Rio Rico to Harshaw 138kV Transmission Line Project

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Rio Rico to Harshaw 138kV Transmission Line Project

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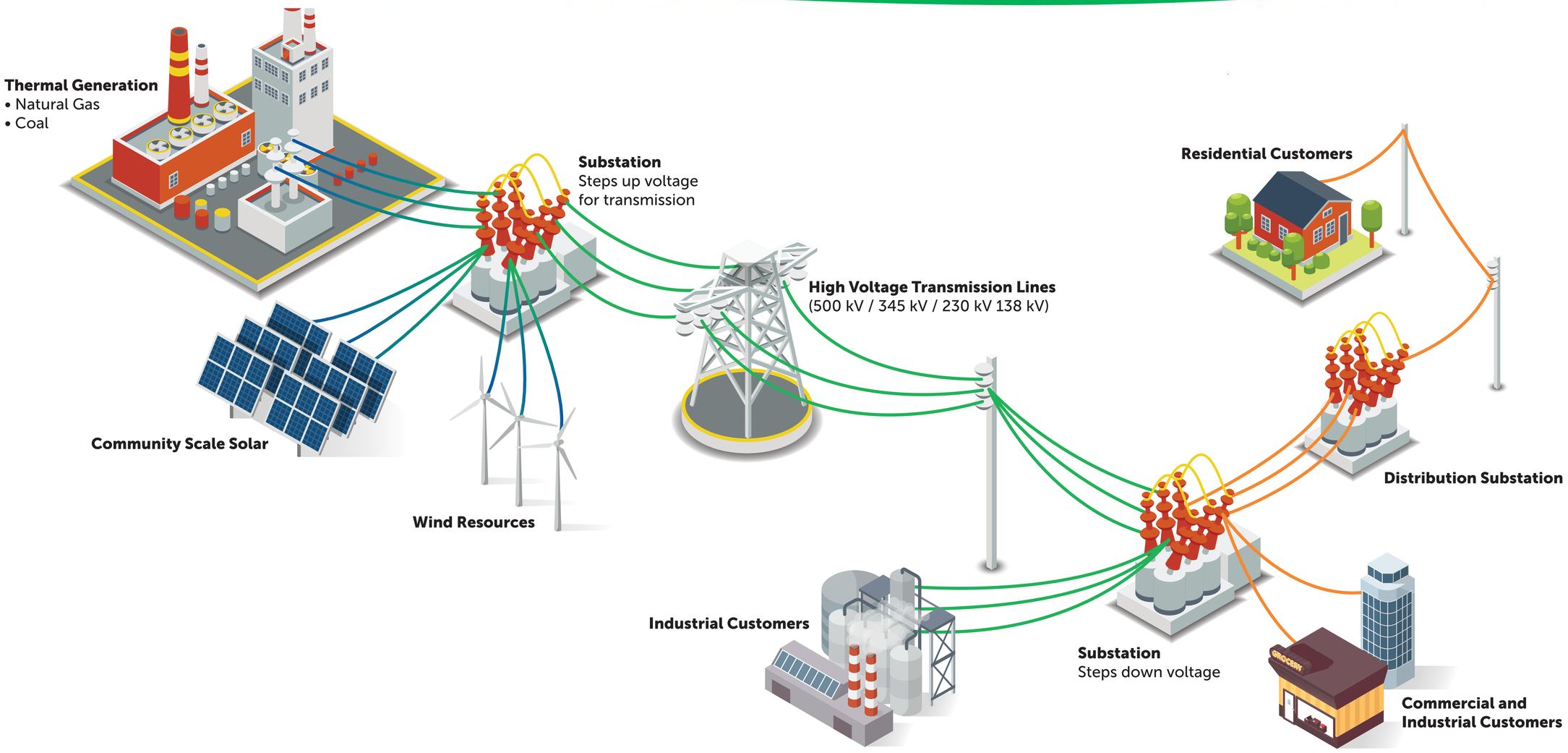

Generation	Transmission	Sub-Transmission and Distribution

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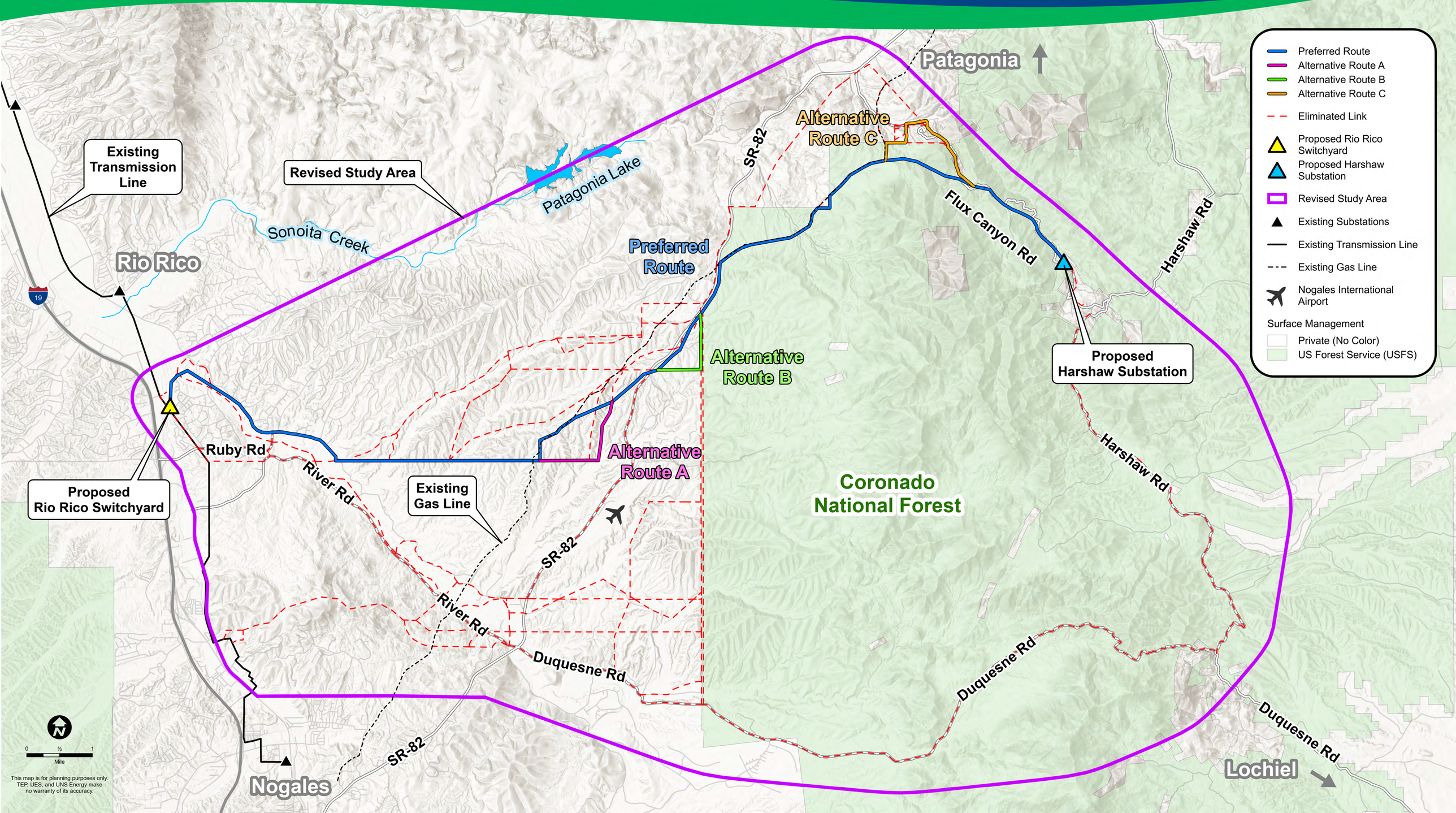

