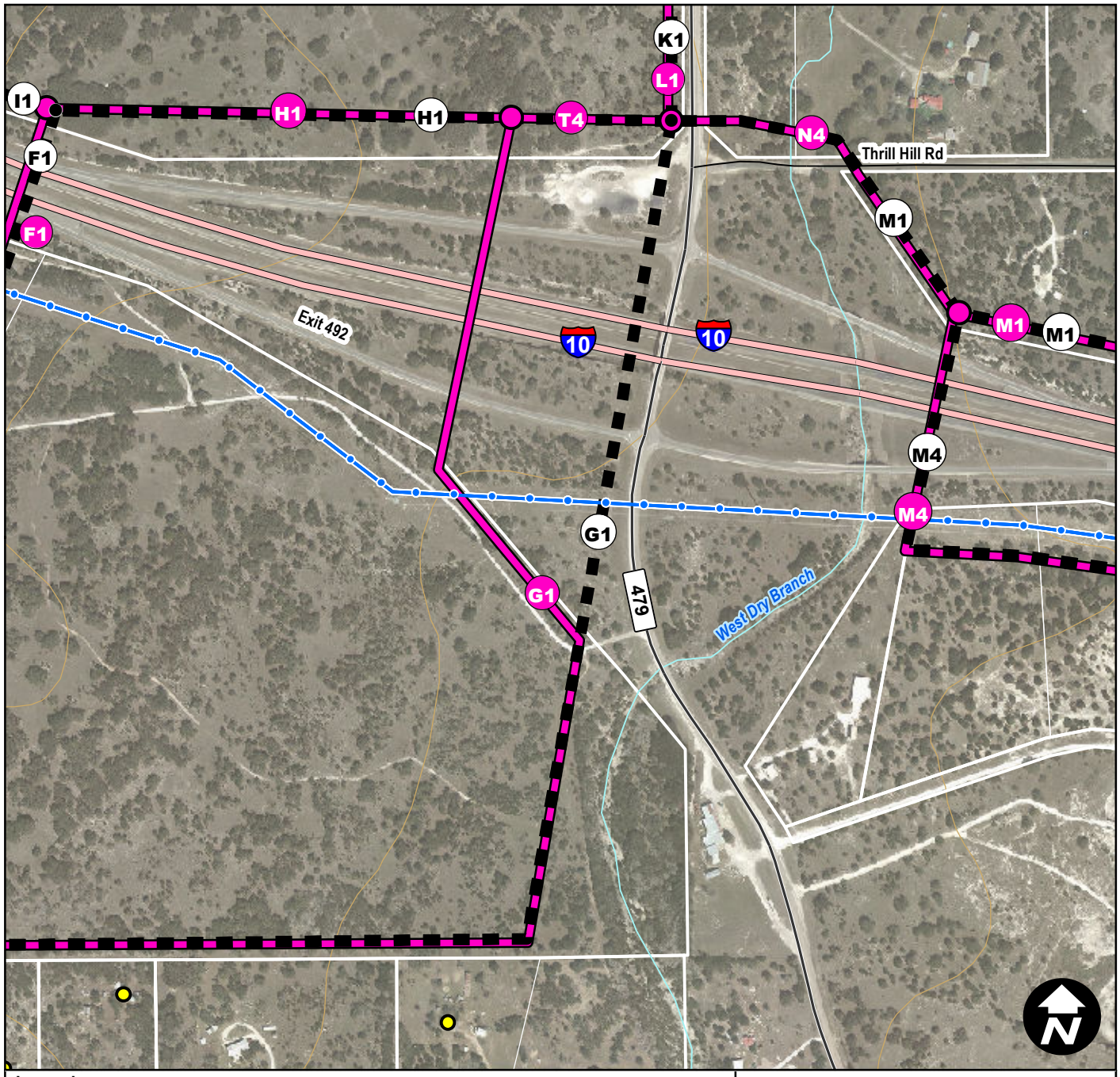

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 345-kV Transmission Line
- 10 — Interstate Highway
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour

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Figure 4-10

Realignment of G1; Relabel Eastern Portion of H1 as T4 Following the Open House Meetings

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Feet

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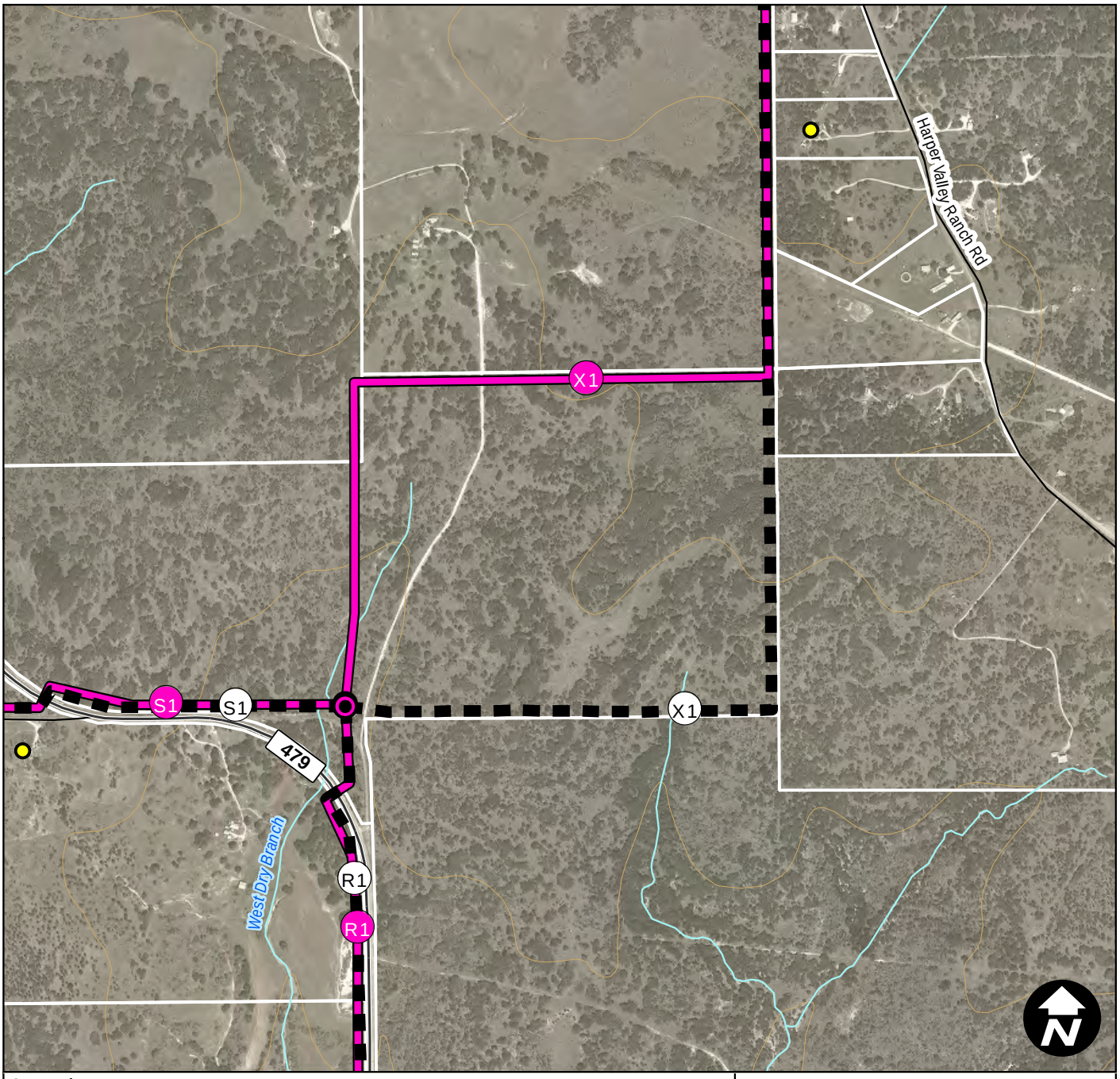

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour

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Figure 4-11

Realignment of X1 Following the Open House Meetings

Feet

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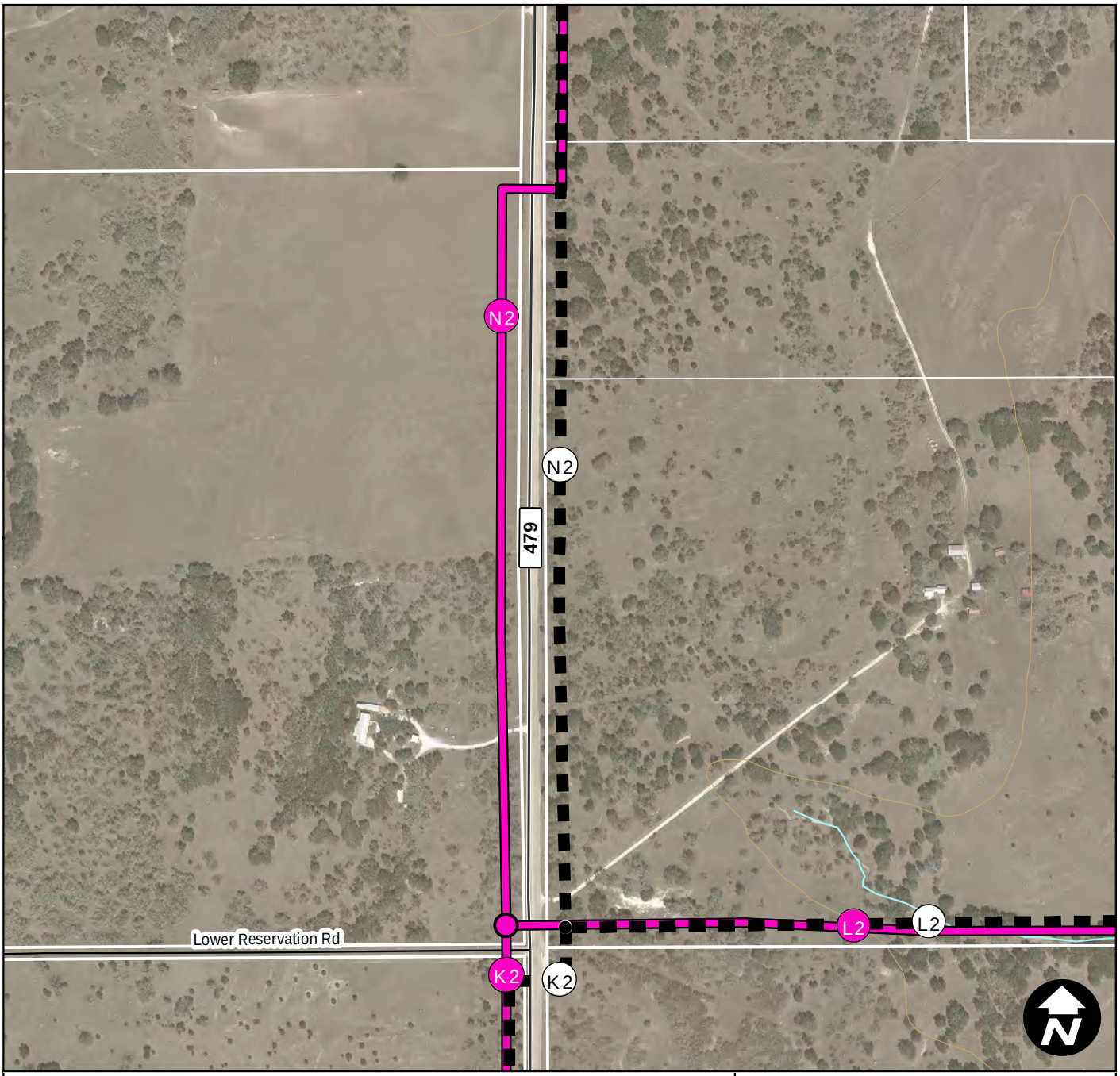

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour

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Figure 4-12

Realignment of N2; Reduction of K2 and Extension of L2 Following the Open House Meetings

Feet

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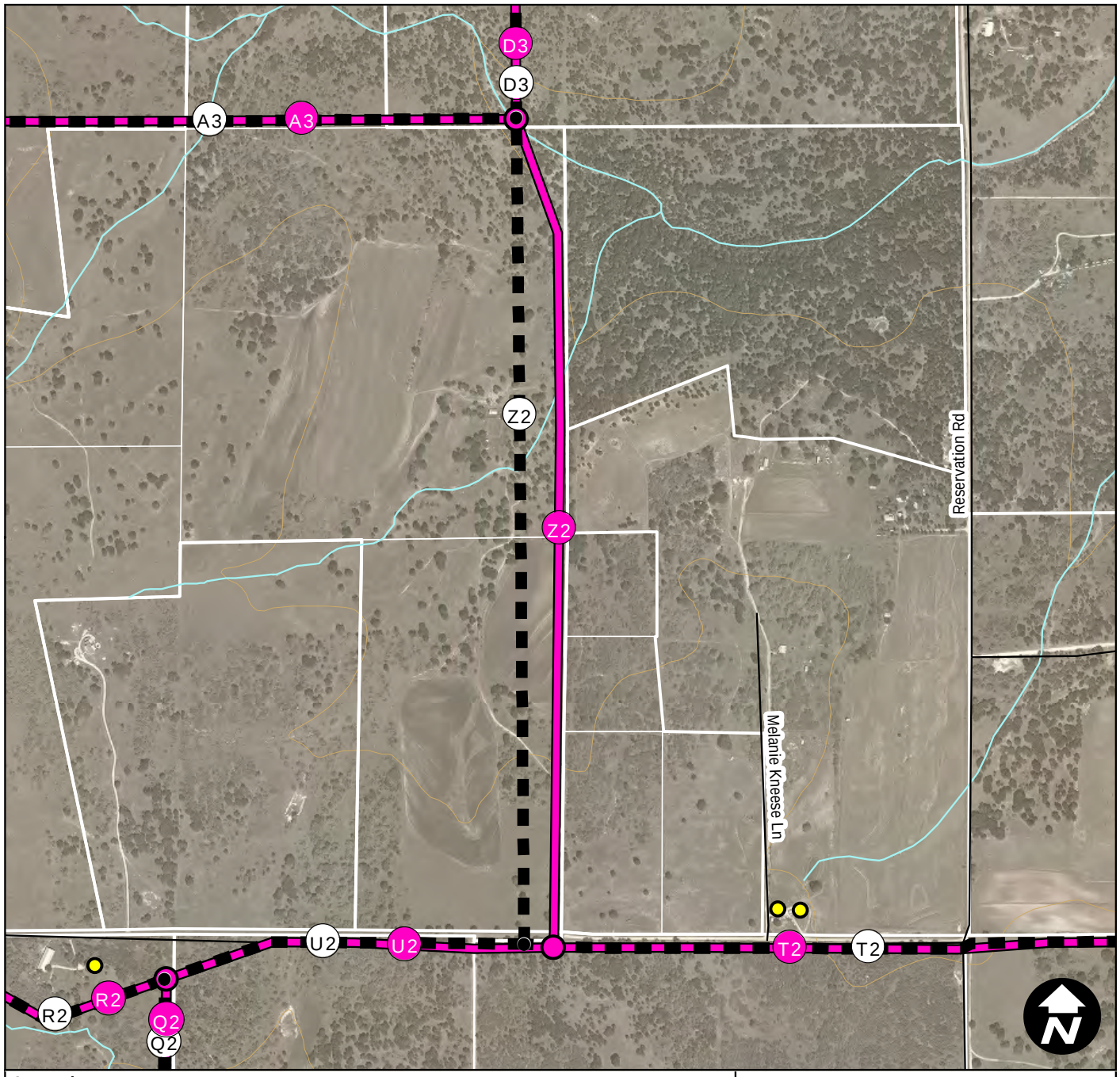

Legend

- Revised or New Alternative Route Segment
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- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- Local or Rural Road
- River or Stream
- 50 foot Contour

