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* Part 3 of 4

EXHIBIT STL-23 – Final Southeast Arizona Transmission Study Report

Pursuant to the October 24, 2016 Procedural Order, Applicant Southline Transmission, L.L.C. provides the following exhibit.

EXHIBIT
STL-23
ADMITTED

FINAL

Southeast Arizona Transmission Study Report

December 5, 2008

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1. Executive Summary

SATS Committee Overview

The initiative to create the Southeast Arizona Transmission System (SATS) study group was based upon the common interests of Tucson Electric Power (TEP) and Southwest

Transmission Cooperative (SWTC). In light of the integrated nature of their respective transmission systems there was an obvious benefit to be achieved from coordination of their study and planning efforts. Meetings were held between August and December of 2006 at which a number of entities expressed interest in pursuing a coordinated planning effort for the entire southeast Arizona region. SATS became an official subcommittee of the Southwest Area Transmission (SWAT) subregional planning committee in October of 2006 and its first study plan was approved by SWAT in May of 2007.

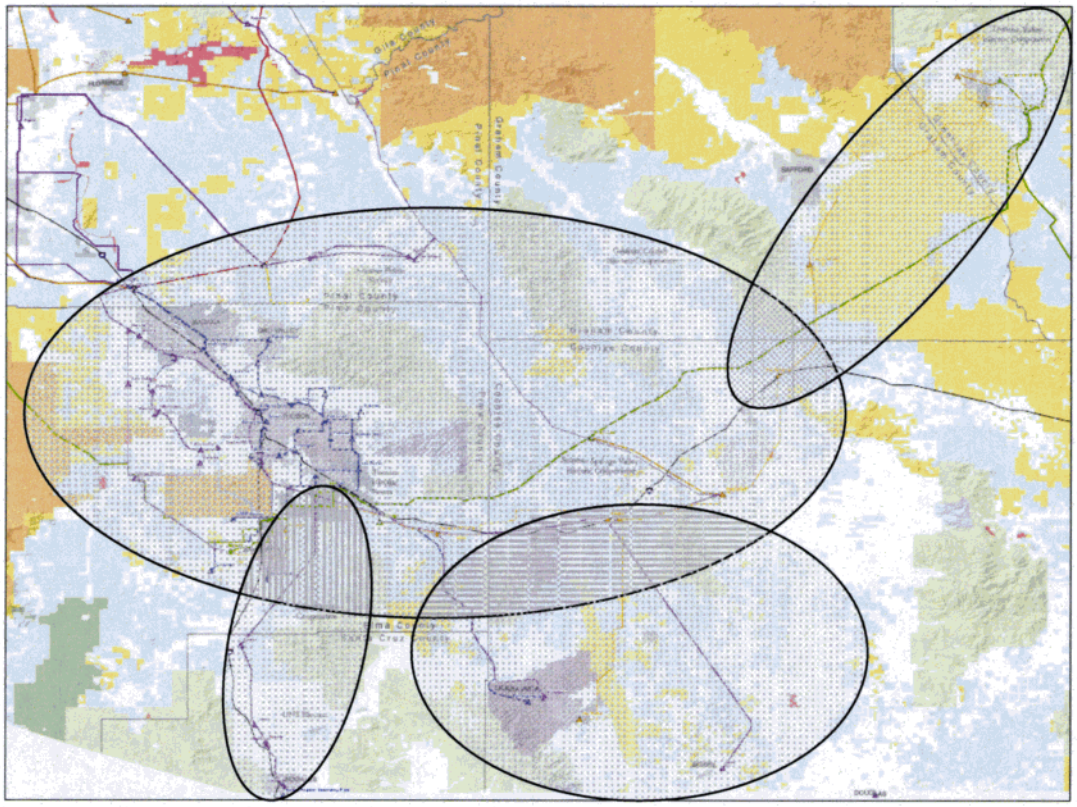
To date twenty entities have participated in the SATS study effort. These participants have included transmission service providers, distribution cooperatives, federal and state agencies, developers, and a military reservation. The following table lists the SATS study participants.

Acciona Energy	Arizona Corporation Commission
Arizona Power Authority	Arizona Independent Scheduling Administrator
Arizona Public Service	Central Arizona Project
El Paso Electric	Environmental Planning Group
Fort Huachuca	New Mexico Renewable Trans. Authority
Public Service of New Mexico	Southwest Transmission Cooperative
Southwestern Power Group	Sulphur Springs Valley Elec. Coop.
SunZia Transmission Project	Trico Electric Cooperative
Tucson Electric Power Company	U.S. Bureau of Reclamation
Western Area Power Administration	Western States Energy Solutions

Table of SATS Participants

The SATS study area includes all, or portions, of Cochise, Graham, Pima, Pinal, and Santa Cruz counties. Within this region are transmission, sub-transmission, and generation facilities owned and operated by various entities including Arizona Public Service (APS), Central Arizona Project (CAP), Sulphur Springs Valley Electric Cooperative (SSVEC), Trico Electric Cooperative (Trico), Unisource Energy (UNSE) and Western Area Power Administration (WESTERN), in addition to SWTC and TEP. There are also possible generation and transmission project proponents within the area, such as the Bowie Power Station generation project and the SunZia Southwest

Transmission Project. The following map provides an illustration of the SATS study area.



SATS Study Footprint

SATS Study Overview

The SATS study process has been a collaborative effort that was conducted in an open and transparent stakeholder forum. Southeast Arizona is a rapidly growing area with a pressing need to increase local area Load Serving Capability from remote resources. Opportunities to maximize the regional value of transmission investment to import remote resources are being explored as they become known. In addition, the group recognizes the importance of actively evaluating impacts of potential EHV transmission and remote resource projects that are under consideration to transmit large quantities of power through SATS. These projects are significant due to SATS' strategic location bordering Mexico, New Mexico and the high growth power markets north and west of the greater Tucson area. Renewable resources are implicitly considered as they are

anticipated to become an increasing portion of the remote resources under consideration to be transmitted into the SATS load pocket. The SATS group relies on information related to evolving efforts to transmit renewable energy into and through Southeast Arizona.

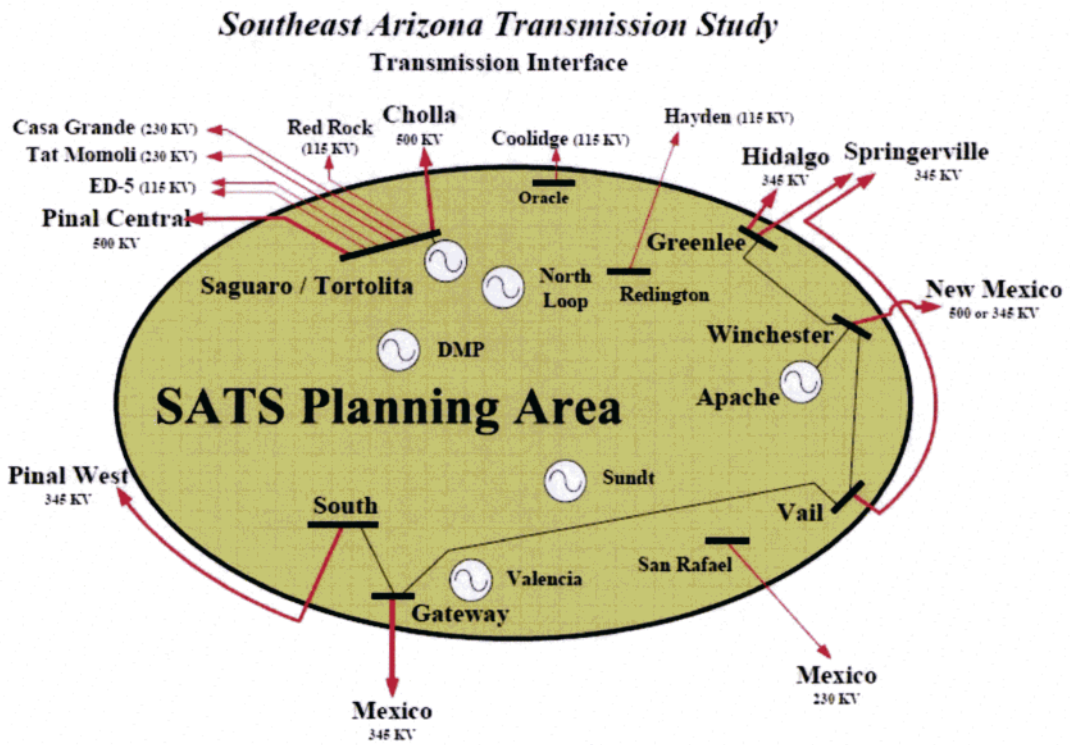
SATS goal is to have a 20 year transmission plan covering the entire SATS area assuming transmission and distribution facilities are owned and operated as a "single system". Key objectives include developing a transmission plan that:

- Provides reliable load serving capability while minimizing redundant transmission investment.
- Consists of alternative projects that offer mutual benefits, and therefore the lowest cost while minimizing aesthetic and environmental impacts.
- Responds to future uncertainties such as load forecast error, ability to site new transmission projects, decisions and timing for large generation and/or transmission projects, plus related technical or financial risk.
- Provides a sound basis for developing individual Transmission Provider long-range transmission plans.
- Establishes a planning process which facilitates ongoing assessment of future opportunities to further optimize long-range strategies.