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Rio Rico
Rio Rico Golf Club
Sonoita Creek
Sonoita Creek State Natural Area
Patagonia Lake State Park
Sonoita Creek
Highway 82
Patagonia
Harshaw Creek
Section 2C
Flux Canyon Rd
Section 1C
Harshaw Rd
Proposed Harshaw Substation
Coronado National Forest
Section 1B
Section 2B
Calabazas Mission
Pendleton Dr
Proposed Rio Rico Switchyard
Section 1A
Route 1 (common to all)
Santa Cruz River
Calabasas Park
Ruby Rd
Section 2A
River Rd
Nogales International Airport
Potrero Creek
Guevavi Mission
Highway 82
Santa Cruz County
City of Nogales
Nogales
Duquesne Rd
Lochiel
Duquesne Rd
Harshaw Creek
19

0 ½ 1 Mile

This map is for planning purposes only. TEP, UES, and UNS Energy make no warranty of its accuracy.

Preferred Alternatives
- Route 1 (common to all)
- Section 1A
- Section 1B
- Section 1C

Alternative Sections
- Section 2A
- Section 2B
- Section 2C

- Section Nodes
- Proposed Rio Rico Switchyard
- Proposed Harshaw Substation
- Study Area
- Municipal Boundaries
- Sonoita Creek State Natural Area
- Conservation Easement
- Existing Substation
- Existing Transmission Line
- Existing Gas Line
- Washes

Surface Management
- Private (No Color)
- US Forest Service (USFS)

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INTERACTIVE MAP STATION

See where you live in relation to the project

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SITING PROCESS

PHASE 1: PRE-ANALYSIS

- Study Area
- Opportunities/Constraints
- Criteria
- Field Visits
- Stakeholder Outreach
- Public Outreach

→ **Preliminary Links**

PHASE 2: DATA INVENTORY

- Planned land uses
- Biological resources
- FCC licensed communication sites
- Sensitive receptors
- Designated scenic areas
- Historic and archaeological sites
- Comprehensive environmental data
- Constructability data
- Stakeholder and public input

PHASE 3: SUITABILITY ASSESSMENT

- Stakeholder Outreach
- Public Outreach

→ **Refined Links**

PHASE 4: COMPATIBILITY ANALYSIS

→ **Alternatives**

PHASE 5: CONCEPT EVALUATION

- Stakeholder Outreach
- Public Outreach
- Ground Truth

→ **CEC Application**

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The Arizona Corporation Commission will consider several factors before approving a Certificate of Environmental Compatibility. These factors, used by UNS to analyze potential line routes, include:

- Wildlife and plant life
- Scenic areas, historic sites and archaeological sites and structures
- Environment
- Noise emission levels and interference with communication signals
- Potential public recreational uses
- Existing development plans
- Engineering feasibility and challenges
- Project costs and potential impacts on customer rates
- Public input

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We are here

1 Project Scoping ✓

Public Meeting

Agency Input

Public Comment

2 Alternative Route Development

Steps include:

1) Preliminary Study Area ✓
2) Preliminary Alternative Routes ✓
3) Final Alternative

Public Meeting

Agency Input

Public Comment

3 Resource Studies

4 Prepare Certificate of Environmental Compatibility (CEC) Application

5 Line Siting Hearing (Apr. 17-21, 2023)

Public Meeting

Public Comment

6 Arizona Corporation Commission Approval

Public Meeting

Public Comment

7 National Environmental Policy Act (NEPA)

Includes:

- Detailed Resource Studies
- Route Analysis
- Forest Service – preferred route identification

8 NEPA Decision

(occurs after ACC approval)

Public Meeting

Agency Input

Public Comment

Public Meeting

Agency Input

Public Comment

9 Project Development and Construction

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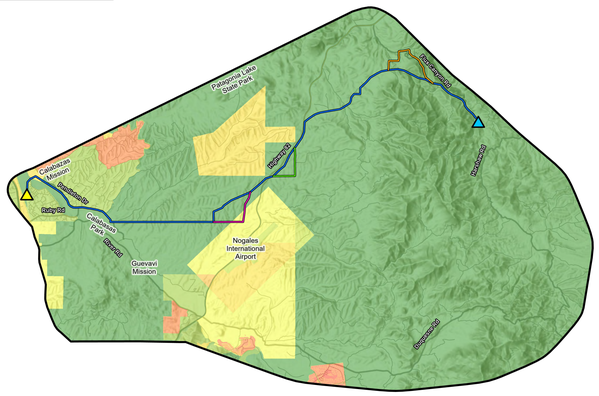
Suitability Factors