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Figure 4-13

Realignment of Z2; Extension of U2 and Reduction of T2 Following the Open House Meetings

Feet

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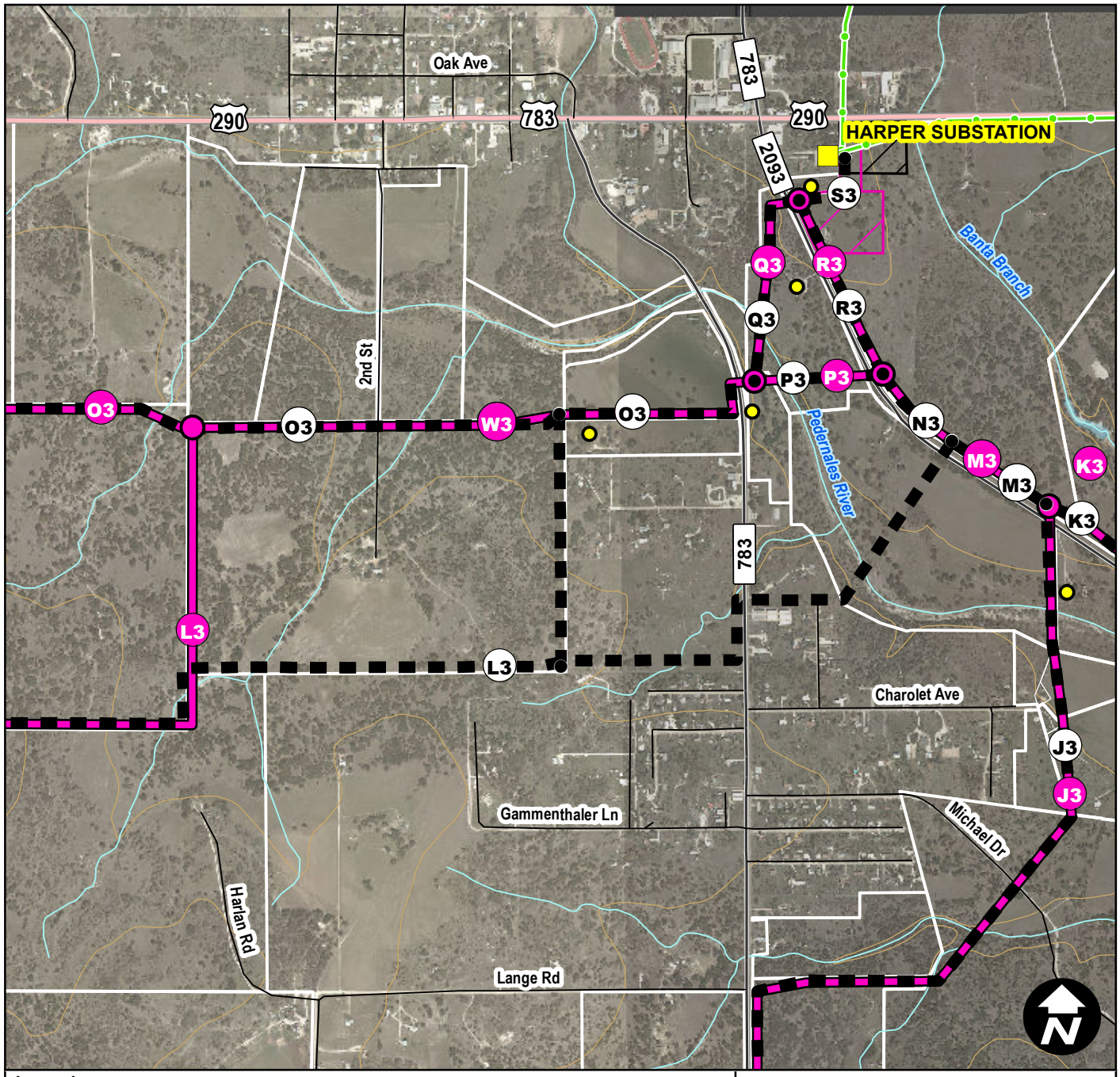

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Original Harper Substation Expansion Area
- Realignment of the Harper Substation Expansion Area
- Habitable Structure within 300 Feet of a Primary Segment
- Project Endpoint
- Property Boundary
- Parcel Boundary
- 69-kV Transmission Line
- 285 — US Highway
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- River or Stream
- 50 foot Contour
- Water Body

5/24/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-14

Realignment of L3; Relabel of Eastern Portion of O3 as W3; Removal of N3 Following the Open House Meetings

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Feet

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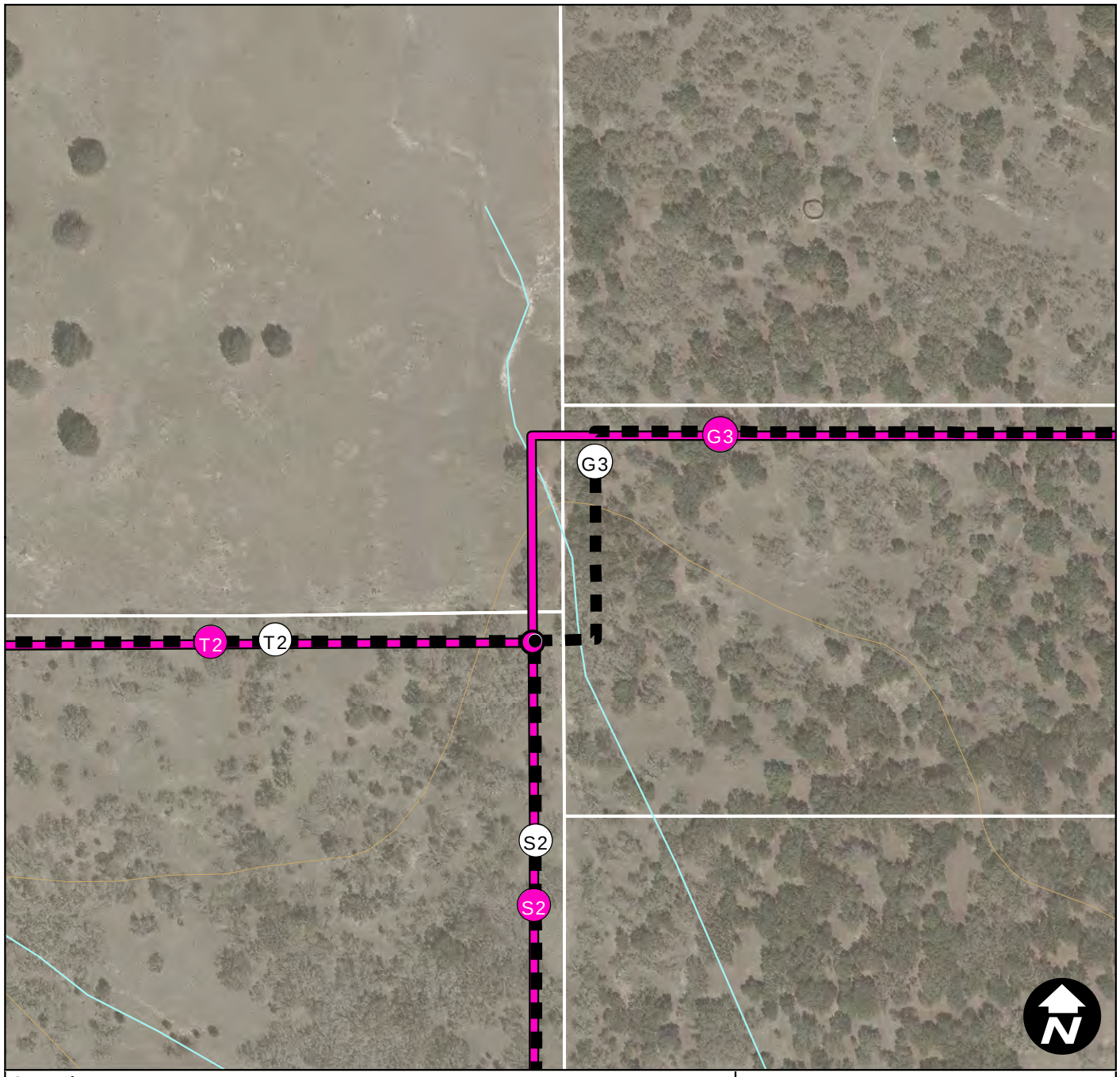

Legend

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- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- River or Stream
- 50 foot Contour

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-15

Realignment of G3 Following the Open House Meetings

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Feet

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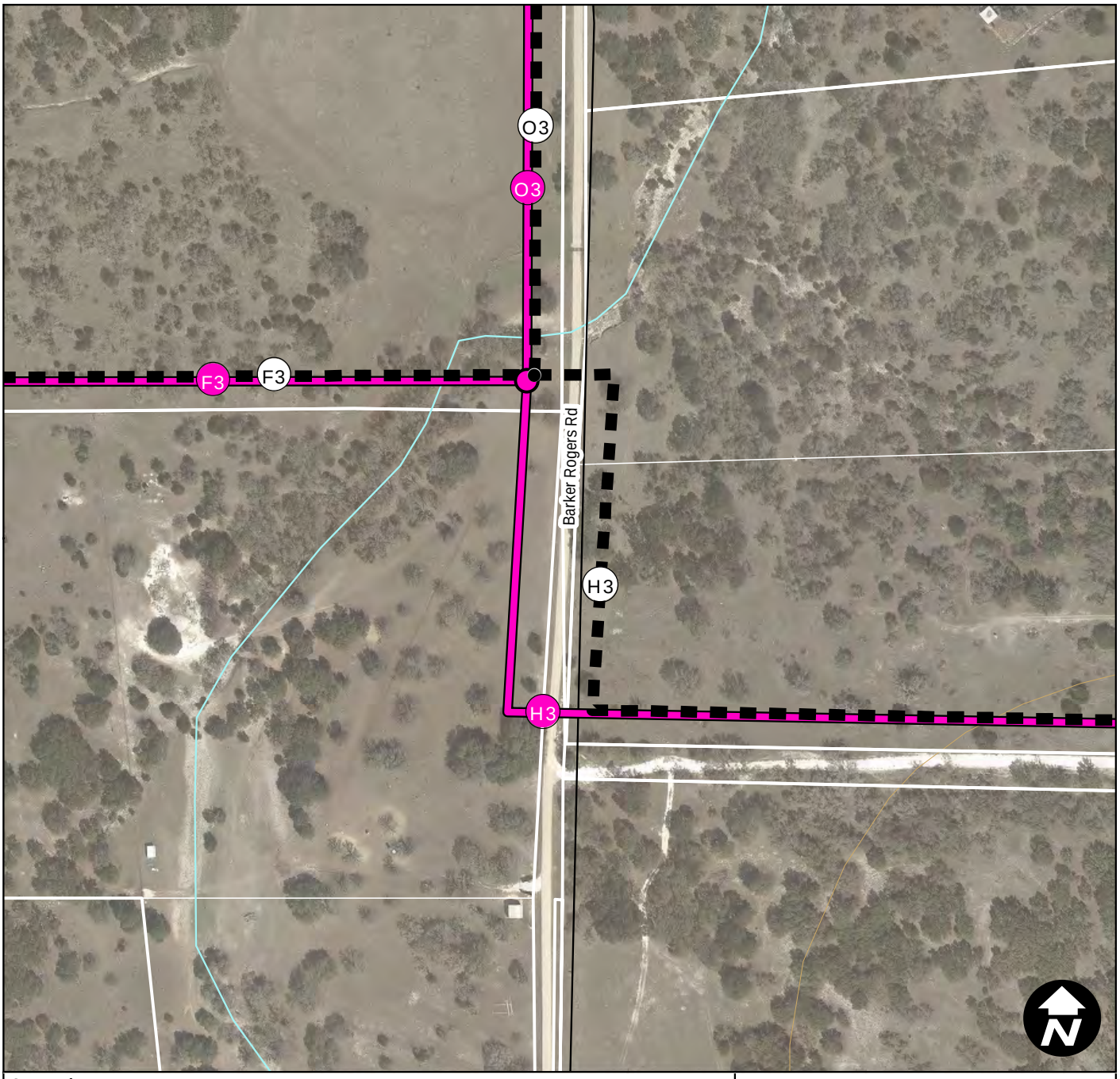

Legend

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- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- Local or Rural Road
- River or Stream
- 50 foot Contour

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-16

Realignment of H3 Following the Open House Meetings

Feet

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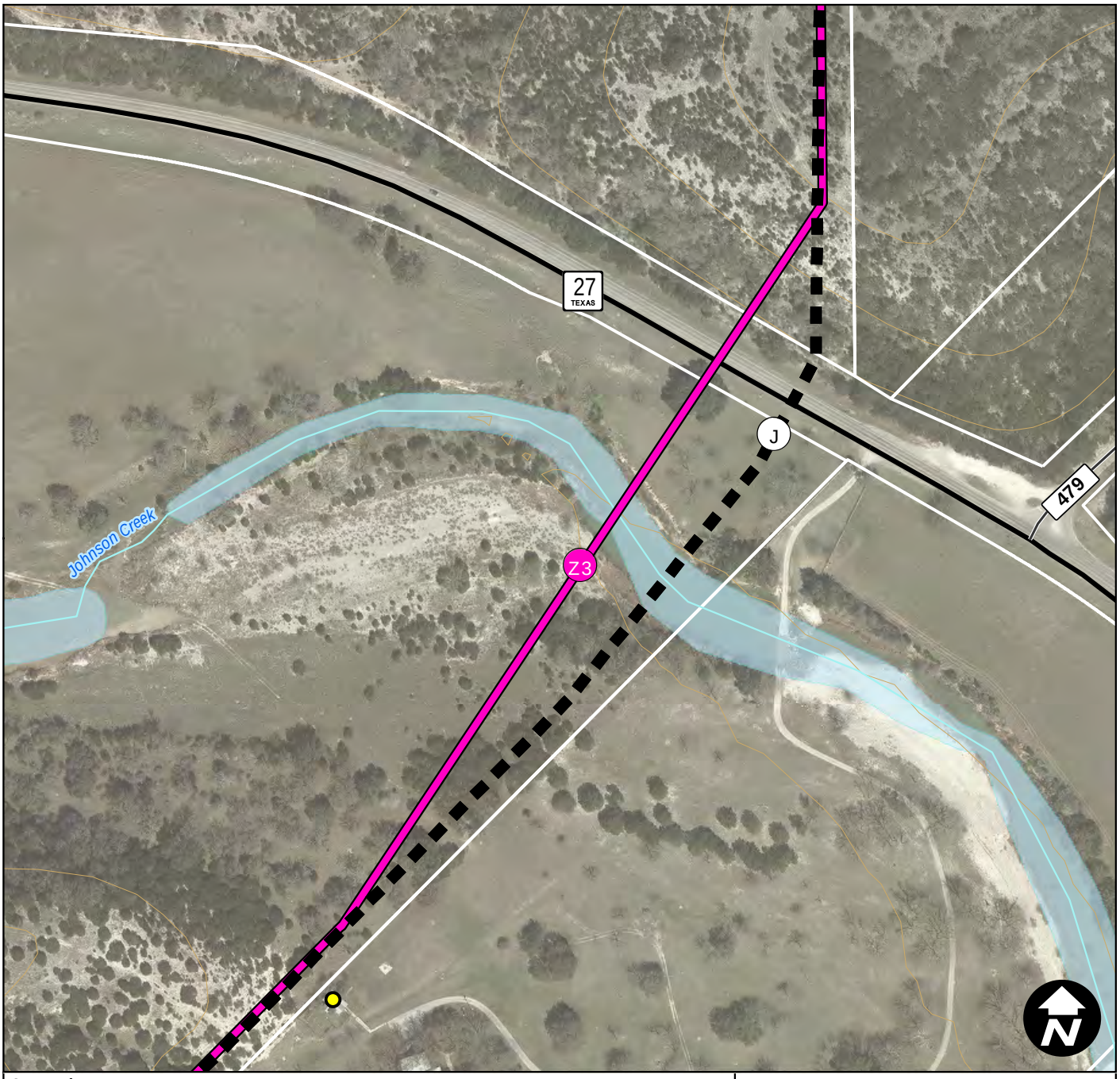