The initial planning horizon for the SATS study spanned the twenty year time frame from 2007 to 2026. Load forecasts spanning this period were provided by each of the SATS load serving entities. In addition, a saturation load study was prepared by TEP for their service area which provided insights beyond the twenty year planning horizon. The primary purpose of the saturation study was to ensure that projects proposed for the twenty year planning horizon would continue to be technically and economically viable. Development of power flow base cases for 2010, 2016, 2026 and saturation was proposed. The purpose of 2010 was to assess projects for the three-to-five year time frame to determine which, if any, issues required resolution using short-term measures. A 2016 case was chosen based on availability of a SWAT case to develop a ten year case. Scope changes were made as the study effort progressed and preliminary saturation case results became available. As the study effort progressed there was a transition to development of improved models for the five, ten and twenty year planning horizons. A twenty year base case (2028) was prepared from the saturation case by

scaling loads down to approximately 75%, and an additional ten year (2018) analysis was based on a greater than 50% saturation case. (Note that percentages referenced to saturation apply only to TEP.)

The electrical interface between the SATS participants' facilities and external systems was defined to provide as much clarity as possible about which transmission systems affect the study area. This interface identifies the boundary between the long-range SATS planning model, and the external systems (for which modeling information was only available for ten years into the future). The SATS interface is illustrated in the following figure:



SATS Transmission Interface

Note that this diagram is intended to illustrate key transmission and/or generation interconnections without regard to transformation among voltage levels.

Planning standards, criteria and assumptions have a profound impact on the study

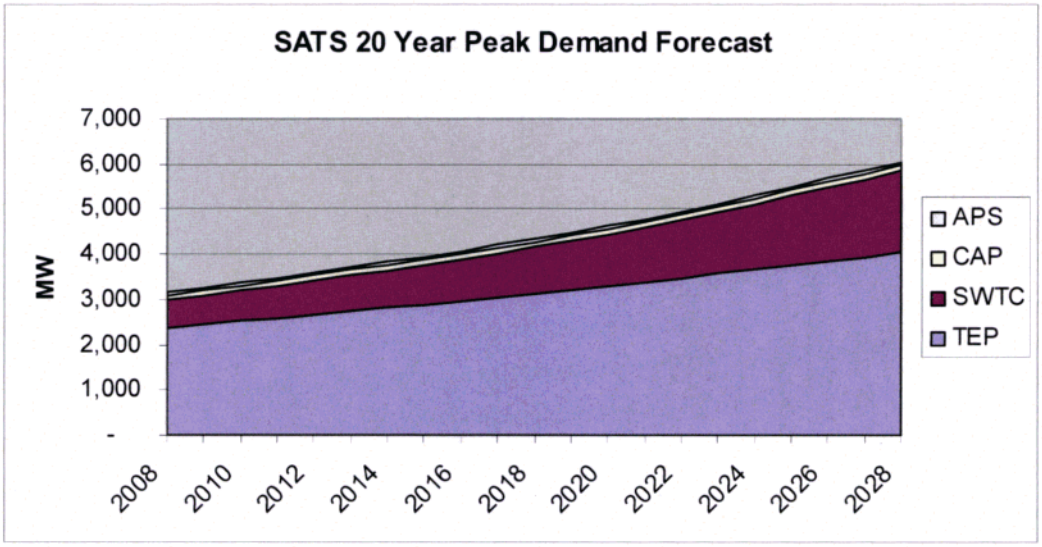
process, system performance evaluation and resulting planned upgrades. All of the SATS Participants agreed that NERC/WECC Planning Standards must be met. Therefore NERC and WECC Standards, with the effective date of April 1, 2005, existing as of the start of the SATS study were used in the analysis to determine the load serving capability of the SATS interconnected network. However, the studies accommodated variances between SWTC and TEP in their respective local criteria.

The SATS study is actually several coordinated studies designed to analyze and define the characteristics of the systems within the SATS footprint, and to determine the various options available to the companies. As a result of this approach each scenario or case has a separate set of assumptions. For example, concerns that exist today required study of sub-areas within the SATS footprint. These studies of local systems, such as in Cochise County and the Tucson metropolitan areas served by TEP and Trico were conducted with the interaction of all potentially impacted stakeholders in an open, cooperative and interactive mode. Study assumptions in these cases were tailored to the needs of the specific area(s) under consideration.

Load Forecasts

All SATS participants with load serving responsibility within the study area provided "base" or "nominal" 20-Year peak demand forecasts including geographic allocation. In the figure below individual forecasts were summed, or "stacked" one on top of the other with TEP[1] at the bottom, SWTC added on, and so on. (Note that summing the individual forecasts does not take diversity into account.)

[1] Note that Unisource Energy loads in Santa Cruz County, that are currently supplied from the WESTERN system but are planned to be served from the TEP network at the Vail substation by 2012, are not included in the TEP forecast. The peak demand forecast for this area, and which was included in the models, ranges from approximately 90 MW in 2012 to about 125 MW in 2028.



SATS 20 Year Peak Demand Forecast

A general observation is that the load in the SATS area is expected to nearly double over the 20 year forecast period.

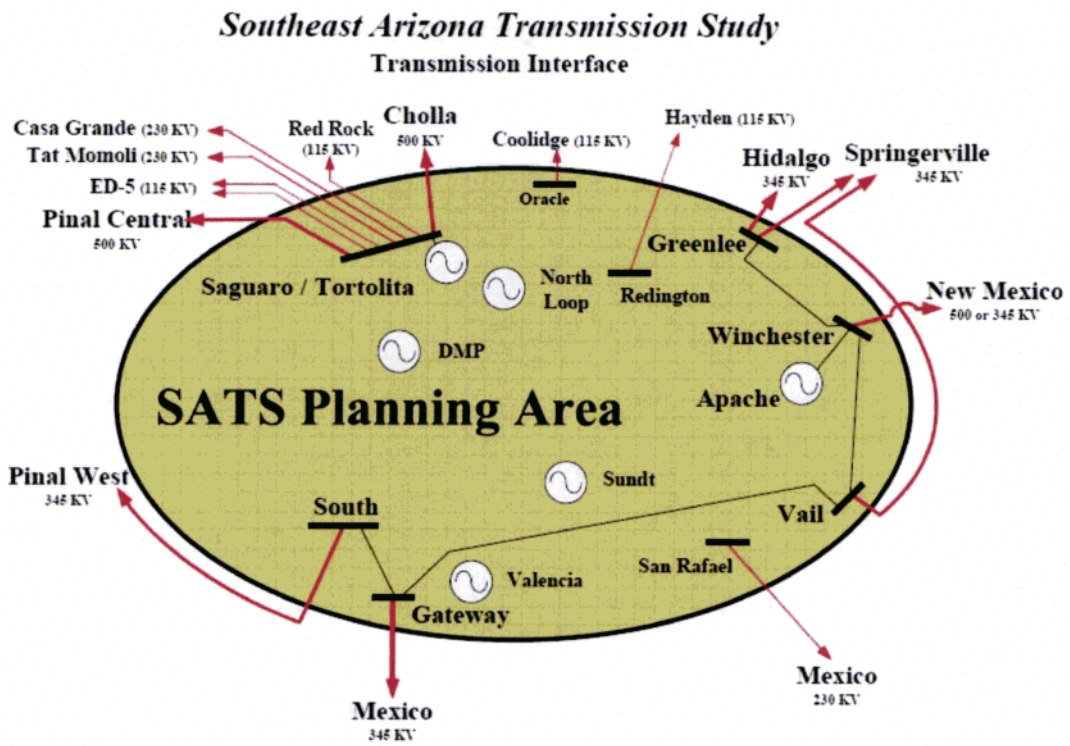
In addition to the 20 year forecasts illustrated above, TEP performed a "saturated" load study for their service area. General land use information obtained from local jurisdictions in the TEP service territory was used to develop geographically distributed peak demand data assuming ultimate build-out. This data was analyzed to identify likely locations for new distribution substations as well as expansion of existing stations. Alternative local area transmission lines were then evaluated to interconnect these new and expanded substations and integrate them into the existing local network. This exercise helped to identify potential future substation locations and transmission corridors needed to serve local loads.