LEGEND

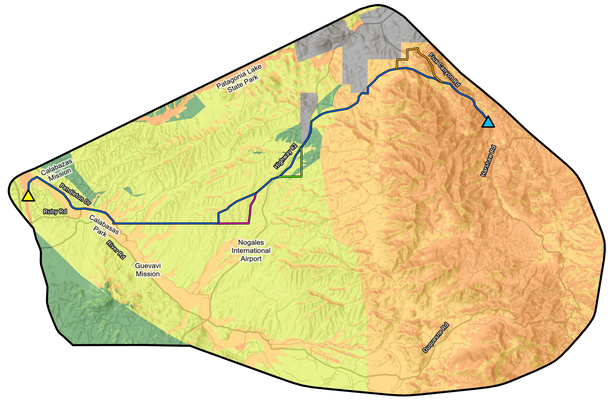
- Proposed Rio Rico Switchyard
- Proposed Harshaw Substation
- Preferred Route
- Alternative Route A
- Alternative Route B
- Alternative Route C

Suitability Analysis

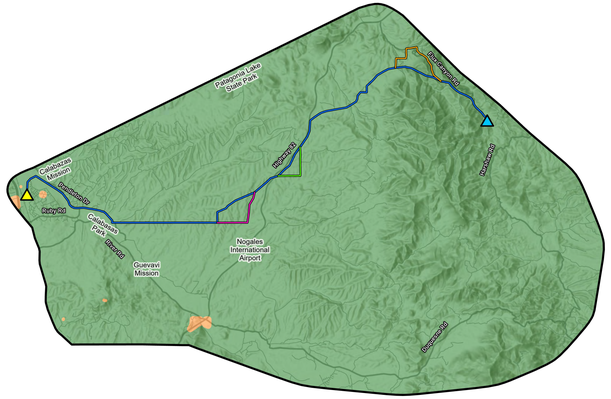
- High Compatibility
- Low Compatibility
- Exclusion Area



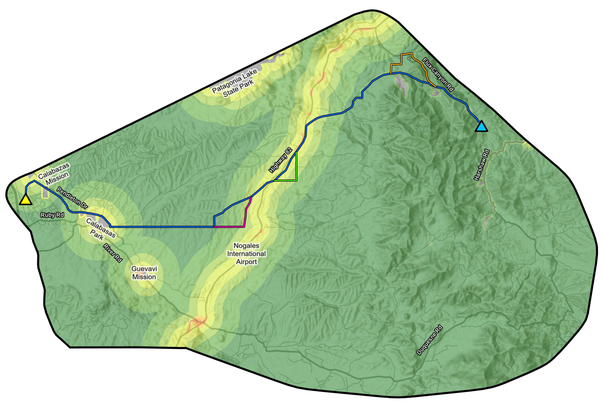
Existing Development Plans



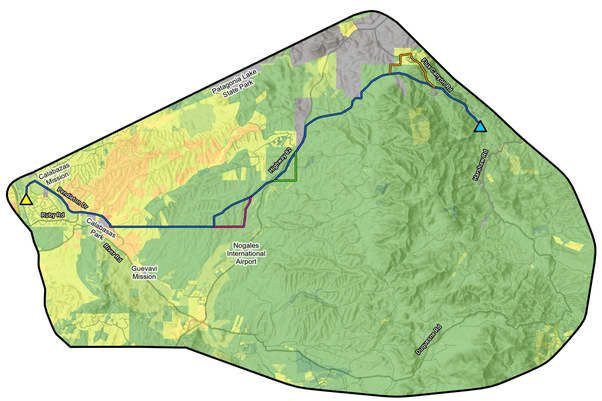
Wildlife and Plant Life



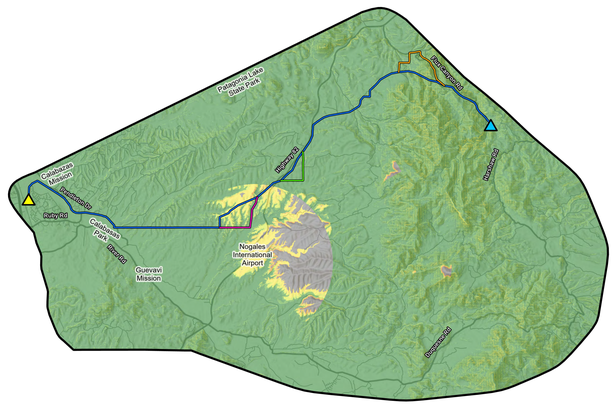
Noise Emissions/ Communication Interference



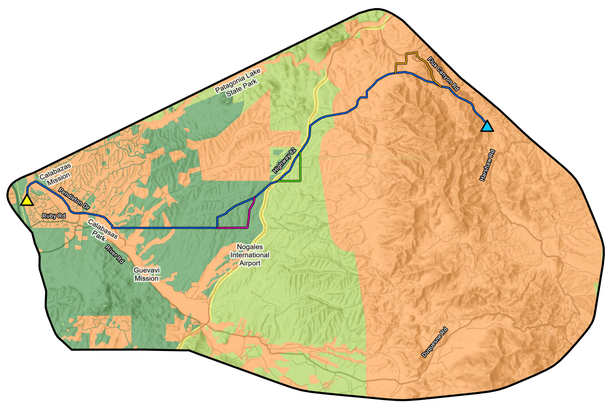
Scenic Areas and Historic/Archaeological Sites



Total Environment



Engineering Feasibility



Public/Stakeholder Input

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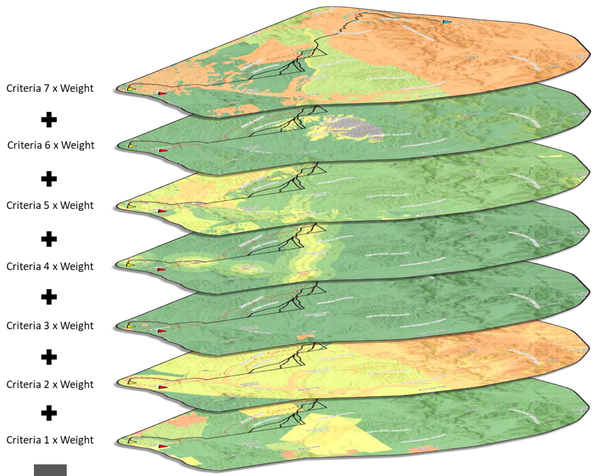
Composite Suitability Models



Suitability factor models are weighted differently based on model and added together.