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 27 TEXAS — State or County Highway
- 427 — Farm to Market Road or Ranch Road
- River or Stream
- 50 foot Contour
- Water Body

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-17

Realignment of Z3 Following the Open House Meetings

Feet

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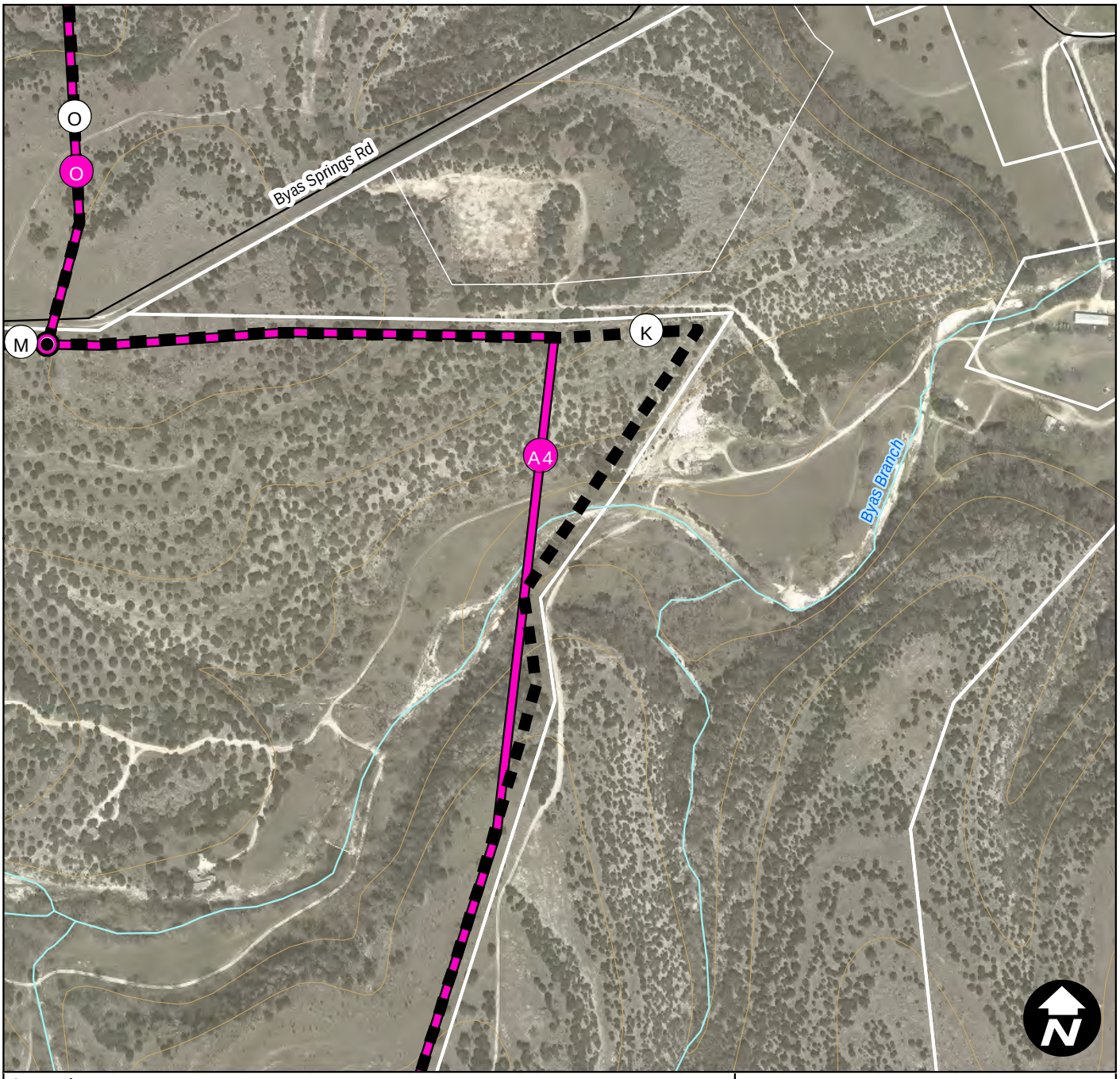

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- Resulting Alternative Route Segment Label
- Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Property Boundary
- Parcel Boundary
- Local or Rural Road
- River or Stream
- 50 foot Contour

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-18

Realignment of A4 Following the Open House Meetings

Feet

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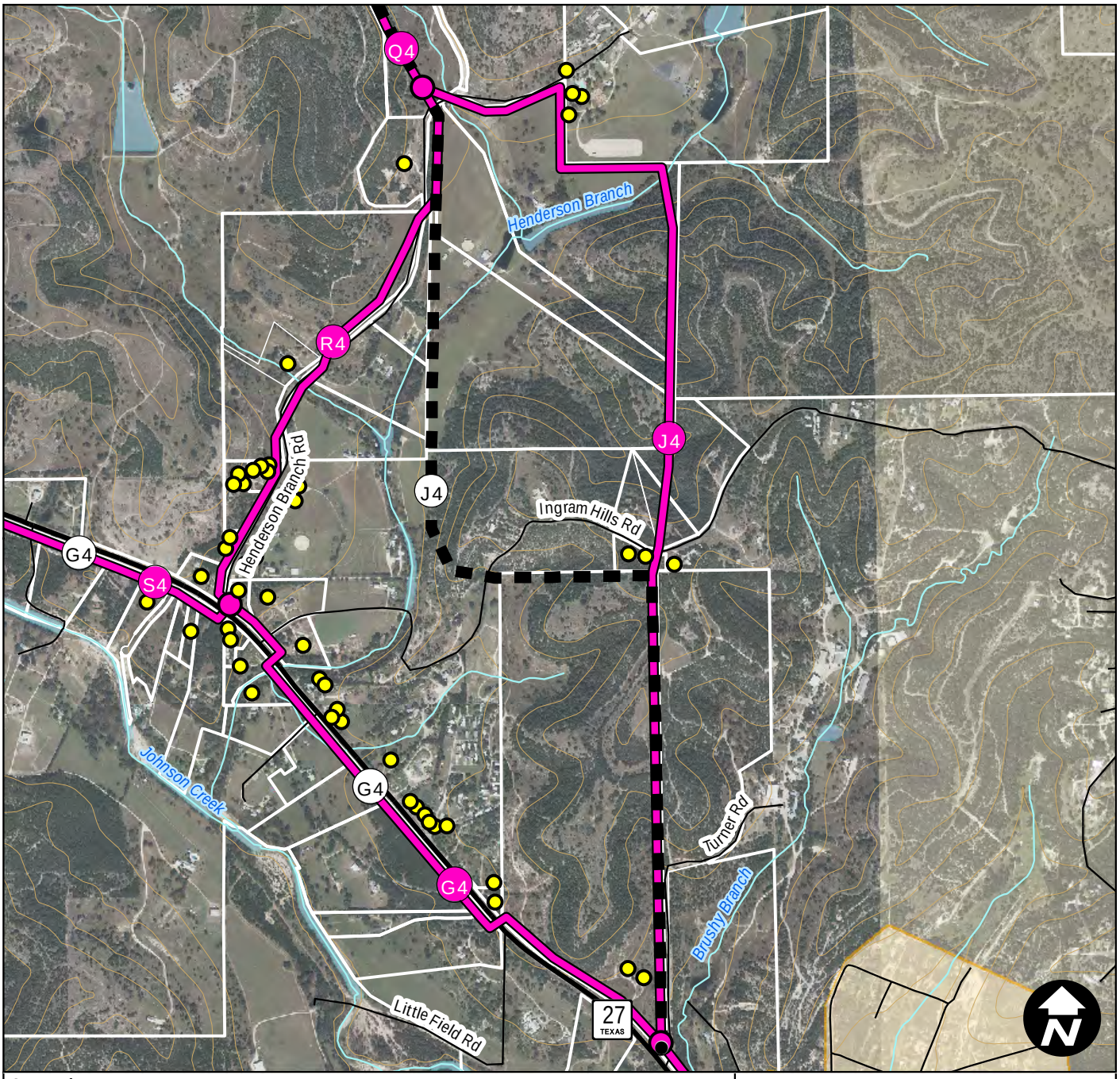

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 27 TEXAS — State or County Highway
- Local or Rural Road
- River or Stream
- City Boundary
- 50 foot Contour
- Water Body

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-19

Realignment of J4 Following the Open House Meetings

LCRA ENERGY • WATER • COMMUNITY SERVICES

POWER ENGINEERS

Feet

0 1,500 3,000

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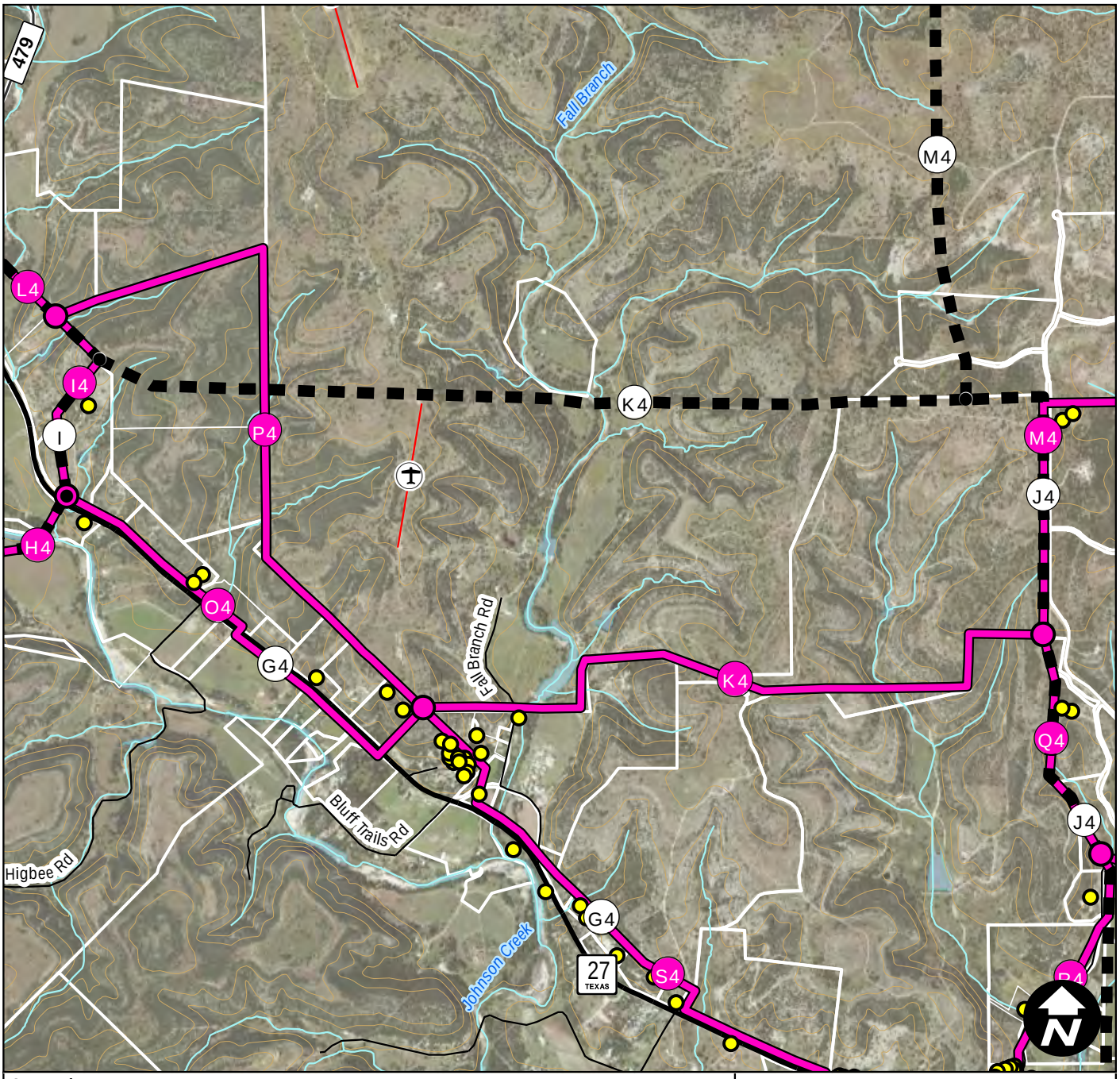

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 27 TEXAS — State or County Highway
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- Private Airstrip
- River or Stream
- 50 foot Contour
- Water Body

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-20

Realignment of K4; Relabel Northern Portion of K4 as P4; Reduction of Q4 and Extension of M4; Relabel Northern Portion of G4 as O4 Following the Open House Meetings

LCRA ENERGY • WATER • COMMUNITY SERVICES

POWER ENGINEERS

Feet

0 2,600 5,200

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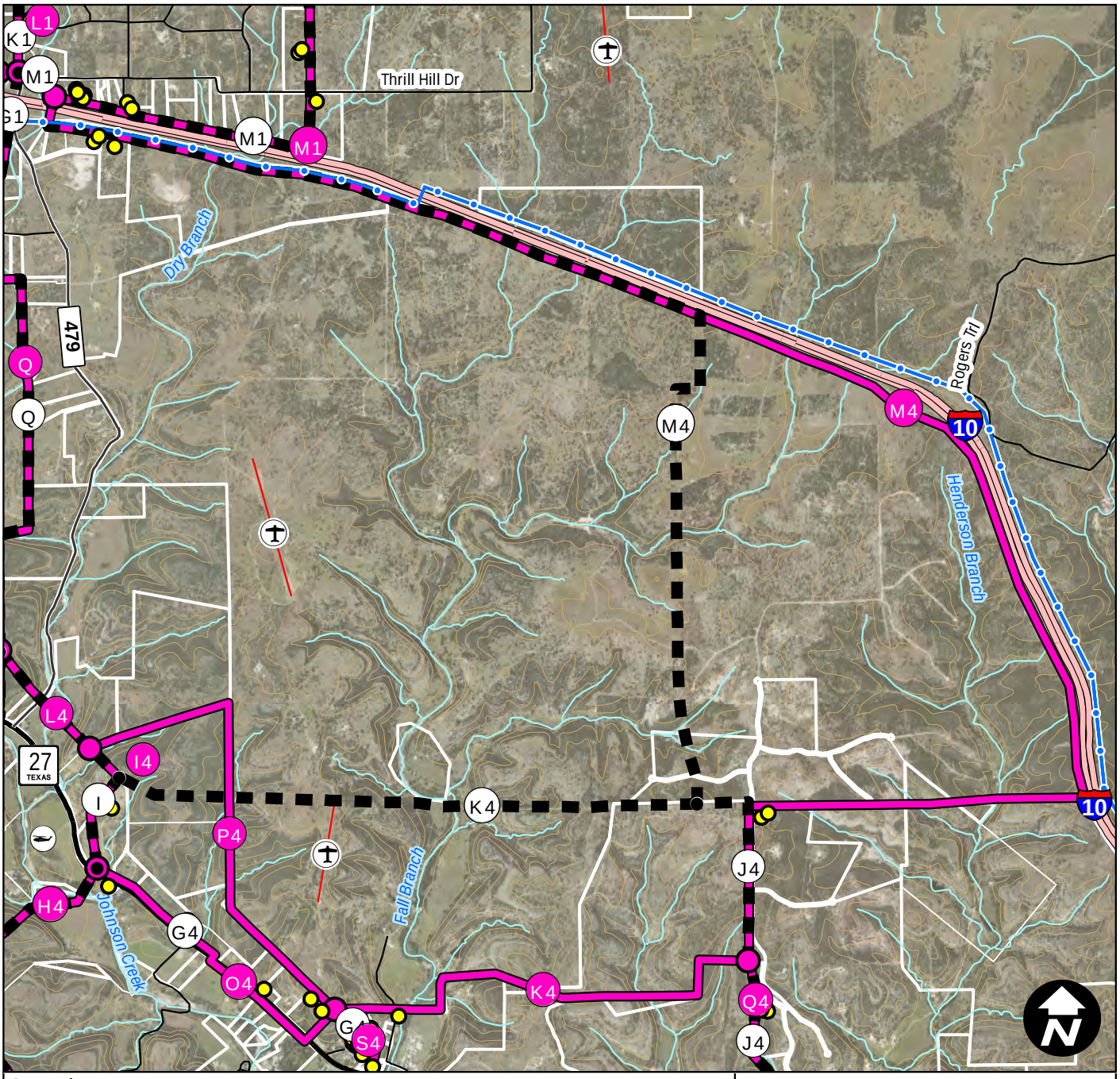