Scenarios

Scenarios may be described as reasonably likely future states of the world (generally the Southwest in this case) that influence decisions about which projects or strategies should be pursued. Scenarios are typically characterized by critical uncertainties, such as the location and capacity of future generation and/or regional transmission projects and load forecasts. There is general recognition of the need to construct new EHV infrastructure to bring additional power from new resources into Arizona. Whichever

EHV project, or combination of projects is selected, there will be differing impacts on the local area systems in Southeast Arizona. For this reason multiple scenarios were developed and modeled. At this time, which of the possible Mega-Projects (TransWest Express, High Plains Express, SunZia, etc.) will be built is unknown. Hence they are treated as study uncertainties and represented as scenarios in the SATS study.

The SATS group agreed to develop a manageable number of materially different scenarios to aid in thinking about project creation and decisions. Scenarios representing major projects that may or may not be constructed are necessary to simulate projects that introduce new resources either directly into the SATS area or may otherwise be imported through potential EHV interconnection(s). As shown below, these scenarios were represented as equivalent generators located at the nodes where these projects are likely to interconnect, or where flows from the projects are likely to enter the SATS network.



SATS Scenario Import/Injection Locations

The generator locations and magnitude of power output used to model the scenarios, as

approved by the SWAT Steering Committee follow:

- Palo Verde (Hassaympa) Up to 1,000 MW
- Pinal West Up to 500+ MW
- Pinal Central Up to 500+ MW
- Winchester Up to 1,500+ MW
- Gateway/Aqua Prieta 500 MW to 1,000 MW

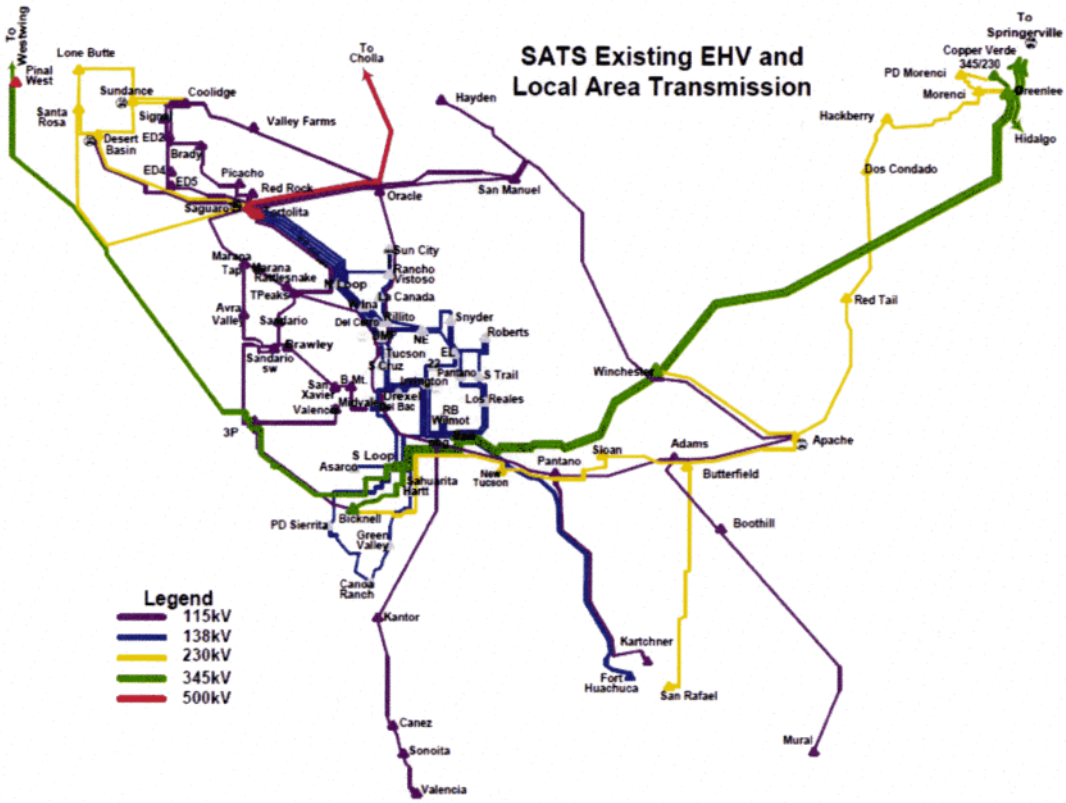
In the present round of studies all injections were assumed to be from Phoenix and southeastern Arizona. Sensitivity analysis to determine the impact of mega-projects south of Tucson will be accomplished as necessary in the next round of studies by turning on Gateway and/or Aqua Prieta and reducing the NW and SE scenario generation.

Current System

TEP's existing EHV transmission network, including jointly owned facilities, consists of about 512 miles of 500kV and 1,098 miles of 345kV transmission of which approximately 2 miles and 239 miles of 500kV and 345kV respectively are wholly owned by TEP. The balance of 510 miles of 500kV and 859 miles of 345kV are jointly owned.

SWTC's existing EHV transmission network, including jointly owned facilities, consists of 51.6 miles of 500 kV and 216 miles of 345 kV transmission of which approximately 2.46 miles and 46.08 miles of 500 kV and 345 kV respectively are wholly owned by SWTC. The balance of its transmission network consists of 537.6 miles of 230 kV, 115 kV, and 69 kV facilities .

The integrated APS, SWTC and WESTERN 115kV transmission facilities interconnect with the adjoining SWTC 230kV system. A significant portion of the 115kV system is networked with and is parallel to the 230kV lines. In addition, there are several radial lines serving loads in the southern and eastern portions of the SATS area.