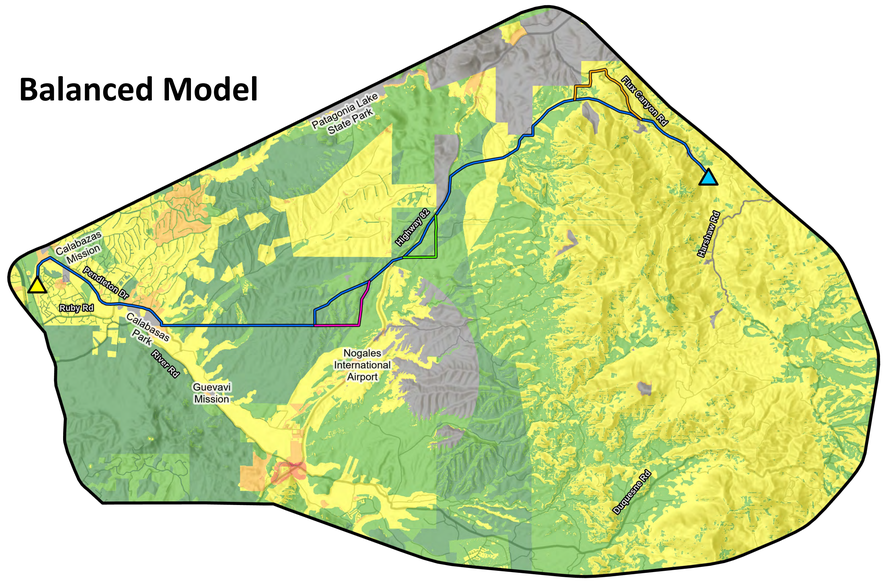
LEGEND

- Proposed Rio Rico Switchyard
- Proposed Harshaw Substation
- Preferred Route
- Alternative Route A
- Alternative Route B
- Alternative Route C

