

Appendix K

Routing Study

January 2026

HORIZON WEST TRANSMISSION, LLC

Ironwood Transmission Line Project

Routing Study

PROJECT NUMBER:
0257826_0000

PROJECT CONTACT:
Benjamin O'Connor
EMAIL:
Benjamin.OConnor@powereng.com
PHONE:
562-298-6282



This page intentionally left blank.

EXECUTIVE SUMMARY

Horizon West Transmission, LLC (HWT) has prepared this transmission line Routing Study to identify, evaluate and compare alternative transmission line routes and to select a preferred transmission line route for the proposed Ironwood Transmission Line Project (Proposed Project). The Proposed Project is located in Yuma County, Arizona and Imperial County, California.

The Proposed Project is needed to add load-serving transmission capacity to meet current and long-term forecast electrical demand and improve system reliability by providing diverse transmission routes for power supply to the region. The Proposed Project includes the installation of an approximately 86-mile 500-kilovolt (kV) transmission line between the existing North Gila Substation in Yuma County, Arizona and the existing Imperial Valley Substation in Imperial County, California. The California Independent System Operator's (CAISO's) *2022-2023 Transmission Plan* (CAISO 2023a) includes functional specifications for this proposed 500-kV transmission line including line voltage, impedance, ampacity, and approximate line length. In addition to other factors discussed below, these functional specifications were also used to evaluate potential routes.

A total of 113 route links were initially evaluated within the Study Area; 59 of these route links were dismissed from consideration due to land use/environmental constraints and constructability challenges. From the remaining 54 links, 11 feasible route alternatives (shown on Figure 4-5) within three segments were selected for evaluation to identify those that minimize impacts to land and potential environmental impacts within the Study Area and provide the most feasible opportunities to meet the Proposed Project's purpose and need, constructability, permitting, and right-of-way (ROW) considerations. The alternatives presented reflect discussions with federal, state, and local land managers as well as local communities, the Fort Yuma Quechan Tribe and private landowners potentially affected along the route alternatives. A summary of the risks associated with the 11 alternatives are outlined in Table 4.4. Appendix B provides a more detailed comparison of the Preferred Route and alternatives.

Considering the risks associated with the eleven alternative routes and one subroute alternative, the Preferred Route minimizes potential property owner impacts, minimizes effects on the community and environmental resources, and optimizes engineering, constructability and long-term operation. The Preferred Route is shown in the figure below.



Scope of Routing Study

This Routing Study is intended to evaluate, based on functional specifications required by the CAISO, the range of potential route alternatives through which a transmission line achieving the criteria/purpose and need could be constructed, operated, and maintained. The alternatives were identified through a process that balances considerations including, but not limited to, CAISO functional specifications, engineering design, constructability, land and ROW acquisition, designated utility corridors, potential environmental impacts, and concerns from interested stakeholders and landowners. HWT's routing process accounts for key constraints and opportunities, including but not limited to federally designated utility corridors, the use of existing linear features, existing and planned generation projects including the East Mesa Solar Project, the Heber Dunes State Recreation Area, agricultural land uses, design and engineering considerations, and the Fort Yuma Quechan Reservation.

Routing Process

HWT developed and employed a comprehensive, systematic process for identifying, evaluating, and selecting from the alternatives a preferred transmission line route for the Proposed Project. The factors that HWT considered to identify and select a preferred route included: engineering and design requirements, system planning, constructability, regulatory requirements, environmental constraints and opportunities, stakeholder input, potential easement acquisition, permitting, lands and realty, and cost. Following identification of the approximately 670-square-mile Project Study Area, the routing study process included:

1. Collecting land use and environmental resource data from applicable agencies and other relevant sources.
2. Using the data to identify opportunities for and constraints to routing the Proposed Project's facilities.
3. Identifying a network of transmission line route alternative segments.
4. Screening and comparing route alternatives.
5. Identifying preliminary alternative routes.
6. Hosting two series of public open houses in communities near the potential route.
7. Consulting with landowners potentially affected by preliminary route alternatives.

8. Engineering and constructability reviews.
9. Comparing and finalizing alternative routes to move forward and include in state and federal licensing and environmental review documents.

During the routing study process, more than 400 miles of route alternatives were identified and analyzed.

Public and Tribal Outreach and Engagement

HWT hosted two rounds of open houses in California and provided attendees and nearby landowners with an interactive website and opportunities to provide comments.

HWT held a series of three open houses in February 2025. Landowners and tenants within the Project Study Area were invited to attend, and the meetings were open to the public. The purpose of this series of open houses was to introduce the Project, present the Project Study Area and seek community feedback on known constraints or opportunities in that area. HWT also met with some private landowners at their request to discuss potential locations for the Proposed Project, existing and potential constraints, and identify possible routing and siting opportunities to avoid or minimize those constraints. No routes were presented at these open houses intentionally to provide the public with an opportunity to make suggestions on where the transmission line should be located.

Input from the preliminary Routing Study and open houses helped to identify several potential routes. Once preliminary route alternatives were identified and evaluated, HWT continued to seek input from landowners and other stakeholders in the Project Study Area (e.g., Fort Yuma Quechan Tribe, local officials, business interests, recreational groups, and communities in the vicinity of the Proposed Project) before selecting the Preferred Route. In addition to several meetings with the Fort Yuma Quechan Tribe, HWT hosted a second round of public meetings in April and May 2025 with landowners and other stakeholders to solicit their input. The open houses in April and May did identify potential routes on a map for public feedback.

In total, HWT hosted six open houses with 88 people attending. Questions and comments received during the public open house meetings focused on location preference, landowner compensation, funding, and future notifications. HWT considered the comments in completing this Routing Study.

Conclusion

The analysis and comparison of alternatives shows that the Preferred Route (Alternatives 1B, 2, and 3C) best meets the Proposed Project's purpose and need while minimizing impact on land uses and environmental resources. The Preferred Route begins at the Arizona Public Service-owned North Gila Substation and travels north for 5.6 miles before crossing the Colorado River near the Imperial Dam to the west. The Preferred Route then proceeds west, paralleling the northern border of the Fort Yuma Quechan Reservation within the designated Bureau of Land Management California District utility corridors and Section 368 West-wide Energy Corridors. The Preferred Route then turns southwest, still within the utility corridors, and traverses west across the sand dunes and agricultural land until it reaches the San Diego Gas & Electric Company-owned Imperial Valley Substation. The Preferred Route avoids the Fort Yuma Quechan Reservation, existing residential development, areas planned or zoned for future residential development, impacts on existing commercial and industrial operations in the area and minimizes impacts on public ROWs.

TABLE OF CONTENTS

Executive Summary	i
Scope of Routing Study	ii
Routing Process	ii
Public and Tribal Outreach and Engagement	iii
Conclusion	iii
1.0 Introduction	1
1.1 Proposed Project Purpose and Need	1
1.2 Proposed Project Location and Overview	2
1.3 Regulatory Framework.....	2
2.0 Proposed Project Description	9
2.1 Existing and Proposed System	9
2.1.1 Existing Utility System.....	9
2.1.2 Proposed Project System.....	9
2.2 Transmission Facilities.....	11
2.2.1 Structures	11
3.0 Existing Conditions	13
3.1 Introduction.....	13
3.2 Land Use	13
3.2.1 Regulatory Framework.....	13
3.2.2 Existing Conditions	14
3.3 Biological Resources	15
3.3.1 Regulatory Framework.....	15
3.3.2 Existing Conditions	16
3.4 Water Resources	17
3.4.1 Regulatory Framework.....	17
3.4.2 Existing Conditions	17
3.5 Visual Resources and Aesthetics.....	17
3.5.1 Regulatory Framework.....	18
3.5.2 Existing Conditions	18
3.5.3 Visually Sensitive Areas.....	19
3.6 Cultural Resources	20
3.6.1 Regulatory Framework.....	20
3.6.2 Cultural Resources Records Search	20
4.0 Routing Study Process	21
4.1 Step 1 – Study Area.....	21
4.2 Step 2 – Data Inventory and Mapping, Fort Yuma Quechan Tribe Meetings, and Public Outreach	22
4.2.1 Fort Yuma Quechan Tribe Meetings	23
4.2.2 Public Outreach	24
4.2.2 Data Inventory	26
4.3 Step 3 – Identify Routing Opportunities and Constraints	27
4.3.1 Engineering Constraints.....	32
4.4 Step 4 – Identify Transmission Line Route Alternatives	32
4.4.1 Segment 1	32

4.4.2	Segment 2	34
4.4.3	Segment 3	34
4.5	Step 5 – Engineering and Constructability Reviews	35
4.6	Step 6 – Transmission Line Route Alternatives Comparison	35
4.6.1	Introduction	35
4.6.2	Route Alternatives Comparison and Evaluation	35
4.6.3	Preferred Route	58
4.6.4	Route Links Considered and Eliminated	59
4.6.5	Southern Yuma Area Routing Constraints	61
5.0	References Cited	75

TABLES:

TABLE 1-1	PRELIMINARY LIST AND DETAILS OF ANTICIPATED FEDERAL PERMITS AND AUTHORIZATIONS.....	3
TABLE 1-2	PRELIMINARY LIST OF ANTICIPATED STATE PERMITS AND AUTHORIZATIONS (PREFERRED ROUTE)	5
TABLE 2-1	TYPICAL DESIGN CHARACTERISTICS FOR THE PROPOSED PROJECT	10
TABLE 3-1	BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES	19
TABLE 4-1	RESOURCE SENSITIVITY LEVELS	29
TABLE 4-2	ROUTE ALTERNATIVE FEASIBILITY RANKING	36
TABLE 4-3	SOUTHERN YUMA AREA ROUTES SUMMARY COMPARISON TABLE	38
TABLE 4-4	SUMMARY COMPARISON TABLE.....	42
TABLE 4-5	ROUTE LINKS CONSIDERED AND ELIMINATED	59

FIGURES:

FIGURE 1-1	STUDY AREA	8
FIGURE 2-1	TYPICAL 500-KV TRANSMISSION LINE AND ROW CONFIGURATION	11
FIGURE 4-1	ROUTING STUDY PROCESS	22
FIGURE 4-2	SENSITIVITY OVERVIEW	37
FIGURE 4-3	NORTHERN ROUTES	64
FIGURE 4-4	SOUTHERN YUMA AREA ROUTES.....	65
FIGURE 4-5	ROUTE LINKS	66
FIGURE 4-6	ROUTE ALTERNATIVES AND CONSTRAINTS	70
FIGURE 4-7	PREFERRED ROUTE.....	74

APPENDICES:

APPENDIX A	YUMA STUDY AREA ROUTING CONSTRAINTS.....	1
APPENDIX B	ROUTE ALTERNATIVES COMPARISON TABLE.....	1

ACRONYMS AND ABBREVIATIONS

AC	alternating current
ACC	Arizona Corporation Commission
ACEC	Area of Critical Environmental Concern
APS	Arizona Public Service
AZ Site	Arizona Site Database
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CAISO	California Independent System Operator
CDFW	California Department of Fish and Wildlife
CEC	Certificate of Environmental Compatibility
CEQA	California Environmental Quality Act
CMA	Conservation and Management Action
CPCN	Certificate of Public Convenience and Necessity
CPUC	California Public Utilities Commission
ESA	Endangered Species Act of 1973
FAA	Federal Aviation Administration
FERC	Federal Energy Regulatory Commission
FTHL	flat-tailed horned lizard
GIS	geographic information system
GO	General Order
HWT	Horizon West Transmission, LLC
I-8	Interstate 8
IPaC	Information for Planning and Consultation
kV	kilovolt
MW	megawatts
NEPA	National Environmental Policy Act
NHD	National Hydrology Dataset
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
PEA	Proponent's Environmental Assessment
POCO	point of change in ownership
POWER	POWER Engineers, Inc.
Proposed Project	Ironwood Transmission Line Project
Reclamation	Bureau of Reclamation
ROW	right-of-way
SCE	Southern California Edison Company

SDG&E	San Diego Gas & Electric Company
SWPL	Southwest Powerlink
US	United States
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
VRM	Visual Resource Management
WVEC	West-wide Energy Corridors

1.0 INTRODUCTION

Horizon West Transmission, LLC (HWT), a California transmission-only utility (U 222-E), owns and operates transmission assets in the California Independent System Operator's (CAISO's) balancing authority area. HWT was selected by the CAISO as part of its 2022-2023 Transmission Planning Process, consistent with Federal Energy Regulatory Commission (FERC) Order 1000, to construct, own, operate, and maintain the Ironwood Transmission Line Project (Proposed Project), which was identified and determined to be needed to meet policy objectives in the CAISO's approved *2022-2023 Transmission Plan* (CAISO 2023a).

As required by the California Public Utilities Commission's (CPUC's) Proponent's Environmental Assessment (PEA) Guidelines (*Guidelines for Energy Project Applications Requiring California Environmental Quality Act (CEQA) Compliance: Pre-filing and Proponent's Environmental Assessments*, dated November 2019) and the CEQA statute (Pub. Resources Code § 21000 et seq.) and its implementing Guidelines (14 Cal. Code Regs. § 15000 et seq.), this section describes the objectives, purpose, and need for the Proposed Project. Information regarding the Proposed Project's purpose and need will also be provided in HWT's Certificate of Public Convenience and Necessity (CPCN) Application to the CPUC in accordance with CPUC General Order (GO) 131-E. Additionally, the Proposed Project would also be located in the State of Arizona and would require a Certificate of Environmental Compatibility (CEC) from the Arizona Corporation Commission (ACC). Further, the Proposed Project would cross federal lands requiring a right-of-way (ROW) for construction and operation. The federal lands ROW decision would be considered a major federal action and therefore would require compliance with the National Environmental Policy Act (NEPA).

1.1 Proposed Project Purpose and Need

The Proposed Project is needed to mitigate resource deliverability constraints as identified in the CAISO *2022-2023 Transmission Plan* (CAISO 2023a) to meet electrical energy generation requirements established in the CPUC-developed generation portfolios. The Proposed Project was included as part of a portfolio of projects that the CAISO determined could meet the major identified constraints across the Southern California Edison Company (SCE) Metro, SCE Eastern, and San Diego Gas & Electric Company (SDG&E) areas. The CAISO approved the Proposed Project as necessary to help mitigate the East of Miguel deliverability constraint, which the CAISO found presently results in zero deliverability for resources in the CPUC's base portfolio (3,080 megawatts [MW]) and sensitivity portfolio (10,398 MW) of electrical energy resources (CAISO 2023b). Ultimately, the Proposed Project would help support state portfolio standard goals, contributing to reduced carbon emissions and relieving strained transmission corridors.

Following a comprehensive and detailed routing analysis that was informed by and incorporated potential environmental, stakeholder, and engineering concerns as well as the functional specifications required by the CAISO, the Proposed Project was included in the CAISO *2022-2023 Transmission Plan* because it best meets the Project objectives described in that plan while minimizing, to the greatest extent practicable, potential impacts to environmental resources and potentially affected communities.

1.2 Proposed Project Location and Overview

The Proposed Project is an approximately 86-mile-long 500-kilovolt (kV) transmission line from Arizona Public Service's (APS') North Gila Substation to the SDG&E Imperial Valley Substation. The Proposed Project is located in western Yuma County, Arizona and Imperial County, California, crossing predominantly unincorporated lands. It is located in the vicinity of the incorporated communities of El Centro, Imperial, Calexico, Holtville, and Brawley, California, and Yuma, Arizona, and lands of the United States.

The Proposed Project includes construction and operation of the overhead transmission line, up to the point of change in ownership (POCO) within approximately 100 feet of the connecting utilities' substation property lines. At each substation, the owning utility installs the 500-kV transmission line from the respective POCO and line shunt reactors to a new 500-kV bus within the substation to enable interconnection of the Proposed Project.

1.3 Regulatory Framework

The Preferred Route for the Proposed Project will be located on federal lands administered by the Bureau of Land Management (BLM) (Yuma Field Office in Arizona and El Centro Field Office in California) and Bureau of Reclamation (Reclamation), as well as private, and state of California lands. NEPA and CEQA lead agencies, expected to be the BLM and CPUC respectively, must conduct a detailed analysis of the natural and human environment to make certain findings prior to making the decision(s) on the Proposed Project. The Project will also be required to obtain a CEC from the ACC. Federal findings will be documented under NEPA regulations due to a major federal action (grant of ROW); the California lead agency under CEQA must identify whether impacts are significant with a duty to mitigate or avoid such impacts in the CEQA document; and the ACC will decide whether to issue a CEC based on a comprehensive evaluation of environmental, technical, and community factors. The federal and state agencies must each prepare and present their own findings to their decision-makers. Consequently, justifying the findings are the separate responsibility of each agency. Although separate NEPA and CEQA processes and procedures will proceed for the Proposed Project, it is expected that lead agencies will closely coordinate with each other during the environmental review process, alternatives development, and alternatives comparison and selection to ensure that decisions under NEPA and CEQA are compatible. If necessary, lead agencies, along with HWT, may document a process or procedures for resolving incompatibilities with a Memorandum of Understanding. The necessary federal, state, and regional discretionary permits that may be required for the Proposed Project are listed in Table 1-1 and Table 1-2.

TABLE 1-1 PRELIMINARY LIST AND DETAILS OF ANTICIPATED FEDERAL PERMITS AND AUTHORIZATIONS

FEDERAL PERMIT OR AUTHORIZATION	AGENCY/ AGENCIES	GOVERNING RULE OR STATUTE	PERMIT/AUTHORIZATION TRIGGERS(S)	ANTICIPATED TECHNICAL STUDIES/REPORTS	APPLICATION PROCESS
Right-of-Way (ROW) Grant(s)	Bureau of Land Management (BLM)	Federal Land Policy Management Act (43 United States Code [U.S.C.] 43 § 1701 et seq.)	Necessary to construct, own, and operate a transmission line on federal land.	A Plan of Development (POD), including the Proposed Project design, construction means and methods, real estate information, and a preliminary assessment of potential impacts to environmental resources is required.	The federal land management agencies require preparation of a Standard Form (SF) 299 (i.e., application) requesting a ROW Grant. The SF-299 was submitted with a POD in March 2025.
Right of Use Authorization	Bureau of Reclamation (Reclamation)	The Reclamation Act of 1939 (U.S.C. 43 § 429 et seq.)	To construct, own, and operate a transmission line on federal lands under its jurisdiction, HWT is required to obtain a Use Authorization from Reclamation.	Per 43 Code of Federal Regulations (C.F.R.) 429(c), a right-of-use authorization on Reclamation land, requires a detailed description of the proposed use, the location and legal description of the land needed, the duration of the proposed use, the type of development or activity intended, potential environmental impacts, and any necessary mitigation measures; essentially, a comprehensive plan outlining how you intend to use the land and the potential effects of the proposed activity.	Reclamation requires preparation of a SF 299 (i.e., application) to request a use authorization for the use of Reclamation land. The SF-299 was submitted in March 2025.
National Environmental Policy Act (NEPA) Record of Decision (ROD)	BLM and Reclamation	NEPA (43 U.S.C. § 1638)	ROW Grant/Right of Use Authorization	Technical studies in coordination with the BLM/Reclamation. Upon completion of technical studies and a POD, the NEPA process will be initiated. Only projects with the potential to significantly affect the environment require an Environmental Impact Statement and ROD. HWT will prepare an appropriate NEPA document.	The SF299/POD serves as the application for the ROW Grant(s)/Right of Use Authorization, which triggers the NEPA process. A NEPA document will be prepared through cooperation between federal agencies.
Federal Endangered Species Act (ESA) Section 7 Consultation	United States Fish and Wildlife Service (USFWS)	ESA (16 U.S.C. § 1531 et seq.) Section 7	For federal actions potentially affecting ESA-listed species or their Critical Habitats, the lead agency is required to consult with the USFWS pursuant to Section 7.	Technical studies including a habitat assessment / vegetation mapping and appropriate focused/protocol surveys in coordination with the lead agency and USFWS (see Attachment 7.E-2.a Environmental Studies and Surveys) and prepare a Biological Assessment.	The USFWS requires that the lead agency initiate consultation and the preparation of Biological Assessment of impacts to listed species or their Critical Habitats. The USFWS will prepare a Biological Opinion of those impacts.

FEDERAL PERMIT OR AUTHORIZATION	AGENCY/ AGENCIES	GOVERNING RULE OR STATUTE	PERMIT/AUTHORIZATION TRIGGERS(S)	ANTICIPATED TECHNICAL STUDIES/REPORTS	APPLICATION PROCESS
National Historic Preservation Act (NHPA) Section 106	BLM	NHPA (54 U.S.C. § 306108) Section 106	For federal actions potentially affecting historic properties, the lead agency is required to consult with the State Historic Preservation Office (SHPO) pursuant to Section 106.	Cultural Resource Inventory and Survey Report.	The lead agency will initiate consultation with SHPO to provide a report that describes cultural resources in the Proposed Project Area, Potential Effects and an assessment of effects on those resources. SHPO will provide concurrence or consultation will continue.
Nationwide Permit (NWP) 57 Pre-Construction Notification (PCN)	United States Army Corps of Engineers (USACE) (Los Angeles District 1)	Clean Water Act (CWA) (33 U.S.C. §1251 et seq.) Section 404	To construct, maintain, repair, and remove a transmission line and associated facilities in waters of the U.S., HWT is required to obtain a NWP 57. A PCN is required if Proposed Project activities impact waters of the US on Tribal lands; result in permanent waterway realignment; include bank stabilization without incorporating bioengineering techniques; adversely impact essential fish habitat; or result in a loss of waters of the US within specific watersheds.	Aquatic Resources Delineation to identify potential waters of the US and conduct other technical studies for biological and cultural resources which must be addressed in the PCN.	Prepare a NWP 57 PCN, which serves as the application for a CWA Section 404 authorization from the USACE. The PCN will include ENG Form 6082 and all associated documentation as required by that form, and any supplemental reports for related technical studies.
Section 10 Permit	USACE	Rivers and Harbors Act of 1899	Placement of any structure in, over, or under a navigable water like the Colorado River.	Aquatic Resources Delineation to identify potential waters of the US. Other technical studies for biological and cultural resources. Additional studies may include an engineering analysis to assess structural integrity, construction methods, and material as well as well a navigation impact study.	To apply for a Section 10 permit under the Rivers and Harbors Act, the process typically begins with a pre-application consultation with the USACE. This is followed by submittal of a detailed application, including Project drawings, site maps, environmental documentation, and engineering assessments. If the Project warrants it, USACE will issue a public notice and open a comment period—usually lasting 15 to 30 days—for input from agencies and the public. After the comment period closes, the USACE reviews the application, weighing factors like environmental impact, navigation, and overall public interest. The review phase can take several months depending on Project complexity and potential concerns raised.

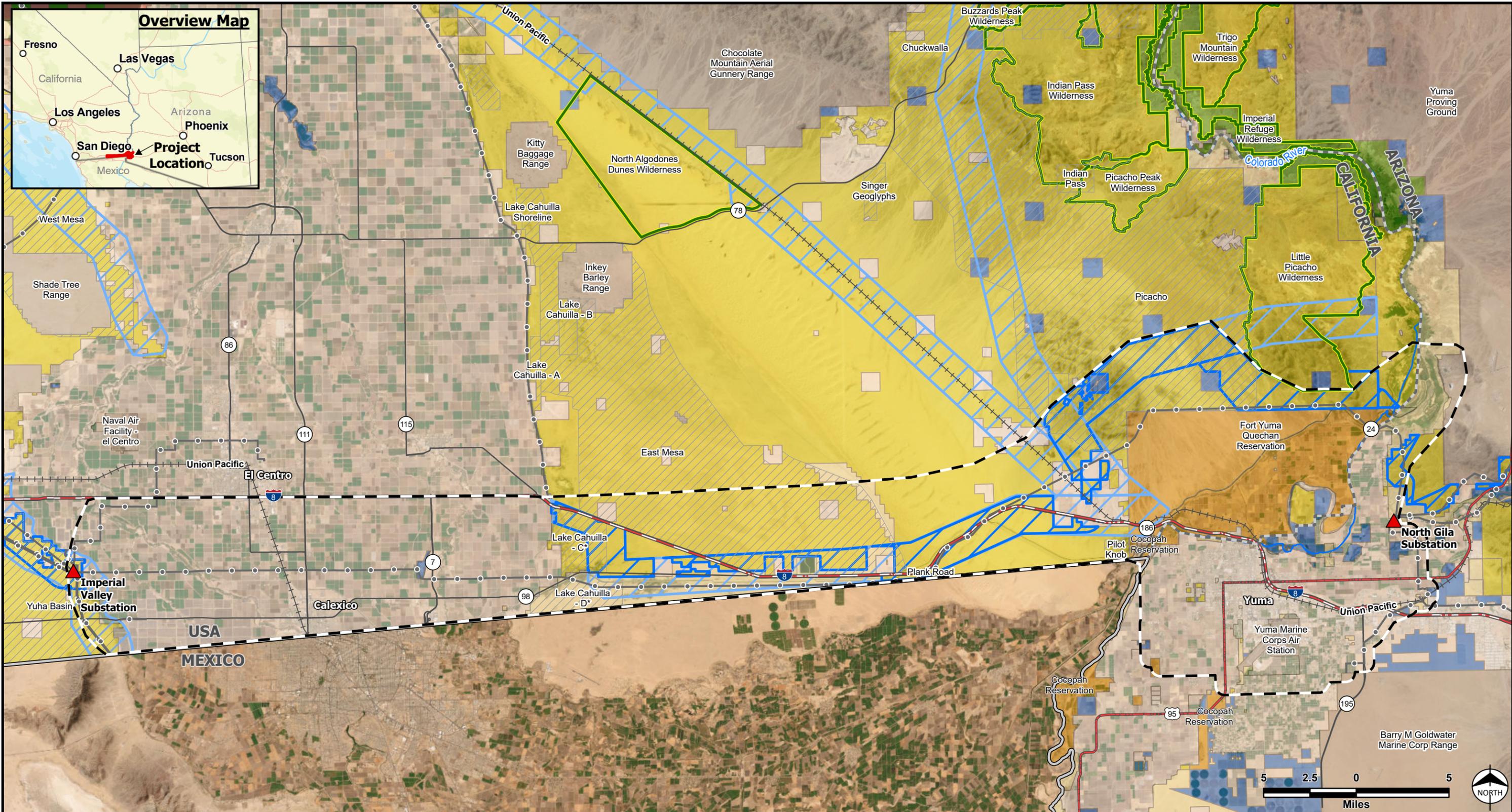
TABLE 1-2 PRELIMINARY LIST OF ANTICIPATED STATE PERMITS AND AUTHORIZATIONS (PREFERRED ROUTE)

STATE PERMIT OR AUTHORIZATION	AGENCY/ AGENCIES	GOVERNING RULE OR STATUTE	PERMIT/ AUTHORIZATION TRIGGER(S)	ANTICIPATED TECHNICAL STUDIES/REPORTS	APPLICATION PROCESS
California Permits or Authorizations					
Certificate of Public Convenience and Necessity (CPCN)	California Public Utilities Commission (CPUC)	Public Utilities Code Chapter 5 §1001, et seq.; General Order 131-D	CPUC has the sole regulatory jurisdiction to approve or deny the construction and operation of transmission lines designed for operation at 200 kV or more.	CPCN Application/Proponent's Environmental Assessment (PEA), including various technical studies addressing the CEQA resource categories identified in the CPUC's CEQA checklist.	Prepare and submit a CPCN application as well as a PEA, which is required for projects that would significantly affect the environment and supports both the CPCN General Proceeding and CEQA process.
California Environmental Quality Act (CEQA) Notice of Determination (NOD)	CPUC	PRC §21000 et seq CCR, Title 14, Chapter 3, § 15000 et seq.	A CPCN is considered a discretionary action; therefore, compliance with the CEQA is required. Through its November 2019 Guidelines for Energy Project Applications Requiring CEQA Compliance: Pre-filing and Proponent's Environmental Assessments the CPUC, as lead state agency, has a well-established process.	CPUC or HWT will prepare an appropriate CEQA document.	Prepare and submit to the CPUC a PEA along with the Proposed Project's CPCN application. Once the application is deemed complete, the CPUC will initiate the CEQA review process. HWT will provide updates in support of the CEQA process. The CEQA process, then, would tie into the CPCN General Proceeding (see above).
Incidental Take Permit (ITP)	California Department of Fish and Wildlife (CDFW)	California Fish and Game Code (CFGC) Section 2081 CCR Title 14, Section 783	Permit required to authorize incidental take of a state (i.e., California Endangered Species Act)-listed and candidate species.	To conduct technical studies including a habitat assessment/vegetation mapping and appropriate focused/protocol surveys in coordination with the CDFW and prepare an ITP Application.	Prepare an ITP Application following the guidelines provided by the CDFW.