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 345-kV Transmission Line
- 10 — Interstate Highway
- 27 TEXAS — State or County Highway
- 427 — Farm to Market Road or Ranch Road
- Local or Rural Road
- Private Airstrip
- Heliport
- River or Stream
- 50 foot Contour

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-21

Realignment of M4 Following the Open House Meetings

LCRA ENERGY • WATER • COMMUNITY SERVICES

POWER ENGINEERS

Feet

0 4,000 8,000

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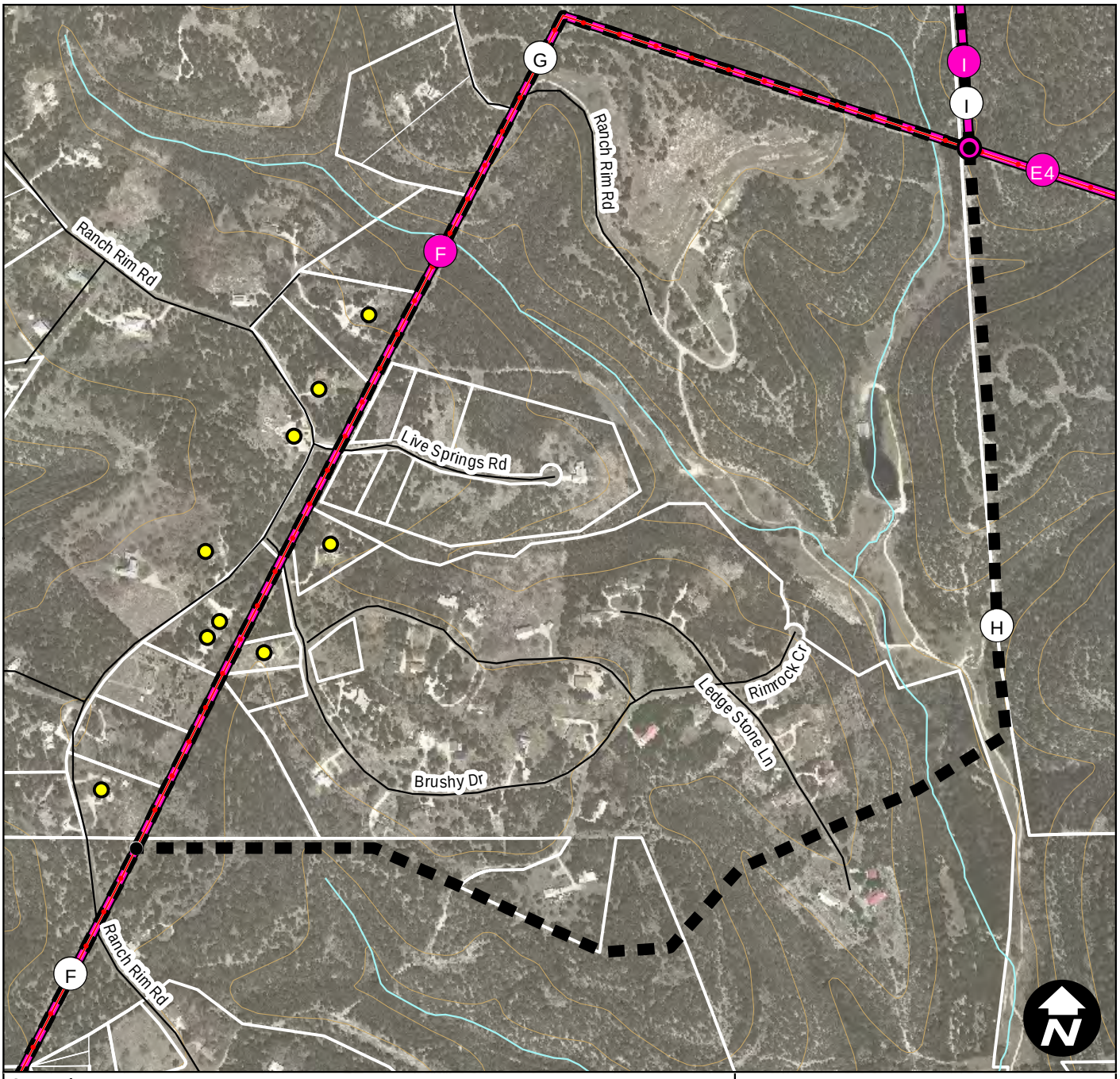

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Habitable Structure within 300 Feet of a Primary Segment
- Property Boundary
- Parcel Boundary
- 138-kV Transmission Line
- Local or Rural Road
- River or Stream
- 50 foot Contour

4/15/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-22

Removal of H Following the Open House Meetings

LCRA ENERGY • WATER • COMMUNITY SERVICES

POWER ENGINEERS

Feet

0 750 1,500

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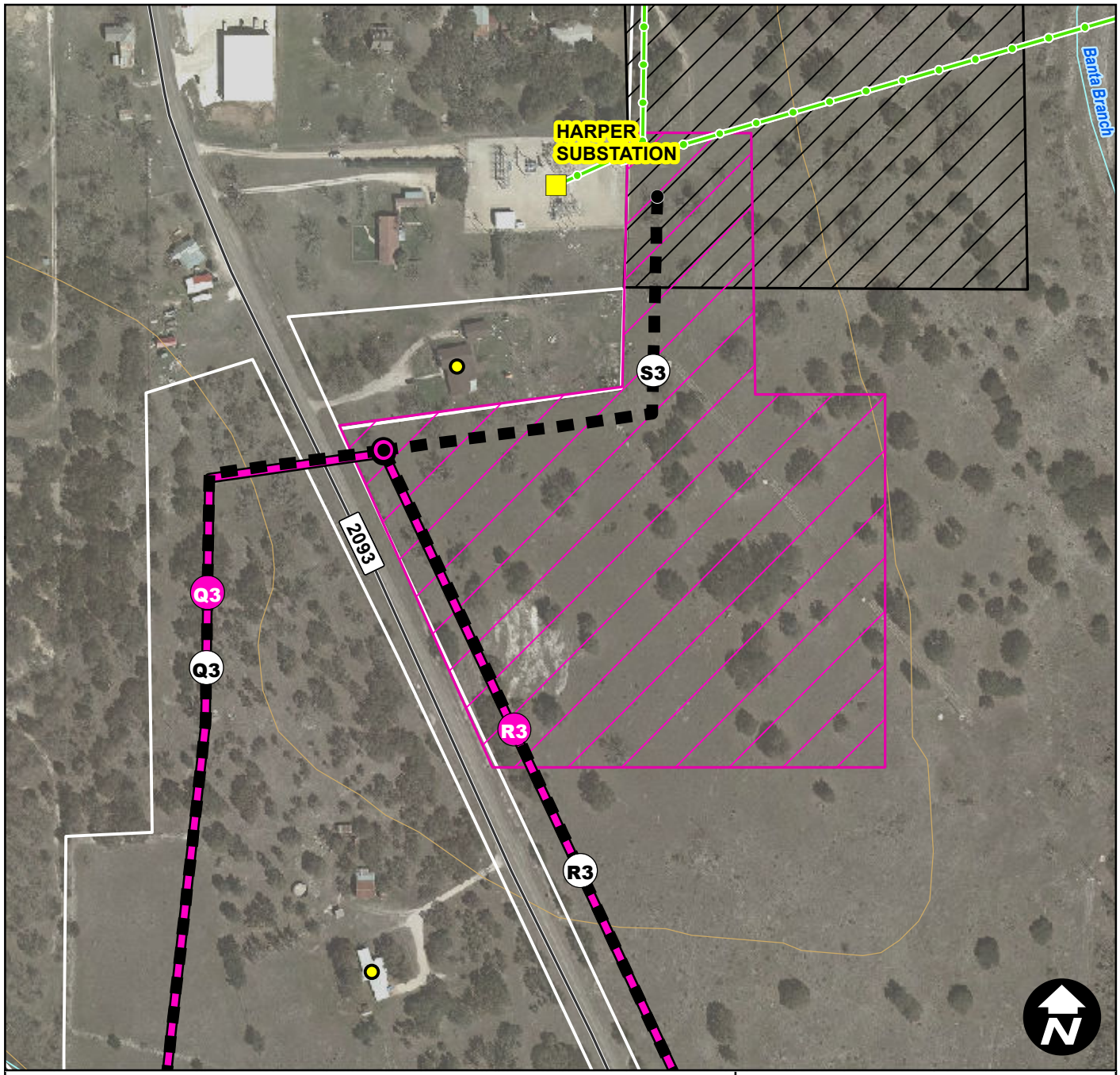

Legend

- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A — Resulting Alternative Route Segment Label
- A — Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Original Harper Substation Expansion Area
- Realignment of the Harper Substation Expansion Area
- Habitable Structure within 300 Feet of a Primary Segment
- Project Endpoint
- Property Boundary
- 69-kV Transmission Line
- 427 — Farm to Market Road or Ranch Road
- River or Stream
- 50 foot Contour

5/24/2019

Mountain Home 138-kV Transmission Line Project

Figure 4-23

Shifting of the Harper Substation and Removal of S3 Following the Open House Meetings

LCRA ENERGY • WATER • COMMUNITY SERVICES

POWER ENGINEERS

Feet

0 250 500

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Insert 11x17 Figure 4-24 Resulting Primary Alternative Routes Following the Open House Meetings

FRONT Page 1

Insert 11x17 Figure 4-24 Resulting Primary Alternative Routes Following the Open House Meetings

BACK Page 1

Following the modifications to the 98 preliminary alternative route segments and identification of the new alternative route segments, 119 primary alternative route segments resulted. Numerous possible alternative routes using these 119 primary alternative route segments exist. POWER and LCRA TSC identified a total of 40 primary alternative routes for comparison that utilize all of the alternative route segments and substation site options and also provide geographic diversity. Additional forward progressing routes could be formed by connecting the segments in different combinations than those presented in Table 4-3 below. Table 4-3 details the route segment composition and overall length of the 40 primary alternative routes identified by LCRA TSC and POWER. See Figures 4-25a and 4-25b in Appendix D for more detail on the location of the resulting routes.

TABLE 4-3 PRIMARY ALTERNATIVE ROUTES

PRIMARY ALTERNATIVE ROUTES	SEGMENT COMBINATION	TOTAL LENGTH IN MILES
Hunt 1	X3-B-F-I-U3-V3-Z3-Q-A1-B1-F1-H1-T4-L1-O1-Sub 1-R1-X1-I2-J2-H2-I3-J3-M3-R3	22.8
Hunt 2	X3-B-F-I-H4-I4-L4-Q-A1-B1-F1-H1-T4-L1-Sub 2-N1-Z1-B2-F2-I3-J3-M3-R3	22.7
Hunt 3	X3-B-C-D-K-Y3-Z3-Q-A1-B1-F1-H1-T4-L1-Sub 2-N1-Z1-A2-D2-G2-H2-I3-J3-M3-R3	24.3
Hunt 4	X3-A-L-B4-N-P-R-S-A1-G1-T4-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	26.3
Hunt 5	X3-B-C-J-V3-Z3-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	21.5
Hunt 6	X3-B-C-J-V3-Z3-Q-A1-G1-T4-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	21.6
Hunt 7	X3-B-F-I-H4-I4-L4-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	22.8
Hunt 8	X3-B-F-I-H4-I4-L4-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-Q3	22.6
Hunt 9	X3-B-F-I-H4-I4-L4-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-Z2-D3-F3-O3-W3-P3-R3	22.9
Hunt 10	X3-B-F-I-H4-I4-L4-Q-A1-G1-T4-Sub 3-N4-M1-Z1-B2-F2-I3-K3-M3-R3	24.2
Hunt 11	X3-B-F-I-H4-I4-L4-Q-A1-G1-T4-Sub 3-L1-O1-R1-X1-I2-J2-H2-I3-K3-M3-R3	24.1
Hunt 12	X3-B-F-I-U3-V3-Z3-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	22.6
Hunt 13	X3-B-F-I-U3-V3-Z3-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-Q3	22.3
Hunt 14	X3-B-F-I-U3-V3-Z3-Q-A1-B1-F1-H1-T4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-Z2-D3-F3-O3-W3-Q3	22.5
Hunt 15	X3-B-C-D-E-L-B4-N-P-R-Z-C1-E1-J1-Sub 4-Q1-U1-M2-V2-X2-Y2-A3-D3-F3-H3-L3-W3-P3-R3	28.0
Hunt 16	X3-B-C-J-V3-Z3-Q-A1-B1-F1-I1-J1-Sub 4-Q1-T1-V1-Y1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	24.4
Hunt 17	X3-B-C-J-V3-Z3-Q-A1-B1-F1-I1-J1-Sub 4-Q1-U1-M2-V2-B3-E3-F3-O3-W3-Q3	24.3
Hunt 18	X3-B-F-I-H4-I4-L4-Q-S-Z-C1-E1-J1-Sub 4-P1-R1-X1-I2-J2-H2-I3-K3-M3-R3	27.1
Hunt 19	X3-B-F-I-H4-I4-L4-Q-S-Z-C1-E1-J1-Sub 4-Q1-U1-W1-K2-L2-J2-H2-I3-K3-M3-R3	27.8
Hunt 20	X3-B-F-I-U3-V3-Z3-Q-S-Z-C1-E1-J1-Sub 4-P1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	25.7
Hunt 21	X3-B-F-I-U3-V3-Z3-Q-S-Z-C1-E1-J1-Sub 4-Q1-U1-M2-V2-B3-E3-F3-O3-W3-P3-R3	26.4
Hunt 22	X3-B-F-I-U3-V3-Z3-Q-A1-B1-F1-I1-J1-Sub 4-Q1-T1-V1-T3-K2-N2-P2-W2-Y2-C3-E3-F3-H3-L3-W3-Q3	25.4
Hunt 23	X3-B-C-D-K-A4-O-R-Z-C1-E1-J1-Sub 4-Q1-U1-W1-T3-Y1-C2-D2-E2-F2-I3-J3-M3-R3	25.7
Hunt 24	X3-B-C-D-K-A4-M-N-T-D4-V-W-X*-Sub 5-Y-C1-D1-F1-H1-T4-L1-O1-R1-X1-I2-Q2-U2-Z2-D3-F3-O3-W3-Q3	26.9
Hunt 25	X3-B-C-D-K-A4-M-N-T-D4-V-W-X*-Sub 5-Y-C1-E1-J1-Q1-U1-M2-O2-P2-R2-U2-Z2-D3-F3-O3-W3-Q3	27.3
Hunt 26	X3-A-L-C4-D4-V-W-X*-Sub 5-Y-C1-E1-J1-Q1-U1-M2-V2-B3-E3-F3-O3-W3-Q3	27.9
Hunt 27	X3-B-C-D-E-L-B4-N-T-D4-V-Sub 6-W-Y-C1-E1-J1-Q1-T1-S1-X1-C2-D2-E2-F2-I3-K3-M3-R3	29.8

TABLE 4-3 PRIMARY ALTERNATIVE ROUTES

PRIMARY ALTERNATIVE ROUTES	SEGMENT COMBINATION	TOTAL LENGTH IN MILES
Hunt 28	X3-B-C-D-K-A4-M-N-T-D4-U-Sub 6-W-Y-C1-D1-F1-H1-T4-L1-O1-R1-X1-I2-Q2-U2-Z2-D3-F3-O3-W3-P3-R3	27.6
Hunt 29	X3-B-C-D-K-A4-M-N-T-D4-V-Sub 6-W-Y-C1-E1-I1-H1-T4-L1-N1-Z1-B2-F2-I3-J3-M3-R3	26.8
Hunt 30	X3-B-C-D-E-L-C4-D4-V-Sub 6-W-Y-C1-E1-J1-Q1-U1-M2-V2-X2-C3-E3-F3-H3-L3-W3-Q3	28.5
Ingram 1	F4-G4-R4-Q4-M4-N4-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	25.5
Ingram 2	F4-G4-S4-O4-I4-L4-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	23.2
Ingram 3	F4-G4-S4-P4-L4-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	23.4
Ingram 4	F4-J4-Q4-K4-P4-L4-Q-A1-B1-F1-H1-Sub 3-L1-N1-Z1-A2-D2-G2-S2-G3-L3-W3-P3-R3	25.4
Ingram 5	F4-J4-Q4-K4-P4-L4-Q-A1-B1-F1-H1-Sub 3-L1-N1-Z1-B2-F2-I3-J3-M3-R3	25.2
Ingram 6	F4-J4-Q4-K4-P4-L4-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-Q3	25.0
Ingram 7	F4-J4-Q4-M4-N4-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-P3-R3	25.4
Ingram 8	E4-I-H4-I4-L4-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-Q2-U2-T2-G3-L3-W3-P3-R3	25.5
Ingram 9	E4-I-U3-V3-Z3-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-J2-S2-G3-L3-W3-P3-R3	25.2
Ingram 10	E4-I-U3-V3-Z3-Q-A1-B1-F1-H1-Sub 3-L1-O1-R1-X1-I2-Q2-U2-Z2-D3-F3-O3-W3-Q3	25.2

*This segment will be used entering and exiting the substation site.