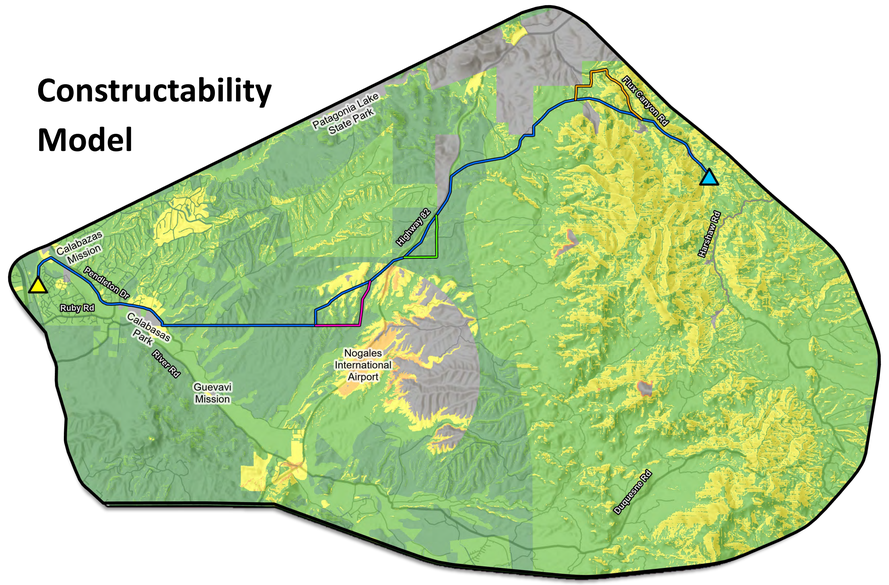
Suitability Analysis

- High Compatibility
- Low Compatibility
- Exclusion Area

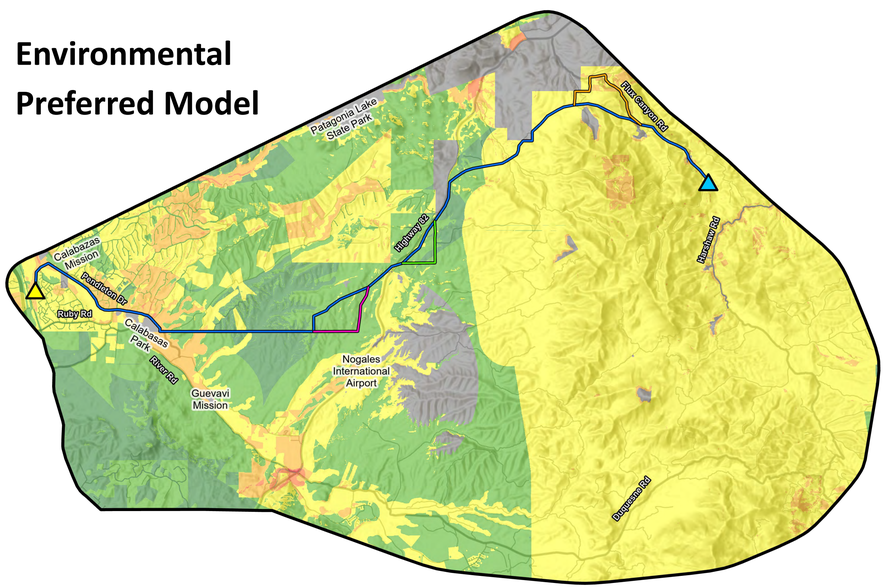
Balanced Model



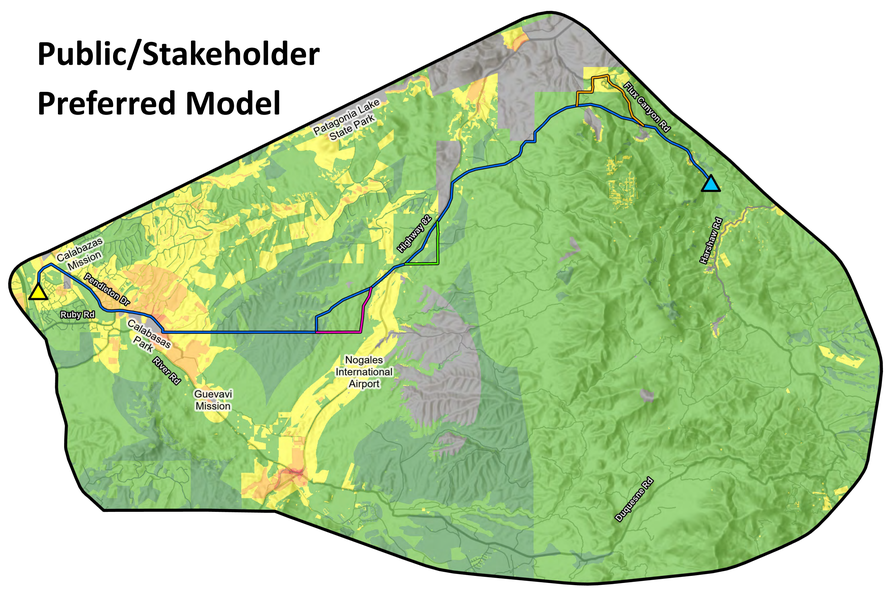
Constructability Model



Environmental Preferred Model



Public/Stakeholder Preferred Model



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Pole Characteristics

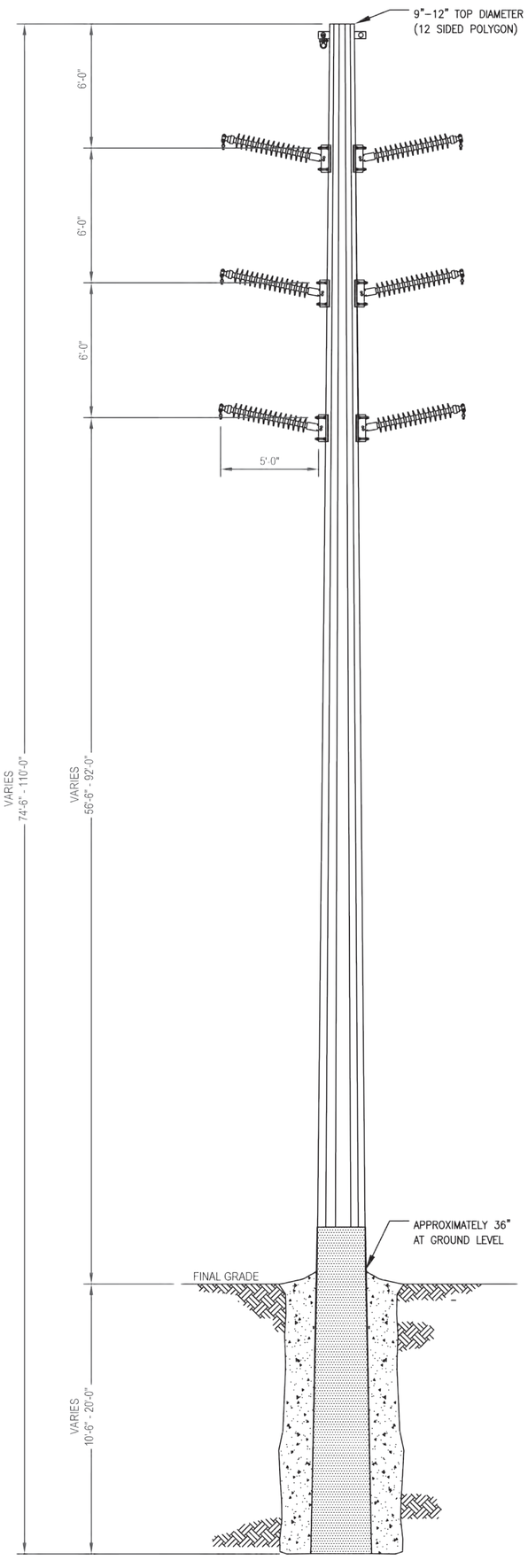
Type: Tubular weathering steel monopoles

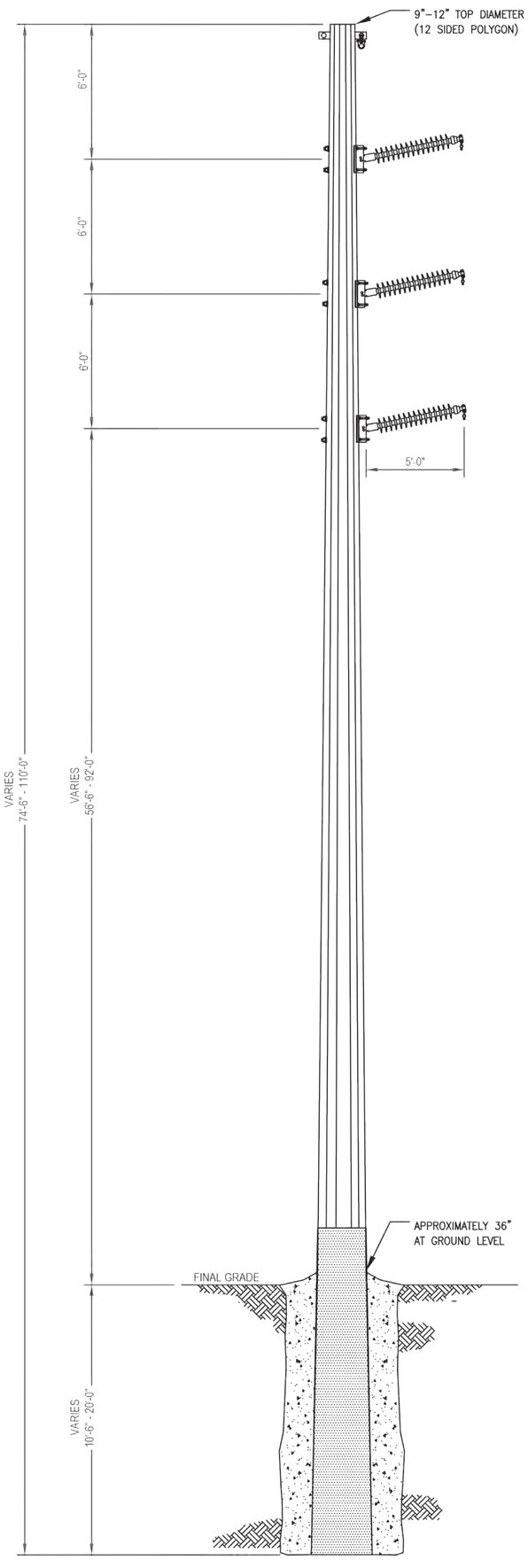
Pole height: Typically 75-110 feet

Span length: 600-1,000 feet
(distance between poles)