STATE PERMIT OR AUTHORIZATION	AGENCY/ AGENCIES	GOVERNING RULE OR STATUTE	PERMIT/ AUTHORIZATION TRIGGER(S)	ANTICIPATED TECHNICAL STUDIES/REPORTS	APPLICATION PROCESS
Lake or Streambed Alteration Agreement (LSAA)	CDFW	CFGC Section 1600 et seq.	CDFW has discretionary approval of applications for activities that may substantially adversely affect fish and wildlife resources or alter jurisdictional waters of the State.	To conduct a Jurisdictional Delineation to identify features under jurisdiction of the CDFW pursuant to CFGC and conduct other technical studies for other biological resources which must be addressed in the application.	Prepare an LSAA application following completion of a preliminary jurisdictional delineation. CDFW will review the application for completeness and issue an LSAA upon completion of the CEQA process.
Water Quality Certification (WQC)	Regional Water Quality Control Board (RWQCB; Region 7 Colorado River Basin)	CWA (33 U.S.C. §1251 et seq.) Section 401 (see also CWA Section 404, Table 2-1)	The State Water Resources Control Board (SWRCB) and RWQCBs have discretionary approval of applications for activities that may substantially adversely affect waters of the state.	May require a Preliminary Wetland Delineation and Jurisdictional Determination of wetlands and waters under the jurisdiction of RWQCB Region 7.	Prepare a 401 CWA Application, which is required to obtain a WQC consistent with USACE NWP 57.
Construction Stormwater General Permit (CGP)	RWQCB (Region 7 Colorado River Basin)	CWA Sections 301 and 402(p) National Pollutant Discharge Elimination System (NPDES)	Projects that disturb more than one acre of land require coverage.	Stormwater Pollution Prevention Plan (SWPPP), including Best Management Practices (BMP) Plan.	Prepare and submit a SWPPP consistent with the statewide 2022 Construction General Permit (Order WQ 2022- 0057-DWQ).
California State Lands Commission (CSLC) Lease	California State Lands Commission	California Civil Code § 670, 830	Structures within the Ordinary Low Water Mark of the historic Colorado River.	Title review, historical, and hydrogeologic review to determine location of lands with state title.	Prepare an application, then the CSLC will complete Title/Boundary Review and environmental review, process the lease and permit, and vote on the lease. Finally, staff closes the transaction.
Arizona Permits or Authorizations					

STATE PERMIT OR AUTHORIZATION	AGENCY/ AGENCIES	GOVERNING RULE OR STATUTE	PERMIT/ AUTHORIZATION TRIGGER(S)	ANTICIPATED TECHNICAL STUDIES/REPORTS	APPLICATION PROCESS
Certificate of Environmental Compatibility (CEC)	Arizona Corporation Commission (ACC)	AAC §14-3-201 et seq	Required for construction and operation of a 115 kV or greater transmission line.	Application, including a detailed Proposed Project Description and alternatives, and appended technical studies. HWT will prepare environmental studies required by the ACC to obtain the CEC for the portions of the Proposed Project in Arizona, utilizing similar information as used in the CPUC PEA.	Prepare a CEC application as outlined in AAC §14-3- 219.
WQC	Arizona Department of Environmental Quality (ADEQ)	CWA (33 U.S.C. §1251 et seq.) Section 401	The ADEQ has discretionary approval of applications for activities that may substantially adversely affect waters of the state.	May require a Preliminary Wetland Delineation and Jurisdictional Determination of wetlands and waters under the jurisdiction of ADEQ.	Prepare a 401 CWA Application (Application Form for State Certification of Activities Requiring a USACE General or NWP) which is required to obtain a WQC. The application would include the USACE PCN Form.
CGP Authorization to Discharge	ADEQ	CWA Sections 301 and 402(p) Arizona Revised Statutes, Title 49, Chapter 2, Article 3.1	The ADEQ has discretionary approval of applications for activities that discharge into waters of the state from point sources of pollution.	SWPPP, including BMP Plan	Prepare a Notice of Intent (NOI) for coverage under the 2020 CGP (AZG2020-001) to be submitted online, including a SWPPP and BMP Plan.
Arizona State Lands Department (ASLD) Lease	ASLD	Arizona Revised Statutes § 37-1121 to 1130, 37-461	Structures within the Ordinary High-Water Mark of the historic Colorado River.	Title review, historical, and hydrogeologic review to determine lands with state title. Consult with all required parties including ADFW.	Prepare a complete application to the ASLD under Title 12, Chapter 5 of the Arizona Administrative Code. Ultimately the ASLD Commissioner would approve or reject the application.

FIGURE 1-1 STUDY AREA



Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction	US Fish and Wildlife Service (USFWS)
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	Colorado River	Bureau of Indian Affairs (BIA)	US Fish and Wildlife Service (USFWS)
Project Study Area	Section 368 Energy Corridor	U.S. Route	Wilderness Area	State Boundary	Bureau of Land Management (BLM)	Local Government
	BLM Utility Corridor	State Highway		US-Mexico Border	Department of Defense (DOD)	State Lands
		Railroad			Bureau of Reclamation (Reclamation)	Private/Undetermined

Figure 1-1

Study Area

Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ



*ACEC on Reclamation withdrawn lands managed by the BLM.

2.0 PROPOSED PROJECT DESCRIPTION

2.1 Existing and Proposed System

2.1.1 Existing Utility System

The existing high voltage electrical utility system in which the Proposed Project would be constructed consists of an existing single-circuit 500-kV transmission line extending from the APS owned and operated North Gila Substation in Arizona to the SDG&E owned and operated Imperial Valley Substation in California. Extending further west and outside of the Proposed Project area, two existing single-circuit 500-kV transmission lines extend into the SDG&E service territory from the Imperial Valley Substation. In addition to these high voltage 500-kV transmission lines, additional lower voltage transmission lines extend from these two substations in Arizona and California and traverse through the Proposed Project area. Where feasible, Project alternatives were routed adjacent to existing transmission lines.

2.1.2 Proposed Project System

This section provides descriptions of the Proposed Project components, including structure types, conductors, insulators and associated hardware to support the conductors, overhead ground wires, and foundations, as well as access roads, work areas, laydown yards. This section also provides information on management of induced currents.

The Proposed Project will include construction and operation of the overhead transmission line, up to the POCO within approximately 100 feet of the connecting utilities' substation property lines. At each substation, the applicable utility will install the 500-kV transmission line from the respective POCO and line shunt reactors to a new 500-kV bus within the substation to enable interconnection of the Proposed Project. The Proposed Project will not modify the existing utility system.

The Proposed Project will reinforce system reliability and allow delivery of electrical generation to Southern California while benefitting customers directly in San Diego County and Imperial County. The Proposed Project along with other transmission projects included in CAISO's 2022-2023 Transmission Planning Process (Imperial Valley-North of SONGS, North of SONGS-Serrano, and Serrano-Del Amo-Mesa transmission line projects) will help alleviate deliverability constraints and allow deliverability of electrical resources to San Diego and the Los Angeles Basin (Orange County, Los Angeles County) directly or indirectly through relief of other established pathways. On the eastern side of the Proposed Project's Study Area, the Proposed Project will also benefit the North Gila (Yuma, Arizona) area by reinforcing the reliability of the grid in Yuma County.

Typical design characteristics for the Proposed Project are listed in Table 2-1 with additional detail provided in the following sections. Final Proposed Project design characteristics will be determined in the detailed design phase prior to construction. Figure 2-2 is a diagram of a typical 500-kV transmission line and ROW configuration.

TABLE 2-1 TYPICAL DESIGN CHARACTERISTICS FOR THE PROPOSED PROJECT

FEATURE		DESCRIPTION
Transmission Line		
Line length	Approximately 86 miles	
Structure types	Guyed-V lattice and self-supporting steel tubular and lattice	
Structure height	Typical 145 feet; range of height varies with span and terrain	
Span length, typical	1,200 to 1,600 feet	
Span length, alternate (due to special conditions)	410 to 1,800 feet	
Number of structures per mile, typical	3 to 4	
Right-of-way width, typical ¹	250 feet	
Right-of-way width, narrow (agricultural areas)	250 feet	
Voltage	500 kV to 550 kV alternating current (AC)	
Capacity	3,700 megawatts approximately	
Circuit configuration	Single-circuit; horizontal, vertical, or delta depending on structure	
Conductor size	Three 1- to 2-inch diameter conductors per bundle, ACSS	
Minimum ground clearance of conductor (per NESC/General Order 95 requirements)	30 to 40 feet	
Overhead wire	Two overhead wires; comprised of either overhead ground wires and/or optical ground wires	
Land Permanently Disturbed²		
Lattice Guyed "V" (pedestal foundation plus 4 grouted anchors for guy wires)	Approximately 7-foot diameter foundation area + one-foot diameter for each of the four anchors (0.79 square feet x 4 = 3.16 square feet additional disturbance per structure)	
Self-supporting lattice (concrete drilled pier or micropile foundation)	Approximately 3-foot to 8-foot diameter foundation area per leg (4-leg or H-frame)	
Self-supporting tubular (concrete drilled pier or micropile foundation)	Approximately 6-foot to 12-foot diameter foundation area (monopole, 3-pole angle/dead-end)	
Land Temporarily Disturbed		
Structure work area ³	250 feet by 250 feet per site (1.4 acre)	
Staging area/yard	One yard every 20 miles; approximately 15 to 20 acres per site	
Wire pull-and-tension/stringing site	Approximately 250 feet by 600 feet (3.4 acres); one every 12,500 to 20,000 feet, with a midspan sleeving site located roughly in the middle	
Access Roads⁴		
New roads	24 feet total width (20-foot-wide travelway and 2-foot-wide berms / drainage on each side)	
Improve existing roads	20-foot travelway and 2-foot-wide berms / drainage on each side = 24 feet total width	
<p>Notes:</p> <p>ACSR = Aluminum Conductor Steel Reinforced; ACSS = Aluminum Conductor Steel Supported; NESC = National Electrical Safety Code</p> <p>¹ The right-of-way (ROW) width required for a transmission line is generally determined by the voltage level, structure type, and other factors such as safety, environmental considerations, and maintenance needs. While regulatory agencies such as the Federal Energy Regulatory Commission (FERC) do not specify ROW widths for transmission lines they do provide guidelines related to safety, vegetation management, and clearance that help determine the required ROW width. Further, this width is necessary to allow adjustments to final Project feature locations that avoid environmental constraints (e.g., aquatic features, cultural resources, geologic topographies), ensures that construction equipment has adequate space to perform tasks within the defined boundary (e.g., turn around large vehicles, pulling sites, tensioning sites, staging yards), and promotes regional planning goals (e.g., locating within existing utility corridors, efficient footprint that promotes joint utility use and future expansion, conformance with local plans).</p> <p>² Permanent structure foundation diameter and embedment depth is dependent on soil properties and structure loading and would be determined during detailed design.</p> <p>³ Temporary structure work area is inclusive of permanent structure base area.</p> <p>⁴ Typical main access road or spur road width indicated; maximum road widths would be specified in the Plan of Development and are dependent on terrain and construction specifications for selected transmission line route.</p>		

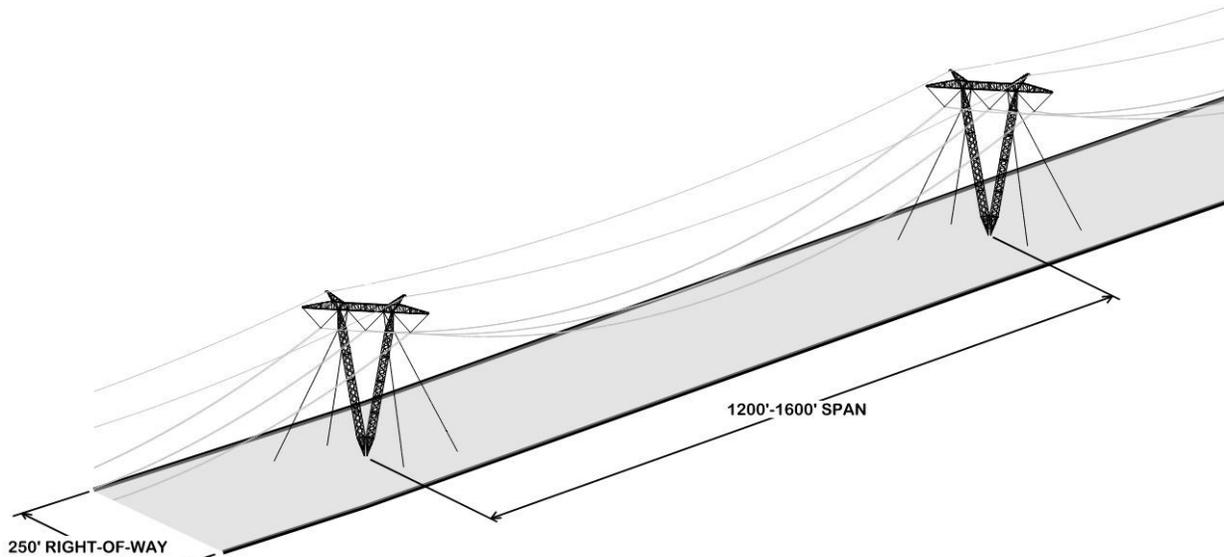


FIGURE 2-1 TYPICAL 500-KV TRANSMISSION LINE AND ROW CONFIGURATION

2.2 Transmission Facilities

One single-circuit 500-kV alternating current (AC) overhead transmission line will be constructed for the Proposed Project. The transmission line will extend between the existing North Gila Substation in Arizona and the existing Imperial Valley Substation in California for approximately 86 miles, depending on the route selected for construction. The transmission components include structures, foundations, conductors, insulators, associated hardware to support the conductor, and overhead ground wire.

The design, construction, operation, and maintenance of the Proposed Project will be designed to meet or exceed the requirements of the National Electrical Safety Code; United States Department of Labor, Occupational Safety and Health Standards; and GO 95. The construction contractor(s) will be responsible for properly grounding all metallic fences that parallel the transmission line for more than 500 feet and are located within 150 feet of the centerline. Grounding will also include large metal buildings and other types of metallic objects within 150 feet of the centerline.

2.2.1 Structures

Typical 500-kV structure types, as described below, could be used for the Proposed Project, including the following:

Guyed Structures

- Lattice Guyed "V" (LGV)

Self-Supporting Structures

- Lattice Tower Tangent (LTT)
- Lattice Tower Angle (LTA)
- Lattice Tower Dead-End (LTD)
- Lattice H-Frame Tangent (LHT)

- Lattice Mast Tangent (LMT)
- Tubular Monopole Tangent (TMT)
- Tubular Monopole Y-Frame Tangent (TYT)
- Tubular Monopole Angle (TMA)
- Tubular H-Frame Tangent (THT)
- Tubular 3-Pole Angle (T3A)
- Tubular 3-Pole Dead-End (T3D)

The locations for each structure type will be determined during final design, and selected based on site-specific conditions (e.g., topography, terrain, constrained ROW) or to mitigate impacts resulting from the Proposed Project. Proposed structures vary in height; however, none will exceed 200 feet, in order to remain below the threshold at which the structure may affect navigable airspace based on Federal Aviation Administration (FAA) regulations. A diagram of each structure type that may be used for the Proposed Project is included in Appendix A. Appendix A also includes additional details on other components that are necessary for the construction and operation of the Proposed Project.

3.0 EXISTING CONDITIONS

3.1 Introduction

This section describes the Proposed Project's existing conditions and land use, biological resources, water resources, visual resources and aesthetics, and cultural resources.

3.2 Land Use

More than 95% of the Proposed Project is located within undeveloped open areas, with the remaining less than 5% located within developed areas (including the City of El Centro, City of Calexico and City of Yuma). Imperial County, the City of El Centro, City of Calexico, Yuma County, and the City of Yuma have designated lands within the Study Area as either Residential, Agricultural, Industrial, Commercial, Open Space, Government, Mixed Use, Business Park, Public/Quasi-Public, Resort, or Recreation.

3.2.1 Regulatory Framework

Federal

The Proposed Project is located within the California Desert Conservation Area managed by the BLM. Applicable federal land use policies or regulations include:

- Federal Land Policy and Management Act
- California Desert Conservation Area Plan
- Desert Renewable Energy Conservation Plan
- BLM Land Use Plan Amendments
- Northern and Eastern Colorado Desert Coordinated Management Plan
- Imperial Sand Dunes Recreation Area Management Plan
- Yuma Resource Management Plan

State of California

Pursuant to California Public Utilities Code Section 1001 and CPUC GO 131-E, the CPUC has sole and exclusive jurisdiction over the siting and design of electric power line projects, distribution lines, substations, or electric facilities constructed by public utilities in California. Under the CEQA, the CPUC is the lead agency with respect to such Proposed Project elements within California.

Local Government

The Proposed Project is approximately 86 linear miles in Imperial County, California, and Yuma County, Arizona.

Jurisdictions in the Study Area include Imperial County and Yuma County. Local government land use codes and comprehensive plans for relevant requirements, guidelines, and policies were reviewed including:

- Imperial County Zoning Ordinance
- Imperial County General Plan
- Yuma County Zoning Ordinance
- Yuma County Comprehensive Plan

These codes provide the legal framework for regulating and permitting land use and development in each jurisdiction. The plans provide goals and policies to support development while protecting land uses and cultural and natural resources, including floodplains, wetlands, riparian corridors, natural areas, wildlife habitat, and prime farmland.

3.2.2 Existing Conditions

Land use data were collected from sources available in the public domain such as geographic information system (GIS) data and land use plans and development codes for Imperial County and Yuma County.

Land use in the Proposed Project Study Area is predominantly recreational or agricultural but also includes a segment of the Colorado River and a small area zoned Specific Plan for future development adjacent to the community of Heber.

Existing Land Use

The Study Area comprises predominately recreational or agricultural zoned uses but also includes a segment of the Colorado River and a small area zoned Specific Plan for future development adjacent to the community of Heber.

Defined places of worship, schools, and parks and recreational facilities are absent in the Study Area and are generally concentrated in the areas just south and west of the Study Area boundaries. The exception being within and surrounding the City of Yuma, where dense urban development exists and significant amounts of religious, residential and commercial sections are located within the Study Area. Specifically, this area includes the following 81¹ places of worship²: Roman Catholic (5), Baptist (6), Lutheran (3), Episcopal/Anglican (2), Presbyterian (2), Methodist (2), Nazarene (2), LDS (2), Adventist (2), Jehovah's Witness (2), Pentecostal (2), Other Christian (48), Judaism (1), Hindu (1), and Islam (1). In addition to attending services, members of these congregations practice their beliefs in the Project Study Area through youth and family community service, distribution of food and necessities to the poor and infirmed, social justice support, immigrant assistance, and interfaith community initiatives.

The Study Area also includes the Fort Yuma Quechan Reservation. The area within and surrounding the Reservation contains areas that continue to be used for ceremonial purposes. Additionally, the city of Winterhaven includes facilities such as the Fort Yuma Quechan's main office, recreational facilities, and school.

Other areas of dense urban development consisting of residential, commercial, and industrial uses are located in California near the Cities of El Centro, Heber, and Calexico. This area also

¹ Number of specific denomination locations in parenthesis.

² Cathedrals, churches, temples, centers, etc.

consists predominantly of irrigated agricultural lands mixed with several cattle producing operations that would pose a conflict with the Proposed Project.

Major transportation thoroughfares in the vicinity of the Proposed Project include Interstate 8 (I-8) and State Route 98. These highways run parallel to existing transmission lines and the Proposed Project in utilities corridors that run through Yuma County and Imperial County.

Utilities in the vicinity of the Proposed Project include numerous existing solar energy collection fields developed over the past decade in the southwestern Imperial Valley between I-8 and the United States (US)-Mexico Border. The most dominant utility is the existing 500-76 kV Southwest Powerlink (SWPL) transmission line, which the Proposed Project would parallel when feasible.

3.3 Biological Resources

Federal, state, and local regulations were reviewed for applicability to the Proposed Project.

3.3.1 Regulatory Framework

Federal

- Endangered Species Act (16 United States Code [U.S.C.] § 1531 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)
- Bald and Golden Eagle Protection Act (16 U.S.C. § 668)
- California Desert Conservation Area Plan
- Desert Renewable Energy Conservation Plan
- Imperial Sand Dunes Recreation Area Management Plan
- Northern and Eastern Colorado Desert Coordinated Management Plan
- Yuma Resource Management Plan
- BLM Land Use Plan Amendment

State of California

- California Endangered Species Act (California Fish and Game Code § 2050-2100)
- California Code of Regulations Title 14 Section 460
- Native Plant Protection Act
- California Fish and Game Code §§ 3511, 4700, 5050, and 5515
- California Fish and Game Code §§ 3500-3516, and 3800
- California Public Resources Code §§ 4292 and 4293
- CPUC, GO 95, Rule 35, Vegetation Management
- California Native Plant Society

State of Arizona

- Arizona Native Plant Law
- Arizona Wildlife Conservation Strategy

3.3.2 Existing Conditions

To identify the presence or potential presence of sensitive biological resources in the Proposed Project Study Area, the following data sources were reviewed:

- Publicly available aerial imagery of the Study Area
- California Department of Fish and Wildlife (CDFW) California Natural Diversity Database RareFind5
- California Native Plant Society's Online Inventory of Rare and Endangered Plants of California
- United States Fish and Wildlife Service's (USFWS') Information for Planning and Consultation (IPaC)
- CDFW Special Animals List
- CDFW Special Vascular Plants, Bryophytes, and Lichens List
- Arizona Game and Fish Department's Species of Greatest Conservation Need List
- BLM's Sensitive Species List

Based on review of this data there are several sensitive biological resources located within the Proposed Project Study Area. These may include but are not limited to the following resources:

- Western Burrowing Owl
- Desert Tortoise
- Flat-tailed Horned Lizard
- Southwestern Willow Flycatcher
- Yuma Ridgeway's Rail
- California Black Rail
- Yellow-billed Cuckoo
- Gila Woodpecker
- Special-status Raptors
- Special-status Plants

3.4 Water Resources

Federal, state, and local regulations were reviewed for applicability to the Proposed Project.

3.4.1 Regulatory Framework

Federal

- California Desert Conservation Area Plan
- Desert Renewable Energy Conservation Plan
- Imperial Sand Dunes Recreation Area Management Plan
- Eastern Colorado Desert Coordinated Management Plan
- Yuma Resource Management Plan
- Clean Water Act of (33 U.S.C. § 1251 et seq.)
- Section 401 – Water Quality Certification (23 CCR § 3830, et seq).
- Section 404 – Permitting for Dredge and Fill Activities in Wetlands and Waters of the US.

State of California

- California Fish and Game Code §§ 1600-1617, Lake and Streambed Alteration Agreement
- Porter-Cologne Water Quality Control Act

3.4.2 Existing Conditions

To identify the presence or potential presence of sensitive waters resources in the Proposed Project Study Area, the following data sources were reviewed:

- National Wetlands Inventory (NWI)
- National Hydrology Dataset (NHD)
- Watershed Boundary Dataset
- Natural Resources Conservation Service's Web Soil Survey
- National List of Hydric Soils

Based on review of this data, there are likely jurisdictional waters resources located within the Proposed Project Study Area. A delineation of potentially jurisdictional waters within the Proposed Project Study Area will be conducted at a future date in support of any jurisdictional waters permits needed for the Proposed Project.

3.5 Visual Resources and Aesthetics

This section summarizes the visual resources along Proposed Project alternative routes and identifies visually sensitive areas that may be affected by the siting of a transmission line. The

summary includes a description of the study methodology, Study Area overview, and a sensitivity analysis.

Visual resource information was collected from federal sources including from the BLM to determine agency management classes, including BLM's Visual Resource Management (VRM) Classes identified in the respective Resource Management Plans (see Land Use Resources). In addition, designated state and federal scenic roads were identified in the Study Area. These data were obtained from the Federal Highway Administration (2024), California Department of Transportation (Caltrans 2024) and Arizona Department of Transportation (2024). The visual resources constraint analysis also incorporated relevant state and nationally significant jurisdictional data that may be visually sensitive.

3.5.1 Regulatory Framework

Federal, state, and local regulations were reviewed for applicability to the Proposed Project.

Federal

- BLM Visual Resource Management System
- California Desert Conservation Area, Land Management Plan
- Desert Renewable Energy Conservation Plan, Land Use Plan Amendment
- Land Use Plan Amendment-Wide Conservation and Management Actions (CMAs)
- California Desert National Conservation Lands CMAs
- General Public Lands CMAs
- Development Focus Areas CMAs
- Northern and Eastern Colorado Desert Coordinated Management Plan
- Imperial Sand Dunes Recreation Area Management Plan
- Yuma Resource Management Plan
- Best Management Practices for Reducing Visual Impact of Renewable Energy Facilities on BLM-Administered Lands

State of California

- California Department of Transportation: Scenic Highway Program

State of Arizona

- Arizona Department of Transportation: Scenic Highway Program

3.5.2 Existing Conditions

The Proposed Project landscape setting is located within California's Imperial Valley and southwestern Arizona within the Sonoran Basin and Range ecoregion (United States Environmental Protection Agency 2024). The landscape is generally characterized by flat desert bounded by high-relief mountains and foothills provided as backdrop or set within the viewshed. The topography of the Proposed Project Study Area ranges from relatively flat to slightly sloping

valleys to steep sloping, rugged mountain ranges. Elevations in the valley bottoms range from slightly below sea level to over 2,000 feet at some mountain peaks in the background viewshed (Stud Mountain, Quartz Peak). More typically, surrounding mountain peaks are in the 500- to 1,500-foot (above mean sea level) elevation range.

The desert landscape provides a dramatic contrast against the backdrop of the surrounding mountain ranges. Ecoregions in the Proposed Project Study Area include Western Sonoran Basins (western uplands), Imperial Valley, Central Sonoran/Colorado Desert Mountains, Sand Hills/Dunes, Central Sonoran/Colorado Desert Basin uplands, and Lower Colorado River Valley riparian landscape. Vegetation consists of Sonoran Desert communities which contain large areas of paloverde-cactus shrub and giant saguaro cactus. Microphyll woodland trees and shrubs, such as ironwood, blue paloverde, smoketree, and desert willow generally are unique to this desert, occupying desert washes with occasional moisture flow. Water features in the Proposed Project Study Area consist of irrigation ditches, the Central Arizona Project Canal, and the Colorado River, with the Salton Sea occupying the extreme northern portion of the regional landscape.

For initial impacts on viewers, impacts will be based on Proposed Project visibility and location within a specified distance zone (e.g., high sensitivity viewer and Proposed Project in middle-ground with strong contrasts) and viewing condition variables. Visibility is determined through primary observation (Key Observation Point field reconnaissance). To aid in determining CEQA impact significance, visual sensitivity and Proposed Project contrast will be used. Proposed Project contrast is based on the BLM Contrast Rating methodology (BLM 1986a).

3.5.3 Visually Sensitive Areas

BLM VRM classifications and associated objectives define the levels of acceptable visual change (contrast) allowed on BLM-administered land, ranging from Class I to Class IV; Class I being the most restrictive and Class IV being the least restrictive. Table 3-1 summarizes VRM Class objectives per BLM Manual H-8410-1 (BLM 1986b). There are no formal guidelines for managing visual resources on state, private, or other non-federal lands.

TABLE 3-1 BLM VISUAL RESOURCE MANAGEMENT OBJECTIVES

MANAGEMENT CLASS	DESCRIPTION
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be very low. Management activities may be seen but should not attract attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic elements.

3.6 Cultural Resources

3.6.1 Regulatory Framework

The primary regulations relevant to cultural resources in the Study Area include Section 106 of the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act of 1979, Native American Graves Protection and Repatriation Act and the Desert Renewable Energy Conservation Plan Programmatic Agreement. Because the Study Area includes lands owned and managed by the BLM, the Proposed Project would constitute an undertaking as specified in Section 106 and will require the completion of a detailed cultural resources investigation, including but not limited to a formal Class I literature review and Class III pedestrian inventory, to determine whether historic properties exist within the Proposed Project Study Area. A records search was conducted to assess potential effects to previously recorded cultural resources as described below.

3.6.2 Cultural Resources Records Search

To assess the presence and distribution of cultural resources that exist within the Study Area, several databases and maps were consulted. These included online databases for the National Register of Historic Places (NRHP), National Historic Landmarks, National Historic Trails, historical General Land Office plat maps, historical aerial photographs, and US Geological Survey topographic maps. Additionally, a file search was completed through the California Historical Resources Information System and the Arizona Site Database (AZSite).

Three National Historic Trails exist within the Study Area including Betty's Kitchen National Recreation Trail, Juan Batista de Anza National Historic Trail, and Gila Trail/Butterfield Overland Trail. Six National Historic Landmarks exist within the Study Area, all located in the Yuma area. Native American reservations and sovereign lands, including the Fort Yuma Quechan Reservation and a portion of the Cocopah Reservation were identified in the Study Area.

The review of records provided by the California Historical Resources Information System and AZSite identified 1,862 previously documented sites and isolated cultural resources (including archaeological and built environment resources) within the Study Area. These cultural resources include but are not limited to the following resource types:

- Architectural features such as roads, canals, bridges, energy related infrastructure and single-family residences.
- Archaeological resources such as isolated and low-density artifact scatters, petroglyphs, trail systems, mining complexes.
- The Historic Yuma District.

Of the 1,862 cultural resources identified in the records search for the Study Area, the majority do not appear to have been formally evaluated for NRHP eligibility.

The Proposed Project would, to the extent feasible, seek to avoid cultural resources through Project design.

4.0 ROUTING STUDY PROCESS

The routing study process is organized in the six steps described below and in Figure 4-1:

- Step 1: Identify a Study Area that would encompass the identification of reasonable alternatives for the Proposed Project.
- Step 2: Collect data to characterize the land uses and environmental resources in the Proposed Project Study Area and conduct public outreach.
- Step 3: Identify opportunities for and constraints to routing the Proposed Project.
- Step 4: Identify route alternatives for the Proposed Project.
- Step 5: Conduct engineering and constructability review.
- Step 6: Screen, compare, and rank the route alternatives and identify a Preferred Route to carry forward into permitting.

4.1 Step 1 – Study Area

A Study Area was established to define a geographical area within which reasonable and feasible potential routing alternatives for a high voltage transmission line could be established consistent with the purpose and need for the Proposed Project (see Section 1.0). Environmental data was collected within the approximately 670-square-mile Study Area that overlays Yuma County and Imperial County (shown in Figure 1-1) and used to identify potential transmission line routes. Much of the Study Area contains undeveloped lands under federal jurisdiction; however, there are developed areas (including the City of El Centro, City of Calexico and the City of Yuma). Federally owned lands and managed jurisdictions include the Bureau of Indian Affairs (BIA), BLM, Department of Defense, Reclamation, and USFWS, while other lands are under the jurisdiction of the states of California and Arizona and local governments. Much of the southern boundary of the Study Area became defined by the Mexico-US border. The northern border of the Study Area was defined by the City of El Centro, I-8, and the Little Picacho Wilderness area. BLM managed land to the north of the Fort Yuma Quechan Reservation was included in the Study Area so as to capture West-wide Energy Corridors (WWEC) and BLM Utility Corridors as they would be considered feasible routing opportunities. The eastern side of the Study Area was largely defined by an existing 500-kV transmission line (SWPL and SDG&E) and the Yuma Proving Grounds.