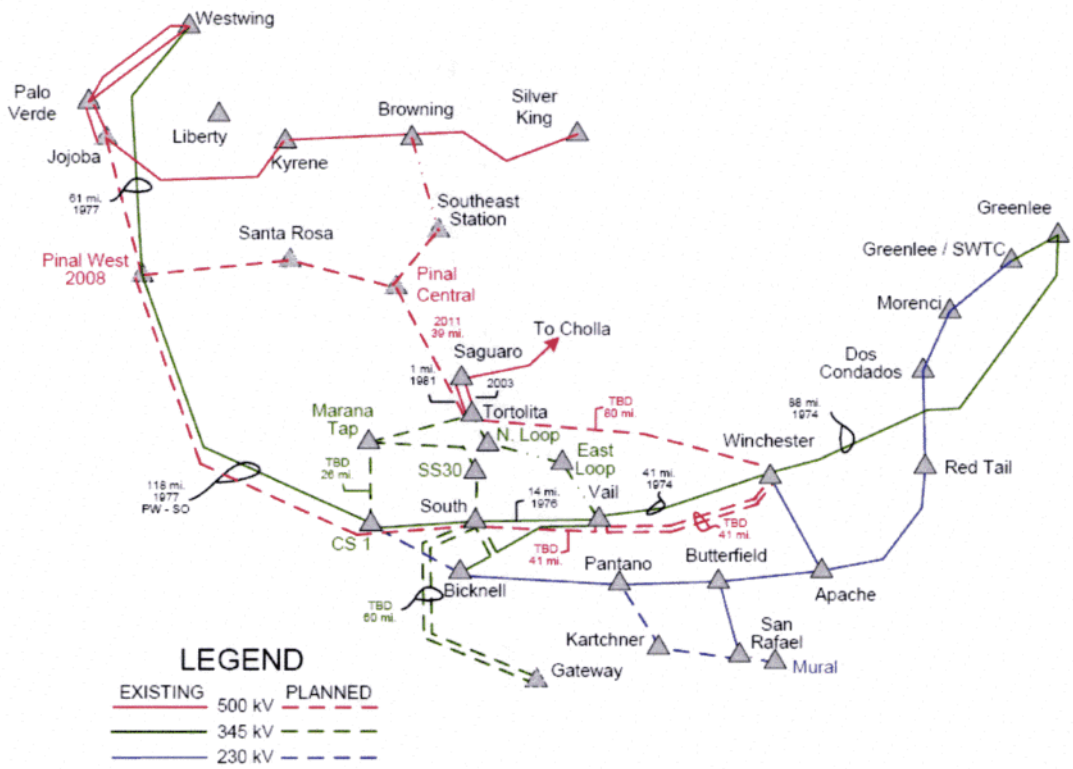


Within the SATS study area the Western 115kV transmission corridors have been identified as valuable assets for a number of the alternative projects. The value is associated with the location of the Western facilities and the potential to share capacity in upgrades to these facilities. As a component of the SATS study efforts Western was requested to review the status of its right-of-ways (ROW) from Saguaro and Oracle south through the Tucson area and east to Apache. The study results indicated that much of the Western Tucson area 115kV system could be upgraded as long as the new facilities resided within the existing 100 foot ROW.

Long-term Strategies

Long-term strategies were developed by assembling combinations of projects which were able to address the system issues identified in the power flow analysis. The approved SATS study scope calls for initial strategy designs to be based upon the assumption that future resource additions will come from either the northwest (PV HUB area) or southeast. Additional sensitivity analysis are planned to be subsequently performed assuming multiple sources of generation as well as internal generation. The

following map illustrates potential transmission expansion projects evaluated in the SATS studies.



Potential Transmission Expansion Projects

In addition to the SATS area wide strategies illustrated on the preceding map, local strategies were also developed for TEP and SWTC. Six EHV strategies were developed for the TEP system in the Tucson area, of which two were initially given high priority to be evaluated. However, what is identified in the report as "Strategy F" later emerged as the highest priority due to its favorable technical, economic and aesthetic characteristics. Strategy F includes two 345kV lines from Tortolita to North Loop and a new North Loop substation. It also includes a new 345 kV substation at Irvington with new 345kV connections from Irvington to Vail and South Loop. Modifications to the 138kV system design envision rebuilding or reconductoring existing multiple circuits between the EHV delivery points and the load centers within Tucson.

SWTC does not anticipate sponsoring any major EHV projects within the timeframe of this analysis. Therefore, its EHV strategies were dependent on other SATS participants EHV strategies. Since TEP was the only SATS participant with EHV strategies SWTC reviewed the TEP alternatives to evaluate which ones would be beneficial to the SWTC system.

Of the three areas that SWTC provides transmission service in this study, the Marana Area was the one that SWTC saw potential benefits from the TEP EHV strategies. There were possible joint projects identified such as 345kV facilities connecting Tortolita, Marana, Three Points and Bicknell. A 345kV line between North Loop and Tortolita has possible benefits to SWTC. These EHV strategies will need to be thoroughly evaluated both economically and technically.

In addition to the transmission plans of SWTC and TEP, the Southwest Public Power Resource (SPPR) group has proposed a project that interacts with potential SATS area projects in the northern portion of the study area. Therefore alternatives coordinating with the SPPR project should be investigated wherein new 230kV facilities extending into Tucson from the Marana Tap could interconnect with the local area 115kV and 138kV systems.

Findings from Power Flow Analysis

2010 Case Analysis – The 2010 cases assume that only those upgrades that are presently funded through approved capital improvement plans or other projects that are otherwise considered highly likely candidates to be funded and constructed by 2010, are in place.

For SWTC their 2009-2010 Construction Work Plan (CWP) includes upgrades of SWTC's existing system as well as joint projects between SWTC and others. Joint projects with CAP include the addition of two new substations, San Joaquin and Adonis, re-conductor of the existing Avra-Marana 115kV line and construction of a new 115kV line from Saguaro to Rattlesnake. Joint projects also include the SWTC and WESTERN construction of a new interconnection at the existing SWTC Pantano substation to the existing WESTERN 115kV line from Adams Tap to Nogales Tap.

TEP's upgrades consist of the addition of a new 500/345kV substation at Pinal West

plus an SVC to provide voltage stability to the TEP 138kV network, both in 2008. During the process of preparing the five year capital budget, TEP determined that existing 138kV facilities between Tortolita and North Loop would limit load serving capability from the relatively strong source at Tortolita. Therefore significant upgrades were proposed in the Tortolita to North Loop corridor. They were recommended because of relatively high load growth and the need to increase transfer capacity from Tortolita. These upgrades consisted of a series of projects staged over the three year period 2008 to 2010.

2016 Case Analysis - Combinations of EHV and local area transmission projects that made sense based on the experience and judgment of TEP and SWTC transmission planners were added to the 2016 cases. This was to make reasonable efforts to identify which projects would be required for load serving capability based on information available at that time. This work was done prior to development and analysis of any saturation load level cases. Development of the 2016 case resulted in a nominal transmission configuration to establish a benchmark upon which to build a revised 10-year (2018) planning horizon case.

TEP upgrades consist of participating in the Pinal West to Pinal Central and SEV 500kV project and adding a new Pinal Central to Tortolita 500kV line plus additional 500/138kV transformation. Additional 345kV transmission will also be needed into Tucson to increase load serving capability. While a decision as to which EHV project had not been made, TEP initially modeled a new Tortolita to East Loop 345kV with a new 345/138kV substation at East Loop. Tortolita to East loop was modeled as it was included in the TEP Preliminary EHV Transmission Plan. In addition to these EHV projects a number of local 138kV projects were identified by TEP for the Tucson service area.

SWTC potential upgrades considered consisted of: (i) participation in the Pinal West to Pinal Central 500kV project and the Pinal Central to Tortolita 500kV project; (ii) interconnection of TEP's line from Pinal West to South 345kV line; (iii) a 230kV injection point into the SSVEC area; and (iv) upgrade of 115kV line from Bicknell to Three Points and Avra to Sandario to Three Points. Using the 2016 SATS base case, SWTC identified a number of potential upgrades as well as a number of possible interconnection points to evaluate in the 2011-2013 CWP process. Projects beyond the 2010 planning period remain conceptual and subject to change as future demands

increase or decrease during evaluation.

2018 Case Analysis – The 2018 base cases evolved from the Saturation cases based on the assumption that loads were at 50% of estimated saturation levels. This observation was used to determine that portion of the substation and/or transformer capacity identified at saturation that would be required to serve load at the 50% point and subsequently the 10-year planning horizon, 2018. Only the EHV upgrades that were required to serve the load in 2018 were included. Initially two EHV options that yielded comparable Load Serving Capability were evaluated; the first being Tortolita to North Loop, and the second Tortolita to East Loop 345kV. Evaluation of these two options indicates that there are significantly greater impacts to the underlying 138kV system by terminating the EHV at North Loop than at East Loop. Though the East Loop EHV option requires less 138kV improvements it incurs the cost of the additional 23 miles of 345kV to extend beyond North Loop and terminate at East Loop.

Additional work is in process to model and analyze other alternative projects that are common to the most likely EHV strategies. The highest priority is Strategy F which envisions a new 345kV line from Vail to Irvington and continuing on to South Loop. This option also includes a new 345/138kV substation at Irvington. Two others, Strategy A and Strategy C will continue to be evaluated to determine their feasibility and cost effectiveness in order to preserving longer range planning flexibility. These particular projects have the potential to provide shorter-term load serving capability when and as needed, while retaining options which may be decided upon later to pursue any of the three strategies depending upon circumstances know at that time in the future.

A proposal by the Southwest Public Power Resources group, described in Section 18, to introduce a 230kV line terminating at the SWTC 115kV Marana Tap will be evaluated as part of the SATS 2009 study plan.