4.5 Primary Alternative Route Evaluation

POWER conducted a thorough evaluation of the 40 primary alternative routes, which is further discussed in Section 5.0. The evaluation of the routes involved quantifying 44 land use and environmental criteria. These criteria are presented in Table 4-4.

TABLE 4-4 LAND USE AND ENVIRONMENTAL CRITERIA FOR ALTERNATIVE ROUTE EVALUATION OF THE MOUNTAIN HOME PROJECT

	LAND USE
1.	Length of primary alternative route (miles)
2.	Number of habitable structures[1] within 300 feet of ROW centerline
3.	Number of habitable structures[1] currently located within 300 feet of an existing transmission line ROW centerline
4.	Length of ROW using existing transmission line ROW
5.	Length of ROW parallel and adjacent to existing transmission line ROW
6.	Length of ROW parallel and adjacent to other existing ROW (roadways)
7.	Length of ROW parallel and adjacent to apparent property lines[2]
8.	Sum of evaluation criteria 4, 5, 6, and 7
9.	Percent of evaluation criteria 4, 5, 6, and 7
10.	Length of ROW across parks/recreational areas[3]
11.	Number of additional parks/recreational areas[3] within 1,000 feet of ROW centerline
12.	Length of ROW across cropland
13.	Length of ROW across pasture/rangeland
14.	Length of ROW across land irrigated by traveling systems (rolling or pivot type)
15.	Length of ROW parallel and adjacent to pipelines[4]
16.	Number of pipeline crossings[4]
17.	Number of transmission line crossings

TABLE 4-4 LAND USE AND ENVIRONMENTAL CRITERIA FOR ALTERNATIVE ROUTE EVALUATION OF THE MOUNTAIN HOME PROJECT

	LAND USE
18.	Number of IH, US and state highway crossings
19.	Number of FM road crossings
20.	Number of cemeteries within 1,000 feet of the ROW centerline
21.	Number of FAA registered public/military airports[5] with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline
22.	Number of FAA registered public/military airports[5] having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline
23.	Number of private airstrips within 10,000 feet of the ROW centerline
24.	Number of heliports within 5,000 feet of the ROW centerline
25.	Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline
26.	Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline
	AESTHETICS
27.	Estimated length of ROW within foreground visual zone[6] of IH, US and state highways
28.	Estimated length of ROW within foreground visual zone[6] of FM roads
29.	Estimated length of ROW within foreground visual zone[6][7] of parks/recreational areas[3]
	ECOLOGY
30.	Length of ROW through upland woodlands/brushland
31.	Length of ROW through bottomland/riparian woodlands
32.	Length of ROW across NWI mapped wetlands
33.	Length of ROW across known habitat of federally listed endangered or threatened species
34.	Area of ROW across Golden-cheeked Warbler modeled habitat where three models agree (acres)
35.	Length of ROW across open water (lakes, ponds)
36.	Number of stream crossings
37.	Number of river crossings
38.	Length of ROW parallel (within 100 feet) to streams or rivers
39.	Length of ROW across 100-year floodplain
	CULTURAL RESOURCES
40.	Number of recorded historic or prehistoric sites crossed by ROW
41.	Number of additional recorded historic or prehistoric sites within 1,000 feet of ROW centerline
42.	Number of NRHP-listed or determined eligible sites crossed by ROW
43.	Number of additional NRHP-listed or determined eligible sites within 1,000 feet of ROW centerline
44.	Length of ROW through areas of high archeological/historic site potential

NOTES: [1] 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 of a transmission project of 230-kV or less.

[2]Apparent property boundaries created by existing roads, highways, or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria.

[3]Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the Proposed Project.

[4]Only metallic pipelines six inches and greater in diameter carrying hydrocarbons were quantified in the pipeline crossing and paralleling calculations.

[5]As listed in the Chart Supplement South Central United States (FAA 2018b formerly known as the Airport/Facility Directory South Central United States) and FAA 2018a.

[6]One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, United States and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria.

[7]One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, United States and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

The analysis of each route involved tabulation of the number, area, or length of each land use or environmental criterion traversed by or located along each of the routes (e.g., number of habitable structures within 300 feet, area of ROW across Golden-cheeked Warbler modeled habitat, or length of woodlands crossed). The number, area or length of each criterion traversed by or along each of the routes was determined using GIS and reviewing the data collected by the POWER Team that is represented on the constraints maps (Figures 4-25a and 4-25b, Appendix D and Figures 5-1a and 5-1b, Appendix E). Section 5.0 presents a comparative discussion of the potential land use and environmental impacts of each route.

5.0 ENVIRONMENTAL IMPACT OF THE PRIMARY ALTERNATIVE ROUTES

The evaluation and comparison of potential impacts for each primary alternative route (route or Route) is based upon consideration of the requirements of Section 37.056(c)(4)(A)-(D) of the Texas Utilities Code, PUC Substantive Rule § 25.101, including the PUC's policy of prudent avoidance, the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects, as well as public comments from and following the open house meetings, field reconnaissance, and the information and responses received from local officials and state/federal regulatory agencies.[1] Measurements for the majority of the environmental criteria were obtained from aerial photography flown in March 2018 and November 2018 and from available digital resource layers using GIS and other programs.

POWER professionals with expertise in different environmental disciplines (geology/soils, hydrology, terrestrial ecology, wetland ecology, land use/aesthetics, socioeconomics, cultural resources [archeological and historical]) and GIS evaluated the routes based upon the features and attributes of each route (as could be discerned by research, field reconnaissance, and aerial photo interpretation) and the general routing criteria developed by LCRA TSC and POWER. Each POWER expert independently analyzed the routes and the data presented in Table 5-1 (Primary Alternative Routes Data) and Table 5-2 (Primary Alternative Route Segments Data) for their technical discipline. A summary of potential impacts to natural, human, and cultural resources is provided in the following sections.

5.1 Natural Resources

5.1.1 Geological Resources

Construction of the proposed transmission line is not anticipated to have any significant adverse effects on the physiographic or geologic features/resources of the area. Erection of the transmission structures will require the excavation and/or minor disturbance of small quantities of near-surface materials but should have no measurable impacts on the geologic resources or features along any of the primary alternative routes.

Although karst features and cave formations may occur within this geologic region, no geologic hazards are anticipated to be created. Any route for the Proposed Project will have some baseline probability of

[1] LCRA TSC will fully evaluate and address the potential impacts of the substations proposed in association with the Proposed Project in the same manner described in this EA with respect to the primary alternative routes.

encountering sensitive karst features. Some of these features are (or will be with further site-specific survey work) detectable from the surface while others may be discovered only during excavation activities. Any alternatives selected should have site-specific karst surveys conducted in order to better understand the potential for impacts to karst features.

5.1.2 Soils

Activities associated with the construction, operation, and maintenance of electrical transmission lines typically do not adversely impact soils when appropriate mitigative measures are implemented during the construction phase. Potential impacts to soils include erosion, compaction, and conversion of prime farmland soils.

The highest risk for soil erosion and compaction is primarily associated with the construction phase of a project. Prior to construction, LCRA TSC will develop a SWPPP to minimize potential impacts associated with soil erosion and off ROW sedimentation. Implementation of this plan will incorporate Best Management Practices (BMPs), including erosion control devices to minimize soil erosion on the ROW during significant rainfall events. The SWPPP will also establish criteria for re-vegetation to ensure adequate soil stabilization during the construction and post construction phases. The native herbaceous layer of vegetation will be maintained, to the extent practical, during construction and most denuded areas with a low erosion potential would be allowed to re-vegetate with native herbaceous species. Areas with a higher erosion potential, including steep slopes and areas with shallow topsoil, may require seeding and/or matting to stabilize disturbed areas and minimize soil erosion potential during the post construction phase. The ROW will be inspected during and after construction to ensure that potential high erosion areas are identified and appropriate BMPs are implemented and maintained.

The study area supports areas of cropland and pastureland, and some of these soils are designated by the USDA as “Prime Farmlands.” As discussed in Section 2.0 the NRCS does not typically consider the construction of a transmission line to be a significant conversion of these soils. Agricultural activities are typically still practiced around the base of the transmission structures after construction is completed. No significant conversions of prime farmland or state important soils are anticipated related to project activities for any of the primary alternative routes.

Insert Table 5-1 Route Data 11x17 Front Page 1

Insert Table 5-1 Route Data 11x17 Back Page 1

Insert Table 5-1 Route Data 11x17 Front Page 2

Insert Table 5-1 Route Data 11x17 Back Page 2

Insert Table 5-2 Segment Data 11x17 Front Page 1

Insert Table 5-2 Segment Data 11x17 Back Page 1

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5.1.3 Mineral and Energy Resources

Activities associated with the construction, operation, and maintenance of electrical transmission lines typically do not adversely impact mineral and energy resources when appropriate measures are implemented during the routing and construction phases. There were no active oil or gas wells identified within the study area. Two metallic oil or gas pipelines were identified within the study area and were taken into consideration during the routing process. The route of a Kinder Morgan natural gas pipeline that is currently proposed to traverse the study area was also identified and taken into consideration during the routing process. The three gravel/rock quarries identified within the study area were avoided. Although unidentified gravel/caliche pits and quarries may occur within the study area, no significant adverse impacts are anticipated to gravel/caliche pits and quarries.

5.1.4 Water Resources

Throughout the routing process, consideration was given toward minimizing potential impacts to surface waters and associated NWI mapped wetlands. For example, POWER attempted to minimize length of ROW parallel to streams. TPWD recommended crossing streams at right angles at their narrowest sections to avoid potential impacts. Crossings of these areas were minimized by maintaining a perpendicular angle at each crossing where practical. Additional TPWD guidelines for construction and clearing within riparian areas were reviewed by POWER and are provided in Appendix A.

5.1.4.1 Surface Water

Surface waters include ephemeral, intermittent or perennial streams, rivers, lakes and ponds. These surface waters include the Pedernales River, Johnston Creek, the North Fork Guadalupe River, Honey Creek, Spring Creek, Byas Branch, Contrary Creek, Fessenden Branch, Klein Branch, Henderson Branch, West Dry Branch, Dry Branch, Fall Branch, Rogers Draw, Banta Branch, and Cedar Lake. Several additional unnamed streams, ponds, stock tanks, and one Soil Conservation Service reservoir, Shelton Ranches Reservoir Number 2, were also identified within the study area. The proposed transmission line will span any water bodies, and structure foundations will be located outside of the ordinary high-water mark. No construction activities are anticipated that would significantly impede water flow within any watersheds. Vegetation at surface water crossings would be removed using methods that minimize damage to natural vegetation conditions in accordance with USACE requirements. Erosion control devices will be implemented in accordance with the SWPPP to reduce potential sedimentation outside of the ROW. Proper inspection and maintenance of these erosion control devices will minimize the potential for erosion of exposed soils on the ROW and deposition of sediments into surface waters.

The Pedernales River, North Fork Guadalupe River, and Johnson Creek are all TPWD-designated ESSS. All 40 alternative routes cross the Pedernales River, and Hunt Routes 15, 17, 21, 22, 26, and 30 cross the Pedernales River twice. No alternative routes cross the North Fork Guadalupe River. Ingram Routes 1 through 7 do not cross Johnson Creek, although all other routes do.

All alternative routes intersect multiple streams somewhere along their length. These streams are calculated from the NHD database; however, since the initial publication of the NHD database, the hydrology of some streams may have been altered or affected by construction of drainage ditches/canals, levees, impoundments, residential areas, etc. The number of stream crossings ranges from a low of 21 for Hunt Route 15, to a high of 36 for Hunt Route 37. All 40 routes parallel (within 100 feet) streams for some distance. The length of ROW parallel to streams ranges from approximately 0.15 mile for Hunt Route 14 and Ingram Route 10, to approximately 1.08 miles for Hunt Route 4.

Thirty of the 40 alternative routes have some length of ROW across open water (lakes, ponds). The length of ROW across open water (lakes, ponds) ranges from none for Hunt Routes 24, 25, 26, 27, 29, and 30, and Ingram Routes 1, 2, 3, and 7, to approximately 0.04 mile for Hunt Route 23.

As discussed in Section 2.6.3, NWI maps are based on topography and interpretation of infrared satellite data and color aerial photographs. As such, NWI data is useful for planning and comparative analysis purposes but should not be relied upon for determining USACE jurisdiction. NWI wetland types identified within the study area include palustrine forested and palustrine shrub/scrub that are associated with streams, creeks, rivers, and ponds. Nine of the 40 Routes ROW cross mapped NWI wetlands. The length of ROW across mapped NWI wetlands is 0.01 mile for Ingram Routes 4, 5, and 6, and 0.06 mile for Hunt Routes 24, 25, 26, 27, 29, and 30.

5.1.4.2 Ground Water

The study area lies outside of the Edwards Aquifer recharge, artesian, and contributing zones. No measurable decrease of aquifer recharge capacity should occur, and groundwater contamination is not anticipated with the implementation of a SWPPP and appropriate BMPs. During construction activities, another potential impact for both surface water and groundwater resources is related to potential fuel and/or other chemical spills. As a component of the SWPPP, standard operating procedures and response specifications relating to petroleum product storage, refueling, and maintenance activities of equipment are provided to avoid and minimize potential contamination to groundwater and surface water resources.

Natural springs were identified within the study area using available data sources and landowner input during the public open house meetings and taken into consideration during the routing process. No known natural springs are crossed by any of the alternative routes. Spanning springs that may be identified along the PUC-approved route and implementing the SWPPP will avoid and minimize adverse impacts to springs. The SWPPP and appropriate BMPs will ensure that construction, operation and maintenance of the proposed transmission line do not adversely affect groundwater resources within the study area.