It should be noted that the southern boundary of the Study Area was initially defined by the dense urban development of the City of Yuma and the Colorado River, which separates the City of Yuma from the Fort Yuma Quechan Reservation and is the boundary between the states of Arizona and California; however, after several meetings with the Fort Yuma Quechan Tribe (see Section 3.1 above), the boundary was extended to include the City of Yuma and areas south of the City. The Study Area is shown on Figure 1-1.

FIGURE 4-1 ROUTING STUDY PROCESS

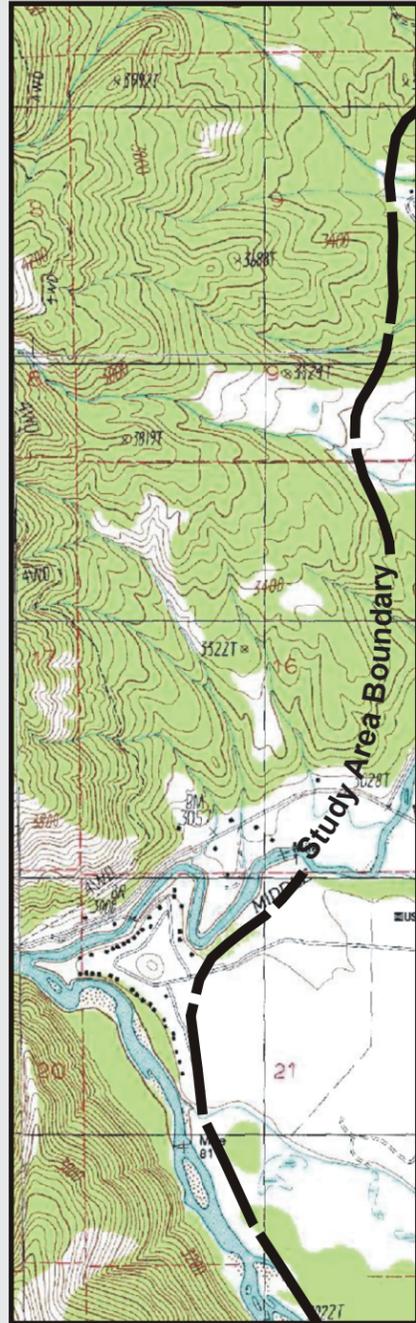
Routing Process | Ironwood Transmssion Line Project

Figure 4-1

Step 1:

Identify a Study Area that would encompass the identification of reasonable alternatives for the Proposed Project.

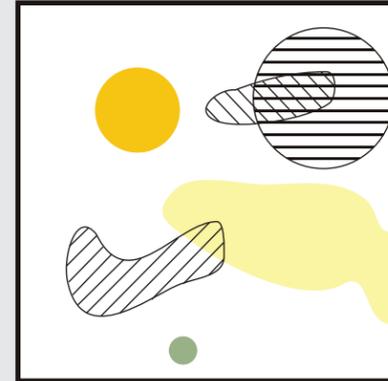
Study Area Map



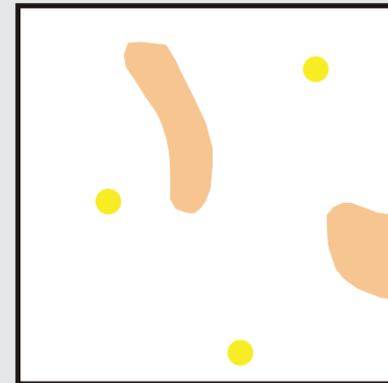
Step 2:

Collect data to characterize the land uses and environmental resources in the Proposed Project Study Area and conduct public outreach.

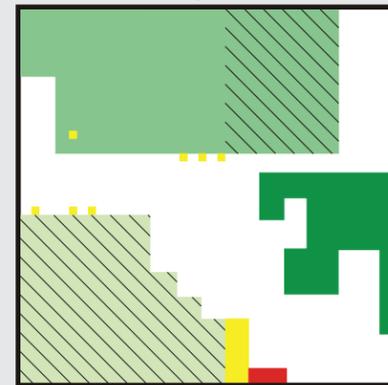
Resource Map



Resource Map



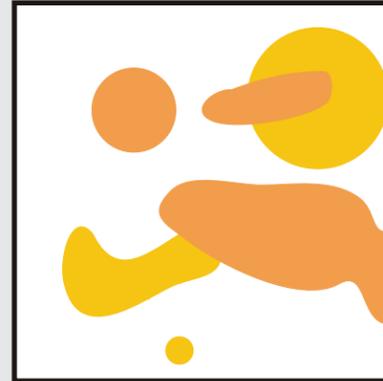
Resource Map



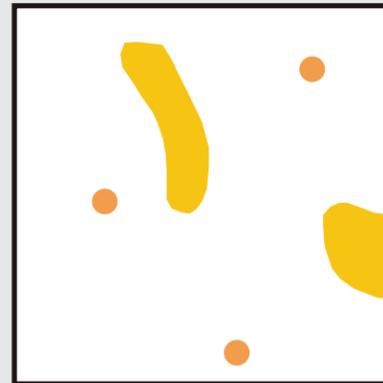
Step 3:

Identify opportunities for and constraints to routing the Proposed Project.

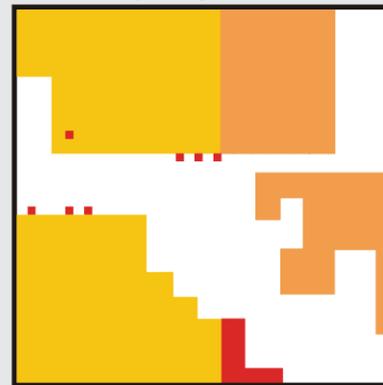
Sensitivity Map



Sensitivity Map

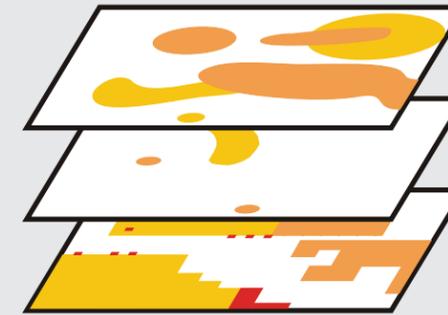


Sensitivity Map

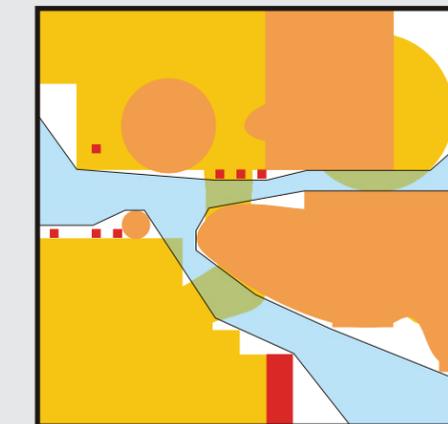


Step 4:

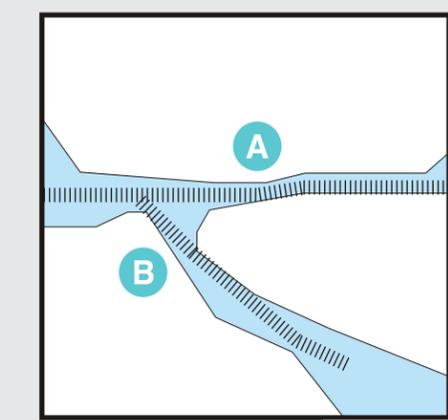
Identify route alternatives for the Proposed Project.



Composite Environmental Constraints



Corridors and Alternatives

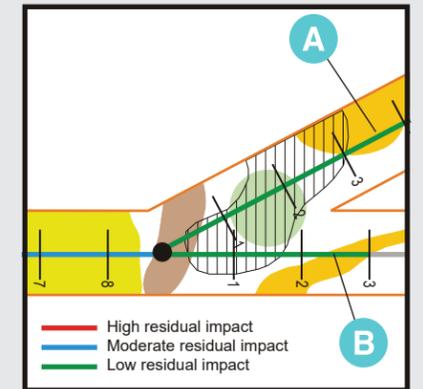


Step 5:

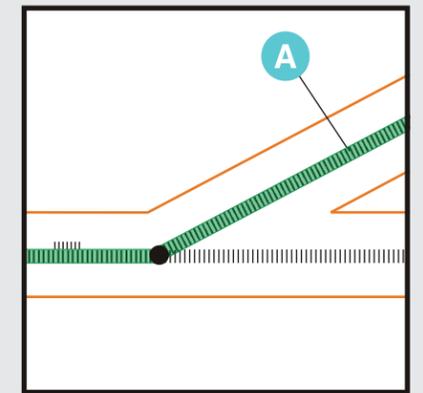
Conduct engineering and constructability review.

Step 6:

Screen, compare, and rank the route alternatives and identify a Preferred Route to carry forward into permitting.



ALTERNATIVE ROUTE	RESIDUAL IMPACTS	BIOLOGICAL RESOURCES	CULTURAL RESOURCES	GEOMORPHIC AND SOILS	LAND USE	VISUAL RESOURCES	WATER RESOURCES	TOTALS	COMMENTS
Route A	Low	0.9	0.3	1.2	2.3	3.3	1.3	9.3	Would remove 2 residences and cross 3 potential landslide areas.
	Moderate	0.5	0.2	2.0	0.5	0.2	0.7	4.1	
	High	0.0	0.1	0.3	0.2	0.5	0.0	1.1	
Route B	Low	2.0	0.6	2.1	1.2	3.0	1.6	10.5	Would cross 4 potential landslide areas and potentially have significant impacts to both biological and cultural resources.
	Moderate	1.3	0.9	2.6	0.3	0.4	1.0	6.5	
	High	0.2	0.3	0.7	0.0	0.1	0.0	1.3	



4.2 Step 2 – Data Inventory and Mapping, Tribal Outreach, and Public Outreach

This section describes the data and input collection process that informed sensitivity levels, constraints, and opportunities. GIS data were collected from several categories including biological resources, cultural resources, land use resources, surface water resources, and visual resources. This section also describes the public outreach and engagement process whereby HWT held several public open houses and one-on-one meetings with landowners upon request.

4.2.1 Tribal Outreach

HWT met with the Fort Yuma Quechan Tribe to discuss the Proposed Project and routing opportunities eight times between June 2023 and April 2025. Representatives of the Tribe at these meetings included the President, Vice President, Councilmembers, Cultural Committee, Tribal Historic Preservation Officer, and the Economic Development Director. The feedback expressed by the Tribe during these meetings is summarized in the bullets below.

- In a meeting between HWT, the Tribal Council, and the Tribe's Economic Development Director on June 15, 2023, the Tribal Council rejected a route through the center of the Fort Yuma Quechan Reservation that would parallel existing transmission infrastructure and noted that there are cultural sensitivities near the northwest corner of the Reservation.
- Beginning in June 2024, the Fort Yuma Quechan Tribe shared concerns about the proposed routes sited north of the Fort Yuma Quechan Reservation, emphasizing that the area north of the Reservation is their ancestral land that holds cultural and spiritual significance.
- Beginning in June 2024, the Fort Yuma Quechan Tribe expressed to HWT a desire for the Proposed Project to be routed through the southwestern corner of the Fort Yuma Quechan Reservation in California, just east of Pilot Knob. Although extensive investigations by HWT and its consultants were conducted between June 2024 and July 2025 to accommodate this request, including alternatives through Yuma, along the Colorado River, and parallel to I-8, no viable alternatives were identified (see Figure 4-3A).
- Beginning in December 2024, the Tribal President, members of the Tribal Council, and members of the Cultural Committee stated their opposition to any route option north of the Fort Yuma Quechan Reservation.
- Throughout the meetings held between HWT and the Fort Yuma Quechan Tribe, HWT continued to propose the option to explore a ROW through the Fort Yuma Quechan Reservation as a routing option for the Proposed Project; However, to date, Tribal leadership has expressed interest in this option only to support a route that would go south of the Reservation.

As requested by, and to address the concerns of, the Fort Yuma Quechan Tribe in June 2024, HWT identified and evaluated potential route options south of the Fort Yuma Quechan Reservation. These alternatives are described in Section 4.4.1, Table 4-3, and Section 4.6.5.

HWT also initiated voluntary, informal outreach in June 2025 by electronically transmitting project information packets to the following area Tribes: Ak-Chin Indian Community, Barona Group of Capitan Grande Band of Mission Indians, Campo Band of Diegueno Mission Indians, Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes, Fort McDowell Yavapai Nation, Fort Mojave Indian Tribe, Fort Yuma Quechan Tribe, Ewiiapaayp Band of Kumeyaay Indians, Gila River Indian Community, Hopi Tribe, Iipay Nation of Santa Ysabel, Inaja-Cosmit Band of Indians, Jamul Indian Village, La Posta Band of Diegueno Mission Indians, Manzanita Band of Kumeyaay Nation, Mesa Grande Band of Diegueno Mission Indians, Mescalero Apache Tribe, Pascua Yaqui Tribe, Pueblo of Zuni, San Pasqual Band of Diegueno Mission Indians, Salt River Pima-Maricopa Indian Community, Sycuan Band of the Kumeyaay Nation, Tohono O'odham Nation, Torres-Martinez Desert Cahuilla Indians, Twenty-Nine Palms Band of Mission Indians, and Viejas Band of Kumeyaay Indians. A project information packet was also mailed to Kwaaymil Laguna Band of Indians.

As of July 2025, specific routing feedback has been received from the Cocopah Indian Tribe's Cultural Resources Manager who requested that Segment 2 of the Project be routed along or south of State Route 98 and noted that the Cargo Muchacho Mountains are a culturally sensitive area. Additionally, the Colorado River Indian Tribes indicated that the area near the Colorado River is culturally sensitive.

4.2.2 Public Outreach

Recognizing the importance of and their commitment to interaction with the public in the vicinity of the Proposed Project, HWT developed a *Community Outreach and Engagement Plan* with the intent of informing potentially affected landowners and other stakeholders (e.g., local officials, adjacent communities) about the Proposed Project. The *Community Outreach and Engagement Plan* included several methods for ensuring that stakeholders could be heard through various means, including:

- Establishing a Project-dedicated telephone line: 833-734-0723
- Establishing a Project email address: horizonwest@nee.com
- Establishing a Project website: <https://www.horizonwesttransmission.com/ironwood.html>
- Developing an interactive website that allowed the community to provide specific comments about the Project Study Area and alternative routes: <https://ironwood.mysocialpinpoint.com/>
- Hosting three public meetings in February and three public meetings in April/May 2025. Public meetings were conducted in an open house format with HWT representatives providing information at the following stations: Project Overview, Project Schedule, Project Benefits, California Approval Process, Transmission Line Design, Environmental Review, Project Area Maps, How Transmission Works, Construction Process.
- Conducting one-on-one meetings with individual landowners as requested by the landowner.
- Providing information in English and Spanish.

Agricultural Open House

As part of a series of public open houses, HWT hosted a meeting for the agricultural community on February 18, 2025, in coordination with the Imperial County Farm Bureau, Imperial Valley

Vegetable Growers Association and Coalition of Labor, Agriculture & Business. The open house was held at the AgWest Farm Credit Agricultural Center and was attended by 23 farmers, landowners, agricultural organization leaders and business representatives who provided valuable feedback and insight. Agricultural leaders sent emails and newsletters announcing the open house to the agricultural community.

Attendees received Project fact sheets describing the Proposed Project, viewed Project exhibits and Project Study Area maps and were able to interact one-on-one with team members. Attendees asked questions regarding siting/location, the approval process, and benefits or impacts for the region, landowners and farms.

HWT distributed comment cards for attendees to provide further feedback following the open house or asked attendees to share input via phone, email or the interactive website.

Heber Open House

An open house was held February 19, 2025, at the Heber Community Center, which drew 14 attendees who provided valuable insight and feedback and included residents, current and former local officials, farmers and Fort Yuma Quechan Tribe representatives.

Notifications of the open house were mailed to properties within the Proposed Project Study Area and were provided in newspaper and radio advertisements. Attendees at the Heber open house generally asked about the nature of the Proposed Project, and HWT representatives provided information about the purpose and need for the Project and the Project description. Several attendees appreciated the potential reliability benefits and referenced a large blackout event several years ago. The importance of coordination with Tribal Nations was highlighted. Several attendees expressed a desire for the Proposed Project to facilitate the export of geothermal energy generation from the Imperial Valley. Visitors gravitated towards the maps of the Project Study Area. Attendees also received Project fact sheets and comment cards, interacted with team members and viewed Project exhibits.

Calexico Open House

An open house was held February 20, 2025, at the Calexico Woman's Improvement Club, which drew 12 attendees and included former elected officials, a local community college representative, a BLM representative, farmers, and residents. Notifications of the open house were mailed to properties within the Proposed Project Study Area and were provided in newspaper and radio advertisements. A reporter from the Calexico Chronicle attended the event and conducted an interview with a HWT representative for an article that was published in the Calexico Chronicle on February 22, 2025.³

Attendees at the Calexico open house generally requested information on the Proposed Project and its benefits for the region. Some attendees requested to receive general updates and were interested in the Proposed Project location in relation to their home. Visitors gravitated towards the Project Study Area maps. Attendees received Project fact sheets and comments cards, interacted with team members and viewed Project exhibits.

³ [New Power Line Aims to Boost Grid Reliability in Imperial Valley - Calexico Chronicle.](#)

Second Agricultural Open House

For a second round of open houses to seek public input on alternative routes, a meeting for the agricultural community was held on April 30, 2025, at the AgWest Farm Credit Agricultural Center with 11 attendees providing valuable insight and feedback. Agricultural leaders sent emails/newsletters, provided verbal updates and made phone calls to notify the agricultural community of the open house. Agricultural attendees included farm owners, landowners, agricultural organization leaders and business representatives. Attendees asked questions regarding siting/location, the approval process, benefits or impacts for the region, landowners and farms. Attendees interacted with numerous team members, though no attended asked questions relating to environmental permitting or resources. The majority of attendees were focused on the alternative route maps in the center of the room and asked detailed questions about impacts to their specific properties, farms, ranches and businesses.

Second Heber Open House

An open house was hosted on April 30, 2025, at the Heber Community Center with eight people attending. Attendees at the second Heber open house were mainly community and government representatives, with some agricultural and business constituents also in attendance. Attendees asked questions and engaged with HWT representatives at all stations around the room.

Notifications of the open house were mailed to properties within the Project Study Area and were provided in newspaper and radio advertisements.

Second Calexico Open House

An open house was hosted on May 1, 2025, at the Calexico Women's Improvement Club, which drew eight attendees that included agricultural, landowner and community constituents. Attendees included current and former local officials, agricultural leaders and residents. Attendees at the Calexico Open House were mainly focused on and showed interest in the potential location of the line. They inquired about safety of the line during natural disasters and in relation to electromagnetic fields, as well as voiced concerns about the line coming close to or crossing their properties. Information on solar projects and the Imperial Irrigation District tying into the proposed 500-kV line were also topics of discussion.

Notifications of the open house were mailed to properties within the Proposed Project Study Area and were provided in newspaper and radio advertisements.

4.2.2 Data Inventory

Available secondary data from federal, state, and local government agencies were gathered and compiled for the Study Area. A general list of the data considered in the routing study is outlined below.

- Biological Resources
 - Plants/Vegetation communities
 - Wildlife habitat
 - Sensitive, threatened and endangered species (wildlife and plants)

- Land Use Resources
 - Jurisdiction and land ownership
 - Land use and zoning codes and regulations
 - Local, state, and federal ordinances and regulations
 - Areas of Critical Environmental Concern and Wilderness Areas
 - Existing and planned land use
 - Transportation facilities, including roads, railroads, and airports/airstrips
 - Parks, recreation, and preservation areas, and conservation easements
 - Schools and places of worship
 - Utilities, including electric transmission lines, oil/gas pipelines and wells, and water wells
- Surface Water Resources
- Cultural Resources
- Visual Resources
 - Existing setting and visual conditions
 - Agency visual management objectives
 - Sensitive viewers

Documentation of the inventoried data included a combination of mapped and written elements. Mapped information was organized using a GIS database. The GIS data were used to depict resources in the Study Area, assess resource sensitivity, identify opportunities for and constraints to routing, and identify, compare, and evaluate route alternatives for the transmission line.

4.3 Step 3 – Identify Routing Opportunities and Constraints

Identifying opportunities and constraints for routing a transmission line was based on the sensitivity of each resource to the introduction of a new transmission line in the Study Area. Resource sensitivity is defined as a measure of the probable adverse response to direct and indirect effects associated with construction, operation, and maintenance of the transmission line. In determining the sensitivity of a resource to the Proposed Project, the following factors were qualitatively considered:

- The rarity, high intrinsic worth, singularity, or diversity of a resource in the Study Area (i.e., resource value).
- Any formal concern expressed for a resource, either through legal protection or by designation of special status or by law or ordinance (i.e., protective status).
- The level of conflict based on policies of land management and/or use, community values, and political opinion (i.e., present and future uses).
- The degree to which a resource represents a significant hazard to the Proposed Project's construction, operation, or maintenance (i.e., hazards).

Considering the criteria described above, the resource data were evaluated and assigned a sensitivity level of low, moderate, or high as defined below. The lower the sensitivity of a resource, the more compatible it would be for siting a transmission line in a given area.

- **Low Sensitivity:** Areas where resource conflicts identified through the Routing Study process are minimal. These areas of low sensitivity are considered to be of minimal constraint, or high opportunity, for locating a transmission line. In this study, examples of low sensitivity areas include proposed utility easements, existing utility facilities (overhead distribution and transmission lines), designated utility corridors, interstate highway buffers, US Highway buffers, local/residential streets (public roads/streets), natural gas or petroleum pipeline buffers, and non-irrigated agricultural lands.
- **Moderate Sensitivity:** Areas of potential environmental effects due to effects on important or valued resources, resources assigned protective status, or some conflict with the proposed use. Locations of moderate sensitivity are considered to be moderate constraint areas and less desirable than low sensitivity areas for routing and accommodating a transmission line. In this Routing Study, examples of moderate sensitivity areas include streams, water bodies, wetlands, floodplains, mechanically irrigated agricultural fields, recreational facilities, and state lands.
- **High Sensitivity:** Areas determined to be less suitable because of unique, highly valued, complex, protected resources and significant potential conflict with the proposed use, or areas posing a hazard to construction and operation of the transmission line. Locations of high sensitivity are considered to be the least desirable location of a transmission line. For the purpose of this Routing Study, examples of high sensitivity areas include locations of communication towers, extractive/mining areas, buildings, irrigation canals, substantial sloped terrain, Tribal Lands, Navy Restricted Airspace, Military Training Route crossings, residential structures, existing substations, interstate highways, railroads, US highways, heliports, and visual impacts within 500 feet of residential areas.
- **Exclusion:** Areas where existing law precludes development and operation of a high voltage transmission line or are determined to be unsuitable because of unique, highly valued, complex or legally protected resources; significant potential conflict with existing or planned use; and areas posing substantial hazard to construction, operation or maintenance of the transmission line. These areas may also represent significant cumulative impacts from the interaction between resources. For purposes of the identification or refinement of the assumed centerlines, these areas should be excluded from consideration.

Opportunities for routing the proposed transmission line were based on an analysis of the feasibility of introducing and the presence of the transmission line in the Study Area.

Opportunities for routing the Proposed Project's facilities include locations that:

- Parallel existing compatible linear ROWs, including transmission lines, railroads, highways, irrigation canals, substations, and pipelines.
- Parallel existing compatible ROWs, property lines, section lines, or half-section lines.
- Maximize the use of existing access and minimize new access road construction.
- Facilitate efficient and cost-effective transmission line design and construction.
- Use WWEC, BLM California District Utility Corridor, and BLM Solar Energy Zone.

Refer to Table 4-1 for resource sensitivity levels and opportunities. The data in this table was compiled from publicly available, non-confidential sources. Tribal cultural resources are not included in Table 4-1, as it is confidential.

Once the sensitivity levels were assigned to the resources, GIS was used to overlay all resource sensitivities to create a composite sensitivity map. The composited data served to identify the extent of the constraints and opportunities for routing of the transmission line route corridors in the Study Area (Figure 1-1).

TABLE 4-1 RESOURCE SENSITIVITY LEVELS

RESOURCE CATEGORY	SENSITIVITY LEVEL
Land Use- Existing Land Use	
Incorporated Area/ Urban Growth Boundary	Moderate
School/ Educational Facilities	Exclusion
Communication Tower	High
Irrigation Canals Buffer (50 feet)	High
Agricultural/Pastoral/Non-Irrigated	Low
Military Restricted Airspace or Training Route (up to 200 feet above ground level)	High
Military Operations Areas	High
Developed Areas/ Structures, Residential	Exclusion
BLM 368 Corridor (WWEC)	Opportunity
BLM California District Utility Corridor	Opportunity
BLM Solar Energy Zone	Opportunity
Jurisdiction and Ownership	
Department of Defense	Moderate
Tribal Land (e.g., Fort Yuma Quechan)	High
Bureau of Land Management (BLM)	Low
National Park Service	High
US Army Corps of Engineers	Low
US Bureau of Reclamation	Low
US Fish and Wildlife Service	Moderate
State Trust Land	Low
Other State (NHP, DOT, HS, etc.)	Low
State Fish and Wildlife	Low
State Parks and Recreation	Low
County	Low
Local Government	Low
Private	Low

RESOURCE CATEGORY	SENSITIVITY LEVEL
Special Management Areas	
BLM Wilderness Areas	Exclusion
BLM Wilderness Study Areas	Exclusion
BLM Area of Critical Environmental Concern (ACEC)	High
BLM National Conservation Areas	Exclusion
National Monument	High
National Scenic Area	Exclusion
Wild and Scenic Rivers	High
National Wildlife Refuges	High
Conservation Easements	High
Habitat Conservation Plan or Natural Community Conservation Plan areas	Varies
Environmental/ Biological Resources	
Critical Habitat	High
California Natural Diversity Database plants/animals	Varies
California Habitat Connectivity/ Corridor	Moderate
CalEnviroscreen 4.0	Moderate
Fire	
Historic Fire Perimeters	Moderate
CalFIRE Fire Hazard Severity Zones	Moderate
CPUC Fire Threat and High-Fire Threat District Data	Moderate
Water	
National Wetlands Inventory	Moderate
Marine Protected Areas	High
National Hydrography Dataset (NHD)– Water Bodies	Moderate
NHD – Water Area	Moderate
FEMA - Flood Hazard Areas	Moderate
Geology/Soil	
Superfund Site Boundaries	High
Soil Units	Varies
Federally Designated Prime or Unique Farmland; Farmland of Statewide Importance	Moderate
Slope 35+%	High
Landslide Hazard Areas/ Susceptibility Very High/ High	High
Liquefaction Susceptibility Zone	High

RESOURCE CATEGORY	SENSITIVITY LEVEL
Quaternary Fault Line Buffer (150 feet)	Exclusion
Cultural	
National Register of Historic Points Buffer (1 mile)	High
National Register of Historic Places Buffer (1 mile)	High
Cemeteries Buffer (500 feet)	Exclusion
California & Arizona Historical Landmarks Buffer (1 mile)	High
Office of Historic Preservation Built Environment Resource Directory Buffer (1 mile)	High
Visual	
Foreground Views from Designated Scenic Highways/Byways (National, State) Buffer (1 mile)	High
Foreground Views from Nationally Significant Scenic/Recreational/ Historic Trails (National Recreation Trail, National Historic Trail, National Scenic Trail) Buffer (500 feet)	High
BLM Visual Resource Management (VRM) Class IV	Low
BLM VRM Class III	Moderate
BLM VRM Class II	High
BLM VRM Class I	Exclusion
Land Use - Utilities/Generation	
Transmission Lines (>115 kV) Buffer (1,000 feet)	Opportunity
Substation Buffer (500 feet)	Opportunity
Natural Gas or Petroleum Pipeline Buffer (300 feet)	Opportunity
Wind Generation Buffer (300 feet)	High
Solar Generation Facility	Exclusion
Transportation	
Interstate (ROW) Buffer (150 feet)	High
Interstate Buffer (150 feet to 1,000 feet)	Opportunity
Railroad (ROW) Buffer (300 feet)	High
Railroad Buffer (300 feet to 1,000 feet)	Opportunity
Railroad – Inactive	Opportunity
US/State Highway (ROW) Buffer (50 feet)	High
US/State Highway Buffer (50 feet to 1,000)	Opportunity
Airports Buffer (1 mile)	Exclusion
Airstrips Buffer (.05 miles)	Exclusion

4.3.1 Engineering Constraints

In the Study Area, the primary engineering constraints included the need for additional ROW adjacent to multiple overhead utility lines, existing transmission line crossings, and limited space for construction of a 500-kV transmission line near industrial/commercial/residential buildings. There are also technical constraints in the Study Area such as soil profiles, terrain and steep slopes, FAA restrictions, and paralleling or crossings of canals and irrigation infrastructure, railroads, and pipelines. The ROW width required for a transmission line is generally determined by the voltage level, structure type, and other factors such as safety, environmental considerations, and maintenance needs. While regulatory agencies such as FERC do not specify ROW widths for transmission lines, they do provide guidelines related to safety, vegetation management, and clearance that help determine the required ROW width. Further, this width is necessary to allow adjustments to final Project feature locations that avoid environmental constraints (e.g., aquatic features, cultural resources, geologic topographies), ensures that construction equipment has adequate space to perform tasks within the defined boundary (e.g., turn around large vehicles, pulling sites, tensioning sites, staging yards), and promotes regional planning goals (e.g., locating within existing utility corridors, efficient footprint that promotes joint utility use and future expansion, conformance with local plans). Where feasible, Project alternatives were routed adjacent to existing transmission lines.

Other engineering constraints included limited access, and a high level of traffic control needed for both initial construction and routine maintenance of the transmission line. HWT conducted desktop engineering reviews and multiple site visits to identify solutions to these engineering constraints.