Poles per mile: 5-9 Structures

Right of way width: Up to 100 feet





A typical weathering steel monopole supporting a 138 kilovolt transmission line

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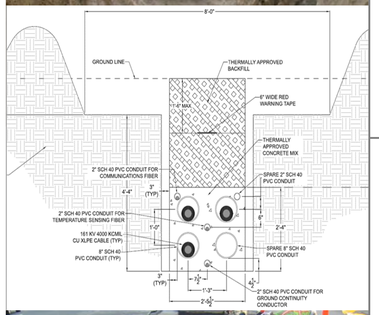

	UNDERGROUND TRANSMISSION	OVERHEAD TRANSMISSION
TEMPORARY VISUAL IMPACT AND DISTURBANCE	. Continuous disturbance along right of way. Minimum 30’ wide. . Typical trench created for duct bank is 4’ wide by 5’deep. Width and depth will increase with slope in terrain. . Access roads adjacent to trench continuously for access. . Vault excavation typically 30’ long by 10’ wide. Work area 75’ by 75’ for equipment. Located every ~4000’ due to cable length. . Linear earthwork including excavation, cutting, and benching of hills to install duct bank. . Minimum of 3.5 acres of disturbance per mile.	. Disturbance occurs at transmission pole locations, typically every 500’ to 700’ for 138 kV. . Temporary disturbance at pole locations varies but typical at 138 kV is 50’ by 75’. . Access roads only to pole locations. Use of existing roads. . Wire pulling sites typically 100’ by 300’. . Minimal earthwork, mainly clearing of large vegetation along right of way, and removal of all vegetation at pole locations. . Minimum of 0.7 acres of disturbance per mile.
PERMANENT VISUAL IMPACT AND DISTURBANCE	. Right of way will need to be kept clear of large vegetation to prevent root damage. . Access required to vaults for inspection. . No infrastructure visible except for high visibility markers and vault manhole caps. Scar of earthwork will remain.	. Right of way will need to be kept clear of large vegetation to maintain clearances to overhead conductors. . Access not required to all poles, but preferred for maintenance. . Poles and wires will be visible. Standard poles are self-rusting steel to blend with surroundings and limit visual impact.
MAINTENANCE / OPERATIONS	. Crews require special training, none currently at UNS. . Inspections require line to be out of service for worker safety. . Annual outage for inspections, typically 1 to 2 days per vault/mile . 5 year inspection would increase outage to 3-5 days per vault. . Minimized risk of unplanned outage due to weather. . In the event of cable failure, locating fault is difficult and can take specialized equipment. Once failure point is located, repair can take days to months depending on spare materials onsite.	. Utilize existing UNS maintenance personnel and training. . Annual visual inspection does not require outage, typically 2 hours/mile. . Most maintenance can occur while line is energized. . Higher risk of unplanned outage due to weather. . Locating failure points is performed visually typically within hours; repairs can often be completed within a day.
IMPACT TO THE ENVIRONMENT	. Construction of duct bank has substantial environmental impacts. . If environmentally/culturally sensitive areas exist, trenchless installation can be utilized. Length limited; significantly increases cost. . Large impact to wildlife, water, & environment during construction. . Less impact to wildlife, water, environmental after installation. . Low wildfire risk along underground route.	. Overhead lines can typically span environmentally/culturally sensitive areas. . Lines are designed to mitigate risks to wildlife such as birds. . Wildfire risk is low on overhead lines with proper maintenance and vegetation management program. UNS has robust operational procedures in place.

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	UNDERGROUND TRANSMISSION	OVERHEAD TRANSMISSION
ELECTRIC & MAGNETIC FIELDS	. Electric fields from underground lines are negligible. . Magnetic fields are generally higher than overhead lines directly above duct bank but decrease rapidly with distance. . Values are typically negligible at edge of right of way.	. Electric & Magnetic fields are found within transmission right of way. . Values are typically negligible at edge of right of way.
TRANSMISSION COSTS	. Typically 6 to 12 times the cost of overhead but can be higher based on project constraints. Average 10 times.	. About $2-3M per mile of overhead transmission line.
ENGINEERING AND OPERATIONS LIMITATIONS	. Underground cable and associated equipment life expectancy is approximately 50-60 years. . Underground transmission lines typically experience higher line losses than overhead transmission lines. . Underground transmission lines typically carry less power and require larger or multiple cables to carry similar power to overhead transmission lines. . Typically underground lines are limited to approximately 20 miles due to operational impacts. . Lines require long sweeping turns both vertically and horizontally which creates difficulty in hilly/mountainous environments.	. Overhead transmission line expected life range is over 80 years. . Overhead transmission lines typically experience less line loss than underground transmission lines. . Overhead transmission lines can carry more power than underground transmission lines. . No length limit to overhead transmission lines. . Can be installed in difficult terrain without significant impact to the environment.
CONSTRUCTION CHALLENGES	. Vegetation clearing required along right-of-way. . Large amount of grading and excavation required. . Jack and bore or horizontal directional drilling installations may be required for environmental and road crossings which are impactful to surrounding environment. . Road or lane closures common for routes along highways. . Could restrict access to homes for periods of time. . Presence of rock or hard soils can increase time and effort and have significant cost impacts.	. Vegetation clearing required along right-of-way. . Construction along roads could require lane closure and traffic control during day. . Subsurface conditions such as rock has minimal impact on installation time.