5.1.4.3 Floodplains

Based on available FEMA data, designated 100-year floodplains are associated with low-lying creek bottoms, and associated depressional areas within the study area. Transmission structures may be located within these floodplains; however, engineering considerations and proper structure placement should alleviate the potential for adverse impacts of floodwater flow by minimizing impedance. Construction of the Proposed Project should not have any significant impacts on the overall function of the floodplain, nor adversely affect adjacent or downstream properties. If transmission structures are to be located within the floodplain, LCRA TSC will coordinate with the appropriate county floodplain administrators. The length of ROW across the 100-year floodplain was tabulated and ranges from 0.54 mile for Ingram Route 1 to 1.88 miles for Hunt Route 18.

5.1.5 Ecosystems

5.1.5.1 Vegetation

The study area is primarily comprised of upland woodland/brushland vegetation and pasture/rangeland. Bottomland/riparian woodlands are typically limited to narrow corridors near streams. Some croplands exist on the southwest portions of the study area, near Johnson Creek. Potential impacts to vegetation would result from clearing the new ROW of woody vegetation and/or clearing herbaceous vegetation. These activities facilitate access for structure construction, line stringing and maintenance activities. Vegetation removal will be performed in accordance with natural and cultural resource regulations, using methods that will minimize damage to natural landscape conditions, while ensuring that the transmission line can be constructed, operated, and maintained safely and in accordance with agency regulations governing utility construction. Prior to construction, removal of woody vegetation within the new or expanded ROW would be required within upland woodland/brushland, bottomland/riparian forest, and woody wetland areas. Mowing and/or shredding of herbaceous vegetation may be required within pasture/rangeland. Future ROW maintenance activities may include periodic mowing and/or herbicide applications to maintain the herbaceous vegetation layer within the ROW.

Clearing trees and shrubs from woodland areas would generate a degree of habitat fragmentation. The degree of new habitat fragmentation is typically reduced when a route uses an existing transmission line ROW or parallels an existing linear feature such as a pipeline, transmission line, roadway, or fence line/property line. During the route development process, consideration was provided to avoid extensive woodland and riparian areas and to maximize the length of the routes using existing transmission line ROW or parallel and adjacent to existing linear corridors.

A summary of the TPWD recommendations (Appendix A) includes maximizing the use of existing electrical transmission facilities and, where new ROW construction is required, paralleling existing linear corridors as much as practicable to minimize potential impacts to undisturbed habitats. Recommendations also included minimizing the clearing of sensitive vegetation types, including native grasslands, forest and woodland community areas, and riparian vegetation. The TPWD also recommends implementing practices to prevent establishment of invasive plant species and sustain native species; however, the native vegetation within these areas has likely been previously modified. These recommendations were considered and implemented where practical during the routing process.

All of the primary alternative routes parallel existing linear corridors for some portion of their lengths (including property boundaries) that may minimize potential impacts to vegetation and minimize habitat fragmentation (Table 5-1). This is discussed further in Sections 5.2.3.2 through 5.2.3.5.

The length of ROW across upland woodland/brushland vegetation ranges from 14.89 miles for Hunt Route 2 to 19.75 miles for Hunt Route 19. The length of ROW across bottomland/riparian woodlands ranges from 0.45 mile for Ingram Route 1 to 1.24 miles for Hunt Route 19.

Temporary impacts to row crop species would be greatest during the growing season and these could be minimized with the seasonal timing of construction activities. Permanent impacts (loss of production areas) would be limited to the footprint of the transmission structures since these areas are inaccessible with large farming or cultivating equipment. Minimal impacts to crop species will occur during the construction phase of the Proposed Project since most of the alternative routes do not cross cropland.

Ingram Routes 2 and 3 are the only alternative routes intersecting cropland that is currently under cultivation (0.15 mile). All other 38 routes do not cross currently cultivated cropland. Route lengths proposed within pasture/rangeland areas vary from approximately 6.59 miles for Hunt Route 13 to

approximately 18.45 miles for Hunt Route 15. None of the primary alternative routes cross land with known mobile irrigation systems.

Impacts to vegetation would be limited to areas necessary for the construction, operation, and maintenance of the proposed transmission line. ROW clearing activities would be completed with minimal vegetation impacts and existing groundcover would be maintained when practical. LCRA TSC's vegetation management activities are described in Section 1.0 of this document.

5.1.5.2 Wildlife

The primary impact of construction activities on terrestrial wildlife species would be from temporary disturbances associated with construction activities and removal of vegetation (habitat modification/ fragmentation). Increased noise and equipment movement during construction may temporarily displace mobile wildlife species from the immediate workspace area. These impacts would be short-term and normal wildlife movements would be expected to resume after construction is completed. Potential long-term impacts include those resulting from forested habitat alterations and/or fragmentation. Most of the vegetation types encountered along the primary alternative routes are associated with upland woodland/brushland, bottomland/riparian woodland/brushland, or pasture/rangeland. Generally, native habitats in the study area have previously been modified to a high degree to support various land uses and developments. Most of the remnant native habitat remains in isolated patches, parks, preserves, and/or is associated with stream corridors. These remnant habitats often serve as shelter and/or movement corridors for many species. By using existing ROWs or paralleling existing linear features such as transmission lines, roadways, or property lines, the degree of impact to wildlife and habitat fragmentation is typically reduced.

Construction activities may also impact small, immobile, or fossorial (living underground) animal species through accidental impacts or the alteration of local habitats. Impacts to these species may occur due to equipment or vehicular movement on the ROW, by either direct impact or from compaction of the soil if the species is fossorial. Potential impacts of this type are not considered significant in the study area and are not likely to have an adverse effect on any species' population dynamics.

If ROW clearing occurs during the nesting season, potential impacts could occur within the ROW area related to potential take of migratory bird eggs and/or nestlings. Increases in noise and activity levels during construction could also potentially disturb breeding or other activities of species nesting in areas immediately adjacent to the ROW. The TPWD recommends using practices to avoid harassment and

harm to migratory birds, for vegetation removal, and that ground-disturbing activities be done outside the nesting season (Appendix A).

Measures can be implemented to minimize the risk for electrocution and/or collisions of birds with structure design and additional mitigative measures. The danger of electrocution to birds should be insignificant since the distance between conductors, from conductor to structure, and from conductor to ground wire for the proposed 138-kV transmission line is greater than the wingspan of any bird in the area. The transmission structures and wires of the line could be a collision hazard to birds in flight. The study area is located within the Central Flyway for Neotropical migratory birds. Normally these migratory birds fly at altitudes exceeding the tower structure heights and would be at risk only during periods of migratory fallout (inclement weather and/or high opposing direction winds forcing them to lower altitudes, including ground level).

The most likely potential permanent impact to wildlife would result from the clearing of upland and bottomland (including wetlands) woodland habitats. Since a large percentage of the native vegetation has previously been converted to pastureland/rangeland, residential, and commercial uses, the remnant woodland vegetation often serves as a habitat and/or a movement corridor for many species. By utilizing existing ROWs and/or paralleling existing linear features to the greatest reasonable extent, the potential impact to wildlife and habitat fragmentation are minimized.

Potential impacts to aquatic ecosystems would include effects resulting from erosion, siltation, and sedimentation. Vegetation clearing of the ROW may result in increased suspended solids entering surface waters traversed by the transmission line. Increases in suspended solids may adversely affect aquatic organisms that require relatively clear water for foraging and/or reproduction. Implementation of the SWPPP and installation of erosion control devices would minimize these potential impacts as previously discussed in Section 5.1.3.1.

Physical aquatic habitat loss or alteration could result wherever riparian vegetation is removed and at temporary crossings for access roads. Increased levels of siltation or sedimentation may also potentially impact downstream areas primarily affecting filter feeding benthic and other aquatic invertebrates. No significant adverse impacts are anticipated to any aquatic habitats crossed or adjacent to the ROW for any of the alternative routes. LCRA TSC’s procedures to minimize sediment runoff are presented in Section 1.0 of this document.

Construction of the Proposed Project is not expected to have significant impacts on commercially or recreationally important wildlife species occurring within the study area. Wildlife may temporarily be displaced from areas of activity during the construction phase but should return to normal movement patterns during the operation phase.

5.1.5.3 Threatened and Endangered Species

In order to determine potential impacts to threatened or endangered species, a review using available information was completed. Known occupied habitat data for listed species were obtained from the TXNDD (2018) and a study to determine high probability Golden-cheeked Warbler breeding habitat was provided by Blanton & Associates, Inc. (2018). Current county listings for federal- and state-listed threatened and endangered species and USFWS-designated critical habitat locations were included in the review. A large portion of the natural vegetation within the study area has previously been converted to pasture/rangeland or residential.

LCRA TSC contracted with Blanton & Associates to conduct a habitat study utilizing three existing habitat models for the federally-listed endangered Golden-cheeked Warbler. Blanton & Associates (2018) identified areas with the highest probability of Golden-cheeked Warbler breeding habitat. Modeled habitat area was tabulated where all three models overlapped and is crossed by the proposed ROW. This modeled habitat indicates only the probability of suitable Golden-cheeked Warbler habitat and does not indicate the presence of Golden-cheeked Warblers. Data retrieved from this habitat study were taken into consideration while developing potential route segments.

The approximate area of proposed ROW across Golden-cheeked Warbler modeled habitat (where all three models overlap) was tabulated. All 40 alternative routes traverse high-probability Golden-cheeked Warbler breeding habitat for a portion of the route length. The area of ROW crossing Golden-cheeked Warbler modeled habitat ranges from 48.4 acres for Hunt Route 3 to 104.4 acres for Hunt Route 4. Impacts to potential Golden-cheeked Warbler habitat may be unavoidable but can be minimized depending on the alternative route selected. Additional consultation with USFWS may be required if suitable habitat is observed during the field survey of a PUC-approved route.

Length of ROW across known habitat of federally-listed endangered or threatened species was tabulated using TXNDD's (2018) buffered EO records. Review of TXNDD (2018) data indicates that none of the 40 alternative routes cross a buffered element of occurrence record or known habitat of federally-listed endangered or threatened species.

Other avian species such as the Bald Eagle, Whooping Crane, Piping Plover, Interior Least Tern, Red Knot, and Peregrine Falcon (two spp.) are not expected to occur except as possible migrants that pass through the study area and potentially occupy habitats temporarily or seasonally. The Zone-tailed Hawk may occur within the study area as a rare winter or summer resident. These seasonal habitats may be spanned or avoided entirely; the Proposed Project is not anticipated to have any adverse impacts to these species.

No impacts are anticipated to the Cagle's Map Turtle due to the practice of spanning surface waters and the implementation of a SWPPP. Both the White-nosed Coati, although rare, and the Texas Horned Lizard have the potential to occur within the ROW of the PUC-approved route; although, no significant impacts are anticipated to their populations or habitat. Other listed species, such as the Red Wolf, Gray Wolf, and American Black Bear are not anticipated to occur within the study area due to limited distribution, lack of suitable habitat, or extirpation from the area.

The construction of a transmission line does not include activities associated with collecting, hooking, hunting, netting, shooting, or snaring by any means or device, and does not include an attempt to conduct such activities. Therefore, "take" of state-listed species as defined in Section 1.01(5) of the Texas Parks and Wildlife Code is not anticipated by this project. Construction activities along the ROW may temporarily displace wildlife species. If state-listed species, such as the Texas Horned Lizard, are observed during construction, they would be relocated out of the construction area by a permitted individual or allowed to leave the area on their own. Overall, impacts of the Proposed Project are expected to be minimal and temporary; displaced organisms would be expected to return after construction or permanently relocate. Spanning surface waters and wetlands, and implementing the SWPPP to the extent practicable, will avoid and minimize significant adverse impacts to state-listed and federal candidate aquatic species listed in Table 2-8 in Section 2.0

For TPWD recommendations regarding rare species within the study area, please refer to the TPWD letter in Appendix A. As stated in TPWD's response letter, a lack of site-specific records should not be interpreted as the presence or absence of data, but instead that limited information is available to TPWD at the time of its review (Appendix A).

5.1.5.4 Summary of Potential Natural Resources Impacts

Biological criteria primarily considered for the Proposed Project included the length of ROW through upland woodland/brushlands, riparian/bottomland woodland, NWI mapped wetlands, known habitat of

federally-listed endangered or threatened species, and area of ROW across Golden-cheeked Warbler modeled habitat. Consideration was also given to length of ROW parallel to streams or rivers, length of ROW across 100-year floodplains, number of river crossings, and number of stream crossings. The overall length of each route and length of each route utilizing existing transmission line ROW or paralleling other compatible ROW as a means to minimize fragmentation and clearing, were also considered. Due to the presence of high-probability Golden-cheeked Warbler habitat within the study area, impacts to the Golden-cheeked Warbler may be unavoidable and may require USFWS consultation. No significant impacts to any other biological resources are anticipated for any of the primary alternative routes.

- Hunt Route 2 has the shortest length of ROW through upland woodland/brushland, at approximately 14.89 miles.
- Ingram Route 1 has the shortest length of ROW through bottomland/riparian woodlands, at approximately 0.45 mile.
- Hunt Routes 1 through 23, Hunt Route 28, Ingram Routes 1 through 3, and Ingram Routes 7 through 10 have no ROW through NWI mapped wetlands.
- No routes cross any known habitat of federally listed endangered or threatened species.
- Hunt Route 3 has the least area of ROW across Golden-cheeked Warbler modeled habitat, at approximately 48.4 acres.
- Ingram Routes 1, 2, 3, and 7, and Hunt Routes 24, 25, 26, 27, 29, and 30 have no ROW across open water.
- Hunt Route 15 has the least number of stream crossings, at 21 crossings.
- All routes cross the Pedernales River at least once; Hunt Routes 15, 17, 21, 22, 26, and 30 cross the Pedernales River twice.
- Hunt Route 14 and Ingram Route 10 have the least length of ROW parallel to streams or rivers, at approximately 0.15 mile.
- Ingram Route 1 has the shortest length of ROW across 100-year floodplains, at 0.54 mile.
- Ingram Routes 1 through 7 do not cross Johnson Creek, but all other routes do.

5.2 Human Resources

5.2.1 Socioeconomic

LCRA TSC uses its own employees or contractors during the clearing and construction phase of transmission line projects. However, a portion of the project costs will find their way into the local economy through purchases such as fuel, food, lodging, and possibly building materials. ROW easement

payments will be made to individuals whose private property is crossed by the transmission line based on the appraised land value. LCRA TSC is also required to pay state and local sales tax on purchases and is subject to paying local property tax on land and improvements. None of the land associated with ROW acquired for the transmission line and none of the land purchased by LCRA TSC for the new substation and substation expansion activities will be taken off the tax rolls. The cost of permitting, designing, and constructing the line will be paid for through revenue generated from electric transmission service. Rates for LCRA TSC's electric transmission service are regulated by the PUC.

Potential long-term economic benefits to the community resulting from construction of the Proposed Project are based on the requirement that electric utilities provide an adequate and reliable level of power throughout their service areas. Economic growth and development rely heavily on adequate public utilities, including a reliable electrical power supply. Without this basic infrastructure, a community's potential for economic growth is constrained.

5.2.2 Community Values

The term "community values" is included as a factor for the consideration of transmission line certification under Section 37.056(c)(4) of the Texas Utilities Code. Impacts on community values was classified by POWER into two types: 1) direct effects, or those effects that would occur if the location and construction of a transmission line results in the removal of, or loss of public access to, a valued resource; and 2) indirect effects, or those effects that would result from a loss in the enjoyment or use of a resource due to the characteristics (primarily aesthetic) of the proposed line, transmission structures, or ROW. Impacts on community values, whether direct or indirect, can be more accurately gauged as they affect recreational areas or resources and the visual environment of an area (aesthetics). Impacts in these areas are discussed in detail in Sections 5.2.5 and 5.2.7 of this report.