4.4 Step 4 – Identify Transmission Line Route Alternatives

In combination with the sensitivity analysis described above, additional existing data such as Google Earth aerial photo imagery, land use and environmental resource data, and field reconnaissance visits, were used to develop the initial route alternatives.

The Proposed Project Study Area was split into three segments: Segment 1, Segment 2, and Segment 3 (Figure 4-6). Segment 1 includes the area from the North Gila Substation north through the mountainous and variable terrain of the Laguna and Cargo Muchacho Mountains (Figure 4-6A); Segment 2 includes the area between the Cargo Muchacho Mountains west within the desert, Imperial Valley sand dunes and East Mesa (Figure 4-6B); and Segment 3 includes the area from the East Mesa desert area through Imperial Valley agricultural lands west to the Imperial Valley Substation (Figure 4-6C). To determine the potential Proposed Project alignments, route alternatives and route groups were defined for all three segments. Route alternatives covered the segment end to end whereas route groups were a cluster of sub-regional route options which were aggregated for comparison. The team identified four viable alternatives for Segment 1; two for Segment 2; and five for Segment 3. The best performing alternative for each of the three segments were then combined into a Preferred Route. A detailed description of each alternative is provided below.

4.4.1 Segment 1

Segment 1, Figure 4-6A, is the easternmost portion of the Study Area. Segment 1 alternatives connect the North Gila Substation to the eastern edge of Segment 2 near the southern end of Coachella Canal Road.

Segment 1 Route Alternatives

- **Alternative 1A** (45.70 miles) begins at the North Gila Substation and traverses north across Reclamation and BLM land. The route avoids Mittry Lake by paralleling the northeastern edge of the Study Area boundary, before turning west to cross the canals and dams north of Mittry Lake. Alternative 1A then crosses BLM land within the WWEC and designated utility corridors, avoiding the Fort Yuma Quechan Reservation to the south. Alternative 1A then cuts north at Picacho Road, avoiding a parcel of state land, before turning southeast to then parallel an existing 500-kV transmission line (SWPL), which it follows to the end of Segment 1.
- **Alternative 1B** (37.23 miles) follows the same path as Alternative 1A except for the Mittry Lake area. Instead of circumventing the lake to the north, Alternative 1B crosses Mittry Lake on the southern end near Laguna Dam. It then cuts due west within the WWEC and designated utility corridor where it rejoins the same alignment as Alternative 1A.
- **Alternative 1C** (35.13 miles) follows the same path as Alternative 1B until the Picacho Road area. Instead of cutting to the north like Alternatives 1A and 1B, Alternative 1C continues due west across mountainous terrain, adjacent to the northern border of the Fort Yuma Reservation parallel to the existing SWPL transmission line, before rejoining the same alignment as Alternatives 1A and 1B within the designated utility corridor.
- **Alternative 1D** (36.14 miles) follows the same path as Alternative 1C until the area of Barney Oldfield Road. Instead of crossing the mountainous terrain linearly, Alternative 1D cuts to the northwest for 1.5 miles before cutting back to the southwest for 1.3 miles before rejoining the same alignment as Alternatives 1A and 1B.
- **Alternative 1-Alt** (2.6 miles) is included in this routing study as a potential link alternative for Alternative 1A, 1B, 1C, and 1D to avoid impacts to Imperial Sand Dunes recreational activities. Within this routing study it is not equally compared to the other Alternatives as it is not a Segment end-to-end route. Alternative 1-Alt begins at the west end of link E3b. Alternative 1-Alt then follows Link E13 and parallels the canal on the southeast side. Alternative 1-Alt then crosses the canal and rejoins the shared alignment with Alternative 1B/1C/1D at the beginning of Link E4b.

Segment 1 Southern Yuma Routes

- **Alternative Y1** (44.03 miles) consists of links A2, A3, B1, A14, A29, A23, A25, and A26. Alternative Y1 begins at the North Gila Substation and follows the southern border of the Study area circumventing the city of Yuma. The route begins by traversing south across agricultural land and paralleling the existing 230 kV transmission line for 14 miles. The route then parallels the southern edge of a canal for 4.5 miles before crossing the canal and continuing west before cutting north for 1 mile, then west for 3.5 miles, then north for 5.8 miles. The route then traverses west across a United States-Mexico border crossing facility and then parallels the US-Mexico border for 12.3 miles until the end of Segment 1.
- **Alternative Y2** (28.61 miles) consists of links A2, A5, A6, A8, A10, A15, A21, A23, and A26. Alternative Y2 begins at the North Gila Substation and traverses due west for 1.85 miles before cutting southwest across agricultural land. Alternative Y2 continues due west for 4.0 miles crossing a river, a canal, and paralleling E Levee Road. The route then parallels S Levee Road north for 0.7 mile before crossing UPRR tracks and I-8 in the northeast corner of the city of Yuma. The route continues west, crossing N 4th

Avenue and paralleling a canal to the south for 5.8 miles. Alternative Y2 then crosses the Colorado River, skirts the northern edge of a United States-Mexico border crossing facility, then parallels the US-Mexico border for 12.3 miles until the end of Segment 1.

- **Alternative Y3** (28.43 miles) consists of links A2, A5, A7, A16, A19, A20, and A28. Alternative Y3 begins at the North Gila Substation and traverses due west for 2.6 miles and crossing a river before paralleling Levee Rd for 5 miles. The route then turns southwest, crossing UPRR tracks, I-8, and Winterhaven Dr. Alternative Y3 then parallels I-8 on the northern side of the Colorado River for 5.0 miles before crossing a canal and skirting the southern edge of the Quechan Casino Resort property. Alternative Y3 then continues west for 8.0 miles until the end of Segment 1.

4.4.2 Segment 2

Segment 2, Figure 4-6B, begins where the western portion of Segment 1 terminates and ends at the southern end of Desert Road in East Mesa.

- **Alternative 2** (20.70 miles) begins at the terminus of Segment 1. It traverses due west for 9.23 miles before cutting south towards Evan Hewes Highway for 1.2 miles. After crossing the highway, Alternative 2 parallels State Highway 98 for 10.2 miles before linking up with the Segment 3 route alternatives.
- **Alternative 2A** (20.80 miles) begins at the same point as Alternative 2 but continues to the southwest for 1.7 miles instead of cutting due west. After Alternative 2A crosses I-8, it cuts west for 2.6 miles, then cuts south to cross the canals, before turning due west again, parallel to the existing SWPL transmission line, for 16 miles to link with the starting point of Alternatives 3 and 3B.

4.4.3 Segment 3

Segment 3, Figure 4-6C, begins where the western portion of Segment 2 terminates and ends at the southern end of Desert Road in East Mesa.

- **Alternative 3** (26.85 miles) begins at the terminus of Alternative 2A and is parallel to the existing SWPL transmission line for nearly its entire length. It traverses due west for 7.7 miles while paralleling Kumberg Road. After crossing State Route 7 and Heber Dunes Road, Alternative 3 cuts to the northwest for 0.55 miles. It then cuts back due west for 11.5 miles. Alternative 3 then parallels Forrester Road for 0.33 mile, then due west for 0.75 mile, then southwest for 0.6 mile until it crosses Lyons Road. It then parallels Lyons Road for 5.7 miles until it reaches the Imperial Valley substation.
- **Alternative 3A** (29.66 miles) begins at the southern end of Desert Road, which parallels to the northwest for 2.86 miles. After crossing Hunt Road, Alternative 3A traverses farmland due west for 22.8 miles. It then cuts to the southwest for 0.87 miles before cutting back due west for 2.81 miles until it terminates at the Imperial Valley Substation. This alternative does not parallel an existing transmission line.
- **Alternative 3B** (26.96 miles) begins at the point where Alternative 2A ends. Alternative 3B then parallels State Route 98 for 1.0 mile before cutting due west for 9.6 miles. It then cuts diagonally to the northwest before paralleling E Jasper Road, Willoughby Road and Preston Road for 11.7 miles. After another 3.8 miles of traversing farmland to the west, Alternative 3B terminates at the Imperial Valley Substation. This alternative does not parallel an existing transmission line.

- **Alternative 3C** (28.71 miles) begins at the terminus of Alternative 2A. It then follows the same alignment as Alternative 3 for 11.64 miles, parallel to the existing SWPL transmission line, before cutting due south along route link I1 to join Alternative 3B for 11.5 miles before cutting south again along link I13. Alternative 3C then traverses west across farmland for 4.2 miles before terminating at the Imperial Valley Substation.
- **Alternative 3D** (28.67 miles) follows the same alignment as Alternative 3C, and is parallel to the existing SWPL transmission line, except it cuts south at route link I2 instead of route link I1.

4.5 Step 5 – Engineering and Constructability Reviews

After preliminary routes were developed, HWT conducted engineering and constructability reviews of the alternatives and made adjustments as necessary. In some instances, additional links were identified and in other instances they were modified slightly to make them feasible for construction. Engineering and constructability reviews resulted in changes like: adjusting angles of canal crossings, shifting routes to parallel opportunities, reducing number of angle structures, adjusting routes to better utilize Section 368 Energy (WVEC) Corridors, avoiding private land owner parcels, avoiding VRM Class II areas, adjusting location of route in dunes for constructability, or shifting route due to feedback from open houses.

4.6 Step 6 – Transmission Line Route Alternatives Comparison

4.6.1 Introduction

The following discussions describe how HWT narrowed the 11 alternatives to identify the Preferred Route.

4.6.2 Route Alternatives Comparison and Evaluation

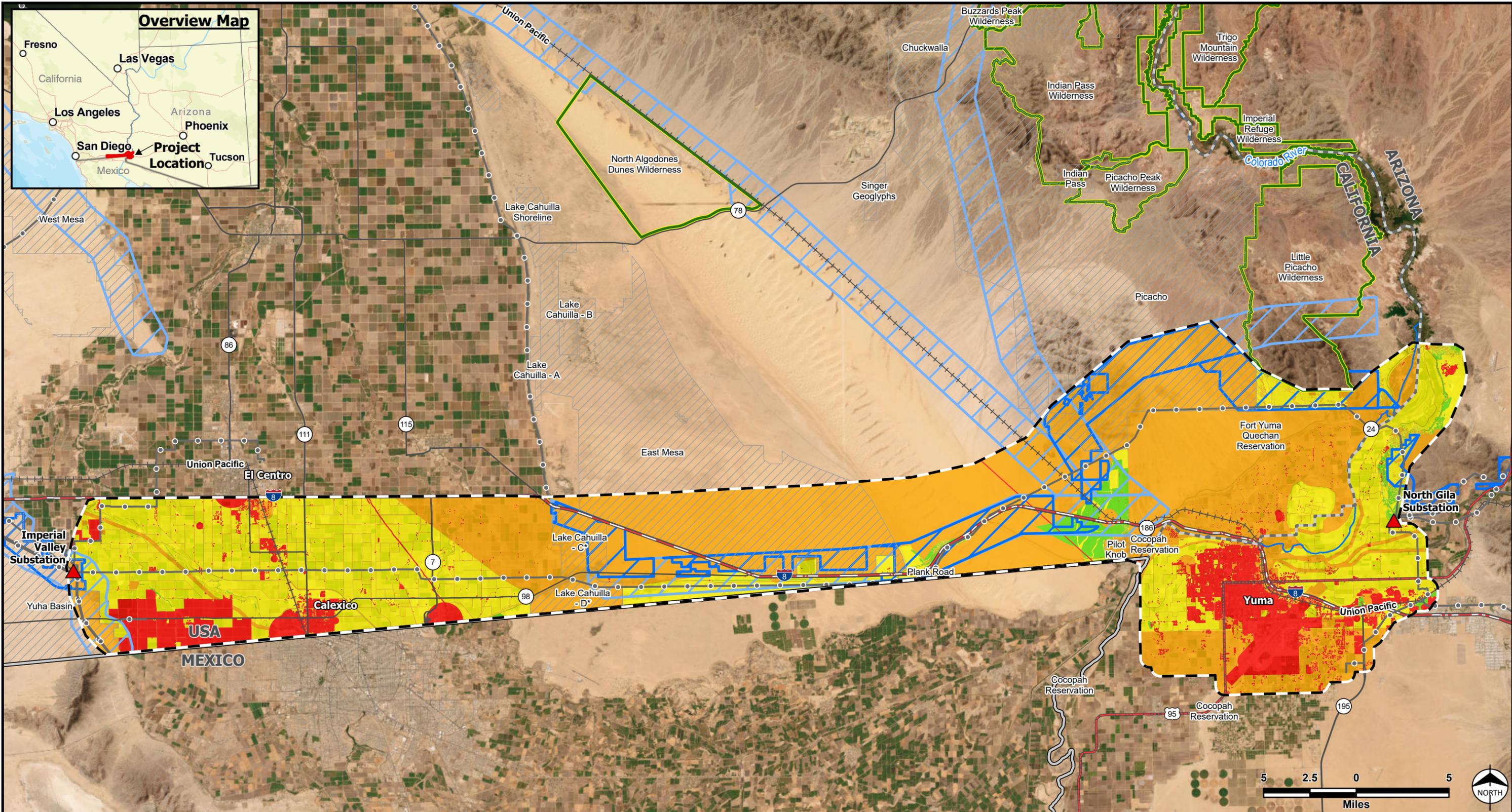
The routing criteria listed in Section 4.1 were used to compare and evaluate each end-to-end route alternative. In analyzing the routing criteria data calculated for each segment alternative, a feasibility level based on engineering and environmental constraints and opportunities was assigned for each alternative. The higher the feasibility ranking the more compatible the route, the lower the feasibility ranking the less compatible the route.

Figure 4-6 (at the end of this section) illustrates the dominant constraints associated with the route alternatives. Based on the analysis, Table 4-2 presents the best performing alternative for each Segment. More detail regarding the evaluation and comparison is provided in the table in Appendix B (Route Alternatives Comparison). As can be seen in Appendix B, Alternative 1C ranked the highest, though Alternative 1B is the Preferred Alternative. This is due to Alternative 1B having significantly more route mileage within federally designated WVEC and BLM 368 Utility Corridors and associated potential to be federally permitted. Similarly, Alternative 3 ranked highest in the Segment 3 analysis, though Alternative 3C is the Preferred Alternative. This is due to landowner issues on Alternative 3. Multiple parcel owners are not currently willing participants for easement acquisition which would make Alternative 3 more difficult to license than Alternative 3C. Section 4.6.3 provides a discussion of the advantages of the Preferred Route.

TABLE 4-2 ROUTE ALTERNATIVE FEASIBILITY RANKING

SEGMENT	BEST PERFORMING ALTERNATIVE
Segment 1	Alternative 1B
Segment 2	Alternative 2
Segment 3	Alternative 3C

FIGURE 4-2 SENSITIVITY OVERVIEW



Overview Map



<p>Project Features</p> <ul style="list-style-type: none"> Existing Substation Project Study Area 	<p>Transmission</p> <ul style="list-style-type: none"> Existing Transmission Line (230 kV+) Section 368 Energy Corridor BLM Utility Corridor 	<p>Transportation</p> <ul style="list-style-type: none"> Interstate Highway U.S. Route State Highway Railroad 	<p>Special Management Area</p> <ul style="list-style-type: none"> Area of Critical Environmental Concern (ACEC)* Wilderness Area 	<p>Reference</p> <ul style="list-style-type: none"> Colorado River State Boundary US-Mexico Border 	<p>Sensitivity</p> <ul style="list-style-type: none"> Exclusion High Moderate Low
--	---	--	---	---	--

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-2

Sensitivity

Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ



TABLE 4-3 SOUTHERN YUMA AREA ROUTES SUMMARY COMPARISON TABLE

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON		
			Southern Yuma Routes		
			Y1	Y2	Y3
			Links: A2, A3, B1, A14, A29, A23, A25	Links: A2, A5, A6, A8, A10, A15, A21, A23	Links: A2, A5, A7, A16, A19, A20, A28
Total Length (miles)		<i>Shorter length reduces Project costs to ratepayers and can reduce total environmental impacts.</i>	44.03	28.61	28.43
Parallels Existing Transmission Lines (miles)		<i>Parallel lines reduce visual impacts and consolidates impacts on views. Also potentially reduces the need for new access roads.</i>	>=115 kV: 15.83 (35.9%) EHV >= 230 kV: 13.11 (29.8%) < 230 kV: 2.72 (6.2%)	>=115 kV: 0.82 (2.9%) EHV >= 230 kV: 0.00 (0.0%) < 230 kV: 0.82 (2.9%)	>=115 kV: 8.80 (30.9%) EHV >= 230 kV: 0.00 (0.00%) < 230 kV: 8.80 (30.9%)
# of Existing Crossings	Transmission	<i>Minimizing number of crossings reduces the complexity of engineering, reduces risk of outages and reduces visual impacts from the need for taller structures at each crossing.</i>	>= 230 kV: 8 < 230 kV: 13	>= 230 kV: 2 < 230 kV: 4	>= 230 kV: 2 < 230 kV: 13
	Pipeline		6	5	3
	Water		Perennial Stream – 3 Canals – 35 Waterbodies - 0	Perennial Stream – 2 Canals – 18 Waterbodies - 1	Perennial Stream – 2 Canals – 14 Waterbodies - 0
	Roads		Interstates - 1 US Highways - 2 State Highways - 2	Interstates - 1 US Highways - 0 State Highways - 1	Interstates - 3 US Highways - 0 State Highways - 1
	Railroads		2	2	1
Length in BLM Utility Corridors/WWEC (miles)		<i>Locating within BLM corridors reduces Federal permitting risks by placing facilities in previously evaluated/approved locations. May also reduce the need for Plan Amendments for federal land management plans.</i>	Length in merged corridors 1.13 (2.6%)	Length in merged corridors 1.13 (3.9%)	Length in merged corridors 14.27 (50.2%)
Land Jurisdiction (miles)		<i>Locating on Federal/State Lands reduces the need for private easements but increases permitting risks and schedule.</i>	State: 2.26 Federal: 13.37 Private/Undetermined: 27.26	State: 1.47 Federal: 13.26 Private/Undetermined: 11.48	State: 1.86 Federal: 13.34 Private/Undetermined: 6.25

ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON		
			Southern Yuma Routes		
			Y1	Y2	Y3
			Links: A2, A3, B1, A14, A29, A23, A25	Links: A2, A5, A6, A8, A10, A15, A21, A23	Links: A2, A5, A7, A16, A19, A20, A28
# of Private Parcels Crossed	<i>Reducing private parcels reduces # of easements needed and the cost of land acquisition.</i>		142	26	23
# of Buildings in ROW (250-ft)	<i>Structure conflicts within ROW that would require removal.</i>		39	12	2
# of Buildings Within 250-ft of Centerline	<i>Structure conflicts within and adjacent to ROW that would require possible removal.</i>		81	16	4
Engineering/ Constructability Concerns	<i>Fewer E&C concerns reduce potential land disturbance, impacts, and cost to rate payers.</i>		Would require approx. 14 heavy angles up to 90-degrees through Yuma area. Construction conflicts through residential areas including significant traffic impacts and road closures.	Would require approx. 7 heavy angles up to 90-degrees through Yuma area. Construction conflicts through residential areas including significant traffic impacts and road closures.	Would require approx. 7 heavy angles up to 90-degrees through Yuma area. Construction conflicts through residential areas including significant traffic impacts and road closures.
Environmental	Fire Risk	<i>Lower fire risk</i>	Minimal	Minimal	Minimal
	Biological Resources	<i>Avoid/minimize impacts to sensitive species</i>	<p>Areas of Critical Environmental Concern (ACECs): Travels through Plank Road ACEC for 0.364 miles outside of the WWEC (same as route Y2).</p> <p>Species: High potential for Burrowing Owl and some riparian birds in areas where the route crosses drainage areas. Most of the habitat consists of agricultural areas, however, which is highly suitable for Burrowing Owl.</p> <p>Waters: Fewest potential drainage/wetland crossings than other Y routes.</p>	<p>ACECs: Travels through Plank Road ACEC for 0.364 miles outside of the WWEC (same as route Y1).</p> <p>Species: High potential for Burrowing Owl and some riparian birds in areas where the route crosses drainage areas.</p> <p>Waters: Fewest potential drainage/wetland crossings than other Segment 1 routes.</p>	<p>ACECs: No portion of the route travels through ACEC outside of the WWEC.</p> <p>Species: High potential for federally protected (FP) and other protected species (Black and Yuma Ridgeway's rail, riparian birds) in areas close to the Colorado River and other riparian areas.</p> <p>Waters: Most potential drainage crossings compared to routes Y1 and Y2.</p>

ROUTING EVALUATION FACTOR	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
	RELATIVE PROPOSED PROJECT VALUE		Southern Yuma Routes		
			Y1	Y2	Y3
			Links: A2, A3, B1, A14, A29, A23, A25	Links: A2, A5, A6, A8, A10, A15, A21, A23	Links: A2, A5, A7, A16, A19, A20, A28
			Differentiators between routes Y1 compared to Y2 and Y3: Shortest expected linear distance of impacts to potentially jurisdictional waters. Second fewest estimated impacts to sensitive habitat.	Differentiators between routes 21 compared to Y1 and Y3: Longest expected linear distance of impacts to potentially jurisdictional waters and sensitive habitats. Fewest estimated linear impacts to sensitive habitat.	Differentiators between routes Y3 compared to Y1 and Y2: Longest expected linear distance of impacts to potentially jurisdictional waters and sensitive habitats. Most potential to impact sensitive wildlife species due to having the closest proximity and exposure to the Colorado River.
	Sensitive Land Uses	<i>Avoid/minimize impacts to sensitive lands</i>	<ul style="list-style-type: none"> -Most buildings in ROW and within 250-ft of centerline. -Most irrigation canal crossings. -Most farmland of Statewide importance crossed. - Proximity to US-Mexico Border. -Traverses the Fort Yuma Quechan Reservation. 	<ul style="list-style-type: none"> -Second most buildings in ROW and within 250-ft of centerline. -Second most irrigation canal crossings. -Second most farmland of Statewide importance crossed. -Proximity to US-Mexico Border. -Traverses the Fort Yuma Quechan Reservation and the Cocopah North Reservation. 	<ul style="list-style-type: none"> -Fewest buildings in ROW and within 250-ft of centerline. -Least irrigation canal crossings. -Least farmland of Statewide importance crossed. -Traverses the Fort Yuma Quechan Reservation.
	Cultural Resources	<i>Avoid/minimize impacts to cultural resources</i>	<ul style="list-style-type: none"> -Traverses the Fort Yuma Quechan Reservation. 	<ul style="list-style-type: none"> -Traverses through downtown Yuma. -Intersects Downtown Historic Yuma District. -Traverses the Fort Yuma Quechan Reservation and the Cocopah North Reservation. 	<ul style="list-style-type: none"> -Most miles within the Fort Yuma Quechan Reservation.

ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON		
			Southern Yuma Routes		
			Y1	Y2	Y3
			Links: A2, A3, B1, A14, A29, A23, A25	Links: A2, A5, A6, A8, A10, A15, A21, A23	Links: A2, A5, A7, A16, A19, A20, A28
	Visual Resources	<p><i>Reduce potential visual impacts from Proposed Project</i></p> <p><i>VRM Class II would require a Resource Plan Amendment. NHT (Visual/Cultural): Could require mitigation measures if Proposed Project visual impacts affect eligibility</i></p>	<p>-2 Visual Resource Management (VRM) Class II crossings.</p> <p>-Greatest VRM Class II distance crossed (tied.)</p> <p>- Highest overall structure/visual contrasts.</p> <p>-Crosses four Nationally Significant Trails.</p> <p>-Significant visual impacts due to proximity to existing homes and planned residential.</p>	<p>-2 Visual Resource Management (VRM) Class II crossings.</p> <p>-Greatest VRM class II distance crossed (tied.)</p> <p>-Significant visual impacts due to proximity to existing homes, planned residential, downtown Yuma, and park areas.</p> <p>-Crosses four Nationally Significant Trails.</p>	<p>-2 Visual Resource Management (VRM) Class II crossings.</p> <p>-Lowest VRM Class II distance crossed.</p> <p>-Lowest overall structure/visual contrasts.</p> <p>-Significant visual impacts due to proximity to existing homes, planned residential, downtown Yuma, and park areas.</p> <p>-Crosses 10 Nationally Significant Trails.</p>
Social/Community Impacts	<p><i>Avoiding established communities/urban areas minimizes visual and land use impacts, including possible socioeconomic impacts.</i></p>	<p>-Does not avoid Tribal land.</p> <p>-City of Yuma land use concerns.</p>	<p>-Does not avoid Tribal land.</p> <p>-City of Yuma land use concerns, high density residential.</p>	<p>-Does not avoid Tribal land.</p> <p>-City of Yuma land use concerns, high density residential.</p>	
Permitting Risks	<p><i>Reducing permitting risk lowers costs to ratepayers and schedule risks for licensing and constructing the Proposed Project.</i></p>	<p>-Requires Department of Defense and Federal Aviation Administration review and approval and federal permitting.</p> <p>-Additional FAA concerns south of Yuma International Airport/MCAS Yuma.</p> <p>-Aquatics and Cultural Resource and ROW permit concerns (BIA) relative to other alternatives.</p>	<p>-Avoids Yuma International Airport/MCAS Yuma.</p> <p>-Aquatics and Cultural Resource and ROW permit concerns (BIA) relative to other alternatives.</p> <p>-Not within BLM 368 Utility Corridor.</p>	<p>-Avoids Yuma International Airport/MCAS Yuma.</p> <p>-Segment A16 carries broadened LSAA, potential Section 404 individual permit, Section 10, and Section 106 concerns.</p> <p>-Greatest length within BLM 368 Utility Corridor.</p>	

ROUTING EVALUATION FACTOR		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON			
		RELATIVE PROPOSED PROJECT VALUE	Southern Yuma Routes		
			Y1	Y2	Y3
		Links: A2, A3, B1, A14, A29, A23, A25	Links: A2, A5, A6, A8, A10, A15, A21, A23	Links: A2, A5, A7, A16, A19, A20, A28	
		-Not within BLM 368 Utility Corridor.		-Additional Cultural Resources permit concerns (BIA) relative to other alternatives.	

TABLE 4-4 SUMMARY COMPARISON TABLE

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
			Segment 1				
			1A	1B Preferred	1C	1D	1-Alt
		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d	
Total Length (miles)	<i>Shorter length reduces Project costs to ratepayers and can reduce total environmental impacts.</i>	45.9	37.4	35.3	36.3	2.6	
Parallels Existing Transmission Lines (miles)	<i>Parallel lines reduce visual impacts and consolidates impacts on views. Also potentially reduces the need for new access roads.</i>	>= 230 kV: 8.0 (17.5%) < 230 kV: 4.5 (9.8%)	>= 230 kV: 9.6 (25.6%) < 230 kV: 3.6 (9.7%)	>= 230 kV: 14.4 (40.9%) < 230 kV: 3.6 (10.3%)	>= 230 kV: 13.9 (38.2%) < 230 kV: 3.6 (10.0%)	>= 230 kV: 0 (0%) < 230 kV: 0 (0%)	
# of Existing Crossings	Transmission	Minimizing number of crossings reduces the complexity of	>= 230 kV: 0 < 230 kV: 9	>= 230 kV: 0 < 230 kV: 7	>= 230 kV: 0 < 230 kV: 7	>= 230 kV: 0 < 230 kV: 7	>= 230 kV: 0 < 230 kV: 0
	Pipeline		3	3	3	3	0

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
			Segment 1				
			1A	1B Preferred	1C	1D	1-Alt
			Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d
Water	engineering, reduces risk of outages and reduces visual impacts from the need for taller structures at each crossing	Perennial Stream – 1 Canals – 6 Waterbodies - 0	Perennial Stream – 1 Canals – 5 Waterbodies - 1	Perennial Stream – 1 Canals – 5 Waterbodies - 1	Perennial Stream – 1 Canals – 5 Waterbodies - 1	Perennial Stream – 0 Canals – 2 Waterbodies - 0	
		Interstates - 0 US Highways - 0 State Highways - 0	Interstates - 0 US Highways - 0 State Highways - 0	Interstates - 0 US Highways - 0 State Highways - 0	Interstates - 0 US Highways - 0 State Highways - 0	Interstates - 0 US Highways - 0 State Highways - 0	
		1	1	1	1	0	
Length in BLM Utility Corridors/WWEC (miles)	Locating within BLM corridors reduces Federal permitting risks by placing facilities in previously evaluated/approved locations. May also reduce the need for Plan Amendments for federal land management plans.	Length in merged corridors 28.1 (61.3%)	Length in merged corridors 29.8 (79.6%)	Length in merged corridors 20.6 (58.2%)	Length in merged corridors 21.4 (59.0%)	Length in merged corridors 2.57 (100.0%)	
Land Jurisdiction (miles)	Locating on Federal/State Lands reduces the need for private easements but increases permitting risks and schedule.	State: 0.0 Federal: 45.3 Private/ Undetermined: 0.6	State: 0.0 Federal: 36.7 Private/ Undetermined: 0.7	State: 0.0 Federal: 34.6 Private/ Undetermined: 0.7	State: 0.0 Federal: 35.6 Private/ Undetermined: 0.7	State: 0.0 Federal: 2.6 Private/ Undetermined: 0.0	
# of Private Parcels Crossed	Reducing private parcels reduces # of easements	8	8	8	8	0	

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
				Segment 1				
				1A	1B Preferred	1C	1D	1-Alt
		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d		
	<i>needed and the cost of land acquisition.</i>							
# of Buildings in ROW (250-ft)	<i>Structure conflicts within ROW that would require possible removal.</i>	0	0	0	0	0	0	
# of Buildings Within 250-ft of Centerline	<i>Structure conflicts within and adjacent to ROW that would require possible removal or potential significant impacts.</i>	0	0	0	0	0	0	
Engineering/ Constructability Concerns	<i>Fewer E&C concerns reduce potential land disturbance, impacts, and cost to rate payers.</i>	-Steep slopes/terrain/ accessibility issues in Cargo Muchacho Mts. & northeast. Slope > 35% = 2.1 Angles 15° > = 21	-Steep slopes/terrain/ accessibility issues in Cargo Muchacho Mts. & northeast. Slope > 35% = 2.3 Angles 15° > = 15	-Steep slopes/terrain/ accessibility issues in Cargo Muchacho Mts. & northeast. Slope > 35% = 3.0 Angles 15° > = 9	-Steep slopes/terrain/ accessibility issues in Cargo Muchacho Mts. & northeast. Slope > 35% = 2.0 Angles 15° > = 13	Slope > 35% = 0 Angles 15° > = 0		
Environmental	Fire Risk	<i>Lower fire risk</i>	Minimal	Minimal	Minimal	Minimal	Minimal	
	Biological Resources	<i>Avoid/minimize impacts to sensitive species</i>	ACECs: Does not travel through ACECs outside of the WWEC. Species: High potential for FP and other protected Species: High potential for FP and other protected	ACECs: Does not travel through ACECs outside of the WWEC. Species: High potential for FP and other protected species (Black and Yuma Ridgeway's rail, riparian birds) within	ACECs: Travels ~7.12 total miles through ACECs that are outside of the WWEC. Species: High potential for FP and other protected	ACECs: Travels ~7.25 total miles through ACECs that are outside of the WWEC. Species: High potential for FP and other protected species (Black and Yuma Ridgeway's rail,	ACECs: Travels through 0 miles of ACECs. -Travels through 0.09 miles of sensitive habitat cover.	