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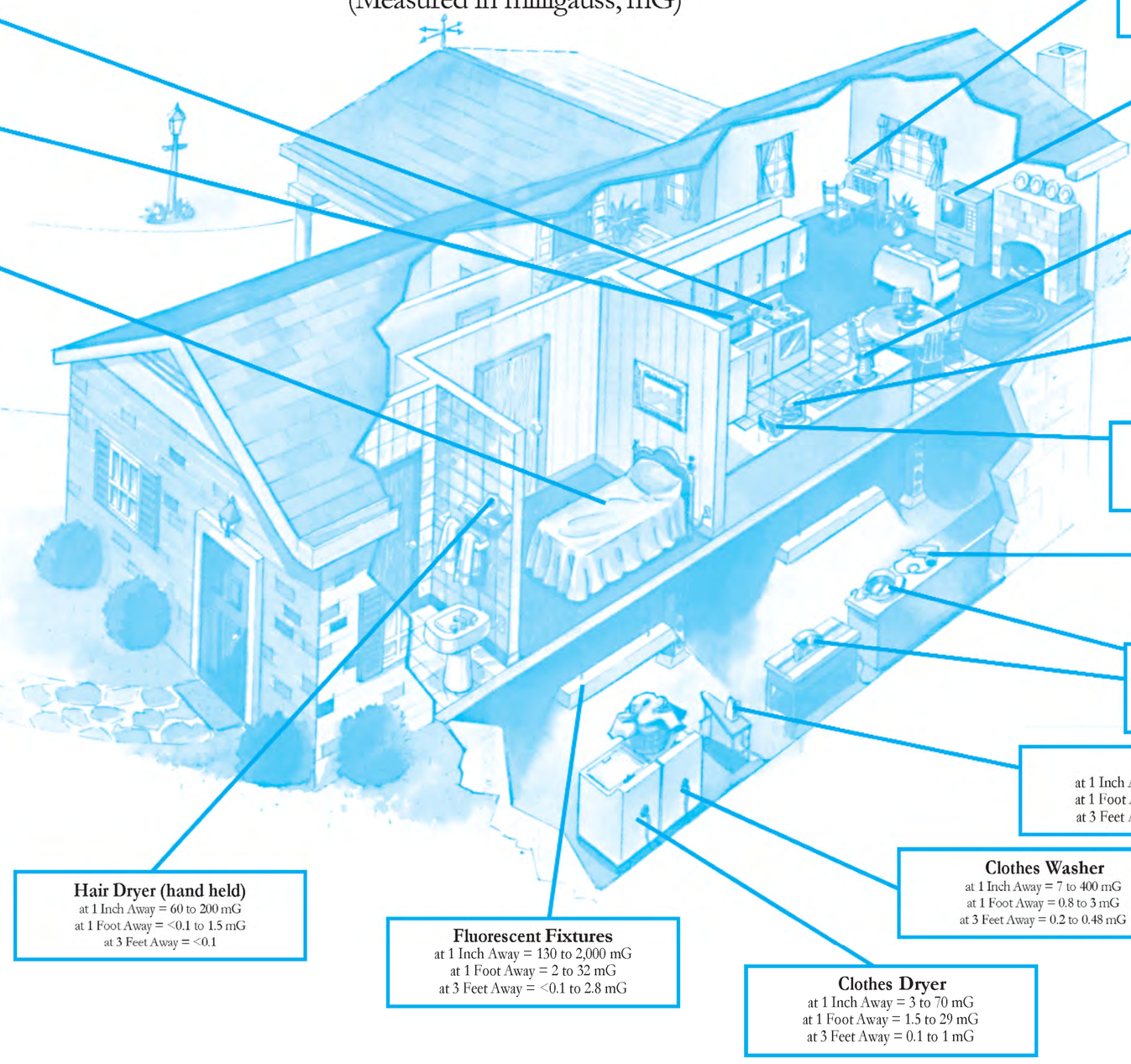
An electric magnetic field is an invisible force field that occurs naturally (e.g., lightning and the Earth's magnetic field), and also as a byproduct of technology. Electric magnetic fields surround any electrical device, such as appliances, house wiring, and power lines. They are emitted by electrically powered systems that light, cool and heat our homes, provide our communications and entertainment, and support other aspects of our modern lifestyle. The transmission, distribution and use of electric power results in weak electric and magnetic fields.

Comparing the magnetic field levels of appliances to electric transmission and distribution lines, you can see that many common household items produce a higher field than an electric power transmission and distribution system.

Magnetic Field Levels Around Homes

(Measured in milligauss, mG)



Electric Range
at 1 Inch Away = 60 to 2,000 mG
at 1 Foot Away = 4 to 40 mG
at 3 Feet Away = <0.1 to 7 mG

Microwave
at 1 Inch Away = 750 to 2,000 mG
at 1 Foot Away = 40 to 80 mG
at 3 Feet Away = 3 to 8 mG

Electric Blanket
at 1 Inch Away = 3 to 50 mG

Fluorescent Desk Lamp
at 1 Inch Away = 400 to 4,000 mG
at 1 Foot Away = 6 to 20 mG
at 3 Feet Away = 0.2 to 2.1 mG

Television
at 1 Inch Away = 25 to 500 mG
at 1 Foot Away = 0.4 to 20 mG
at 3 Feet Away = <0.1 to 1.5 mG

Blenders
at 1 Inch Away = 200 to 1,200 mG
at 1 Foot Away = 5.2 to 17 mG
at 3 Feet Away = 0.3 to 1.1 mG

Coffee Makers
at 1 Inch Away = 15 to 250 mG
at 1 Foot Away = 0.9 to 1.2 mG
at 3 Feet Away = <0.1 mG

Toasters
at 1 Inch Away = 70 to 150 mG
at 1 Foot Away = 0.6 to 7 mG
at 3 Feet Away = <0.1 to 0.11 mG

Drills
at 1 Inch Away = 4,000 to 8,000 mG
at 1 Foot Away = 22 to 31 mG
at 3 Feet Away = 0.8 to 2 mG

Saber & Circular Saws
at 1 Inch Away = 2,100 to 10,000 mG
at 1 Foot Away = 9 to 210 mG
at 3 Feet Away = 0.2 to 10 mG