5.2.3 Land Use

The magnitude of potential land use impacts resulting from the construction of a transmission line is determined by the amount of land burdened by the actual ROW and by the compatibility of the transmission line ROW with adjacent land uses. During construction, temporary impacts to land uses within the ROW occurs due to the movement of workers, equipment, and materials through the area. Construction noise and dust, as well as temporary disruptions of traffic flow, may also temporarily affect residents and businesses in the area immediately adjacent to the ROW. Coordination between LCRA TSC, its contractors, and landowners regarding ROW access and construction scheduling should minimize these disruptions. The primary criteria considered to compare potential land use impacts of the

Proposed Project include proximity to habitable structures, length utilizing or paralleling existing ROW, length paralleling apparent property lines, and overall route length.

5.2.3.1 Habitable Structures

One of the most important measures of potential land use impacts is the number of habitable structures located in the vicinity of each route. Habitable structure information for each primary alternative route is shown in Tables 5-3 through 5-42 (Appendix C). POWER determined the number of, and distance to, habitable structures within 300 feet of the centerline of each route through evaluation during field reconnaissance and measurements obtained using GIS and aerial photographs.

All 40 of the Routes have habitable structures located within 300 feet of their centerlines. Hunt Route 18 has the least number of habitable structures located within 300 feet of its centerline at 23. Ingram Route 2 has the most habitable structures located within 300 feet of its centerline at 76. The number of habitable structures located within 300 feet of each of the primary alternative route centerlines are presented in Table 5-1. All known habitable structure locations within 300 feet are shown on Figures 5-1a and 5-1b (Appendix E).

In addition to the total number of habitable structures located within 300 feet of the primary alternative route centerlines, POWER also determined for each alternative route the number of habitable structures that are currently located within 300 feet of an existing electric transmission line (Table 5-1, criterion 3).

5.2.3.2 Utilizing/Paralleling Existing Transmission Line ROW

The least impact to land use generally results from locating new lines within or parallel to an existing transmission line ROW. PUC Substantive Rule § 25.101(b)(3)(B) states that (among others) the following factors shall be considered in the selection of the alternative routes:

- Whether the routes utilize existing compatible ROW, including the use of vacant positions on existing multiple-circuit transmission lines.
- Whether the routes parallel existing compatible ROW.
- Whether the routes parallel property lines or other natural or cultural features.

Utilizing Existing Transmission Line ROWs

LCRA TSC has determined that some segments for the Proposed Project could utilize the existing Hunt - Ingram 138-kV Transmission Line (T487) ROW. Where these segments utilize the existing ROW, new

double-circuit single pole transmission structures (Figures 1-6 and 1-7) would be required to support the existing 138-kV circuit between Hunt and Ingram as well as the new 138-kV circuit to be added as part of the Proposed Project. LCRA TSC has determined that rebuilding the existing line would require the acquisition of additional ROW in some areas along the existing route. The total alternative route lengths using existing transmission line ROW vary from none for Ingram Routes 1 through 7, to approximately 4.47 miles each for Ingram Routes 8, 9, and 10. The lengths using existing transmission line ROW for each of the primary alternative routes are presented in Table 5-1.

Paralleling Existing Transmission Line ROWs

POWER identified one existing transmission line corridor within the study area that the Proposed Project could potentially parallel in a reliable manner. The total alternative route lengths parallel and adjacent to existing transmission line ROW vary from none for 25 of the primary alternative routes, to approximately 1.88 miles each for Ingram Routes 1 and 7. The lengths parallel and adjacent to existing transmission line ROW for each of the primary alternative routes are presented in Table 5-1.

5.2.3.3 Paralleling Other Existing Compatible ROW

Paralleling other existing compatible ROW (such as roadways, railways, etc.) is also generally considered a favorable routing criterion, resulting in fewer impacts than establishing new ROW. POWER identified existing compatible ROWs as potential paralleling opportunities in accordance with PUC Substantive Rule § 25.101(b)(3)(B). However, POWER deviated from paralleling some compatible ROWs to avoid other known constraints (e.g., existing habitable structures, water wells, waterways).

All of the primary alternative routes parallel other existing ROW to the extent feasible. The routes with lengths paralleling other existing ROW range from approximately 1.73 miles each for Hunt Routes 5 and 6, to approximately 10.78 miles for Hunt Route 29. The lengths parallel and adjacent to other existing ROW for each of the primary alternative routes are presented in Table 5-1.

Roadway ROWs

Most highways and other roads are coincident with property lines. Thus, in many cases, when routes parallel roads, they are also parallel and adjacent to property lines. POWER evaluated paralleling IH 10, SH 27, SH 41, FM 479, FM 783, and FM 2093, and numerous other local roads. Many of the roadways are oriented in a north to south direction and presented acceptable paralleling opportunities. Where feasible, alternative route segments parallel these major roads and other public roads such as Klein

Branch Road, Henderson Branch Road, Sedalia Trail, Duderstadt Road, Byas Springs Road, Haynie Road, and Reservation Road. Paralleling US Hwy 290 was not feasible due to existing development.

Railroad ROWs

No railroads were identified within the study area.

5.2.3.4 Paralleling Property Lines

Paralleling property lines is a favorable routing criterion identified in PUC Substantive Rule § 25.101(b)(3)(B). Paralleling property lines or fence lines may minimize the potential for disruption to agricultural activities and may create less of a constraint for future development of a tract of land. LCRA TSC provided POWER with updated parcel line data that was obtained from the Gillespie, Kerr, and Kimble Counties Appraisal Districts in May 2019.

There can be differences between property lines and parcel lines depending on how the information is organized at the county appraisal district. LCRA TSC grouped the updated appraisal district parcel data where possible in an effort to identify potential aggregated ownership. As a result, the parcel line data available at the time of the preparation of this EA corresponds to the current individual parcels of property, but not necessarily all aggregated individual ownership. Where there are contiguous parcels in apparent common ownership, only paralleling of the outside boundary of the parcels was tabulated. Paralleling interior parcel lines within a group of two or more contiguous parcels was not tabulated as parallel to apparent property lines. Each route was developed to parallel property lines where feasible, while also considering other important factors such as engineering constraints and costs.

All of the primary alternative routes parallel apparent property boundaries to the extent feasible in the absence of other existing linear corridors. The length of primary alternative routes that parallel apparent property boundaries ranges from approximately 9.54 miles for Ingram Route 1, to approximately 19.51 miles for Hunt Route 15. The lengths parallel and adjacent to apparent property boundaries for each of the primary alternative routes are presented in Table 5-1.

The total length of primary alternative routes using existing transmission line ROW, parallel and adjacent to existing transmission line ROW, other existing ROW, and apparent property line ranges from approximately 77 percent or 17.35 miles for Route Hunt 14, to approximately 88 percent or 22.50 miles for Hunt Route 20.

5.2.3.5 Paralleling Pipelines

POWER reviewed aerial photography and the RRC website to identify existing metallic oil or natural gas pipeline ROW within the study area. Verification was conducted during field reconnaissance where possible. The length of route paralleling pipelines ranges from none for 11 of the primary alternative routes, to approximately 0.66 mile for 29 of the primary alternative routes. The lengths parallel and adjacent to pipelines for each of the primary alternative routes are presented in Table 5-1. In accordance with PUC directives, the paralleling of pipelines was not considered to be a positive or negative attribute of a particular route by POWER when evaluating potential routing for the Proposed Project. POWER also identified the possible route of a proposed Kinder Morgan metallic natural gas pipeline within the study area. None of the primary alternative routes parallel the route of the proposed Kinder Morgan pipeline.

5.2.3.6 Overall Length of Routes

The overall length of a route can be an indicator of the relative level of potential land use and environmental impacts. Potential impacts to land use are typically minimized with routes that have shorter lengths, as less land surface area is required for the ROW. The total lengths of the routes vary from approximately 21.48 miles for Hunt Route 5, to approximately 29.80 miles for Hunt Route 27. The differences in route lengths reflect the direct or indirect pathway of each route between the project endpoints. The length of the routes may also reflect the effort to use existing transmission line ROW, parallel existing transmission lines, other existing linear features like highways, apparent property boundaries, and the geographic diversity of the primary alternative routes. The approximate lengths for each of the primary alternative routes are presented in Table 5-1.

5.2.4 Transportation/Aviation

5.2.4.1 Transportation

Potential impacts to transportation may include temporary disruption of traffic and/or conflicts with proposed roadway and/or utility improvements. Traffic disruptions would include those associated with the movement of construction equipment and materials to and from the ROW and increased traffic flow and/or periodic congestion during the construction phase of the Proposed Project. These impacts are typically considered minor, temporary, and short-term.

All of the primary alternative routes have IH, US, SH, or FM road crossings. The number of US or SH crossings ranges from one each for Ingram Routes 4, 5, 6, and 7, to seven for Ingram Route 2. The number of FM road crossings ranges from three each for 23 of the primary alternative routes, to five for

Hunt Route 22. The number of IH, US, SH, and FM road crossings for each of the primary alternative routes are presented in Table 5-1.

5.2.4.2 Aviation

According to FAA Part 77 regulations, Title 14 CFR Part 77, the construction of a transmission line requires FAA notification if structure heights exceed the height of an imaginary surface extending outward and upward at a slope of 100:1 for a horizontal distance of 20,000 feet from the nearest point of the nearest runway of a public or military airport having at least one runway longer than 3,200 feet. The FAA also requires notification if the tower structure height exceeds a 50:1 slope for a horizontal distance of 10,000 feet from the nearest runway of a public or military airport where no runway is longer than 3,200 feet in length and if the tower structure height exceeds a 25:1 slope for a horizontal distance of 5,000 feet for heliports.

The review of federal and state aviation/airport maps and databases, aerial photo interpretation, TxDOT Division of Aviation information, and field reconnaissance were used to identify airports and airstrips located within the study area and within 20,000 feet of the primary alternative routes. There are no FAA registered public or military airports with runways longer than 3,200 feet identified within 20,000 feet of the routes. There are no FAA registered public or military airports with runways shorter than 3,200 feet identified within 10,000 feet of the routes.

The number of private heliports identified within 5,000 feet of the primary alternative routes range from none for Hunt Routes 15, 23, 25, 27, and 30, to a high of two each for 27 of the primary alternative routes. The number of private heliports for each of the primary alternative routes is presented in Table 5-1.

The number of private airstrips identified within 10,000 feet of the primary alternative routes range from a low of two each for Hunt Routes 26 and 30, and Ingram Routes 1 and 7, to a high of five each for Hunt Routes 2, 3, and 10. The number of private airstrips for each of the primary alternative routes is presented in Table 5-1. The number of FAA-listed private airstrips identified within 10,000 feet of the primary alternative routes range from a low of zero each for Hunt Routes 26 and 30, to a high of three each for Hunt Routes 2, 3, and 10 and Ingram Routes 4 and 5. The number of Non FAA-listed private airstrips identified within 10,000 feet of the primary alternative routes range from a low of zero each for Ingram Routes 1 and 7, to a high of two each for all of the Hunt Routes and Ingram Routes 8, 9, and 10.

The distance for each private airstrip from the nearest route segment was measured using GIS and aerial photograph interpretation (Table 5-43). All known private airstrip locations are shown on Figures 5-1a and 5-1b (Appendix E).

TABLE 5-43 AIRPORT FACILITIES AND RUNWAY LOCATIONS

FIGURE 5-1 MAP ID	AIRSTRIP	PRIMARY ALTERNATIVE ROUTES	NEAREST ROUTE SEGMENT	DISTANCE FROM NEAREST ROUTE SEGMENT (FEET)*	ESTIMATED RUNWAY LENGTH (FEET)[1/*]	EXCEEDS THE SLOPE[1,2]
301	East Honey Creek Ranch Airport Non FAA Listed Private[3]	Hunt 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, and Ingram 8, 9, 10	A	1,007	1,500	Yes
302	Medivac Heliport at River Bend Ranch Non FAA Listed Private[3]	Hunt 4, 26	A	2,334	N/A	No
303	Unidentified Airstrip 1 Non FAA Listed Private[3]	Hunt 4, 15, 23, 24, 25, 26, 27, 28, 29, 30	C4	2,210	2,400	Yes
304	PELA Heliport Non FAA Listed Private[3]	Hunt 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, and Ingram 2, 3, 4, 5, 6, 8, 9, 10	I4	1,246	N/A	No
305	TRT Ranch Corporation Non FAA Listed (Pending) Private[3]	Hunt 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, and Ingram 2, 3, 5, 6, 8, 9, 10	P4	1,702	2,500	Yes
306	Apache Springs Airport FAA Listed Private	Hunt 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29 and Ingram 2, 3, 4, 5, 6, 8, 9, 10	O	3,788	2,700	Yes
307	Dos Arroyos Ranch Airport FAA Listed Private	Hunt 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 19, 20, 21, 22, and Ingram 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	P4	3,254	3,700	Yes

TABLE 5-43 AIRPORT FACILITIES AND RUNWAY LOCATIONS

FIGURE 5-1 MAP ID	AIRSTRIP	PRIMARY ALTERNATIVE ROUTES	NEAREST ROUTE SEGMENT	DISTANCE FROM NEAREST ROUTE SEGMENT (FEET)*	ESTIMATED RUNWAY LENGTH (FEET)[1]/*	EXCEEDS THE SLOPE[1,2]
308	Unidentified Heliport 1 Non FAA Listed Private[3]	Hunt 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, 22, 24, 28, 29 and Ingram 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	L1	366	N/A	Yes
309	Cielo Grande Ranch Airport FAA Listed Private	Hunt 2, 3, 10, 29, and Ingram 1, 4, 5, 7	B2	3,317	2,100	Yes

[1]FAA 2018b; *POWER aerial photo and USGS interpretation.
[2]POWER used aerial photo and USGS interpretation considering elevation information obtained from USGS topographic maps and a typical transmission structure height of 100 feet.
[3]Non FAA Listed Private are airports, airstrips, or heliports that are not listed on the FAA database 2018b.

5.2.5 Parks and Recreation

Potential impacts to recreation include the disruption or preemption of recreational activities. As previously mentioned, the study area contains recreation areas that consist of several camps, a neighborhood park, a school playground, roadside parks, and hunting or fishing areas.

As shown on Figures 5-1a and 5-1b, none of the primary alternative routes directly cross any formally designated recreational areas pursuant to the definitions established by the PUC CCN application form.

The number of additional parks or recreational areas within 1,000 feet of the primary alternative routes range from none for 38 of the primary alternative routes, to two each for Ingram Routes 1 and 7. The number of additional parks or recreational areas within 1,000 feet for each of the primary alternative routes is presented in Table 5-1.

The distance of each park or recreation area from the nearest route segment was measured using GIS and aerial photography interpretation (Table 5-44). No significant impacts to the use of the parks and recreation facilities located within the study area are anticipated from any of the alternative routes. As discussed in Chapter 2, there are a number of private camps, ranches, and hunting and fishing areas within the study area where recreational activities occur. No significant adverse impacts are anticipated for such

areas from any of the alternative routes. All formally designated park or recreational area locations as defined by the PUC CCN application form are shown on Figures 5-1a and 5-1b (Appendix E).

TABLE 5-44 PARKS AND RECREATION AREAS

FIGURE 5-1 MAP ID	PARKS AND RECREATION AREAS (WITH OWNERSHIP)	NEAREST ROUTE SEGMENT	PRIMARY ALTERNATIVE ROUTES	DISTANCE FROM NEAREST ROUTE SEGMENT (FEET)*
401	IH 10 Rest Area East Bound (TxDOT)	M4	Ingram 1, 7	78
402	IH 10 Rest Area West Bound (TxDOT)	M4	Ingram 1, 7	670

*Source: POWER Aerial Photo and USGS Interpretation.