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
				Segment 1				
				1A	1B Preferred	1C	1D	1-Alt
		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d		
		<p>species (Black and Yuma Ridgeway's rail, riparian birds) within wetlands being crossed around Colorado River. Crosses through Cargo Muchacho Mountains, which is suitable habitat for FP desert bighorn sheep and golden eagle. Expected impacts to microphyll woodlands.</p> <p>Waters: Most potential drainage/wetland crossings than other Segment 1 routes.</p> <p>Differentiators between routes 1A compared to 1B, 1C, and 1D: It is the longest route and also</p>	<p>wetlands being crossed around Colorado River. Crosses through Cargo Muchacho Mountains, which is suitable habitat for FP desert bighorn sheep and golden eagle. Potentially the most potential impacts to microphyll woodlands.</p> <p>Waters: Third fewest drainage/wetland crossings within Segment 1 routes (but very close to 1D).</p> <p>Differentiators between routes 1B compared to 1A, 1C, and 1D: Shorter route than 1A over the Colorado River (still perpendicular crossing), but it is the longest route through the desert foothills and Cargo Muchacho Mountains. Second longest distance through sensitive habitats.</p>	<p>species (Black and Yuma Ridgeway's rail, riparian birds) within wetlands being crossed around Colorado River. Crosses through Cargo Muchacho Mountains, which is suitable habitat for FP desert bighorn sheep and golden eagle. Expected impacts to microphyll woodlands.</p> <p>Waters: Second fewest potential drainage/wetland crossings than other Segment 1 routes.</p> <p>Differentiators between routes 1C compared to 1A, 1B, and 1D: Shorter route than 1A over the Colorado River</p>	<p>riparian birds) within wetlands being crossed around Colorado River. Crosses through Cargo Muchacho Mountains, which is suitable habitat for FP desert bighorn sheep and golden eagle. Expected impacts to microphyll woodlands.</p> <p>Waters: Third most potential drainage/wetland crossings than other Segment 1 routes.</p> <p>Differentiators between routes 1D compared to 1A, 1B, and 1C: Shorter route than 1A over the Colorado River (still perpendicular crossing) and fewer impacts to the Cargo Muchacho Mountains than route 1B, but more than 1C. Second-shortest linear distance</p>			

ROUTING EVALUATION FACTOR		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON					
		Segment 1					
		1A	1B Preferred	1C	1D	1-Alt	
RELATIVE PROPOSED PROJECT VALUE		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d	
			has the longest linear distance through sensitive habitats compared to other Segment 1 routes, which likely means the most habitat impacts. Longer perpendicular crossing over the Colorado River than the other Segment 1 routes (potential impacts to migrating birds). Most potential impacts to microphyll woodlands.		(still perpendicular crossing) and shortest route overall with the shortest- linear distance through sensitive habitats.	through sensitive habitat.	
	Sensitive Land Uses	<i>Avoid/minimize impacts to sensitive lands</i>	-Least irrigation canal crossings. -Tied for most highway crossings.	-Second most irrigation canal crossings. -Tied for most highway crossings.	-Adjacent to Quechan Casino Resort. -Second most irrigation canal crossings. -Tied for most highway crossings.	-Located near US – Mexico border crossing. -Most irrigation canal crossings. -Parallels irrigation canal. -Least highway crossings.	- 2 canal crossings - No highway crossings

		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON					
		Segment 1					
ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE	1A		1B Preferred	1C	1D	1-Alt
		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d		Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d	Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d
	Cultural Resources	<i>Avoid/minimize impacts to cultural resources</i>	<p>-Conflicts with Fort Yuma Quechan Tribe's concerns regarding this route following existing SWPL transmission line because of known cultural resources being present along that route.</p> <p>- Conflicts with Fort Yuma Quechan Tribe's concerns regarding crossing the culturally significant Cargo Muchacho Mts.</p>	<p>-Highest number of miles through the proposed Kw'tsan National Monument (KNM).</p> <p>-</p> <p>-Conflicts with Fort Yuma Quechan Tribe's concerns regarding this route following existing SWPL transmission line because of known cultural resources being present along that route.</p> <p>- Conflicts with Fort Yuma Quechan Tribe's concerns regarding crossing the culturally significant Cargo Muchacho Mts.</p> <p>-Crosses known historical mining area.</p>	<p>-Conflicts with Fort Yuma Quechan Tribe's concerns regarding this route following existing SWPL transmission line because of known cultural resources being present along that route.</p> <p>- Conflicts with Fort Yuma Quechan Tribe's concerns regarding crossing the culturally significant Cargo Muchacho Mts.</p>	<p>-Fewest miles within the proposed KNM.</p> <p>-Conflicts with Fort Yuma Quechan Tribe's concerns regarding this route following existing SWPL transmission line because of known cultural resources being present along that route.</p> <p>- Conflicts with Fort Yuma Quechan Tribe's concerns regarding crossing the culturally significant Cargo Muchacho Mts.</p>	<p>-Crosses the All American Canal (NRHP Listed Resource).</p> <p>-Adjacent to the Plank Road ACEC (within 50 feet).</p>
	Visual Resources	<i>Reduce potential visual impacts from Proposed Project</i>	<p>-5 Visual Resource Management (VRM) Class II crossings; greatest distance VRM Class II</p>	<p>-5 VRM Class II crossings, tied with 1C/1D for least Class II crossing (4.5 miles). -High greenfield scenic quality impacts in Cargo Muchacho Mts.</p>	<p>-5 VRM Class II crossings, tied with 1B/1D for least Class II crossing (4.5 miles).</p>	<p>-5 VRM Class II crossings, tied with 1B/1C for least Class II crossing (4.5 miles).</p>	<p>-No VRM Class II crossings</p>

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON							
				Segment 1							
				1A	1B Preferred	1C	1D	1-Alt			
		Links: C1, C6, C7, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d		Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, E4d		Links: C1, C2, C3, C4, C5, D1, E5, E6, E7, E9, E3a, E3b, E4a, E4b, E4c, E4d		Links: C1, C2, C3, C4, C5, D1, E5, E8, E2, E3a, E3b, E4a, E4b, E4c, E4d		Links: C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E13, E4d	
		<p><i>VRM Class II would require a Resource Plan Amendment. NHT (Visual/Cultural): Could require mitigation measures if Proposed Project visual impacts affect eligibility</i></p> <p>crossings (7.7 miles). -High greenfield scenic quality impacts in Cargo Muchacho Mts. -Highest visual impacts on residential/parks/recreation/developed.</p>				<p>-Lowest greenfield scenic quality impacts in Cargo Muchacho Mts. -Lowest (tied) overall structure/visual contrasts paralleling most existing transmission line.</p>		<p>-Lowest (tied) overall structure/visual contrasts paralleling most existing transmission line.</p>			
Social/Community Impacts		<p><i>Avoiding established communities/urban areas minimizes visual and land use impacts, including possible socioeconomic impacts.</i></p>		<p>-Avoids Tribal lands -Avoids City of Yuma and communities surrounding Yuma.</p>		<p>-Avoids Tribal lands -Avoids City of Yuma and communities surrounding Yuma.</p>		<p>-Avoids Tribal lands -Avoids City of Yuma and communities surrounding Yuma.</p>		<p>-Avoids City of Yuma and communities surrounding Yuma</p>	
Permitting Risks		<p><i>Reducing permitting risk lowers costs to ratepayers and schedule risks for licensing and constructing the Proposed Project.</i></p>		<p>-Requires Department of Defense, IID, and Reclamation review and approval and federal permitting. Avoids AZ State lands.</p>		<p>-Requires Reclamation review and approval and federal permitting. Avoids AZ State lands.</p>		<p>-Requires Reclamation review and approval and federal permitting. Avoids AZ State lands.</p>		<p>-Requires Reclamation review and approval and federal permitting. Avoids AZ State lands.</p>	

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON	
			Segment 2	
			2 Preferred	2A
			Links: F1, F2, F3, F4	Links: F5, F6, F7
Total Length (miles)		<i>Shorter length reduces Proposed Project costs to ratepayers and can reduce total environmental impacts.</i>	20.5	20.7
Parallels Existing Transmission Lines (miles)		<i>Parallel lines reduce visual impacts and consolidates impacts on views. Also potentially reduces the need for new access roads.</i>	>= 230 kV: 0.0 (0%) < 230 kV: 3.6 (17.7%)	>= 230 kV: 16.1 (77.8%) < 230 kV: 8.5 (41.2%)
# of Existing Crossings	Transmission	<i>Minimizing number of crossings reduces the complexity of engineering, reduces risk of outages and reduces visual impacts from the need for taller structures at each crossing.</i>	>= 230 kV: 0 < 230 kV: 6	>= 230 kV: 0 < 230 kV: 7
	Pipeline		0	0
	Water		Perennial Stream – 0 Canals – 1 Waterbodies - 0	Perennial Stream – 0 Canals – 10 Waterbodies - 1
	Roads		Interstates - 1 US Highways - 0 State Highways - 1	Interstates - 1 US Highways - 0 State Highways - 1
	Rail Roads		0	0
Length in BLM Utility Corridors/WWEC (miles)		<i>Locating within BLM corridors reduces Federal permitting risks by placing facilities in previously evaluated/approved locations. May also reduce the need for Plan Amendments for federal land management plans.</i>	19.1 (93.4%)	18.6 (89.8%)
Land Jurisdiction (miles)		<i>Locating on Federal/State Lands reduces the need for private easements but increases permitting risks and schedule.</i>	State: 0.0 Federal: 19.5 Private/Undetermined: 1.0	State: 0.0 Federal: 20.7 Private/Undetermined: 0.0
# of Private Parcels Crossed		<i>Reducing private parcels reduces # of easements needed and the cost of land acquisition.</i>	2	0
# of Buildings in ROW (250-ft)		<i>Structure conflicts within ROW that would require possible removal.</i>	0	0

ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON	
			Segment 2	
			2 Preferred	2A
			Links: F1, F2, F3, F4	Links: F5, F6, F7
# of Buildings Within 250-ft of Centerline	<i>Structure conflicts within and adjacent to ROW that would require possible removal or potential significant impacts.</i>		0	0
Engineering/ Constructability Concerns	<i>Fewer E&C concerns reduce potential land disturbance, impacts, and cost to rate payers.</i>		Slope > 35% = 0.0 Angles 15° > = 3	Slope > 35% = 0.0 Angles 15° > = 4
Environmental	Fire Risk	<i>Lower fire risk</i>	Minimal	Minimal
	Biological Resources	<i>Avoid/ minimize impacts to sensitive species</i>	<p>ACECs: Travels ~3 total miles through ACECs that are outside of the WWEC.</p> <p>Species: Potential for FP species (Black and Yuma Ridgeway's rail) within wetlands being crossed. High potential for flat-tailed horned lizard (FTHL) throughout route 2 and crosses through flat-tailed horned lizard management area.</p> <p>Waters: ~3 miles of potential wetland crossings.</p> <p>Differentiators between routes 2 and 2A: More linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species and FTHL. However, fewer wetland/riparian acreage impacts than 2A. Travels through FTHL Management Area where route 2A does not.</p>	<p>ACECs: Travels ~3 total miles through ACECs that are outside of the WWEC.</p> <p>Species: High potential for FP species (Black and Yuma Ridgeway's rail) within wetlands being crossed. High potential for FTHL throughout route 2A.</p> <p>Waters: ~3 miles of potential wetland crossings.</p> <p>Differentiators between routes 2A and 2: Fewer linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species, but more acreage impacts to possible wetland/riparian areas. Avoids FTHL Management areas, but still likely impacts to FTHL.</p>
	Sensitive Land Uses	<i>Avoid/ minimize impacts to sensitive lands</i>	<p>-Least irrigation canal crossings.</p> <p>-Tied for most highway crossings.</p>	<p>-Most irrigation canal crossings.</p> <p>-Tied for most highway crossings.</p>

ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON	
			Segment 2	
			2 Preferred	2A
			Links: F1, F2, F3, F4	Links: F5, F6, F7
	Cultural Resources	<i>Avoid/ minimize impacts to cultural resources</i>	<ul style="list-style-type: none"> -Crosses Lake Cahuilla boundaries (ACEC) at western extent, sensitive for cultural resources. -Record search data indicates fewer known resources exist through the dunes when compared to 2A. -Follows existing transmission line for 0.8 miles, which may reduce cultural resources impacts . 	<ul style="list-style-type: none"> -Crosses Lake Cahuilla (ACEC) boundaries at western extent, sensitive for cultural resources. -Cultural resources exist near wetland areas. -Follows existing transmission line for 16.1 miles, which may reduce cultural resources impacts.
	Visual Resources	<ul style="list-style-type: none"> <i>Reduce potential visual impacts from Proposed Project</i> <i>VRM Class II would require a Resource Plan Amendment.</i> <i>NHT (Visual/Cultural): Could require mitigation measures if Proposed Project visual impacts affect eligibility</i> 	<ul style="list-style-type: none"> -2 VRM Class II crossings; greatest distance VRM Class II crossings (1.1 miles). -Highest greenfield scenic quality and recreational viewer impacts. 	<ul style="list-style-type: none"> -Lowest overall structure/visual contrasts paralleling most existing transmission line. -Highest impacts on Special Management Area (Lake Cahuilla ACEC) with scenic values.
Social/Community Impacts	<i>Avoiding established communities/urban areas minimizes visual and land use impacts, including possible socioeconomic impacts.</i>		<ul style="list-style-type: none"> -Visual impacts parallel to and crossings of I-8 and associated features. 	<ul style="list-style-type: none"> -Visual impacts parallel to and crossings of I-8 and associated features.
Permitting Risks	<i>Reducing permitting risk lowers costs to ratepayers and schedule risks for licensing and constructing the Proposed Project.</i>		<ul style="list-style-type: none"> -Would require Reclamation review and approval for canal crossings and parallel alignment to canal. -ACEC crossings. -Structure and access in dunes. 	<ul style="list-style-type: none"> -Would require Reclamation review and approval for canal crossings and parallel alignment to canal. -ACEC crossings.

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE	NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
			Segment 3				
			3	3A	3B	3C Preferred	3D
		Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12	
Total Length (miles)		<i>Shorter length reduces Proposed Project costs to ratepayers and can reduce total environmental impacts.</i>	26.9	29.7	27.0	28.7	28.7
26.85, 29.66, 26.96, 28.71, 28.70 Parallels Existing Transmission Lines (miles)		<i>Parallel lines reduce visual impacts and consolidates impacts on views. Also potentially reduces the need for new access roads.</i>	>= 230 kV: 25.2 (93.8%) < 230 kV: 0.0 (0%)	>= 230 kV: 0.1 (0.3%) < 230 kV: 0.0 (0%)	>= 230 kV: 0.1 (0.3%) < 230 kV: 0.8 (3.0%)	>= 230 kV: 11.9 (41.4%) < 230 kV: 0.0 (0%)	>= 230 kV: 14.9 (51.9%) < 230 kV: 0.0 (0%)
# of Existing Crossings	Transmission	<i>Minimizing number of crossings reduces the complexity of engineering, reduces risk of outages and reduces visual impacts from the need for taller structures at each crossing.</i>	>= 230 kV: 3 < 230 kV: 6	>= 230 kV: 3 < 230 kV: 6	>= 230 kV: 3 < 230 kV: 4	>= 230 kV: 3 < 230 kV: 4	>= 230 kV: 3 < 230 kV: 4
	Pipeline		2	2	2	2	2
	Water		Perennial Stream – 2 Canals – 49 Waterbodies - 1	Perennial Stream – 2 Canals – 51 Waterbodies - 0	Perennial Stream – 2 Canals – 47 Waterbodies - 0	Perennial Stream – 2 Canals – 42 Waterbodies - 1	Perennial Stream – 2 Canals – 42 Waterbodies - 1
	Roads		Interstates - 0 US Highways - 0 State Highways - 2	Interstates - 0 US Highways - 0 State Highways - 3	Interstates - 0 US Highways - 0 State Highways - 2	Interstates - 0 US Highways - 0 State Highways - 2	Interstates - 0 US Highways - 0 State Highways - 2
	Railroads		1	1	1	1	1
Length in BLM Utility Corridors/WWEC (miles)		<i>Locating within BLM corridors reduces Federal permitting risks by placing facilities in previously evaluated/approved locations. May also reduce the need for Plan Amendments for federal land management plans.</i>	Length in merged corridors 1.3 (4.8%)	Length in merged corridors: 1.2 (4.2%)	Length in merged corridors: 1.9 (6.9%)	Length in merged corridors: 2.4 (8.4%)	Length in merged corridors: 2.4 (8.4%)
Land Jurisdiction (miles)		<i>Locating on Federal/State Lands reduces the need for private easements but increases permitting risks and schedule.</i>	State :0.7 Federal: 0.4 Private/Undetermined: 25.8	State: 0.0 Federal: 3.8 Private/Undetermined: 25.9	State: 0.0 Federal: 0.8 Private/Undetermined: 26.1	State: 0.7 Federal: 0.5 Private/Undetermined: 27.5	State: 0.7 Federal: 0.5 Private/Undetermined: 27.5

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
				Segment 3				
				3	3A	3B	3C Preferred	3D
			Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12	
# of Private Parcels Crossed	<i>Reducing private parcels reduces # of easements needed and the cost of land acquisition.</i>	80	94	102	92	90		
# of Buildings in ROW (250-ft)	<i>Structure conflicts within ROW that would require possible removal.</i>	2	3	8	8	10		
# of Buildings Within 250-ft of Centerline	<i>Structure conflicts within and adjacent to ROW that would require possible removal or potential significant impacts.</i>	5	39	17	10	12		
Engineering/ Constructability Concerns	<i>Fewer E&C concerns reduce potential land disturbance, impacts, and cost to rate payers.</i>	Slope > 35% = 0.0 Angles 15° > = 7	Slope > 35% = 0.0 Angles 15° > = 9	Slope > 35% = 0.0 Angles 15° > = 10	Slope > 35% = 0.0 Angles 15° > = 14	Slope > 35% = 0.0 Angles 15° > = 13		
Environmental	Fire Risk	<i>Lower Fire Risk</i>	Minimal	Minimal	Minimal	Minimal	Minimal	
	Biological Resources	<i>Avoid/ minimize impacts to sensitive species</i>	ACECs: 0.12 miles through Lake Cahuilla ACEC. Species: Entire route is suitable for Burrowing Owl (BUOW, State Endangered). Potential for FP and protected species (Black and Yuma Ridgeway's rail, riparian birds) within rivers/washes being crossed. Potential for flat-tailed horned	ACECs: 2.68 miles through Lake Cahuilla ACEC on eastern end. Species: Entire route is suitable for BUOW, (State Endangered). Potential for FP and protected species (Black and Yuma Ridgeway's rail, riparian birds) within rivers/washes being crossed. Potential for FTHL at far	ACECs: 0.09 miles through Lake Cahuilla ACEC on eastern end of Segment. Species: Entire route is suitable for Burrowing Owl (BUOW, State Endangered). Potential for FP and protected species (Black and Yuma Ridgeway's rail, riparian birds) within rivers/washes being	ACECs: 0.91 miles through Lake Cahuilla ACEC on eastern end of Segment and Yuha Basin on the western end of the segment (outside of WWEC). Species: Entire route is suitable for BUOW, (State Endangered). Potential for FP and protected species (Black and Yuma Ridgeway's rail, riparian birds) within rivers/washes being	ACECs: 0.91 miles through Lake Cahuilla ACEC on eastern end of Segment and Yuha Basin on the western end of the segment (outside of WWEC). Species: Entire route is suitable for BUOW, (State Endangered). Potential for FP and protected species (Black and Yuma Ridgeway's rail, riparian birds) within rivers/washes being	

		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE	Segment 3				
		3	3A	3B	3C Preferred	3D
		Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12
		<p>lizard (FTHL) at far western end in Yuha Basin ACEC (fewer than other routes). Travels through FTHL Management area for 0.2 miles.</p> <p>Waters: Third fewest drainage impacts than all other Segment 3 routes (but close to 3, 3B, 3C, and 3D in terms of potential impacts – range is 0.53 – 0.61 acre). Crosses mapped swamp/marsh just west of State Hwy 7.</p> <p>Differentiators between routes 3A, 3B, 3C, and 3D: Third fewest linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species. Lowest landfire riparian habitat acreage than other</p>	<p>western end in Yuha Basin ACEC.</p> <p>Waters: Highest number of drainage/river crossings in Segment 3.</p> <p>Differentiators between routes 3A, 3, 3B, 3C, and 3D: Longer distance of potential drainage crossings and highest potential for impacting FP riparian bird species (also has longest linear distance through landfire riparian and sensitive habitats). Along with 3 and 3B, route 3A crosses FTHL Management area (longest route through the FTHL management area).</p>	<p>crossed. Potential for FTHL at far western end in Yuha Basin ACEC.</p> <p>Waters: Fourth fewest drainage impacts than all other Segment 3 routes (but close to 3B, 3C, and 3D in terms of potential impacts – range is 0.53 – 0.61 acre).</p> <p>Differentiators between routes 3, 3A, 3C, and 3D: Potentially fewest linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species. Second lowest amount of potential crossing of sensitive riparian habitats. Along with 3 and 3B, route 3A crosses FTHL Management area (longest route</p>	<p>Ridgeway's rail, riparian birds) within rivers/washes being crossed. Potential for FTHL) at far western end in Yuha Basin ACEC.</p> <p>Waters: Along with 3D, fewest drainage impacts than all other Segment 3 routes (but close to 3, 3B, and 3D in terms of potential impacts – range is 0.53 – 0.61 acre).</p> <p>Differentiators between routes 3, 3A, 3B, and 3D: Potentially fewest linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species. Tied with 3D for second fewest linear distance of impacts to landfire riparian and sensitive vegetation</p>	<p>FTHL at far western end in Yuha Basin ACEC.</p> <p>Waters: Along with 3C, fewest drainage impacts than all other Segment 3 routes (but close to 3, 3B, and 3D in terms of potential impacts – range is 0.53 – 0.61 acre).</p> <p>Differentiators between routes 3, 3A, 3B, and 3C: Potentially fewest linear miles of potential drainage crossings/impacts and potential impacts to FP riparian bird species. Tied with 3C for second shortest distance of linear impacts to landfire riparian and sensitive vegetation communities. Does not cross FTHL Management area.</p>

		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE	Segment 3				
		3	3A	3B	3C Preferred	3D
		Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12
		Segment 3 routes and shortest linear distance through other sensitive habitat. Along with 3A and 3B, route 3 crosses FTHL Management area (but shortest route through the FTHL management area compared to 3A and 3B).		through the FTHL management area).	communities. Does not cross FTHL Management area.	
Sensitive Land Uses	<i>Avoid/ minimize impacts to sensitive lands</i>	-Crosses 3 State/County Roads. -1 canal crossing.	-3 canal crossings. -Crosses 2 State Roads. -Parallels Canal.	-3 canal crossings. -Crosses 2 State Roads. -Parallels Canal.	-4 canal crossings. -Crosses 1 State Road. -Parallels Canal.	-4 canal crossings. -Crosses 1 State Road. -Parallels Canal.
Cultural Resources	<i>Avoid/ minimize impacts to cultural resources</i>	-Crosses Heber Dunes.	-Eastern end of the alignment bisects boundaries of Ancient Lake Cahuilla (<0.25 miles); known resources in this area; ACEC. -Avoids Heber Dunes.	-Avoids Heber Dunes.	-Crosses Heber Dunes.	-Crosses Heber Dunes. -Avoids residential communities which reduces number of built environment structures that may require review for CRHR/NRHP eligibility.
Visual Resources	<i>Reduce potential visual impacts from Proposed Project</i>	-Crosses and is in the foreground of Heber Dunes State Recreational Area.	-Highest impacts on Special Management Area (Lake Cahuilla and	-High structure/visual contrasts.	-Crosses and is in the foreground of Heber Dunes State Recreational Area.	-Lowest overall visibility from residential/developed

ROUTING EVALUATION FACTOR		RELATIVE PROPOSED PROJECT VALUE		NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON				
				Segment 3				
				3	3A	3B	3C Preferred	3D
			Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12	
		<p><i>VRM Class II would require a Resource Plan Amendment.</i></p> <p><i>NHT (Visual/Cultural): Could require mitigation measures if Proposed Project visual impacts affect eligibility</i></p>	<p>-Lowest overall structure/visual contrasts paralleling most existing transmission line</p> <p>-Crosses NHT once.</p>	<p>Yuha Basin ACEC) with scenic values.</p> <p>-Highest structure/visual contrasts paralleling least amount of existing transmission line.</p> <p>- Greatest distance VRM Class III crossings (3.0 miles).</p> <p>-Highest impacts on residential (Heber, El Centro) communities.</p> <p>-Lowest impact on recreational viewers</p> <p>-Crosses NHT once.</p>	<p>-Highest impacts on Calexico residential community.</p> <p>-Crosses NHT once.</p>	<p>-Crosses NHT once.</p>	<p>areas (Calexico, Heber, El Centro).</p> <p>-Crosses and is in the foreground of Heber Dunes State Recreational Area.</p> <p>-Crosses NHT once.</p>	
Social/Community Impacts	<p><i>Avoiding established communities/urban areas minimizes visual and land use impacts, including possible socioeconomic impacts.</i></p>	<p>-Agricultural operation concerns.</p> <p>-Adjacent to Heber Solar</p> <p>-Adjacent to Second Imperial Geothermal.</p>	<p>-Agricultural operation concerns.</p> <p>-Parallels Rivers and Lands Conservancy</p> <p>-Potential for El Centro community opposition.</p>	<p>-Agricultural operation concerns.</p> <p>-Parallels Rivers and Lands Conservancy</p> <p>-Potential for Calexico community opposition.</p>	<p>-Agricultural operation concerns.</p> <p>-Potential for Calexico community opposition.</p>	<p>-Agricultural operation concerns.</p> <p>-Potential for Calexico community opposition.</p>	<p>-Agricultural operation concerns.</p> <p>-Potential for Calexico community opposition.</p>	
Permitting Risks	<p><i>Reducing permitting risk lowers costs to ratepayers and</i></p>	<p>-Additional permitting</p>	<p>-Crosses through City of El Centro.</p>	<p>-Crosses through City of Calexico.</p>	<p>-Crosses through City of Calexico.</p>	<p>-Crosses through City of Calexico.</p>	<p>-Crosses through City of Calexico.</p>	

NORTH GILA TO IMPERIAL VALLEY: TRANSMISSION LINE ALTERNATIVES COMPARISON						
ROUTING EVALUATION FACTOR	RELATIVE PROPOSED PROJECT VALUE	Segment 3				
		3	3A	3B	3C Preferred	3D
		Links: H1, H2, H3, H4, H5, H6, H7, H8, H9, H10	Links: G1, G2, G3, G4	Links: I3, I4, I5, I6, I7, I8, I9, I10, I11, I12	Links: H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, I12	Links: H1, H2, H3, H4, I2, I8, I9, I10, I13, I14, I15, I16, I12
	<i>schedule risks for licensing and constructing the Proposed Project.</i>	complexity crossing Heber Dunes State Recreation Area.			-Additional permitting complexity crossing Heber Dunes State Recreation Area.	-Additional permitting complexity crossing Heber Dunes State Recreation Area.

4.6.3 Preferred Route

Through the comparison of route alternatives, HWT identified the 86.6 miles combination of Alternatives 1B, 2, and 3C as the Preferred Route, because it is the most feasible route with the least challenges (Figure 4-6). Details of the alternatives that make up the Preferred Route are outlined below. All routes considered in the northern area are shown in Figure 4-3.

Alternative 1B

Alternative 1B is made up of links C1, C2, C3, C4, C5, D1, E1, E2, E3a, E3b, E4a, E4b, E4c, and E4d and was deemed the preferred Segment 1 route alternative for several reasons. In terms of engineering constraints it has the least amount of existing transmission line crossings. It also has the greatest length in BLM Utility Corridors/WWEC (29.6 miles or 79.6% of the route length.) Locating within BLM corridors reduces federal permitting risks by placing facilities in previously evaluated and approved locations. It may also reduce the need for Plan Amendments for federal land management plans. Alternative 1B has the second greatest length on federal land which reduces the need for private easement though it may also increase permitting risks and schedule. This risk is outweighed by the fact that Alternative 1B avoids tribal lands and avoids the City of Yuma and communities surrounding Yuma. In terms of biological resources, Alternative 1B is a shorter route than Alternative 1A over the Colorado River (though still a perpendicular crossing), but it is the longest route through the desert foothills and Cargo Muchacho Mountains. It also has the second longest distance through sensitive habitats. However, Alternative 1B does not travel through Areas of Critical Environmental Concern (ACECs) outside of the WWEC corridor which makes it a preferable option to Alternatives 1C or 1D.