2028 Case analysis - The results indicate that a fourth 500/138kV transformer will be needed at the Tortolita substation. Also the major components of the "reach-in" strategies should be in service at about the twenty year planning horizon. Reinforcement into the northwestern Tucson area, whether it be two 345kV lines to North Loop, as in Strategies C and F, or a variation involving 230kV as described in the 2018 case analysis above. Based on currently available information, TEP's preference

would be for new 345kV lines from Vail to Irvington to South Loop with 345/138kV transformation at Irvington, or Strategy F. Otherwise Strategy C would be technically effective. Additional 345/138kV, 345 or 230/115kV and 345/230kV transformers will be needed as well. More detailed analysis will be necessary to determine the number, size and timing for these various transformer additions.

At the 2028 load level, based on the 2008 load forecast, EHV reinforcement consisting of 345kV transmission additions into Vail from the east or into North Loop from the northwest would be adequate to serve SATS area load.

Saturation Case Analysis - Initial results indicated that the 345kV additions described in the 2028 case analysis would not be adequate to serve saturated loads. Therefore extensive 500kV additions were modeled, to include a second Pinal Central to Tortolita line, two Winchester to Vail lines and a Vail to South Loop to Pinal West line. Multiple 500/345kV transformers were required at the Winchester, Vail, South Loop and Pinal West substations. Note that the Tortolita to Winchester 500kV line was modeled in the 2028 cases, and remained in the saturated load cases. These extensive 500kV system upgrades technically meet the SATS area load serving needs. However no analysis was performed to optimize the system or to determine if other options might have extended the life of the 345kV upgrades modeled at the 2028 load level.

Cochise County Study

A sub-committee of the SATS group was formed to address the transmission and load serving concerns specific to the Cochise County area. Of particular concern to this sub-committee was the transmission system serving loads in and surrounding the City of Sierra Vista. Although these concerns have been raised in prior transmission planning activities, a series of outages experienced in the Sierra Vista area, during the period of October 9th through October 11th of 2007, emphasized the need to formalize the discussions and try to find an acceptable solution. When an ACC Staff member characterized the issue as; "one that is very serious and needs to be dealt with ASAP, SATS responded by creating the Cochise County Study Group. Leadership of the Group was assigned to Sulphur Springs Valley Electric Cooperative (SSVEC). SWTC agreed to perform the technical studies associated with the Group's efforts.

Transmission service in Cochise County consists principally of radial lines which feed

into the underlying sub-transmission system. SWTC provides transmission service to SSVEC's Sierra Vista area loads principally via two radial lines; a 115kV line from Pantano to Kartchner substations and a 230kV line from Butterfield to San Rafael substations. Some additional capacity can be imported into the Sierra Vista area over SSVEC's 69kV sub-transmission system from their tie to SWTC's Apache substation. WESTERN provides transmission service to APS which then delivers power, via a radial 115kV transmission line from the Adams Tap substation to its Mural substation, to serve its loads in the south-central and far southeastern corner of Cochise County. TEP serves Fort Huachuca via a radial 138kV line which emanates from its Vail substation. An alternative path for up to approximately 16 MW to Fort Huachuca is provided by a TEP 46kV sub-transmission line connected to the TEP 138kV bus at the South Loop substation. The issue presented for resolution to this subcommittee was that, under various load conditions, an outage of any one of these radial transmission lines (an N-1 condition) could result in the loss of load.

The subcommittee members held their meetings over the period of November, 2007 through January, 2008. The members of this subcommittee agreed that the objective of the study group would be:
To determine and recommend transmission solution(s) using 115, 138, and 230kV lines and substations to solve existing N-1 transmission problems within southern Cochise County.

During this period SWTC conducted a technical evaluation on seven transmission options proposed by the subcommittee. These seven options, which included upgrades to both the area's transmission and sub-transmission systems, were:

1. Pantano-Kartchner-San Rafael-Butterfield 230kV loop.
2. San Rafael to Mural 230kV Extension.
3. Sloan to Huachuca East Radial 230kV.
4. Tie of TEP's 138kV to SWTC's 115kV Lines.
5. Apache-Tombstone-Kartchner 115kV.
6. Emergency Tie to TEP's 138kV at Fort Huachuca.
7. San Rafael to North Kartchner 230/115/69kV.

The Cochise County Study Group agreed that an additional 230kV transmission line into

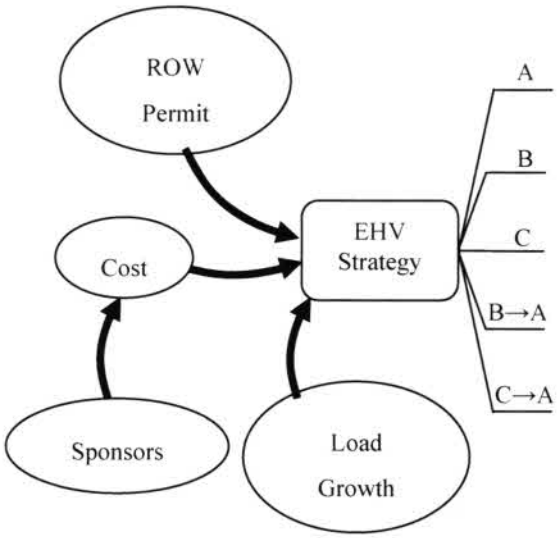
the Sierra Vista area would be necessary to address system reliability and provide for expected future load growth. There was also agreement by the subcommittee that a 230kV loop through the Sierra Vista area is the preferred long-term technical solution. The future loop would not only eliminate reliability issues in the Sierra Vista area, but could also address future load serving issues for APS. What remained an issue within the subcommittee was the timing of this 230kV loop. However, no final conclusion, beyond the need for a 230kV loop, was reached in this initial phase of the Group's study process.

The recommendation of the Cochise County Study Group was to suspend its activities until the completion of a right-of-way study to be commissioned by SWTC. This study is intended to determine the probability of creating a new transmission corridor into the Sierra Vista area.

Developing a Flexible Plan

A flexible plan has built-in features that take uncertainty about future events into account. For example, a given strategy may ultimately offer the greatest load serving capability. However, it may also require the most new 345kV facility construction to implement at a relatively higher cost, and possibly also has the greatest risk associated with obtaining the permits to build. There may be further financial risk of potential stranded investment if projected load growth fails to materialize, or if the actual growth rate is significantly lower than currently forecasted.

Thinking about these uncertainties leads to the addition of variations to the basic strategies to attempt to mitigate regulatory and financial risks. For instance, Strategy B may be modified to preserve the option of switching to Strategy A by acquiring ROW or obtaining options on the rights-of-way needed to add the lines that would not otherwise be necessary in Strategy B. Modifications would also be considered for the Strategy B local area HV transmission plan, again to preserve the option to make the switch to Strategy A. This option is referred to as "B→A" in the below influence diagram.



Conclusions

There are significant benefits of a coordinated subregional study effort using a single system approach. The SATS participants directly involved in developing the study scope; in developing alternative strategies; in modeling and analysis; and documenting results gained a much better understanding of current and emerging system issues than would have been otherwise possible by working independently. Participants who diligently participated in the many meetings and teleconferences, and who reviewed the documentation provided excellent feedback, valuable information and insights that could not have been accessed otherwise.

Specific benefits of joint planning include the following:

- Provides a framework for SATS Transmission Providers to prepare capital budgets and ten year plans
- SATS provides a forum to ensure accuracy of planning models, and to identify system issues involving interconnected transmission facilities, and to jointly develop mutually beneficial solutions;
- Provides a protocol for establishing "need" during project siting activities before regulators;
- Potentially higher reliability, through the use of multiple corridors versus multi-circuits in single corridors wherever possible;
- Identification of potential joint projects which could result in lower overall

construction requirements;

- Working with adjacent subregional study groups provides an effective means to resolve seams issues;
- Lower individual technical and financial risk through better information and creative group thinking;
- Lower cost, aesthetic and environmental impacts through pursuit of possible joint projects.