5.2.6 Electronic Communication Facilities

No known AM radio transmitters were identified within the study area or within 10,000 feet of the primary alternative routes. The number of FM radio transmitters, microwave towers, and other electronic communications towers located within 2,000 feet of any of the primary alternative routes range from none for Hunt Routes 1, 2, 3, 11, and Ingram Route 5, to a high of five for Hunt Route 25. The number of FM radio transmitters, microwave towers, and other electronic communications towers for each of the primary alternative routes is presented in Table 5-1.

The distance of each communication tower from the nearest route segment was measured using GIS and aerial photograph interpretation (Table 5-45). None of the routes are anticipated to have a significant impact on communication operations in the area. All electronic communication facility locations are shown on Figures 5-1a and 5-1b (Appendix E).

TABLE 5-45 ELECTRONIC COMMUNICATION FACILITIES

FIGURE 5-1 MAP ID	TOWER TYPE	NEAREST ROUTE SEGMENT	PRIMARY ALTERNATIVE ROUTES	DISTANCE FROM NEAREST ROUTE SEGMENT (FEET)*
501	KRZS 99.9 FM; Tom, Rick, and Harley Boradcasting LLC microwave; New Cingular Wireless PCS, LLC KNKA428	E4	Ingram 8, 9, 10	794
502	STC Five, LLC ASR	C1	Hunt 15, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 29, 30	1,962
503	CT Cube, LP d/b/a West	P1	Hunt 16, 17, 18, 20, 22, 29	1,199

TABLE 5-45 ELECTRONIC COMMUNICATION FACILITIES

FIGURE 5-1 MAP ID	TOWER TYPE	NEAREST ROUTE SEGMENT	PRIMARY ALTERNATIVE ROUTES	DISTANCE FROM NEAREST ROUTE SEGMENT (FEET)*
	Central Wireless ASR			
504	SBA Infrastructures, LLC ASR	M1	Hunt 10	389
505	Unidentified Communication Tower 1	W2	Hunt 22, 25	240
506	SBA Infrastructures, LLC ASR	O3	Hunt 4, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 20, 21, 22, 24, 25, 26, 28, 30, and Ingram 1, 2, 3, 4, 6, 7, 8, 9, 10	1,412
507	Uniti Towers, LLC ASR	M1	Hunt 10	644
508	Fire Station	U	Hunt 24, 25, 26, 27, 28, 29, 30	346
509	Unidentified Communication Tower 3	O2	Hunt 22, 25	489

*Source: POWER Aerial Photo, USGS Interpretation, and FCC 2018.

5.2.7 Aesthetics

Aesthetic impacts or impacts to visual resources exist when the ROW, lines, and/or transmission structures of a transmission line create an intrusion into, or substantially alter, the character of the existing view. The significance of the impact is directly related to the quality of the view in natural scenic areas, the importance of the existing setting in the use and/or enjoyment of an area, and the extent of valued community resources in recreational areas.

Potential visibility impacts were evaluated by tabulating the linear feet of each route that would potentially create a new or additional impact to potential viewers. The lengths of each route within the foreground visual zone of IH, US and SH, FM roads, and parks or recreational areas (within one-half mile with unobstructed views) were tabulated.

Construction of the proposed 138-kV transmission line could have both temporary and permanent aesthetic effects. Temporary impacts would include views of the actual assembly and erection of the transmission structures. Where wooded areas are cleared, the brush and wood debris could have an additional negative temporary impact on the local visual environment. Permanent impacts from the project would involve the views of the transmission structures and lines. New visual impacts would be

minimized by constructing the new transmission line within existing transmission line ROW or parallel to existing transmission lines.

Ingram Route 1 has the longest length within the foreground visual zone of IH, US, and SH, at approximately 10.63 miles; Hunt Route 1 has the shortest length, at approximately 2.87 miles. Hunt Route 2 has the greatest length within the foreground visual zone of FM roads, at approximately 9.23 miles; Hunt Routes 15 and 25 have the shortest length, at approximately 1.79 miles each. Ingram Routes 1 and 7 have the longest length within the foreground visual zone of parks or recreational areas, at approximately 1.40 miles each; twenty-two of the primary alternative routes have the shortest length, at approximately 0.07 mile each. The lengths of each of the primary alternative routes within the foreground visual zone of IH, US and SH, FM roads, and parks or recreational areas are presented in Table 5-1.

5.2.8 Summary of Potential Human Resource Impacts

As mentioned in Sections 4.3.2.1 and 4.3.2.2 of the EA, respondents to the formal LCRA TSC Mountain Home project questionnaires identified maximizing distances from residences as their primary routing concern and the Ingram project questionnaires identified using or paralleling existing transmission line ROW as their primary routing concern. Land use criteria primarily considered for the Proposed Project focused on the number of habitable structures located within 300 feet of each primary alternative route centerline, the overall length of the primary alternative route, and the length that parallels existing compatible ROWs (transmission lines, roadways, and apparent property lines, etc.).

- Hunt Route 18 has the fewest number of habitable structures located within 300 feet of its centerline, with 23; Hunt Route 20 has the second fewest number of habitable structures, with 25; Hunt Routes 4, 5, and 28 have 26 habitable structures each located within 300 feet of their centerlines.
- Hunt Route 5 has the shortest overall length, approximately 21.48 miles; Hunt Route 6 is slightly longer at approximately 21.59 miles; Hunt Route 13 is approximately 22.34 miles.
- Hunt Routes 16 and 20 have the highest percent route length using existing transmission line ROW, parallel and adjacent to existing transmission line ROW, parallel and adjacent to other existing compatible ROW (roadways, etc.), and parallel and adjacent to apparent property lines, approximately 88 percent each. Ingram Route 1 uses and parallels existing compatible ROW for approximately 87 percent of its length and Hunt Routes 17 and 21 each use and parallel existing compatible ROW for approximately 86 percent of their lengths.

5.3 Cultural Resources

The methodology for identifying, evaluating, and mitigating impacts to cultural resources has been established for federal projects and/or permitting actions, primarily with the National Historic Preservation Act. State regulations typically use similar methods when considering cultural resources affected by non-federal undertakings. This process requires identifying significant (i.e., NRHP- or State-listed or eligible) cultural resources potentially affected by an action, determining the potential impacts of that action, and implementing measures to avoid, minimize, or mitigate those impacts.

5.3.1 Direct Impacts

Construction activities associated with any proposed project can adversely impact cultural resources when they alter the integrity of the characteristics that contribute to a property's significance as defined by the standards of the NRHP or State registries. These characteristics may include location, design, setting, materials, workmanship, feeling, and association. Activities associated with the construction, operation, and maintenance of transmission lines could directly or indirectly impact significant cultural resources. For example, earth moving activities during construction typically have the highest potential to directly impact cultural resources by either destruction of all or part of a property or alteration of the setting. Direct visual impacts may occur when transmission structures are built near significant cultural resources such as intact segments of historical trails and historical buildings that derive at least part of their significance from an unaltered historical setting.

5.3.2 Mitigation

The preferred form of mitigation for direct and indirect impacts to cultural resources is avoidance during the detailed design phase, which occurs after a route has been approved by the PUC. Additional mitigation measures for direct impacts may include implementing a program for data recovery excavations if an archeological site cannot be avoided. Reductions in visual impacts to significant buildings and landscapes may also be accomplished by using berms or vegetation screens. Because a cultural resource survey has not been conducted for any of the routes, cultural resources may exist within the transmission ROW that have not been identified or evaluated and the potential for impacting undiscovered resources exists.

Because the routes have not been systematically surveyed for cultural resources, high probability areas for prehistoric and historical cultural resources were identified along the routes. Based on a review of the Llano map sheet in the BEG Geologic Atlas of Texas (BEG 1986), topographic quadrangles depicting the study area, soil survey data, and the results of archeological projects within the study area, high

probability areas for prehistoric resources include secondary terraces along major rivers and streams, intact Holocene-era sediments, broad floodplains, in areas that may harbor chert lithic resources, and on the edge of terraces above floodplains. High probability areas for historic period archeological sites were identified based on a review of historical USGS topographic maps (1964 and 1979 Kerrville Quadrangles; 1964 and 1982 Hunt Quadrangles; 1964 Bee Caves Creek Quadrangle; 1974 Harper West Quadrangle; 1967 Harper East Quadrangle; 1964 and 1982 Nott Branch Quadrangles; 1964 Contrary Creek Quadrangle, and the 1964 and 1982 Mountain Home Quadrangles), available online through the University of Texas Library Perry Castaneda map collection.

High probability areas for prehistoric and historic resources were mapped using GIS, and the length of each route and segment across these areas was tabulated (Tables 5-1 and 5-2). Following approval of a route by the PUC, a cultural resources assessment will be conducted in accordance with a research design prepared by qualified cultural resource professionals and approved by LCRA TSC and the THC.

5.3.3 Summary of Potential Cultural Resource Impacts

The distance of each recorded archeological site, NRHP property, and cemetery located within 1,000 feet of the nearest route was measured using GIS and aerial photography interpretation. Thirty recorded archeological sites are located within 1,000 feet of the proposed alternative route centerlines (Table 5-46). Eight of these sites are crossed by alternative route ROW. The archeological sites within 1,000 feet of the primary alternative routes are discussed below.

The 30 recorded archeological sites located within 1,000 feet of the primary alternative route centerlines are briefly described below and listed in Table 5-46 along with their distances from the route centerlines. All of the sites are recorded as prehistoric sites. Portions of sites 41GL448 and 41GL449 and all of site 41KR620 have been determined ineligible for listing on the NRHP. Sites 41GL448 and 41Gl449, both lithic procurement sites, are 260 and 523 feet, respectively, from Ingram Route 1 and Ingram Route 7. Site 41KR620, a lithic scatter, is crossed by all 10 of the Ingram alternative routes.

The remaining sites have not been formally assessed for listing on the NRHP. Six sites that have not been assessed for listing on the NRHP are crossed by alternative routes. Of these, sites 41KR76, 41KR77, 41KR92, 41KR565 and 41KR244 are recorded as campsites with burned rock or burned rock middens. Site 41KR244 also has a lithic procurement component, and site 41KR567 is a lithic procurement site.

The remaining 17 sites within 1,000 feet of the proposed alternative routes are all campsites with burned rock or burned rock middens in addition to debitage or stone tools. Site 41GL112 is also a lithic procurement site, and a burial is reported at the site.

TABLE 5-46 ARCHEOLOGICAL SITES RECORDED WITHIN 1,000 FEET OF THE PRIMARY ALTERNATIVE ROUTE CENTERLINES

SITE TRINOMIAL	DISTANCE IN FEET FROM CENTERLINE	PRIMARY ALTERNATIVE ROUTE(S)
41GL25	692	Ingram 1, Ingram 7
41GL26	960	Ingram 1, Ingram 7
41GL112	339	Hunt 1, Hunt 4, Hunt 5, Hunt 6, Hunt 11, Hunt 18, Hunt 19, Ingram 2, Ingram 3, Ingram 6, Ingram 7, Ingram 9
41GL448	260	Ingram 1, Ingram 7
41GL449	523	Ingram 1, Ingram 7
41KR45	749	Hunt 2, Hunt 7, Hunt 8, Hunt 9, Hunt 10, Hunt 11, Hunt 18, Hunt 19, Ingram 8
41KR56	517	Hunt 23, Hunt 24, Hunt 25, Hunt 28, Hunt 29
41KR57	132	Hunt 23, Hunt 24, Hunt 25, Hunt 28, Hunt 29
41KR64	749	Hunt 23, Hunt 24, Hunt 25, Hunt 28, Hunt 29
41KR65	686	Hunt 23, Hunt 24, Hunt 25, Hunt 28, Hunt 29
41KR66	468	Hunt 23, Hunt 24, Hunt 25, Hunt 28, Hunt 29
41KR70	491	Hunt 1, Hunt 3, Hunt 5, Hunt 6, Hunt 12, Hunt 13, Hunt 14, Hunt 16, Hunt 17, Hunt 20, Hunt 21, Hunt 22, Ingram 9, Ingram 10
41KR71	962	Hunt 2, Hunt 7, Hunt 8, Hunt 9, Hunt 10, Hunt 11, Hunt 18, Hunt 19, Ingram 2, Ingram 3, Ingram 4, Ingram 5, Ingram 6, Ingram 8
41KR72	931	Ingram 2
41KR73	756	Ingram2
41KR74	825	Ingram 2
41KR76	41	Ingram 2, Ingram 3
41KR77	3	Ingram 2, Ingram 3
41KR86	807	Ingram 1
41KR90	118	Ingram 1, Ingram 2, Ingram 3
41KR91	504	Ingram 1, Ingram 2, Ingram 3, Ingram 4, Ingram 5, Ingram 6, Ingram 7
	819	Ingram 8, Ingram 9, Ingram 10
41KR92	0	Hunt 2, Hunt 7, Hunt 9, Hunt 10, Hunt 11, Hunt 18, Hunt 19, Ingram 2, Ingram 8
41KR238	527	Hunt 15, Hunt 17, Hunt 21, Hunt 26, Hunt 30,
41KR244	0	Ingram 8, Ingram 9, Ingram 10

TABLE 5-46 ARCHEOLOGICAL SITES RECORDED WITHIN 1,000 FEET OF THE PRIMARY ALTERNATIVE ROUTE CENTERLINES

SITE TRINOMIAL	DISTANCE IN FEET FROM CENTERLINE	PRIMARY ALTERNATIVE ROUTE(S)
41KR245	303	Ingram 8, Ingram 9, Ingram 10
41KR543	314	Hunt 24, Hunt 25, Hunt 26
	414	Hunt 27, Hunt 28, Hunt 29, Hunt 30
41KR565	0	**Ingram 2, Ingram 3**
41KR567	20	**Hunt 23**
41KR586	733	Hunt 24, Hunt 25, Hunt 26, Hunt 27, Hunt 29, Hunt 30
	954	Hunt 28
41KR620	0	**Ingram 1, Ingram 2, Ingram 3, Ingram 4, Ingram 5, Ingram 6, Ingram 7**
	40	**Ingram 8, Ingram 9, Ingram 10**

Note: Bold entries are crossed by a 100-foot ROW centered on the alternative route centerline.

Most of the primary segments have not been systematically surveyed for cultural resources and the potential for undiscovered cultural resources exists. All the routes cross through areas with high probability for archeological sites (prehistoric and historic). High probability areas for historic archeological sites were identified based on a review of historic maps, and include the locations of historic buildings, structures, and features along existing primary and secondary roads. Prehistoric high probability areas include secondary terraces along major rivers and streams, intact Holocene-era sediments, broad floodplains, areas that may contain chert lithic resources, and the edge of terraces above floodplains. Based on the estimated amount of HPA crossed by each route, Hunt Routes 5, 6, 13, and 12 cross the least amount of HPA, with 10.2, 10.5, 10.7, and 10.9 miles of HPA crossed by each route, respectively. Hunt Routes 18, 19, 4 and 26 cross the greatest amount of HPA, with 15.6, 16.1, 16.3, and 16.7 miles of HPA crossed by each route, respectively.

6.0 LIST OF PREPARERS

This EA and Alternative Route Analysis was prepared for LCRA TSC by POWER. LCRA TSC provided information in Sections 1.0 and 4.0. A list of the POWER employees with primary responsibilities for the preparation of this document is presented below.

RESPONSIBILITY	NAME	TITLE
Project Director	Rob R. Reid	Sr. Project Manager II/Vice President
Project Manager	Lisa Barko Meaux	Project Manager III
Hydrology	David Morgan Sairah Teta	Biologist III Biologist I
Ecology	David Morgan Sairah Teta	Biologist III Biologist I
Land Use	Denise Williams	Project Lead I
Aesthetics	Denise Williams	Project Lead I
Public Involvement	Denise Williams Lisa Barko Meaux Emily Innes	Project Lead I Project Manager III Environmental Planner I
Cultural Resources	Darren Schubert Emily Duke	Cultural Resource Specialist II Field Representative II
Maps/Figures/Graphics	Austin Streetman Kristen Severud	GIS Analyst III GIS Analyst II

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