Alternative 2

Alternative 2 is made up of links F1, F2, F3, F4 and was deemed the preferred Segment 2 route alternative due to several factors. Alternative 2 has shorter mileage and less transmission line crossings than Alternative 2A. It also has more mileage in BLM Utility Corridors/WWEC than Alternative 2A (19.3 miles or 93.8% of line length.) Alternative 2 has fewer angles greater than 15°, less mileage on federal land, and fewer irrigation canal crossings. Cultural record search data indicated there are fewer known existing resources through the dunes when compared to Alternative 2A. Biological differentiators between Alternatives 2 and 2A include more linear miles of potential drainage crossings/impacts and potential impacts to Federally Protected riparian bird species and flat-tailed horned lizard (FTHL). However, fewer wetland/riparian acreage impacts than 2A. Alternative 2 also travels through FTHL Management Area where Alternative 2A does not.

Alternative 3C

Alternative 3C is made up of links H1, H2, H3, I1, I7, I8, I9, I10, I13, I14, I15, I16, and I12 and was deemed the preferred Segment 3 route alternative for a variety of reasons. Alternative 3C has the greatest distance of existing transmission line parallels of all the Segment 3 route alternatives (11.8 miles or 41.1% of route length.) It is also tied for least amount of transmission line crossings and greatest distance in BLM Utility Corridors/WWEC (2.4 miles or 8.4% of total route length.) In terms of biological resources, the Differentiators between Alternatives 3, 3A, 3B, and 3D include the fewest linear miles of potential drainage crossings/impacts and potential impacts to Federally Protected riparian bird species. Tied with Alternative 3D for second fewest

linear distance of impacts to landfire riparian and sensitive vegetation communities. Alternative 3C also does not cross FTHL Management area.

The Preferred Route’s key benefits include the following:

- Highest level of engineering and construction feasibility.
- Lowest impact to existing residential land uses and avoids crossing through areas planned for future residential development.
- Avoids Tribal reservation land and other sensitive land uses.
- Maximizes the use of existing ROWs and designated utility corridors.
- Low impacts to operating commercial businesses and industrial operations in the area.
- Lowest impacts to agricultural landowners as a result of landowner meetings.

For these reasons, HWT believes that the Preferred Route is the best route to advance for licensing and permitting. HWT anticipates beginning licensing and permitting processes in 2025.

4.6.4 Route Links Considered and Eliminated

Route links were split into nine different geographical groups and analyzed for compatibility based on the sensitivity criteria outlined in Table 4-1. Route links with low compatibility rankings were eliminated from further consideration. The results of this are summarized below in Table 4-5. Factors provided in the “Dismissal Reason” column are cumulative. While one may not be sufficient for link dismissal (e.g., Tribal land), in combination they provide sufficient reasoning to remove a link from consideration. A map of all links making up routes considered can be seen in Figure 4-5. Reference photos for link dismissal reasons can be found in Appendix A.

TABLE 4-5 ROUTE LINKS CONSIDERED AND ELIMINATED

NAME	SEGMENT	ROW WIDTH (FEET)	LENGTH (MILES)	TYPE	DISMISSAL REASON	AREA
A1	1	250	21.217	DISMISSED	Significant portion of route traverses through center of Fort Yuma Quechan Reservation. Major access constraints; no existing access routes for majority of segment.	A
A2	1	250	0.198	DISMISSED	APS expansion of NG substation is on north side of substation. Exit from the north of substation preferred; would cross AZ state lands.	A
A3	1	250	0.518	DISMISSED	A2 dismissed; would cross AZ state lands (A2).	A
A4	1	250	4.906	DISMISSED	Gila River crossing/parallel.	A
A5	1	250	1.660	DISMISSED	A6 dismissed; would require crossing AZ state lands (A2).	A
A6	1	250	3.417	DISMISSED	Gila River crossing/parallel, canal/levee parallel.	A
A7	1	250	5.697	DISMISSED	Sunny Owls Reservoir, proximity to residential land uses, a RR crossing, an I-8 crossing, and canal crossing.	A

NAME	SEGMENT	ROW WIDTH (FEET)	LENGTH (MILES)	TYPE	DISMISSAL REASON	AREA
A8	1	250	3.792	DISMISSED	ROW constraints, Canal Levee/ Existing land use.	A
A9	1	250	1.015	DISMISSED	ROW constraints, High density residential.	A
A10	1	250	0.255	DISMISSED	ROW constraints, High density residential, RR parallel/ crossing.	A
A11	1	250	0.978	DISMISSED	ROW constraints, High density residential, RR parallel/ crossing, Canal parallel.	A
A12	1	250	5.501	DISMISSED	ROW constraints, High density residential.	A
A13	1	250	5.172	DISMISSED	ROW constraints, High density residential, Canal parallel/ crossing.	A
A14	1	250	0.299	DISMISSED	Canal crossing, US Border Crossing conflict.	A
A15	1	250	5.765	DISMISSED	ROW constraints, Canal parallel, engineering constraints, residential, River crossing.	A
A16	1	250	6.698	DISMISSED	Residential and ROW constraints.	A
A17	1	250	7.523	DISMISSED	Proximity to residences and traverses the Winterhaven community.	A
A18	1	250	0.636	DISMISSED	Utility crossing conflicts, river crossing.	A
A19	1	250	0.924	DISMISSED	Utility crossing conflicts, river crossing.	A
A20	1	250	1.191	DISMISSED	Major access constraints through dunes; no existing access routes.	A
A21	1	250	1.233	DISMISSED	Utility crossing conflicts, US-Mexico Border Crossing, terrain and major access issues due to lack of existing roads.	A
A22	1	250	2.418	DISMISSED	Terrain and access constraints, Canal crossing, terrain.	A
A23	1	250	1.758	DISMISSED	ROW constraints, Canal parallel, US Border Crossing conflict.	A
A24	1	250	1.663	DISMISSED	ROW constraints, Canal crossing/ parallel, Pilot Knob, ACEC.	A
A25	1	250	2.370	DISMISSED	ROW constraints, Canal Parallel/ Crossing, BLM,, US border conflict. Major access constraints through dunes; no existing access routes.	A
A26	1	250	8.167	DISMISSED	Major access constraints through dunes; no existing access routes. Pierson's milk-vetch, ACEC, US-Mexico border conflict.	A
A27	1	250	5.111	DISMISSED	Dunes, lack of access, BLM, I-8 crossing, ACEC, Canal Crossing.	A
A28	1	250	7.042	DISMISSED	Major access constraints through dunes; no existing access routes.	A
A29	1	250	0.363	DISMISSED	US-Mexico Border Crossing, Canal crossing.	A
B1	1	250	30.361	DISMISSED	City of Yuma zoning & planning, RR Crossings/parallels, Residential, I-8 Crossing, Existing/Planned Residential	B

NAME	SEGMENT	ROW WIDTH (FEET)	LENGTH (MILES)	TYPE	DISMISSAL REASON	AREA
					Development, Air Space Restrictions, Cocopah Speedway, Overhead Transmission Line Restrictions.	
C8	1	250	1.588	DISMISSED	Terrain, engineering and access constraints, Canal Crossings.	C
C9	1	250	3.593	DISMISSED	Engineering constraints, Tribal land, Canal Crossings.	C
E10	1	250	2.154	DISMISSED	Tribal land	E
E11	1	250	1.757	DISMISSED	Terrain and access	E
E12	1	250	7.249	DISMISSED	E11 and E10 elimination, Private lands outside of utility corridor, UPRR Crossing.	E
F8	2	250	0.611	DISMISSED	Canal Crossing/ parallel	F
F9	2	250	12.538	DISMISSED	I-8 Parallel/ crossing, BLM ACEC	F
G5	3	150	1.909	DISMISSED	River crossings, solar field	G
G6	3	150	0.485	DISMISSED	Agricultural conflict	G
G7	3	150	0.744	DISMISSED	Agricultural conflict, residential, solar field.	G
G8	3	150	3.485	DISMISSED	Agricultural conflict, residential, solar field, canal crossing.	G
H11	3	150	1.058	DISMISSED	Separation from existing SWPL, additional angles around Heber Dunes.	H
H12	3	150	0.133	DISMISSED	Canal crossing, agricultural	H
H13	3	150	1.420	DISMISSED	Agricultural conflict	H
H14	3	150	0.942	DISMISSED	Canal crossing, agricultural, flood plain	H
H15	3	150	1.439	DISMISSED	Agricultural, river crossing	H
H16	3	150	1.428	DISMISSED	Agricultural conflict	H
H17	3	150	0.798	DISMISSED	Agricultural conflict	H
H18	3	150	1.076	DISMISSED	Agricultural conflict, planned residential	H
H19	3	150	0.760	DISMISSED	Agricultural conflict	H
H20	3	150	3.875	DISMISSED	Agricultural conflict, river crossing	H
I17	3	150	10.815	DISMISSED	Canal crossing, agricultural conflict, residential.	I
I18	3	150	12.380	DISMISSED	Agricultural conflict, residential, canal parallel/ crossing, RR crossing, river crossings.	I
I19	3	150	0.612	DISMISSED	Canal crossing, agricultural conflict, landowner preference.	I
I20	3	150	0.087	DISMISSED	River crossing, floodplain.	I
I21	3	150	2.258	DISMISSED	Rivers and Lands Conservancy, residential, canal crossing.	I
I22	3	150	1.402	DISMISSED	Disturbance and access within BLM ACEC. Better alternative options.	I

4.6.5 Southern Yuma Area Routing Constraints

As requested by the Fort Yuma Quechan Tribe in June 2024, HWT evaluated potential route options south of the Fort Yuma Quechan Reservation. HWT contracted POWER Engineers, Inc.

(POWER) to conduct an in-depth analysis of any potential routing opportunities existing south from North Gila Substation to the parking lot in the southwest corner of the Fort Yuma Quechan Reservation. POWER gathered publicly available federal, state, county, and city spatial data to inform route options. Rincon Consultants supported POWER with environmental and regulatory research and analysis. This analysis determined that a southern route is not possible for numerous reasons. Any route crossing existing residences would require the permanent relocation of residents and the removal of structures, and HWT does not have the power of eminent domain in Arizona. City of Yuma ordinances prohibit high voltage transmission lines in all but one land use that would be crossed by any route, and the City of Yuma cannot grant a variance or conditional use permit as HWT is not a public utility. Lastly, no overhead high voltage lines can be placed within minimum distances of airport approaches⁴ and the US-Mexico border⁵ per federal regulations.

HWT's detailed analysis found that a route south of the Fort Yuma Quechan Reservation is not possible due to many factors and constraints. Through the Routing Study, it was determined that there is no viable routing or permitting path for a southern route through the Yuma area or south of Yuma. Additionally, City of Yuma officials have expressed opposition to a route through the city and significant constraints exist as documented below and shown on Figures 4-2 and 4-4. The southern route alternatives (Alternative Y1, Y2, and Y3) would cross significant areas of existing and planned residential homes that would be incompatible with an overhead high voltage transmission line. Additionally, other engineering and regulatory constraints make the southern routes infeasible (summarized in Table 4-3, Table 4-5, Section 4.6.4.1, and below). The Preferred Route identified would avoid all Tribal lands and stay within the existing WWEC (see Figure 4-7).

Alternative Y1

Alternative Y1 was determined to be infeasible for several reasons. It is made up of links A2, A3, B1, A14, A29, A23, and A25 which were eliminated for a variety of reasons. A2 was deemed less ideal than the link exiting the substation to the north. A3 was dismissed because A2 was not preferred. B1 was eliminated due to conflicts with existing and planned residential development, I-8, canal, Gila River and railroad crossings, airspace restrictions due to two airports, overhead transmission line restrictions in multiple zoning designations, and congestion of existing transmission lines and utility ROWs within the vicinity. Links A14, A29, A23, and A25 were dismissed due to the canal crossings, location outside the adjacent BLM 368 utility corridor, Tribal land considerations and US-Mexico Border Crossing conflicts. On Yuma County lands zoned Open Space and Recreational Resources, Agricultural/Rural Residential, Agricultural/Rural Preservation, and Agriculture/Industrial, any special use permitted utility facilities owned and operated by a private, governmental, quasi-governmental or non-profit agency is allowed. However, on county lands zoned Rural Density Residential, Medium Density Residential, and Low Density Residential, special use permitted residential utility installations are allowed. On City of Yuma lands zoned Recreational and Open Space, all conditional permitted new utility lines shall be placed underground. On City of Yuma lands zoned Agriculture District, General Commercial, Medium Density Residential, and Low Density Residential, conditional permitted public and quasi-public utility buildings and facilities are

⁴ The FAA does not have a specific horizontal distance regulation for power lines. The FAA uses horizontal distance with vertical height in its determination of whether a structure (including power lines) is an obstruction. For power lines that are deemed obstructions, the FAA may require marking with lights or other visual aids to alert aircraft (FAA 2020).

⁵ The required separation for the Proposed Project from the US-Mexico border is determined by a confluence of regulatory requirements, safety standards, environmental considerations, and international agreements analyzed during the federal and state environmental review processes.

allowed when necessary for service to the surrounding territory. The route alternative and constraint locations can be seen in Figure 4-4. This alternative would add an additional five miles compared to the Preferred Route.

Alternative Y2

Alternative Y2 was determined to be infeasible for several reasons. It is made up of links A2, A5, A6, A8, A10, A15, A21, and A23 which were dismissed for the following reasons. A2 was deemed less ideal than the link exiting the substation to the north. A6 was eliminated due to paralleling a canal/levee and the Gila River. A8 was dismissed due to general congestion in Yuma, an infeasible I-8 crossing requiring extremely tall structures that are infeasible to construct, and conflicts with existing land use limiting ROW widths. A10 was dismissed due to conflicts with Yuma Territorial Prison State Historic Park, East Wetlands Park, proximity to high density residential areas, ROW constraints, and railroad parallel/crossing. A21 and A23 are located outside the adjacent BLM 368 utility corridor. On Yuma County lands zoned Open Space and Recreational Resources or Agricultural/Rural Residential, any special use permitted utility facilities owned and operated by a private, governmental, quasi-governmental or non-profit agency is allowed. On City of Yuma lands zoned Recreational and Open Space, all conditional permitted new utility lines shall be placed underground. On City of Yuma lands zoned Agriculture District or Medium Density Residential, conditional permitted public and quasi-public utility buildings and facilities are allowed when necessary for service to the surrounding territory. The route alternative and constraint locations can be seen in Figure 4-4.

Alternative Y3

Alternative Y3 was determined to be infeasible for several reasons. It is made up of links A2, A5, A7, A16, A19, A20, and A28 which were eliminated for several reasons. A2 was deemed less ideal than the link exiting the substation to the north. A5 was dismissed because the links it connects to (A6 and A7) were deemed infeasible. A7 was infeasible due to proximity to the Sunny Owls Reservoir, Fort Yuma Quechan Reservation lands, proximity to residential land uses, a RR crossing, an I-8 crossing, and canal crossing. A16 was eliminated because of proximity to high density residential land use, likely position within the California regulatorily defined channel of the Colorado River, potential for cultural resources adjacent to the Colorado River, potential for protracted federal and state aquatics permitting process, visual resource concerns, and canal crossings. A19 was dismissed to utility crossing conflicts and a river crossing. A20 was removed from consideration because A19 and A17 were eliminated. A28 was dismissed due to access constraints through the dunes. On Yuma County lands zoned Open Space and Recreational Resources, any special use permitted utility facilities owned and operated by a private, governmental, quasi-governmental or non-profit agency is allowed. Y3 does not pass through the City of Yuma. The route alternative and constraint locations can be seen in Figure 4-4.

FIGURE 4-3 NORTHERN ROUTES

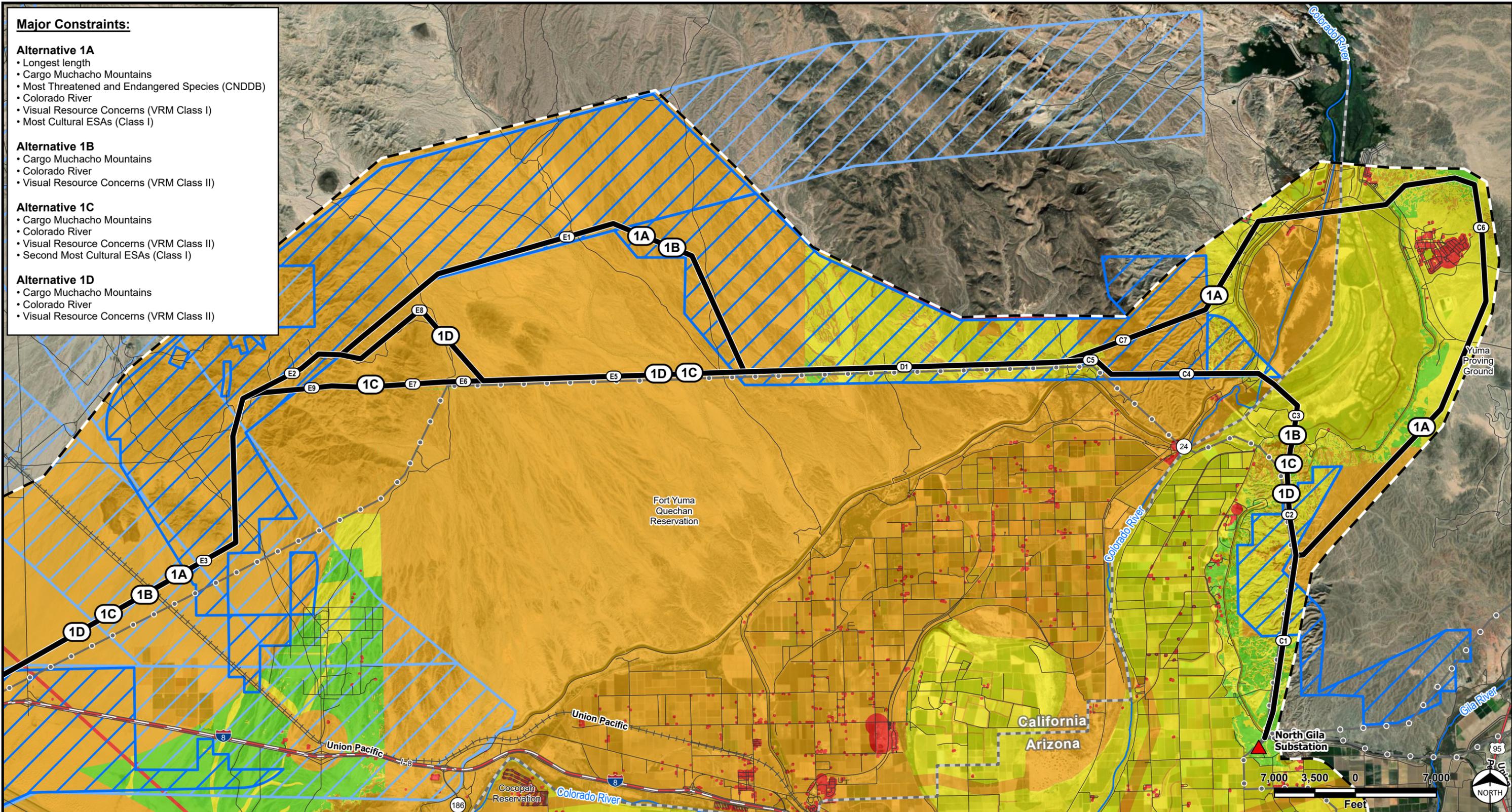
Major Constraints:

- Alternative 1A**
- Longest length
 - Cargo Muchacho Mountains
 - Most Threatened and Endangered Species (CNDDDB)
 - Colorado River
 - Visual Resource Concerns (VRM Class I)
 - Most Cultural ESAs (Class I)

- Alternative 1B**
- Cargo Muchacho Mountains
 - Colorado River
 - Visual Resource Concerns (VRM Class II)

- Alternative 1C**
- Cargo Muchacho Mountains
 - Colorado River
 - Visual Resource Concerns (VRM Class II)
 - Second Most Cultural ESAs (Class I)

- Alternative 1D**
- Cargo Muchacho Mountains
 - Colorado River
 - Visual Resource Concerns (VRM Class II)



Project Features

- ▲ Existing Substation
- Northern Routes
- ▭ Project Study Area

Transmission

- Existing Transmission Line (230 kV+)
- ▨ Section 368 Energy Corridor
- ▨ BLM Utility Corridor

Transportation

- Interstate Highway
- U.S. Route
- State Highway
- Local Road
- +++ Railroad

Reference

- Colorado River
- State Boundary

Sensitivity

- Exclusion
- High
- Moderate
- Low

Figure 4-3

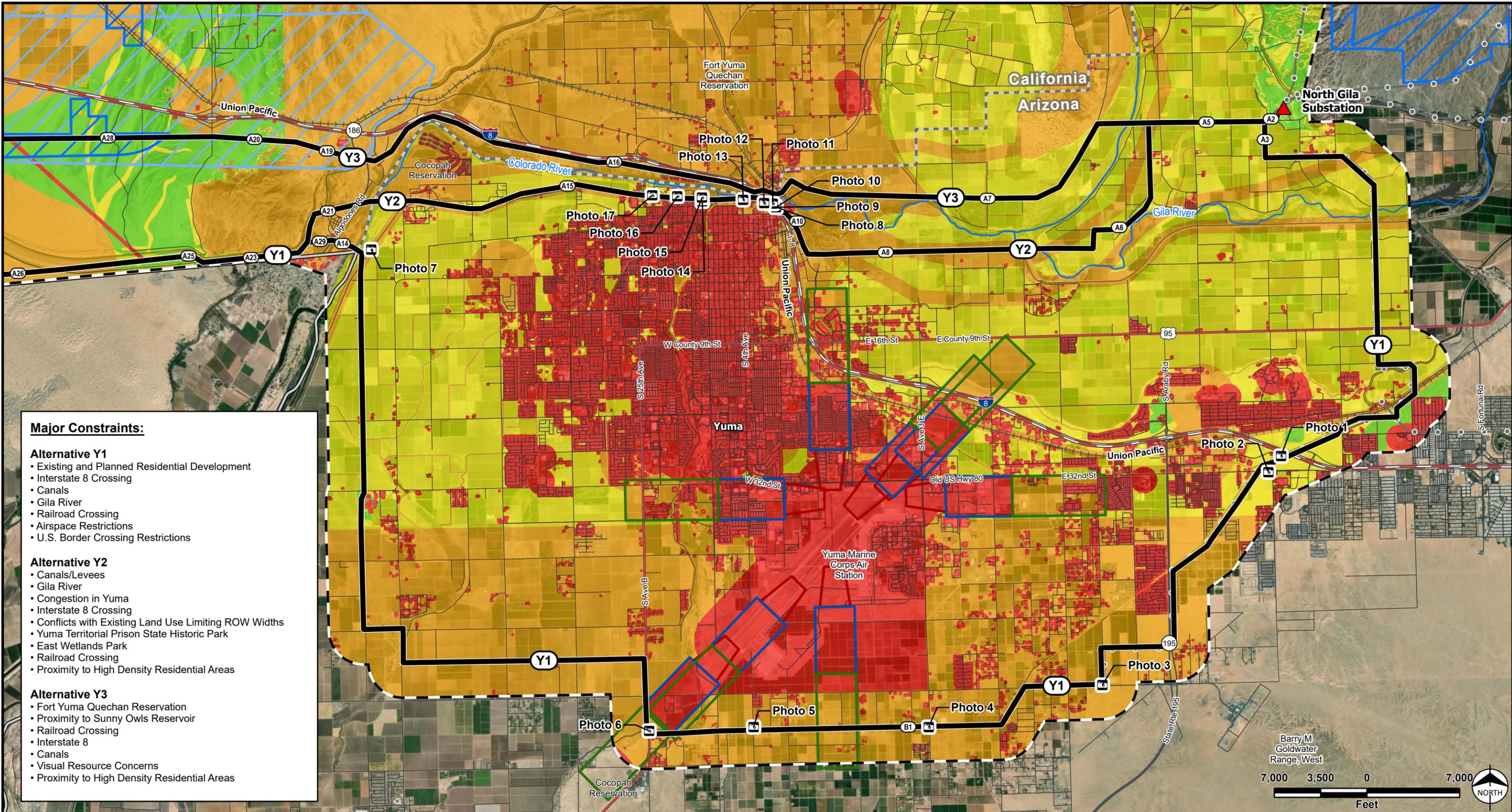
Northern Routes

Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ



Path: G:\Projects\252297_NextEra_IVNS_NGIV Apps\StingReport\StingReport.aprx dbarrackman 9/1/2025

FIGURE 4-4 SOUTHERN YUMA AREA ROUTES



Major Constraints:

- Alternative Y1**
- Existing and Planned Residential Development
 - Interstate 8 Crossing
 - Canals
 - Gila River
 - Railroad Crossing
 - Airspace Restrictions
 - U.S. Border Crossing Restrictions
- Alternative Y2**
- Canals/Levees
 - Gila River
 - Congestion in Yuma
 - Interstate 8 Crossing
 - Conflicts with Existing Land Use Limiting ROW Widths
 - Yuma Territorial Prison State Historic Park
 - East Wetlands Park
 - Railroad Crossing
 - Proximity to High Density Residential Areas
- Alternative Y3**
- Fort Yuma Quechan Reservation
 - Proximity to Sunny Owls Reservoir
 - Railroad Crossing
 - Interstate 8
 - Canals
 - Visual Resource Concerns
 - Proximity to High Density Residential Areas

<p>Project Features</p> <ul style="list-style-type: none"> ▲ Existing Substation — Southern Yuma Route ▭ Project Study Area 	<p>Transmission</p> <ul style="list-style-type: none"> — Existing Transmission Line (230 kV+) ▭ Section 368 Energy Corridor ▭ BLM Utility Corridor 	<p>Transportation</p> <ul style="list-style-type: none"> — Interstate Highway — U.S. Route — State Highway — Local Road +++ Railroad 	<p>Reference</p> <ul style="list-style-type: none"> — Colorado River --- State Boundary — US-Mexico Border 📍 Photo Location 	<p>2019 MCAS Accident Potential Zones</p> <ul style="list-style-type: none"> ▭ Clear Zone (CZ) ▭ Accident Potential Zone I (APZ-I) ▭ Accident Potential Zone II (APZ-II) 	<p>Sensitivity</p> <ul style="list-style-type: none"> ▭ Exclusion ▭ High ▭ Moderate ▭ Low
---	--	--	--	--	--

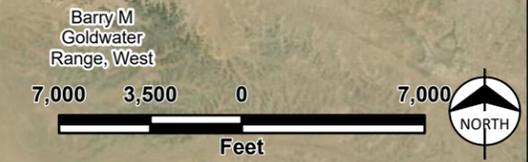
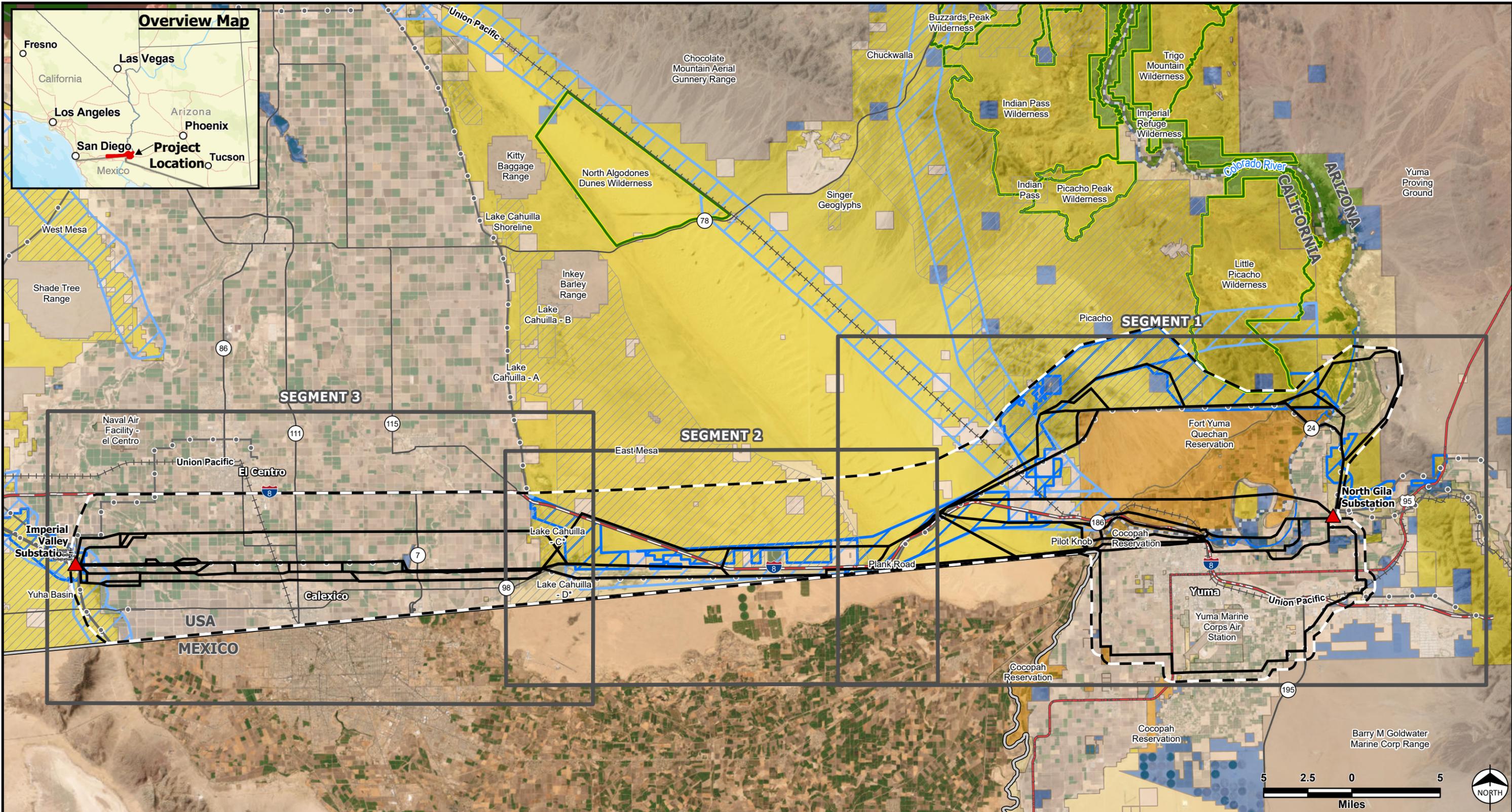