Conducting a subregional study looking out beyond the ten year planning horizon creates a sound basis for developing short-term plans in the context of a long-term view. Key findings include:

- Identified key EHV strategies to serve saturated load at ultimate buildout;
- Identified potential future transmission corridors and substation sites;
- The plan recommends flexibility in view of uncertainty considering alternatives to minimize long term risk;
- Worked collaboratively with the Cochise County stakeholders in the pursuit of developing a short-term (3 to 5 year) plan to address existing contingency issues which will provide a long-term solution;

Establishing a subregional study group facilitates an on-going process to solve remaining or emerging issues:

- Five year planning horizon dilemma, described in Section 15, is to be addressed in the SATS 2009 study plan. The problem has been relatively well defined and divided into discrete geographical study areas within SATS;
- Ongoing effort will continue to guide and inform the public in stakeholder forums as well as Transmission Providers' capital budgets and ten year plans

Recommendations and 2009 SATS Study Plan

Recommendations for the SATS study are documented as a list of actions in the proposed 2009 SATS Study Plan as follows:

Proposed 2009 SATS Study Plan

- Present plan & subsequent findings to SWAT, WestConnect and to local stakeholders
- Revise load forecasts

- Engage SATS in early case building to ensure accuracy of database for 2009 ten year planning cases:
  - Focus on Arizona for ten year planning to include cases for years 1 through 5 plus year ten;
  - Preparation for ACC ten year plans, RMR, BTA and compliance studies;
  - Provide support and documentation to other regulatory agencies such as FERC and Rural Utility Services (RUS);
- Investigate implications of increased Freeport McMoRan Inc (FMI) loads in SATS study footprint:
  - Seek input from, and participation by FMI to address their anticipated plant expansion;
- Investigate alternative configurations to mitigate high flows on the Winchester 345/230kV transformer, Apache – Bicknell 230kV line and 230/345kV Bicknell transformer caused by EHV system contingencies;
- Develop and evaluate alternatives to the two joint Tortolita – North Loop 345kV proposal based on the SPPR Three Terminal proposal;
- Investigate impact of SunZia in coordination with CATS EHV, NM, SWAT RTTF study groups and other entities;
- Develop and evaluate alternatives for joint SWTC/TEP substation(s) to supply TEP/Trico loads south of Tucson;
- Continue Cochise County planning in an effort to comply with ACC Biennial Transmission Assessment recommendations;
- May conduct studies to accommodate renewable energy projects;
- Complete capital cost estimates and economic analysis, including losses;
- Identify potential projects;
- Conduct Scenario Sensitivity analysis, such as Load Forecast, Efficiency, Local Renewable Resources, Local & Distributed Generation, and location of external resources.

2. Introduction and Overview

Tucson Electric Power Company (TEP) and the Southwest Transmission Cooperative, Inc. (SWTC) initiated discussions in August of 2006 to pursue a joint transmission study. The first planning session, to identify common interests and to determine the feasibility of jointly pursuing a twenty-year transmission plan, was convened on August 31, 2006. The parties agreed that the potential benefits were significant enough to develop a

study work plan and to establish an open communication process to elicit broad participation by interested stakeholders.

The Western Area Power Administration (WESTERN) hosted a meeting on October 31, 2006 to explore opportunities presented by a joint planning effort. The timing coincided well with WESTERN's announced plans to conduct a study of the Southeast Study Region (SSR) of Arizona similar to the recently completed study of WESTERN's Northwest Study Region. Coordination of this study with the proposed joint Southeast Arizona Transmission Study made sense since the study area footprints coincide.

A work planning session was held at the Trico Electric Cooperative, Inc. (Trico) offices on December 5, 2006, by parties who were interested in a joint study. Participants included Arizona Public Service (APS), the Central Arizona Project (CAP), Public Service Company of New Mexico (PNM), Sulphur Springs Valley Electric Cooperative, Inc. (SSVEC), SWTC, Trico, TEP and WESTERN, plus other entities including the Entegra Power Group, LLC. (Entegra) and Southwestern Power Group (Bowie and SunZia Projects). These participants agreed that the study should be referred to as the Southeast Arizona Transmission Study (SATS) and further worked collaboratively in facilitated sessions on a draft work plan and schedule for the study. The results of this effort are documented in the SATS Work Plan and Schedule.

The formation of SATS was announced at the SWAT Oversight Committee meeting on October 18, 2006. SATS became a formal SWAT study group and a member of the SWAT Steering Committee. The SWAT Oversight Committee approved the study plan and schedule on May 16, 2007.

SATS participants jointly developed and agreed on goals and objectives, scope and schedule, methodology, criteria and resources to complete the study. A cornerstone of the process is that the study will be conducted on a "single system" basis. Detailed meeting and teleconference notes are available through the WestConnect website.

The SATS planning process has been open to any interested stakeholder with open communication and unencumbered information exchange encouraged and supported. The group has enjoyed the participation of project developers, load serving entities, customers, the Arizona Corporation Commission (ACC) staff, and others, along with

SATS area and neighboring transmission providers. The level of coordination that has taken place within SATS began before the implementation of FERC Order 890. All meeting notices of SATS are posted on the WestConnect website at www.westconnect.com and are forwarded to all entities within the WestConnect footprint via the SWAT e-mail blaster.

3. Participating Organizations

3.1. Acciona Energy: Acciona Energy, a Spanish company, develops and manages renewable energy projects, including small hydro, biomass, solar energy and thermal energy, and the marketing of biofuels. It also has assets in the field of co-generation and wind turbine manufacture. As of 2007, it is carrying out research projects to produce hydrogen from wind power and to manufacture more efficient photovoltaic cells. As of 2007, Acciona Energy is the largest developer, owner and operator of wind farms in the world, with 164 wind farms in nine countries representing over 4,500 megawatts (MW) of wind power installed or under construction. Acciona Energy is also the developer, owner and operator of Nevada Solar One, the world's first solar thermal plant built in more than 16 years, and the third largest facility of its kind.

3.2. Arizona Corporation Commission (ACC): The ACC is a regulating agency for the public power corporations created under the state of Arizona Constitution. Under a state statute, ACC conducts a biennial transmission assessment for the state of Arizona. The ACC has also the authority to approve siting of transmission lines, 115kV and above, and power plants 100 MW and larger. The Commission Staff participates in the regional and sub-regional transmission planning forums.

3.3. Arizona Independent Scheduling Administrator Association (AzISA): AzISA is a voluntary, non-profit Arizona corporation formed January 1, 1999, as an interim electric transmission scheduling administrator to facilitate the operation of Arizona's competitive electric retail market until a regional independent system operator, becomes operational. AzISA will initially administer and oversee all activities on the OASIS of the control area operators.

AzISA intends to serve as the scheduling administrator on behalf of the providers and users of the interconnected transmission system within the State of Arizona and to facilitate open, non-discriminatory transmission access on the interconnected transmission system. If there is distribution congestion, then there may be a role for AzISA in overseeing distribution congestion management and distribution access.

3.4. Arizona Power Authority (Authority): The Authority is a body corporate and politic established by the Arizona legislature in 1944. The Authority is authorized to bargain for, take, and receive electric power developed from the main stream of the Colorado River and sell such capacity and energy to certain qualified purchasers in the State of Arizona. The Authority's primary source of power is the Hoover Plant at Hoover Dam located approximately 25 miles from Las Vegas, Nevada. Transmission of power to Arizona is made available primarily through purchases of transmission capacity from WESTERN.

The Authority's participation in SATS is to help plan reliable transmission service to its wholesale contractors within or near the SATS footprint.

3.5. Arizona Public Service (APS): APS provides electric service to several Cochise County load pockets. In a continuing effort to provide reliable and cost effective service, APS coordinates development of the load serving network with all regional, and local load serving entities. SATS, being a subcommittee of the regional SWAT coordination group, is undergoing a long term electric reliability assessment of the future Cochise county load serving capacity. APS participation within the SATS assessment is to ensure that all future electrical network additions are coordinated with planned future facility additions of the other SATS members.

3.6. Central Arizona Project (CAP): CAP is a water resource development and management project that delivers Colorado River water, either directly or by exchange, into central and southern Arizona. The project was designed to provide water to nearly one million acres of Indian and non-Indian irrigated agricultural land areas in Maricopa, Pinal and Pima Counties, as well as municipal water for several Arizona communities, including the metropolitan

areas of Phoenix and Tucson. The United States Bureau of Reclamation ("Reclamation") constructed and owns the features of the CAP. Under contract with Reclamation, Central Arizona Water Conservation District (CAWCD) operates and maintains the CAP and repays the Arizona portion of the United States' construction costs. The balance of the costs was to settle Indian water rights claims.