Irons
at 1 Inch Away = 80 to 300 mG
at 1 Foot Away = 1.2 to 3.1 mG
at 3 Feet Away = 0.1 to 0.2 mG

Clothes Washer
at 1 Inch Away = 7 to 400 mG
at 1 Foot Away = 0.8 to 3 mG
at 3 Feet Away = 0.2 to 0.48 mG

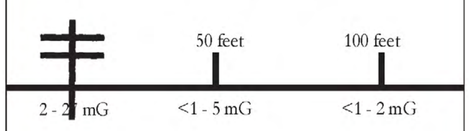
Clothes Dryer
at 1 Inch Away = 3 to 70 mG
at 1 Foot Away = 1.5 to 29 mG
at 3 Feet Away = 0.1 to 1 mG

Hair Dryer (hand held)
at 1 Inch Away = 60 to 200 mG
at 1 Foot Away = <0.1 to 1.5 mG
at 3 Feet Away = <0.1

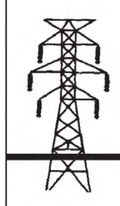
Fluorescent Fixtures
at 1 Inch Away = 130 to 2,000 mG
at 1 Foot Away = 2 to 32 mG
at 3 Feet Away = <0.1 to 2.8 mG

Measured Magnetic Fields Around Power Lines

Distribution Lines
(34.5 kV and under)



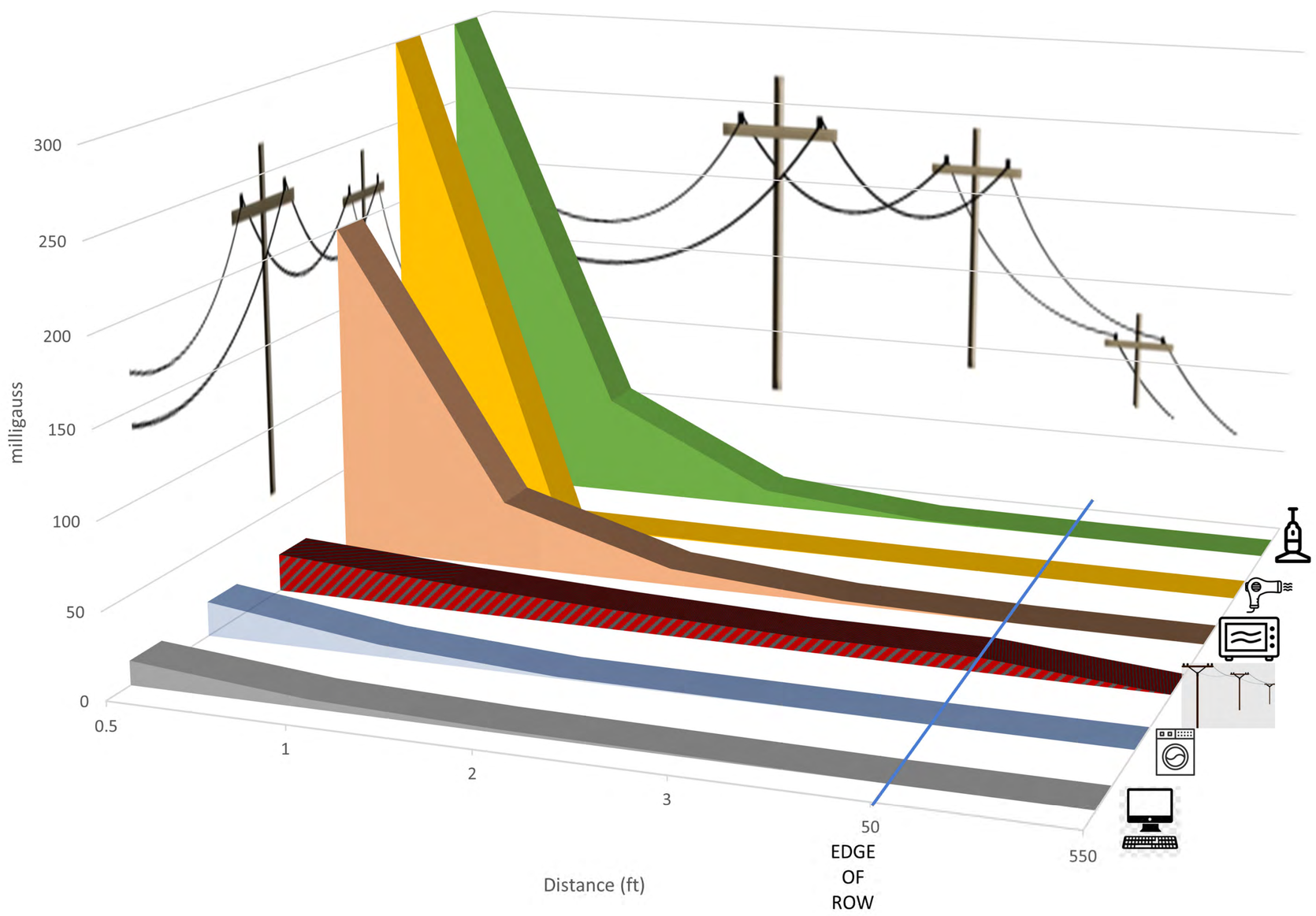
Transmission Lines
(115-500 kV)



Notes:

1. Sources of magnetic fields found in homes have been measured at:
   - household wiring <1 to 10 mG
   - ground currents on cold water pipe up to 5 mG
   - distribution lines <1 to 10 mG
2. Under peak load conditions, we calculate that the magnetic fields at the edge of right-of-way for transmission lines would not exceed 150 mG.

EMFs weaken significantly as they extend away from the source. TEP designs and builds its equipment to meet or exceed national building and safety standards. Median magnetic field strength, measured in milliGauss (mG), for common household items and overhead power lines is shown in the chart below.



Scientists continue to research health risks from electromagnetic fields and radiation from high voltage power lines (EMF/EMR). It is understood that the greater the distance and the less time you spend near the source, the lower your exposure. Based on research to date, given the distance to the powerlines within their 50- to 100-foot-wide rights-of-way, EMF/EMR exposure of 138kV line from a nearby residence would be very low, comparable to appliances in your home, or even less.