Figure 4-4
Southern Yuma Routes
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ
 HORIZONWEST TRANSMISSION

Path: G:\Projects\252297_NextEra_IVNS_NGIV\Apps\SitingReport\SitingReport.aprx dbarrackman 9/1/2025

FIGURE 4-5 ROUTE LINKS

Page 1 of 4

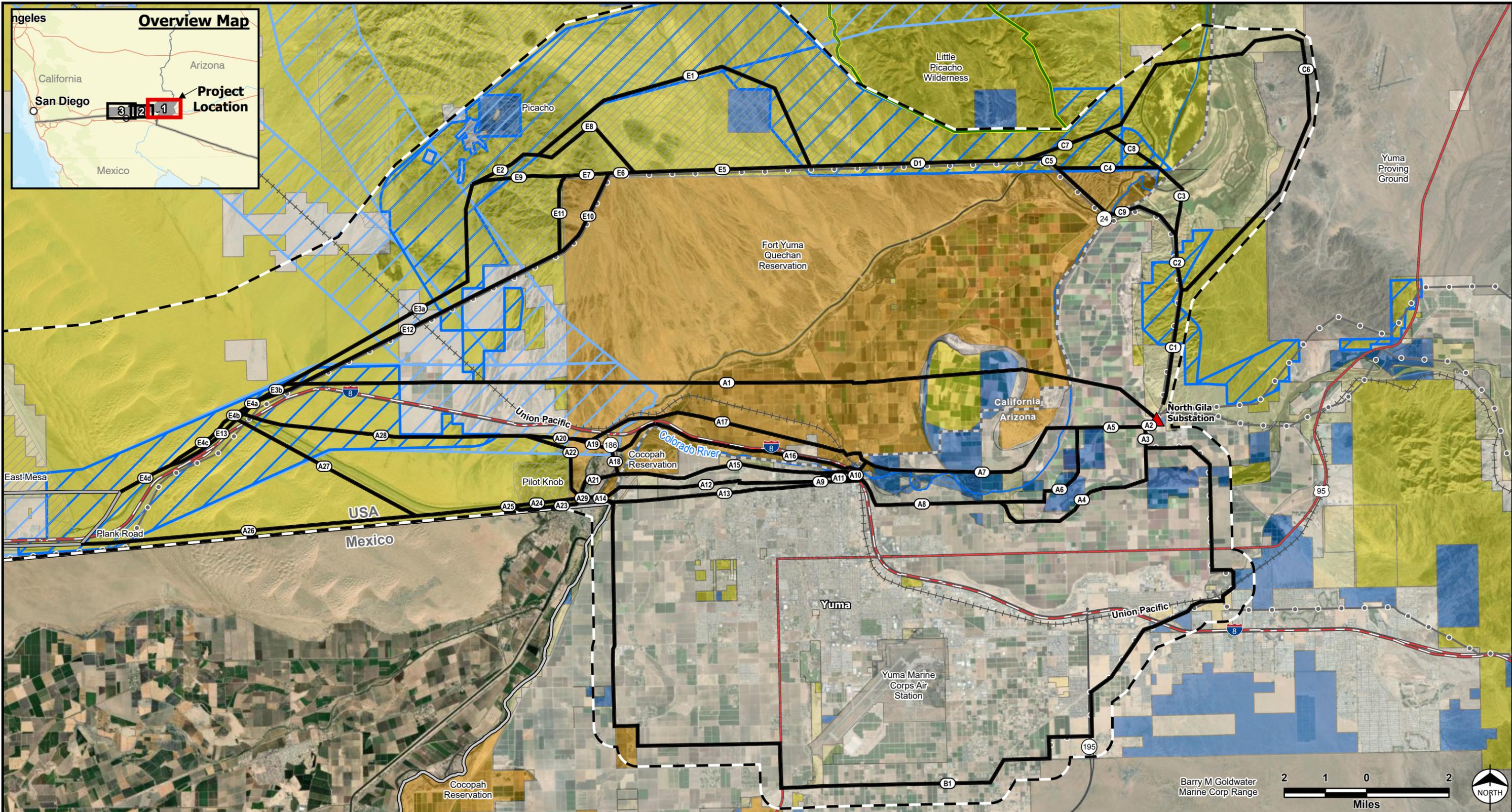


Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction	Ownership
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	Colorado River	Bureau of Indian Affairs (BIA)	US Fish and Wildlife Service (USFWS)
Link Network	Section 368 Energy Corridor	U.S. Route	Wilderness Area	State Boundary	Bureau of Land Management (BLM)	Local Government
Project Study Area	BLM Utility Corridor	State Highway		US-Mexico Border	Department of Defense (DOD)	State Lands
		Railroad		Map Page	Bureau of Reclamation (Reclamation)	Private/Undetermined

Figure 4-5
Route Links Overview
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ
 HORIZONWEST TRANSMISSION

*ACEC on Reclamation withdrawn lands managed by the BLM.
 Sources: Horizon West Transmission, Power Engineers

Page 2 of 4



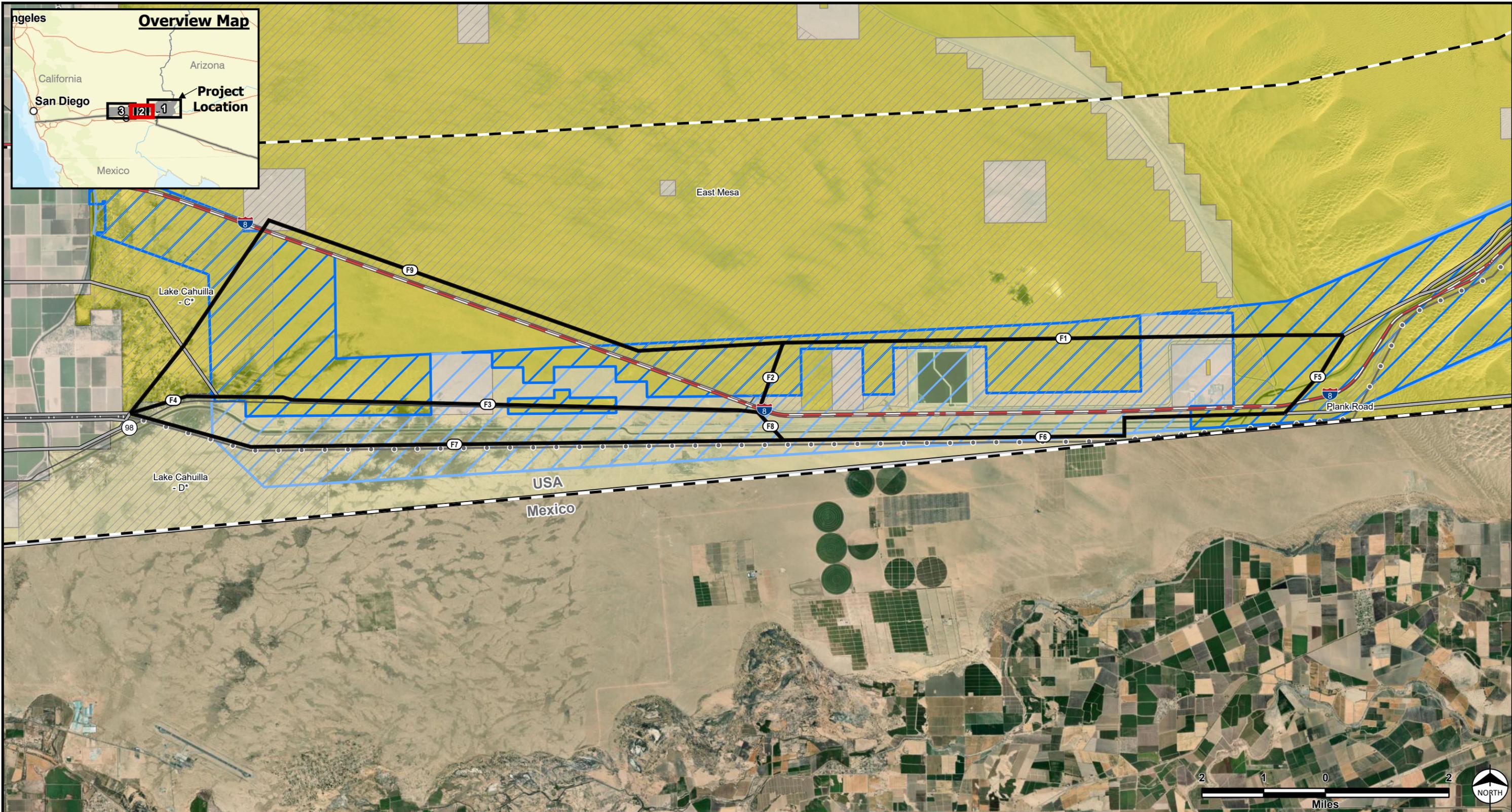
Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction	Ownership
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	Colorado River	Bureau of Indian Affairs (BIA)	Bureau of Reclamation (Reclamation)
Link Network	Section 368 Energy Corridor	U.S. Route	Wilderness Area	State Boundary	Bureau of Land Management (BLM)	US Fish and Wildlife Service (USFWS)
Link Network - Other Segment	BLM Utility Corridor	State Highway		US-Mexico Border	Department of Defense (DOD)	State Lands
Project Study Area		Railroad				Private/Undetermined

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-5A
Route Links Segment 1
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ
 HORIZONWEST TRANSMISSION

Path: G:\Projects\252297_NextEra_NVIS_Apps\StingReport\StingReport.aprx dbarrackman 9/2/2025

Page 3 of 4



<p>Project Features</p> <ul style="list-style-type: none"> — Link Network — Link Network - Other Segment ▭ Project Study Area 	<p>Transmission</p> <ul style="list-style-type: none"> — Existing Transmission Line (230 kV+) ▨ Section 368 Energy Corridor ▨ BLM Utility Corridor 	<p>Transportation</p> <ul style="list-style-type: none"> — Interstate Highway — State Highway 	<p>Special Management Area</p> <ul style="list-style-type: none"> ▨ Area of Critical Environmental Concern (ACEC)* 	<p>Reference</p> <ul style="list-style-type: none"> — US-Mexico Border 	<p>Jurisdiction</p> <ul style="list-style-type: none"> ▨ Bureau of Land Management (BLM) ▨ Bureau of Reclamation (Reclamation) ▨ Private/Undetermined
---	--	--	--	--	---

Figure 4-5B
Route Links Segment 2
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ

*ACEC on Reclamation withdrawn lands managed by the BLM.
 Sources: Horizon West Transmission, Power Engineers

Path: G:\Projects\252297_NextEra_IVNS_NGIV Apps\StingReport\StingReport.aprx dbarrackman 9/1/2025

Page 4 of 4

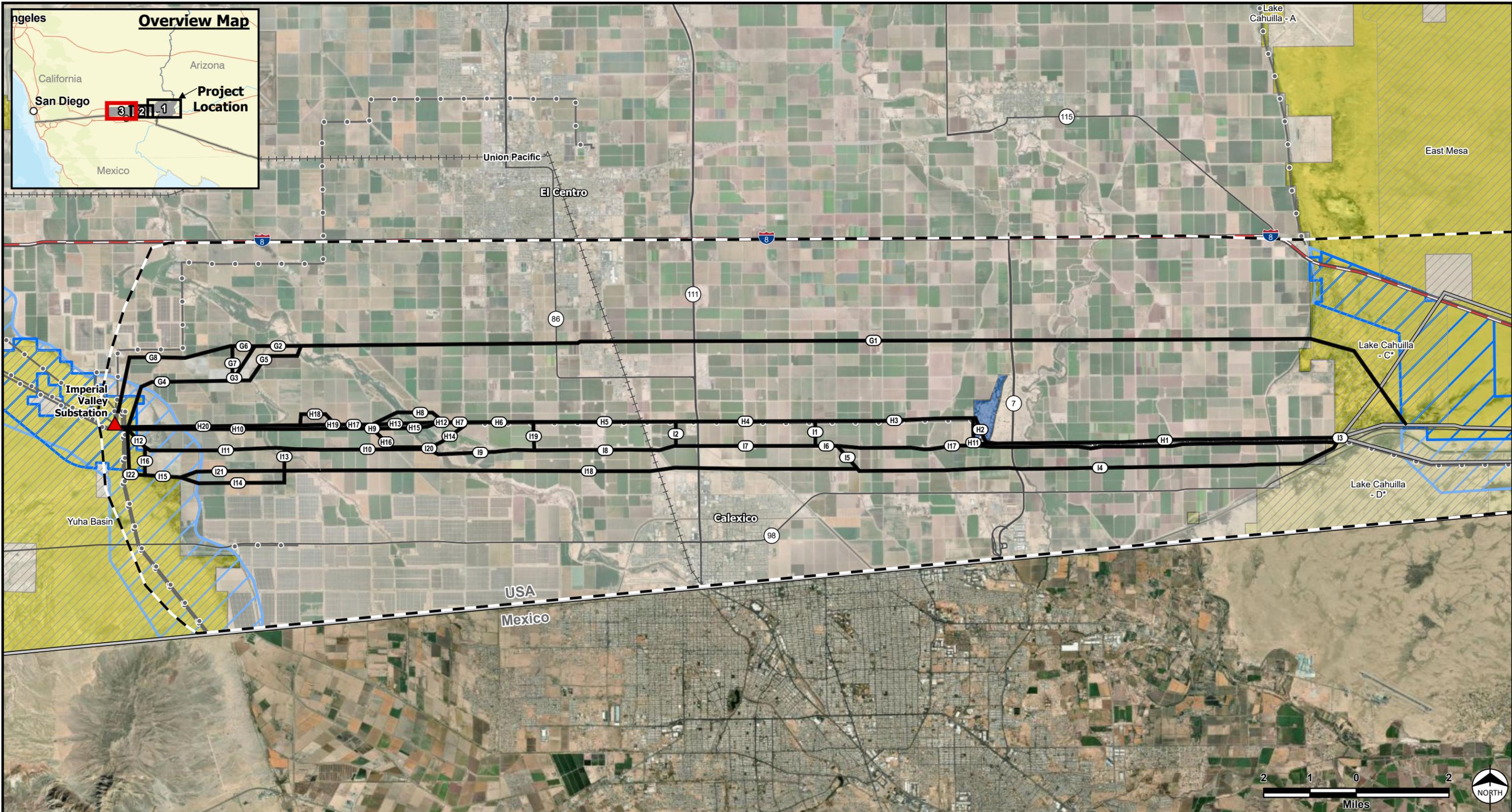


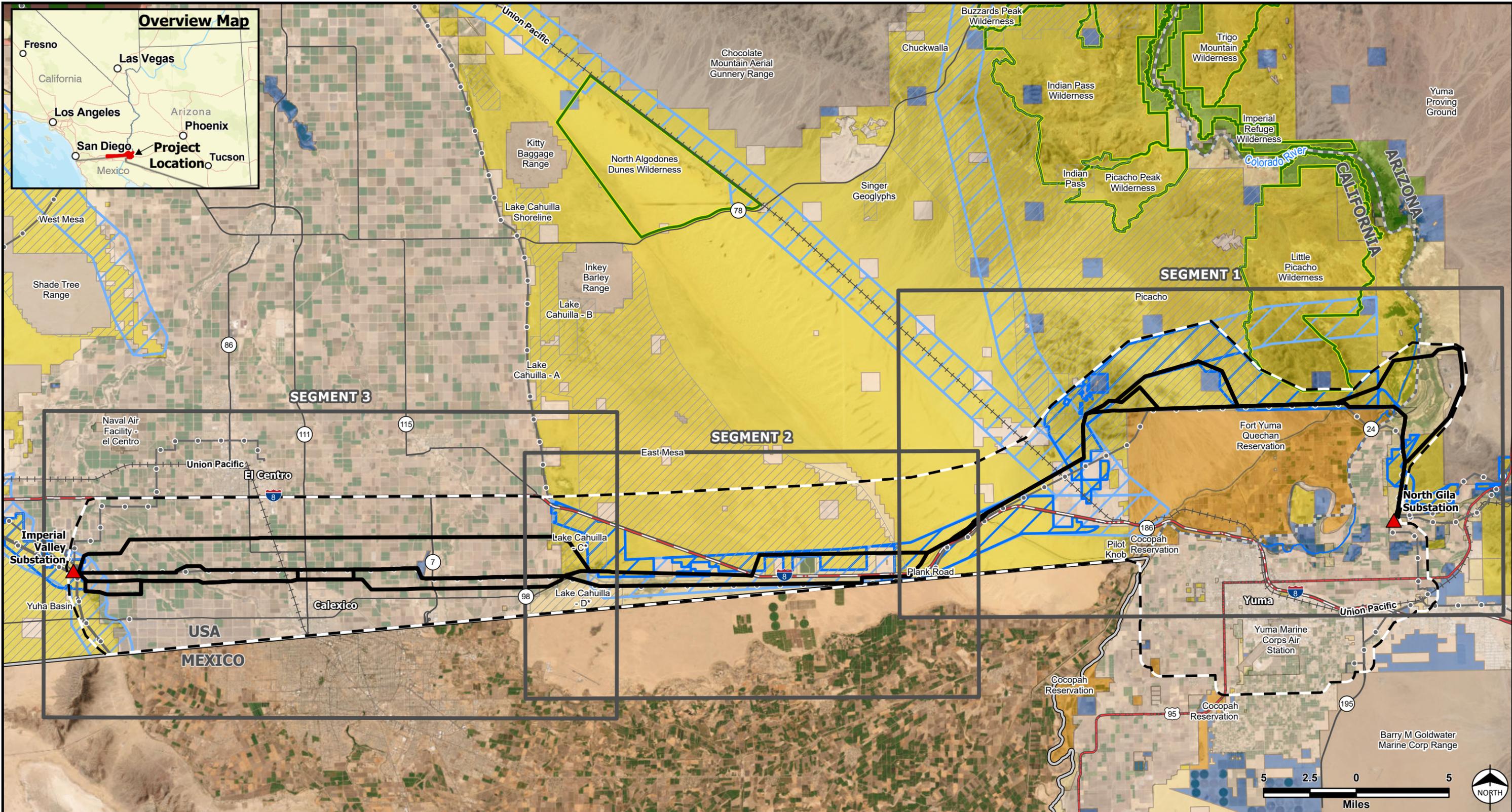
Figure 4-5C
Route Links Segment 3
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ

Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	US-Mexico Border	Bureau of Land Management (BLM)
Link Network	Section 368 Energy Corridor	State Highway			Department of Defense (DOD)
Link Network - Other Segment	BLM Utility Corridor	Railroad			Bureau of Reclamation (Reclamation)
Project Study Area					State Lands
					Private/Undetermined

*ACEC on Reclamation withdrawn lands managed by the BLM.

Path: G:\Projects\252297_NextEra_IVNS_NGIV\Apps\StingReport\StingReport.aprx dbarrackman 9/1/2025

FIGURE 4-6 **ROUTE ALTERNATIVES AND CONSTRAINTS**
Page 1 of 4

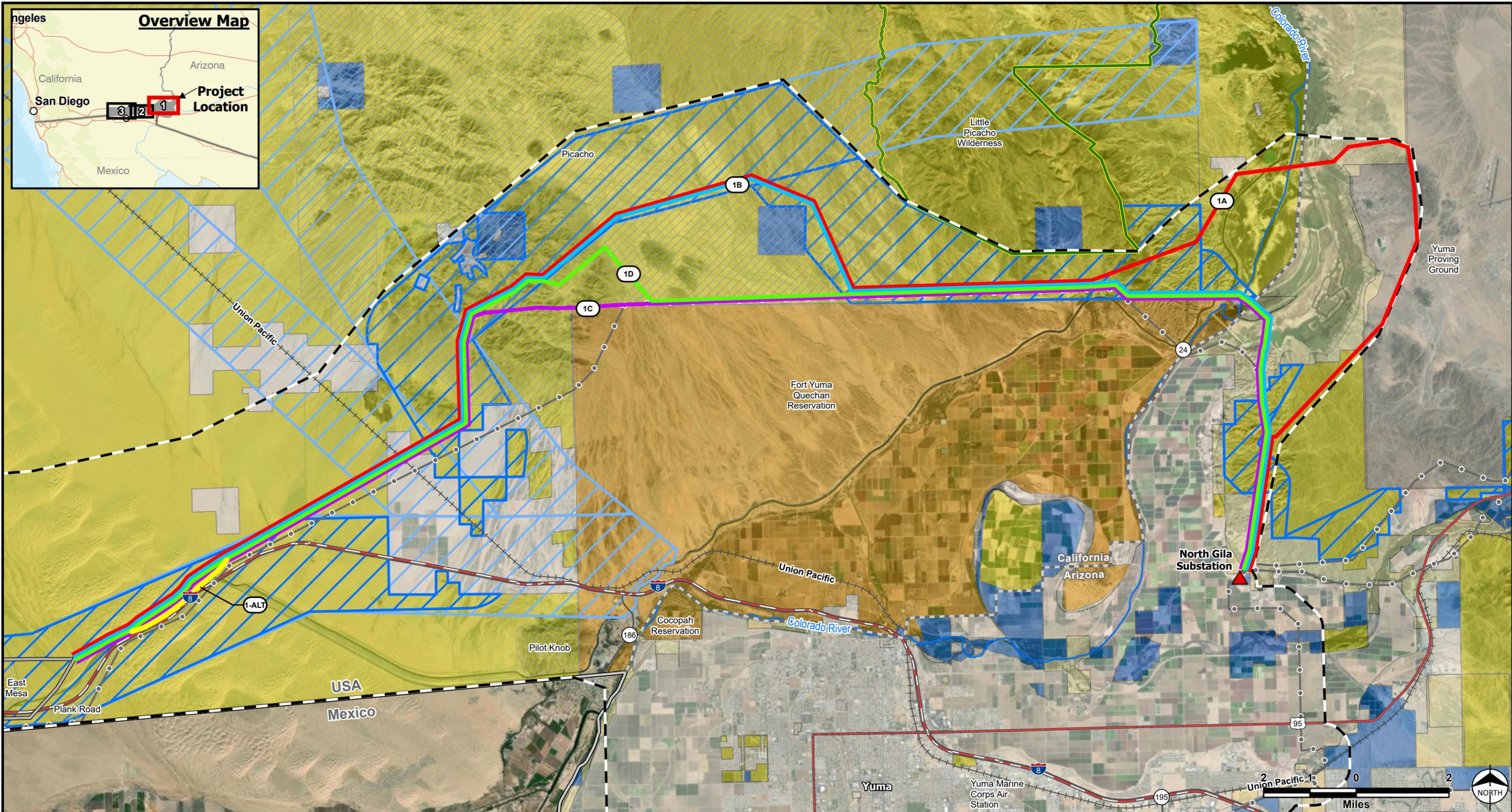


Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction	US Fish and Wildlife Service (USFWS)
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	Colorado River	Bureau of Indian Affairs (BIA)	
Alternative Route	Section 368 Energy Corridor	U.S. Route	Wilderness Area	State Boundary	Bureau of Land Management (BLM)	Local Government
Project Study Area	BLM Utility Corridor	State Highway		US-Mexico Border	Department of Defense (DOD)	State Lands
		Railroad		Map Page	Bureau of Reclamation (Reclamation)	Private/Undetermined

Figure 4-6
Alternative Routes Overview
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ
 HORIZONWEST
 TRANSMISSION

*ACEC on Reclamation withdrawn lands managed by the BLM.
 Sources: Horizon West Transmission, Power Engineers

Page 2 of 4



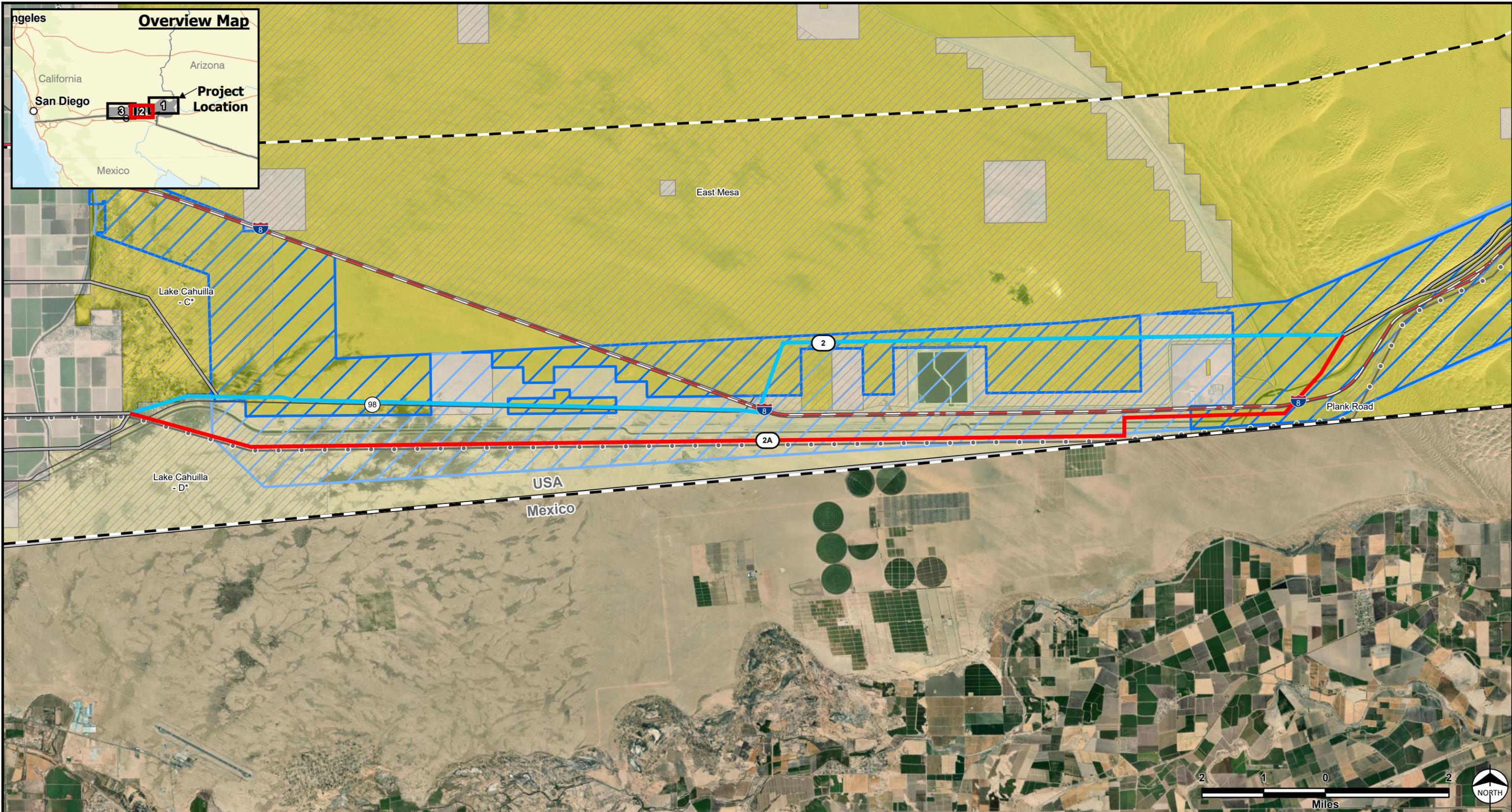
<p>Project Features</p> <ul style="list-style-type: none"> Existing Substation Route Alternative 1A Route Alternative 1B Route Alternative 1C Route Alternative 1D Route Alternative 1-ALT Alternative Routes - Other Segment Project Study Area 	<p>Transmission</p> <ul style="list-style-type: none"> Existing Transmission Line (230 kV+) Section 368 Energy Corridor BLM Utility Corridor 	<p>Transportation</p> <ul style="list-style-type: none"> Interstate Highway U.S. Route State Highway Railroad 	<p>Special Management Area</p> <ul style="list-style-type: none"> Area of Critical Environmental Concern (ACEC)* Wilderness Area 	<p>Reference</p> <ul style="list-style-type: none"> Colorado River State Boundary US-Mexico Border 	<p>Jurisdiction</p> <ul style="list-style-type: none"> Bureau of Indian Affairs (BIA) Bureau of Land Management (BLM) Department of Defense (DOD) Bureau of Reclamation (Reclamation) US Fish and Wildlife Service (USFWS) State Lands Private/Undetermined
---	---	--	---	---	--

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-6A
Alternative Routes Segment 1
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ

Path: G:\Projects\252297_NextEra_IVNS_NGIV\Apps\SitingReport\SitingReport.aprx dbarrackman 9/1/2025

Page 3 of 4



- Project Features**
- Route Alternative 2
 - Route Alternative 2A
 - Alternative Routes - Other Segment
 - Project Study Area

- Transmission**
- Existing Transmission Line (230 kV+)
 - Section 368 Energy Corridor
 - BLM Utility Corridor