The CAP features include nearly 400 miles of 230kV, 115kV and 69kV transmission lines and substations to serve the pumping loads that deliver the water to the state users. The CAP also has generation and transmission rights in the Navajo and Inter-tie Projects as well as Hoover Dam. There are 31 miles of 115kV transmission line within the SATS study area to the west of the Tucson Mountains and 38 miles of 115kV transmission lines originating at Electric District #2 substation and connecting to Saguaro generating station switchyard, which is at the northern boundary of the SATS study area. These two transmission lines serve nine of the 15 CAP pumping plants across the state. CAP is the largest single user of electricity in the state and has a combined load of nearly 500 MW.

3.7. El Paso Electric (EPE): EPE is an interconnected member of the Western Electricity Coordinating Council (WECC) and is located at the far southeastern corner of WECC. EPE is connected to the Southwest Power Pool (SPP) only through an asynchronous tie. In total, EPE owns, in whole or in part, approximately 950 miles of 345kV transmission line, most of which is located within New Mexico. EPE's Extra High Voltage (EHV) transmission system is comprised of three chief components: a series of 345kV AC lines that connect EPE's local transmission system in and around the City of El Paso to the WECC interconnected grid; the single 345kV line that interconnects EPE's local transmission system to the SPP through an HVDC terminal; and the 345kV transmission lines that distribute power imported from the WECC and SPP to EPE's local system. EPE's major transmission interconnections with other utilities are at the (1) West Mesa Switching Station near Albuquerque, New Mexico with Public Service Company of New Mexico (PNM); (2) Eddy County HVDC Terminal near Artesia, New Mexico with Southwestern Public Service Company (SPS); and (3) Springerville Generating Station and Greenlee

Substation (both in Arizona) with Tucson Electric Power Company (TEP). EPE also has a partial ownership interest in three 500kV transmission lines in Arizona, from the Palo Verde Nuclear Generating Station's switchyard to the Kyrene and Westwing Substations in the Phoenix area. EPE has approximately 800 MW of wholly-owned gas-fired generation in the EPE service area and is a joint owner in the coal-fired Four Corners Power Plant (104 MW) and Palo Verde Nuclear Generating Station.

3.8. Environmental Planning Group (EPG): EPG is an interdisciplinary environmental planning and design firm that places responsibility, integrity, and the balance of human, natural, and cultural resources at the forefront of project development and resource management.

3.9. Fort Huachuca: Fort Huachuca is a major Army installation located in Western Cochise County. This facility is equivalent to a city of 15,000 and is one of the largest employers in Southern Arizona. One of the prime missions, electronic testing was located here due to the low electric and magnetic fields (EMF). High Voltage Electric Transmission lines create EMF. The Fort's interest in participating in coordinated transmission planning with local and SATS area transmission providers and other stakeholders is for Energy Security (reliability) and encroachment on mission (increased EMF).

3.10. New Mexico Renewable Transmission Authority (RETA): RETA was created to expand renewable energy transmission and storage projects. The projects undertaken by RETA must source at least 30 percent of their energy from renewable energy sources. RETA is a stand-alone entity administered by an eight-member board. Five members are appointed and serve staggered three-year terms and three are government representatives. RETA can identify and establish corridors for transmission of electricity within the state; participate in regional transmission forums to plan and negotiate for the creation of interstate transmission corridors; finance or plan, acquire, maintain and operate eligible facilities; and exercise the power of eminent domain to forward the development of its projects as long as utility property is not taken and electric reliability is not materially diminished, as determined by the New Mexico Public Regulation Commission.

3.11. Public Service Company of New Mexico (PNM): PNM is New Mexico's largest electricity and natural gas provider, is based in Albuquerque and has offices in more than 20 cities. PNM serves about 487,000 electricity customers and about 490,000 natural gas customers in about 100 communities statewide and also sells electricity on the wholesale market.

3.12. Southwest Area Transmission (SWAT): SWAT is comprised of transmission regulators/governmental entities, transmission users, transmission owners, transmission operators and environmental entities. The goal of SWAT is to promote regional planning in the Desert Southwest. The SWAT regional planning group includes several subcommittees, which are overseen by the SWAT Oversight Committee.

3.13. Southwest Transmission Cooperative (SWTC): SWTC owns and operates transmission facilities and has rights to transmission service to support its six member distribution cooperatives located in the Arizona, Southern California, and New Mexico region. The six cooperatives are Anza Electric Cooperative (AEC), Duncan Valley Electric Cooperative (DVEC), Graham County Electric Cooperative (GCEC), Mohave Electric Cooperative (MEC), Sulphur Springs Valley Electric Cooperative (SSVEC) and Trico Electric Cooperative (Trico). Currently SWTC maintains 608 miles of transmission lines ranging from 69 to 345kV.

SWTC has a vested interest in participating in SATS because four member cooperatives reside in southeastern Arizona. These cooperatives include DVEC, GCEC, SSVEC and Trico. SWTC has seen much benefit in conducting long range studies to identifying joint projects and critical upgrades to the existing system that will allow SWTC to serve projected load growth with the interconnected power system of participating utilities.

3.14. Southwestern Power Group (SWPG): SWPG is an energy project development company located in Phoenix, AZ. SWPG provides front-end project development services for large power generation and EHV transmission projects, including site acquisition, state and county licensing and permitting,

federal licensing and permitting, WECC approvals and other pre-construction activity. SWPG is the owner-developer of Bowie Power Station and SunZia Southwest Transmission Project.

3.15. Sulphur Springs Valley Electric Cooperative (SSVEC): SSVEC is a non-profit, member-owned distribution cooperative providing electricity to more than 50,000 services over some 4,000 miles of energized line. Located in southeastern Arizona, the cooperative's service territory covers parts of Cochise, Graham, Pima and Santa Cruz Counties and includes the communities of Sierra Vista, Huachuca City, Patagonia, Elfrida, Benson, St. David, Bowie, San Simon, Willcox, Sonoita and Pearce-Sunsites.

3.16. SunZia Southwest Transmission Project (SunZia): SunZia is evaluating the potential to develop a new regional electric transmission line between southern New Mexico and southern Arizona. SunZia would allow potential future development of power from renewable energy sources, such as geothermal, wind, and solar, to be transported by the SunZia Project to the Arizona and New Mexico regional transmission systems. SunZia is a participation transmission project that is being developed by Southwestern Power Group of Phoenix, AZ.

3.17. Trico Electric Cooperative, Inc. (Trico): Trico, a Touchstone Energy® Cooperative, is a member-owned, non-profit electric distribution cooperative headquartered in Marana, Arizona, northwest of Tucson. Established in 1945, Trico provides electric service to more than 35,000 member customers over nearly 3,200 miles of line. Trico serves a diverse membership, including urban, suburban and rural communities in northwest Tucson, Green Valley, Marana, Sahuarita, Corona de Tucson and Arivaca

3.18. Tucson Electric Power Company, Inc. (TEP): TEP, a UniSource Energy subsidiary, is a vertically-integrated electric utility that provides retail electric service to more than 375,000 customers in Southeastern Arizona. Tucson's service territory consists of a 1,155 square mile area and includes a population of approximately 931,000 in the greater Tucson metropolitan area of Arizona. UniSource Energy Services (UES), another UniSource Energy subsidiary within the SATS geographic area, is a utility that provides electric service to customers

in Santa Cruz County.

3.19. Western Area Power Administration (WESTERN): WESTERN markets and delivers reliable, cost-based hydroelectric power and related services within a 15-state region of the central and western U.S. WESTERN is one of four power marketing administrations within the U.S. Department of Energy whose role is to market and transmit electricity from multi-use water projects. WESTERN's transmission system carries electricity from 57 power plants operated by the Bureau of Reclamation, U.S. Army Corps of Engineers and the International Boundary and Water Commission. Together, these plants have an installed capacity of 10,395 megawatts.

WESTERN and its energy-producing partners are separately managed and financed. In addition, each water project maintains a separate financial system and records.

3.20. Western States Energy Solutions, LLC: Western States Energy Solutions is a consulting company with expertise in transmission planning, interconnections, and transmission service. It also consults on interconnection configuration, operations issues, relaying configurations, and power related communications issues. Clients include renewable energy developments in New Mexico, Tribal renewable projects in New Mexico, Arizona and California, and gas fired generation in Mexico. Western States Energy Solutions LLC interest in SATS is the development of transmission that will also include wheeling for renewable energy resources to the Tucson and Phoenix areas for New Mexico wind and solar energy projects.