- Transportation**
- Interstate Highway
 - State Highway

- Special Management Area**
- Area of Critical Environmental Concern (ACEC)*

- Reference**
- US-Mexico Border

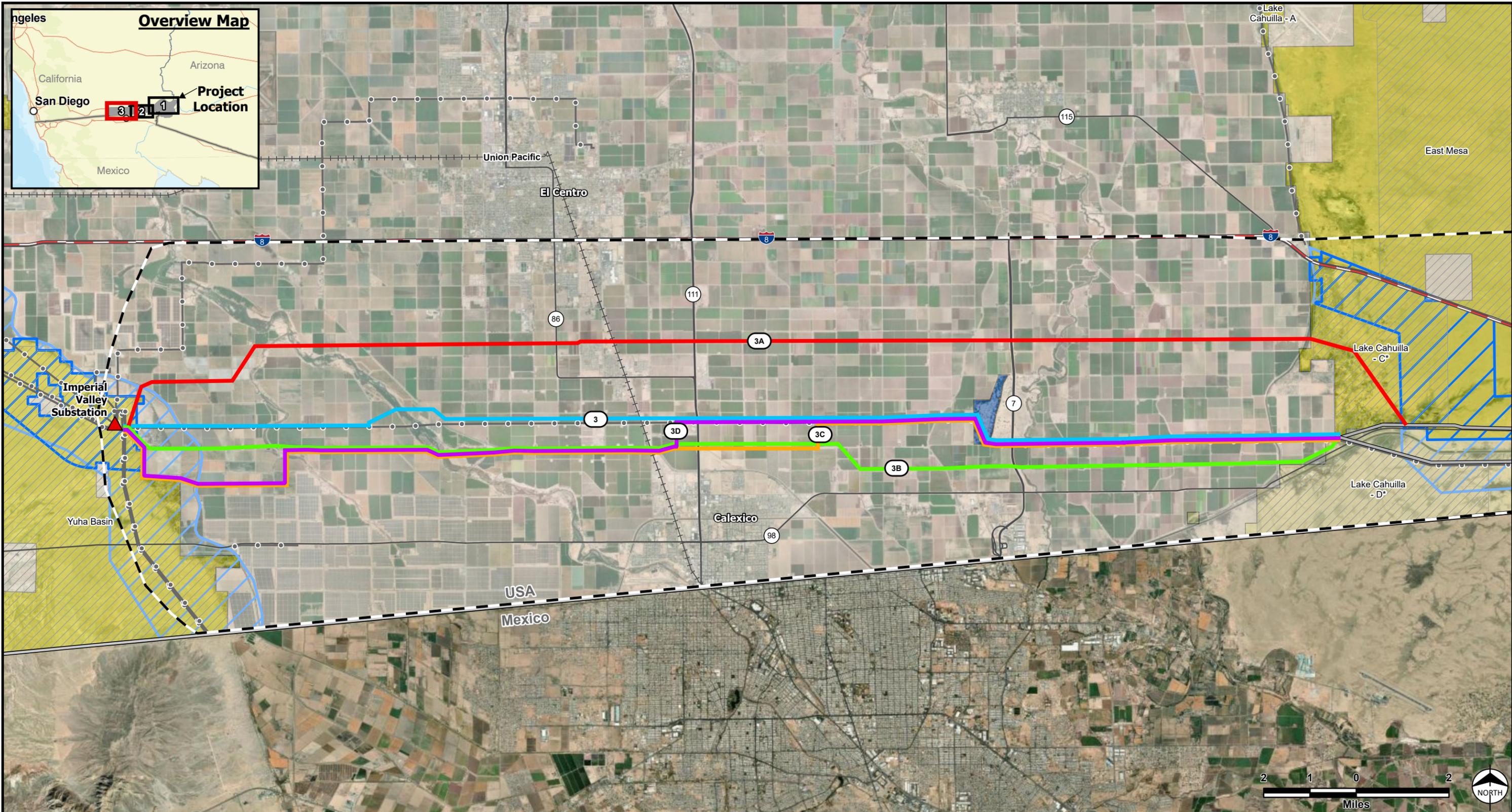
- Jurisdiction**
- Bureau of Land Management (BLM)
 - Bureau of Reclamation (Reclamation)
 - Private/Undetermined

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-6B
Alternative Routes Segment 2
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ
 HORIZONWEST
 TRANSMISSION

Path: G:\Projects\252297_NextEra_IVNS_NGIV Apps\StingReport\StingReport.aprx dbarrackman 9/1/2025

Page 4 of 4



Path: G:\Projects\252297_NextEra_IVNS_Apps\StingReport\StingReport.aprx dbarrackman 9/1/2025

<p>Project Features</p> <ul style="list-style-type: none"> Existing Substation Route Alternative 3 Route Alternative 3A Route Alternative 3B Route Alternative 3C Route Alternative 3D Alternative Routes - Other Segment Project Study Area 	<p>Transmission</p> <ul style="list-style-type: none"> Existing Transmission Line (230 kV+) Section 368 Energy Corridor BLM Utility Corridor 	<p>Transportation</p> <ul style="list-style-type: none"> Interstate Highway State Highway Railroad 	<p>Special Management Area</p> <ul style="list-style-type: none"> Area of Critical Environmental Concern (ACEC)* 	<p>Reference</p> <ul style="list-style-type: none"> US-Mexico Border 	<p>Jurisdiction</p> <ul style="list-style-type: none"> Bureau of Land Management (BLM) Department of Defense (DOD) Bureau of Reclamation (Reclamation) State Lands Private/Undetermined
---	---	---	---	---	--

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-6C

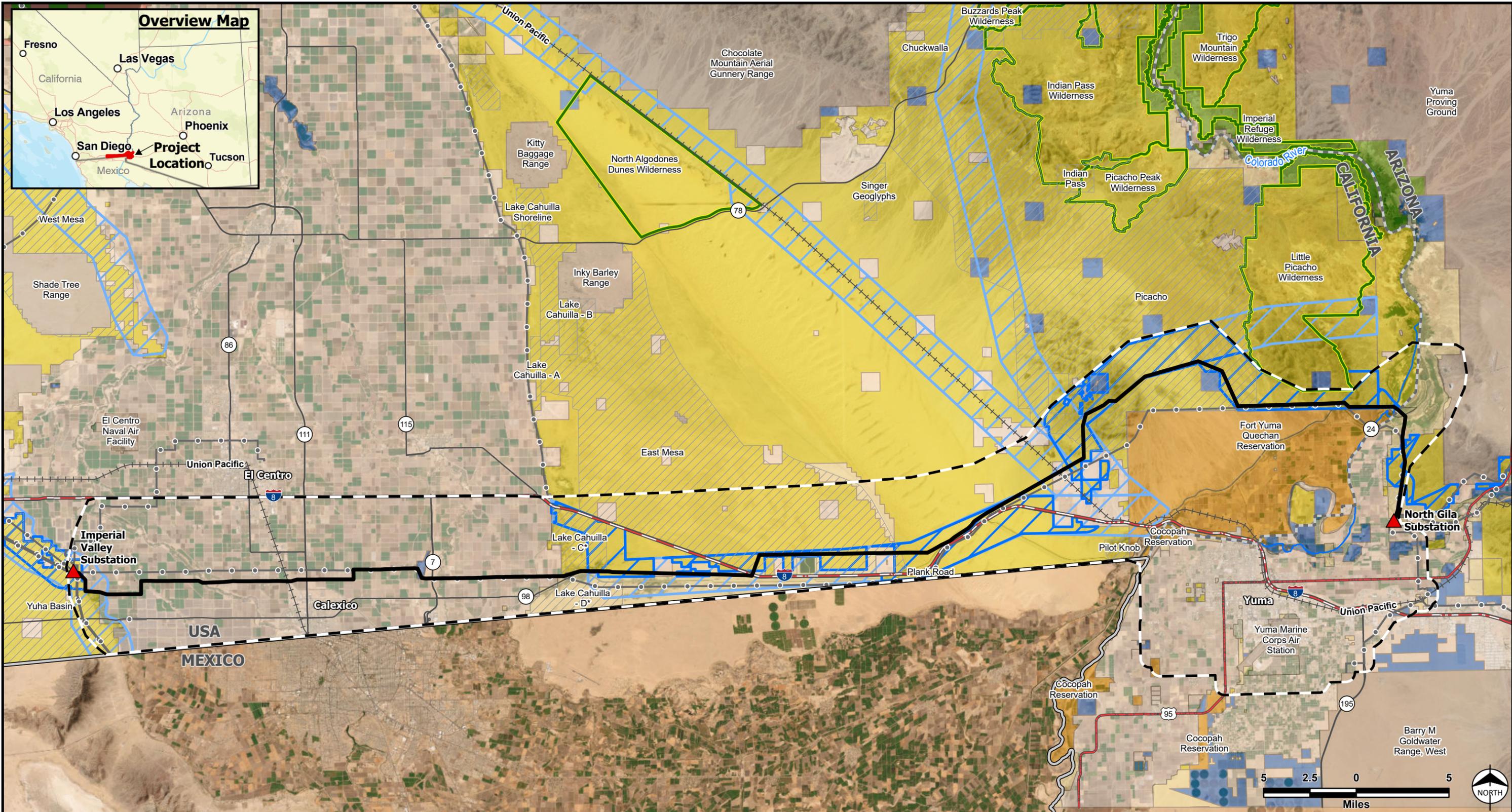
Alternative Routes Segment 3

Routing Study
Ironwood 500 kV Transmission Line Project
Imperial County, CA and Yuma County, AZ

HORIZONWEST TRANSMISSION

Sources: Horizon West Transmission, Power Engineers Created: 9/1/2025

FIGURE 4-7 **PREFERRED ROUTE**



Overview Map



Project Features	Transmission	Transportation	Special Management Area	Reference	Jurisdiction	US Fish and Wildlife Service (USFWS)
Existing Substation	Existing Transmission Line (230 kV+)	Interstate Highway	Area of Critical Environmental Concern (ACEC)*	Colorado River	Bureau of Indian Affairs (BIA)	US Fish and Wildlife Service (USFWS)
Preferred Route (Alternative 1B, 2, and 3C)	Section 368 Energy Corridor	U.S. Route	Wilderness Area	State Boundary	Bureau of Land Management (BLM)	Local Government
Project Study Area	BLM Utility Corridor	State Highway		US-Mexico Border	Department of Defense (DOD)	State Lands
		Railroad			Bureau of Reclamation (Reclamation)	Private/Undetermined

*ACEC on Reclamation withdrawn lands managed by the BLM.

Figure 4-7
Preferred Route
 Routing Study
 Ironwood 500 kV Transmission Line Project
 Imperial County, CA and Yuma County, AZ



5.0 REFERENCES CITED

- Arizona Department of Transportation (AZDOT). 2024. Arizona State Scenic Highways. Available online at: <https://azdot.gov/sites/default/files/2019/05/scenic-map.pdf>. Accessed November 2024.
- Bureau of Land Management (BLM). 1986a. Manual H-8431. Visual Resource Contrast Rating. BLM. Available online at: <http://www.blm.gov/nstc/VRM/8431.html>. Accessed November 2024.
- _____. 1986b. Manual H-8410-1 - Visual Resource Inventory. BLM. Available online at: <http://www.blm.gov/nstc/VRM/8410.html>.
- California Department of Transportation (Caltrans). 2024. California Transportation California State Scenic Highway System Map. Available online at: <https://caltrans.maps.arcgis.com/apps/webappviewer/index.html?id=465dfd3d807c46cc8e8057116f1aaca>. Accessed November 2024.
- California Independent System Operator (CAISO). 2023. Revised Draft 2022-2023 Transmission Plan online at: <https://stakeholdercenter.caiso.com/InitiativeDocuments/ISO-Board-Approved-2022-2023-Transmission-Plan.pdf>.
- Federal Aviation Administration (FAA). 2020. Notice of Proposed Construction or Alteration. Available online at: https://www.faa.gov/documentLibrary/media/Form/FAA_Form_7460-1_012020.pdf Accessed August 2025.
- Federal Emergency Management Agency (FEMA). 2022. National Flood Hazard Layer. Accessed online in July 2022 at: <https://www.fema.gov/flood-maps/national-flood-hazard-layer>.
- Federal Highways Administration (FHWA). 2024. National Scenic Highways. Available online at: <https://fhwaapps.fhwa.dot.gov/bywaysp/state/AZ/map>. Accessed November 2024.
- Power Technology. 2022. Blue Spruce Energy Center, US. Accessed online at: <https://www.power-technology.com/marketdata/blue-spruce-energy-center-us> on November 16, 2022.
- United States Environmental Protection Agency (USEPA). 2024. Level III and IV Ecoregions of the Continental United States Website. Available online at: <https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states>. Accessed November 2024.
- United States Fish and Wildlife Service (USFWS). 2022a. Information for Planning and Consultation (IPaC) resource list for the Proposed Project. Accessed at: <https://ecos.fws.gov/ipac/> on July 5, 2022.
- _____. 2022b. USFWS Threatened and Endangered Species Active Critical Habitat Report. GIS data access at: <https://ecos.fws.gov/ecp/report/table/critical-habitat.html> in July 2022.
- _____. 2022c. USFWS National Wetlands Inventory (NWI) GIS data accessed at: <https://www.fws.gov/wetlands/> in July 2022.

APPENDIX A YUMA STUDY AREA ROUTING CONSTRAINTS



PHOTO 1 LINK B1 ON ALTERNATIVE Y1. LOOKING NORTHEAST ALONG N FRONTAGE RD AT THE I-8 CROSSING.



PHOTO 2 LINK B1 ON ALTERNATIVE Y1. LOOKING EAST ON E 32ND ST AND SHOWING CONFLICTING LAND USES AND EXISTING TRANSMISSION INFRASTRUCTURE.



PHOTO 3 LINK B1 ON ALTERNATIVE Y1. LOOKING NORTHEAST AT APS OWNED ORCHARD SUBSTATION.



PHOTO 4 LINK B1 ON ALTERNATIVE Y1 LOOKING WEST AT CANAL. ALTERNATIVE Y1 WOULD PARALLEL THIS CANAL FOR 4.5 MILES.



PHOTO 5 LINK B1 ON ALTERNATIVE Y1 LOOKING WEST AT THE SAME CANAL PARALLEL AS SHOWN IN PHOTO 4.



PHOTO 6 LINK B1 ON ALTERNATIVE Y1 LOOKING NORTH ALONG S AVE B.



PHOTO 7 LINK B1 ON ALTERNATIVE Y1. LOOKING WEST AT THE US-MEXICO BORDER.



PHOTO 8 LINK A10 ON ALTERNATIVE Y2. LOOKING SOUTH TOWARDS E 1ST ST IN YUMA, CA. I-8 AND UPRR RAILROAD TRACKS ARE TO THE LEFT AND COMMERCIAL AND INDUSTRIAL BUSINESSES ARE TO THE RIGHT.



PHOTO 9 LINK A10 ON ALTERNATIVE Y2. LOOKING WEST TOWARDS THE YUMA WATER TREATMENT PLAN.



PHOTO 10 LINK A10 ON ALTERNATIVE Y2. LOOKING NORTH TOWARDS THE I-8 OVERPASS, YUMA BEACH, AND THE COLORADO RIVER.



PHOTO 11 LINK A15 ON ALTERNATIVE Y2. LOOKING WEST ALONG RAILROAD TRACKS TOWARDS THE HILTON GARDEN INN WITH GATEWAY PARK ON THE RIGHT.



PHOTO 12 LINK A15 ON ALTERNATIVE Y2. LOOKING WEST AT THE HILTON GARDEN INN.



PHOTO 13 LINK A15 ON ALTERNATIVE Y2. LOOKING EAST FROM N 4TH AVE TOWARDS THE I-8 OVERPASS ALONG A CANAL. COLORADO RIVER TO THE LEFT AND COLORADO RIVER STATE HISTORIC PARK TO THE RIGHT.



PHOTO 14 LINK A15 ON ALTERNATIVE Y2. LOOKING WEST ALONG RAILROAD TRACKS. RESIDENTIAL DEVELOPMENT TO THE LEFT AND WEST WETLANDS PARK TO THE RIGHT.



PHOTO 15 LINK A15 ON ALTERNATIVE Y2. LOOKING NORTHWEST INTO WEST WETLANDS PARK.



PHOTO 16 LINK A15 ON ALTERNATIVE Y2. LOOKING EAST IN WEST WETLANDS PARK.



PHOTO 17 LINK A15 ON ALTERNATIVE Y2. LOOKING WEST ALONG CANAL. ALTERNATIVE Y2 WOULD PARALLEL THIS CANAL FOR 5 MILES.

APPENDIX B ROUTE ALTERNATIVES COMPARISON TABLE

CRITERIA CATEGORY	COMPARISON CRITERIA	500-kV Transmission Line Route												Y1	Y2	Y3
		1A	1B	1C	1D	1-ALT*	2	2A	3	3A	3B	3C	3D			
Mileage	Length of line (miles)	45.92	37.41	35.31	36.32	2.57	20.50	20.66	26.85	29.66	26.96	28.71	28.70	44.03	28.61	28.43
	Compatibility Ranking	4	3	1	2		1	2	1	3	1	2	2	3	2	1
Jurisdiction and Land Ownership	Miles of BLM crossed	36.53	33.01	30.92	31.92	2.57	14.15	3.25	0.42	3.77	0.47	0.50	0.50	11.93	11.93	13.09
	Miles of DoD crossed	4.03	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of NPS crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of USFS crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of USBR lands crossed	4.73	3.73	3.73	3.73	0	5.34	17.41	0	0	0.38	0	0	1.44	1.33	0.25
	Miles of USACE lands crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of NRCS lands crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of Tribal lands crossed	0	0	0	0	0	0	0	0	0	0	0	0	0.40	0.97	6.83
	Miles of State lands crossed	0	0	0	0	0	0	0	0.67	0	0	0.67	0.67	2.26	1.47	1.86
	Miles of County land crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of Incorporated city land crossed	0	0	0	0	0	0	0	0	0	0.91	0.91	0.43	5.67	2.86	0
	Miles of Private/Undetermined land crossed	0.63	0.67	0.67	0.67	0	1.00	0.0	25.76	25.89	26.11	27.53	27.52	27.26	11.48	6.25
	No. of Private land parcels crossed	8	8	8	8	0	2	0	80	94	102	92	90	142	26	23
	Compatibility Ranking	3	2	1	2		2	1	1	2	3	3	3	3	1	2
	Biological Resources	Miles of route within T&E Species Federally designated critical habitat	0	0	0	0	0	0	0	0	0	0	0	0	0.44	0.44
Miles of Flat-tailed Horned Lizard Distribution (approx.)		0	0	0	0	0	8.64	0	0.20	0.57	0.25	1.04	1.04	0	0	0
Miles of sensitive habitat cover ¹		0.69	0.88	0.88	0.88	0.09	0.79	0.91	0.34	0.49	0.40	0.45	0.45	4.15	3.97	4.65
T&E potential to occur based on CNDDDB records (less than 25 years old)		53.00	44.00	44.00	44.00	22.00	20.00	24.00	1.00	0	4.00	5.00	4.00	8.00	10.00	10.00
Compatibility Ranking		2	1	1	1		1	2	1	2	3	4	4	2	2	1
Surface Water Resources	Miles of mapped wetlands	6.01	4.19	4.17	4.22	0.09	1.82	1.34	0.59	1.29	0.69	0.61	0.61	1.42	2.94	5.99
	No. of major waterbody (50 ft or more in width) crossings	0	1	1	1	0	0	1	1	0	0	1	1	0	1	0
	Miles of floodplains crossed	6.09	5.71	4.33	4.36	0	0	0	0.33	0.27	0.44	0.80	0.80	3.41	2.5	5.51
	No. of perennial stream crossings	1	1	1	1	0	0	0	2	2	2	2	2	3	2	2
	Compatibility Ranking	3	2	1	1		1	2	1	2	2	2	2	1	2	3

CRITERIA CATEGORY	COMPARISON CRITERIA	500-kV Transmission Line Route											Y1	Y2	Y3	
		1A	1B	1C	1D	1-ALT*	2	2A	3	3A	3B	3C				3D
Land Use/Conservation/Special Mangement	Number of Buildings in ROW (250-ft)	0	0	0	0	0	0	0	2	3	8	8	10	39	12	2
	Number of Buildings within 250-ft of Centerline	0	0	0	0	0	0	0	5	39	17	10	12	81	16	4
	Miles of open space/recreation areas crossed	41.23	36.30	34.20	35.21	2.57	20.70	20.80	0.42	3.25	0.84	0.50	0.50	15.26	23.29	15.73
	Miles of conservation areas crossed	0.47	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of wildlife areas crossed	0.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of ACEC crossings	13.25	13.25	11.15	12.16	0	10.99	3.03	0.32	3.43	0.33	1.16	1.16	1.00	1.00	0.05
	No. of FAA airports within 1.0 mi of centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No. of communication towers within 1000 feet of centerline	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1
	No. of irrigation Canals crossed	6	5	5	5	2	1	10	49	51	47	42	42	35	18	14
	No. of School/ Education facilities within 350 ft of centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of Agricultural/ Pastoral/ Non-Irrigated land crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Mile of Agricultural/Irrigated land crossed	0	0	0	0	0	0	0	23.85	24.65	24.66	25.08	25.13	23.79	2.95	1.22
	Miles of cattle ranchs crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of orchards/avacado groves crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of Designated Prime or Unique Farmland; Farmland of Statewide Importance crossed	0	0	0	0	0	19.71	19.85	26.46	28.86	26.58	28.25	28.24	60.57	22.33	13.94
	Compatibility Ranking	4	3	1	2		1	2	1	5	3	2	4	3	2	1
Existing Roads and Utilities	No. of existing transmission line crossings (>=230kV) ²	0	0	0	0	0	0	0	3	3	3	3	3	8	2	2
	No. of existing transmission line crossings (<230kV) ²	9	7	7	7	0	6	7	6	6	4	4	4	13	4	13
	Miles of route parallel to existing transmission lines (>= 115kV) ²	8.05	9.58	14.44	13.86	0	1.64	18.66	25.18	0.09	0.09	0.09	0.09	15.83	0.82	8.80
	Miles of route parallel to existing EHV transmission lines (>= 230kV) ²	8.05	9.58	14.44	13.86	0	0.0	16.07	25.18	0.09	0.09	11.89	14.89	13.11	0	0
	Miles of route parallel to existing transmission lines (<230kV) ²	4.50	3.63	3.63	3.63	0	3.64	8.51	0	0	0.80	0	0	2.72	0.82	8.80
	Miles of route parallel to existing major pipelines	0	0	0	0	0	0	0	0	0	0	0	0	0	5.34	0.00
	No. of Interstate/U.S./ State Highway crossings	0	0	0	0	0	2	2	2	3	2	2	2	5	2	4
	Miles parallel to US or State Highway (withiin 500')	0	0	0	0	0	10.13	2.60	0	0	1.00	0	0	2.16	0.38	5.50
	Miles parallel to railroad (within 500')	0	0	0	0	0	0	0	0	0	0	0	0	0.33	0	0

CRITERIA CATEGORY	COMPARISON CRITERIA	500-kV Transmission Line Route												Y1	Y2	Y3
		1A	1B	1C	1D	1-ALT*	2	2A	3	3A	3B	3C	3D			
	No. of solar facilities crossed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Compatibility Ranking	2	2	1	1		2	1	1	4	3	2	2	2	1	3
Utility Corridors	Miles of route within federally designated WWEC	27.81	29.44	20.22	21.10	2.57	13.75	3.11	0.29	1.02	0.38	0.38	0.38	1.12	1.12	11.36
	Miles of route within Designated (Legacy) BLM utility corridor	15.96	15.96	9.86	10.73	2.57	19.14	18.55	1.28	1.23	1.86	2.40	2.40	1.13	1.13	14.27
	Miles of designated WWEC and designated BLM utility corridors combined	28.14	29.77	20.56	21.43	2.57	19.14	18.55	1.28	1.23	1.86	2.40	2.40	1.13	1.13	14.27
	Compatibility Ranking	2	1	4	3		1	2	4	3	2	1	1	2	2	1
Visual Resources	Miles of route within BLM VRM Class IV	5.31	5.31	5.31	5.31	2.57	5.44	2.70	0.29	1.18	0.38	0.38	0.38	2.14	2.14	10.64
	Miles of route within BLM VRM Class III	24.92	24.46	22.37	23.37	0	7.75	0.13	0.12	2.59	0.09	0.12	0.12	0	0	0
	Miles of route within BLM VRM Class II	6.30	3.24	3.24	3.24	0	0.96	0.42	0	0	0	0	0	9.79	9.79	2.45
	No. of Nationally Significant Trail crossings	0	0	0	0	0	0	0	1	1	1	1	1	4	4	10
	Miles within Foreground (1-mile) of Designated Scenic Highway/ Byway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Compatibility Ranking	3	2	1	2		2	1	1	2	1	1	1	1	1	2
Cultural Resources	No. of known listed or eligible cultural resources crossed	6	7	6	6	2	0	1	5	4	5	4	4	1	3	3
	No. of known listed or eligible cultural resources within 300 feet	6	7	6	6	2	0	1	5	4	5	4	4	0	2	1
	No. of listed NRHP Properties within 1 mile	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
	Miles of Cultural ESAs (Class I, Rincon)	27.07	22.00	23.74	24.61	2.57	12.03	20.52	5.40	7.29	5.82	7.79	7.79	0	5.68	0.99
	Miles within Foreground Views(1-3 miles based on resource) from Nationally Significant Historic Site/Trail/Feature	0	0	0	0	0	0	0	3.08	3.04	3.03	3.03	3.03	6.90	17.28	15.39
	Compatibility Ranking	4	2	1	3		1	2	4	3	2	1	1	1	3	2
Geologic Hazards, Soils and Topography	Miles of steep topography (>35%) crossed	2.08	2.32	3.01	2.04	0	0	0.01	0	0.01	0.02	0.02	0.02	0.23	0.28	0.44
	Miles of moderate topography (10%-35%) crossed	9.82	7.39	7.64	7.40	0.09	0.07	0.13	0.18	0.21	0.12	0.18	0.18	2.98	3.41	2.48
	Miles of low topography (10% or below) crossed	34.01	27.70	24.66	26.87	2.48	20.42	20.52	26.67	29.43	26.81	28.51	28.50	40.82	24.92	25.51
	Miles of route above 7,000-foot elevation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	No. of quaternary fault line crossings	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1
	Miles of quaternary fault lines parallel to route within 500 ft.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Miles of landslide susceptibility (class 8, 9, 10)	2.19	2.62	3.16	2.62	0	0	0.01	0.05	0.04	0.10	0.03	0.02	0.02	1.73	1.40

CRITERIA CATEGORY	COMPARISON CRITERIA	500-kV Transmission Line Route													Y1	Y2	Y3
		1A	1B	1C	1D	1-ALT*	2	2A	3	3A	3B	3C	3D				
	Compatibility Ranking	1	2	4	3		1	2	3	1	4	2	2	1	3	2	
Constructability	Percentage of route with existing access within 500 feet	61.21%	64.26%	69.95%	73.27%	66.09%	59.55%	94.39%	98.67%	96.80%	92.92%	92.11%	92.11%	74.49%	72.64%	79.73%	
	No. of large angles (>15 degrees)	21	15	9	13	0	3	4	7	9	10	14	13	34	23	21	
	No. of non-spannable floodplains (>1,500 feet long)	4	4	3	3	0	0	0	0	0	0	0	0	2	4	5	
	Compatibility Ranking	3	2	1	1		1	1	1	1	2	3	3	2	3	1	
Resource Sensitivity	Miles of route within exclusion area	0.06	0.06	0.06	0.06	0	0	0	0.07	0.08	0.13	0.07	0.07	0.26	0.55	0.39	
	Miles of route within highly sensitive area	29.13	26.32	24.23	25.23	2.22	17.50	4.81	4.89	10.44	6.46	6.17	5.74	31.07	22.60	16.08	
	Miles of route within moderate sensitivity area	13.84	8.94	8.94	8.94	0.02	2.84	15.61	21.88	19.13	20.35	22.44	22.85	11.56	4.93	6.08	
	Miles of route within low sensitivity area	2.88	2.09	2.09	2.09	0.33	0.16	0.24	0.01	0.01	0.01	0.03	0.03	1.13	0.54	5.88	
	Compatibility Ranking	3	2	1	2		2	1	1	4	3	2	2	3	2	1	
Average Ranking		2.8	1.9	1.5	1.9		1.3	1.6	1.7	2.7	2.4	2.1	2.3	2.0	2.0	1.6	
Overall Route Ranking		4	2	1	2		1	2	1	5	4	2	3	2	2	1	

<p>Legend:</p> <p>Most Compatible</p> <p>Above Average Compatibility</p> <p>Average Compatibility</p> <p>Below Average Compatibility</p> <p>Least Compatible</p>	<p>Notes:</p> <p>* Route 1-ALT is not a complete end-to-end route for comparison.</p> <p>¹ Sensitive habitat cover for this exercise includes riparian and drainage habitat identified from a desktop review within the area of study. Does not include other sensitive habitat or land cover types identified separately (i.e. critical habitat). This information can be further refined after habitat assessment is completed.</p> <p>² Approximate due to unreliable existing transmission line data for southern Yuma routes.</p> <p>³ Do not have records for many of the Arizona resources given that we have not yet completed the BLM Yuma FO records search yet. That being the case, these numbers reflect only the records we currently have.</p> <p>General rationale for assigning compatibility levels for Criteria Categories:</p> <p>Mileage = The shorter the mileage, the more compatible the route.</p> <p>Jurisdiction and Landownership = The fewer parcels crossed, the more compatible the route.</p> <p>Biological Resources = The less resources crossed, the more compatible the route.</p> <p>Surface Water Resources = The less resources crossed, the more compatible the route.</p> <p>Land Use = The shorter the mileage of designated land uses crossed, the more compatible the route.</p> <p>Existing Roads and Utilities = For informational purposes only; not a criterion for route selection</p> <p>Utility Corridors = The greater the mileage within a designated utility corridor, the more compatible the route.</p> <p>Visual Resources = The lower the mileage of high sensitivity (Class I and Retention), the more compatible the route.</p> <p>Cultural Resources = The less resources crossed, the more compatible the route.</p> <p>Geologic Hazards and Topography = The greater the mileage of low topography, the more compatible the route. The lower the number of parallel and crossed fault lines and mileage at high elevation, the more compatible the route.</p> <p>Constructability = The greater the percentage of existing access and the lower the number of large points of intersection and non-spannable floodplains, the more compatible the route.</p> <p>Resource Sensitivity = The greater the mileage of low sensitivity, the more compatible the route. Where low sensitivity miles are greater than high sensitivity miles, the more compatible the route.</p>
---	---