4. Definitions

4.1. Delta V: Change in voltage between pre- and post-contingency conditions.

4.2. Extra High Voltage (EHV) is the term applied to voltage levels that are greater than 230kV.

4.3. High Voltage (HV) is the term applied to voltage levels greater than 100kV and less than or equal to 230kV.

4.4. Initially Out of Service (IOS): A system element is IOS if it is out of service and system adjustment is complete.

4.5. Load Serving Capability (LSC): LSC is the greatest amount of load that can be served considering EHV and HV system limitations, through the combination of transmission capability and maximum available local generation within any given load pocket, while meeting NERC/WECC/Local Internal Reliability Criteria.

4.6. Load Serving Entities: The entity that secures energy and transmission service (and related Interconnected Operations Services) to serve the electrical demand and energy requirements of its end-use customers.

4.7. North American Electric Reliability Corporation (NERC): NERC is an international, independent, self-regulatory, not-for-profit organization, whose mission is to ensure the reliability of the bulk power system in North America.[2]

4.8. Special Protection Scheme (SPS) or Remedial Action Scheme (RAS): SPS or RAS is designed to detect abnormal system conditions and take pre-planned, corrective action (other than the isolation of faulted elements) to provide acceptable system performance. SPS actions include among others, changes in demand (e.g., controlled load shed), generation, or system configuration to maintain system stability, acceptable voltages, or acceptable facility loadings.

4.9. Static VAR Compensator (SVC): An SVC is an electrical device capable of continuously providing reactive power to control dynamic voltage swings under various system conditions.

4.10. System Adjusted: System Adjusted is the post-contingency condition after local generation is adjusted as needed, reactive devices are switched as needed, and elements / load out of service are restored as possible.

4.11. Transmission Providers: A Transmission Provider is "Any public utility that owns, operates or controls facilities used for the transmission of electric energy in interstate commerce".[3]

4.12. UniSource Energy Corporation: Unisource Energy Corporation (NYSE: UNS) is the largest publically-traded company headquartered in Tucson, Ariz. UniSource Energy's primary subsidiaries include Tucson Electric Power (TEP), which serves nearly 400,000 customers in southern Arizona; and UniSource Energy Services (UES), a utility that delivers natural gas and electric service to more than 240,000 customers across Arizona.

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[2] Source: NERC website.

[3] Source: 18 CFR Part 358 [Docket No. RM07-1-000; Order No. 717], Standards of Conduct for Transmission Providers, (Issued October 16, 2008)

4.13. WestConnect: WestConnect is composed of utility companies providing transmission of electricity in the southwestern United States. The members work collaboratively to assess stakeholder and market needs and to develop cost-effective enhancements to the western wholesale electricity market. WestConnect is committed to coordinating its work with other regional industry efforts to achieve as much consistency as possible in the Western Interconnection[4].

4.14. Western Interconnection: The Western Interconnection is one of the two major alternating current (AC) power grids in North America. The other major interconnection is the Eastern Interconnection. The three minor interconnections are the Québec Interconnection, the Texas Interconnection, and the Alaska Interconnection[5].

All of the electric utilities in the Western Interconnection are electrically tied together during normal system conditions and operate at a synchronized frequency operating at an average of 60Hz. The Western Interconnection stretches from Western Canada South to Baja California in Mexico, reaching eastward over the Rockies to the Great Plains.

4.15. Western Electricity Coordinating Council (WECC): The Western Electricity Coordinating Council is a Utah nonprofit corporation with the mission to: 1) maintain a reliable electric power system in the Western Interconnection that supports efficient competitive power markets; and 2) assure open and non-discriminatory transmission access among Members and provide a forum for resolving transmission access disputes between Members consistent with FERC policies where alternatives forums are unavailable or where the Members agree to resolve a disute using the mechanism provided in Section 11 (Transmission Access Mission).

5. Study Process

The SATS study process is consistent with SWAT, WestConnect and Western Interconnection regional planning processes. Since SATS was formed the entire study process has been a collaborative effort that was conducted in an open and transparent

[4] Source: WestConnect website.
[5] Source: WECC website.

stakeholder forum. SATS is recognized as a sub-regional study group within SWAT, and has engaged stakeholders through a transparent process well before this process became a requirement through the FERC Order 890. This process is documented in SATS participating transmission providers' Attachment K to their respective Open Access Transmission Tariffs (OATTs).

SATS has chosen to conduct the study in light of both local and regional needs and concerns. Southeast Arizona is a rapidly growing area with a pressing need to increase local area Load Serving Capability (LSC). The base assumption is that all incremental loads, with the exception of the output from the existing four Sundt steam units and the DMP combustion turbine in the TEP system as described in Section 13, will be supplied from remote resources. Transmission plans resulting from the assumption that all incremental loads will be supplied by remote resources will logically indicate the largest transmission infrastructure capital improvement requirements. This plan may then serve as the benchmark against which to measure deferral or elimination of potential transmission upgrades associated with options to increase energy efficiency, distributed generation, new local generation and other measures. Hence, opportunities to maximize the regional value of transmission investment to import remote resources are welcome, and will be explored as they become known. In addition, the group recognizes the importance of actively evaluating impacts of potential EHV transmission and remote resource projects that are under consideration to transmit large quantities of power to and through SATS. These projects are significant due to SATS' strategic location bordering Mexico, New Mexico and the high growth power markets north and west of the greater Tucson area.

Renewable resources are implicitly considered as they are anticipated to become a larger portion of the remote resources under consideration to be transmitted into the SATS load pocket. The SATS group relies on information related to evolving efforts to transmit renewable energy into and through Southeast Arizona. For example, RETA, along with other SATS participants, will be working with the AZ/NM Renewable Task Force that was set up under SWAT to define renewable energy areas in the state of New Mexico. At the same time RETA plans to be actively involved in the Western Renewable Energy Zones (WREZ) designations. RETA has taken the PNM transmission map along with the wind, solar and geothermal NREL maps, including what is in the queues for renewable resources in New Mexico and has identified

locations on a map along with the estimated potential amount. Upon public comment of the renewable areas, RETA will be looking to define a transmission corridor to export the renewables.

Large projects intended to import new resources, including renewables, are modeled as described in Section 12: Scenarios. Therefore the SATS "reliability" study will provide a sound foundation for the "economic" study process conducted by the Transmission Expansion Planning Policy Committee (TEPPC) of the Western Electricity Coordinating Counsel (WECC). The AZ/NM Renewable Task Force has evolved to become the SWAT Renewable Transmission Task Force (SWAT RTTF) and is expanding its scope to include most of the WestConnect footprint. RETA, TEP and other SATS members are active participants in the expanded SWAT RTTF and in the TEPPC Technical Advisory Subcommittee (TAS). These regional groups are focused on identifying and characterizing significant wind, solar, geothermal and biomass renewable energy resources that are located throughout the Western Interconnection. The general objective of TEPPC is to provide a database, model and preliminary analysis that may be utilized to help facilitate development of renewable projects in conjunction with additional transmission capacity needed to transmit generation projects' output to load centers throughout the west. These regional efforts are intended to dramatically increase the likelihood that mega-projects such as those represented in Section 12: Scenarios will be built.

The SATS study process does not make any provisions for renewable resource integration nor for regulation service that may be necessary to accommodate intermittent or non-dispatchable renewable resources injecting into the SATS Planning Area.

SATS engaged the SWAT Steering Committee, consisting of the sub-regional study group Chairs, to formulate scenarios that simulate large proposed generation and/or associated EHV transmission projects. These potential projects, until commitments are made to pursue any of them, are uncertain and therefore treated as scenarios. In order to expedite twenty-year planning, the SATS participants agreed to scale loads and necessary transmission reinforcement alternatives within the SATS area while maintaining external systems load and resource balance based on the SWAT 2016 base case available at the beginning of the SATS process.

During this process a problem was identified in that a significant increase in SATS load causes thermal stress on surrounding systems external to the SATS footprint. Scenarios were developed to alleviate this problem by simulating possible large generation and transmission projects. This effectively provided an external system equivalent in the absence of a SWAT or other system-wide base case modeling expansion plans beyond the ten-year planning horizon. These scenario proposals were represented as equivalent generators located at the nodes where these projects are likely to interconnect, or where flows from the projects are likely to enter the SATS network. More detail on scenarios is presented in Section 12: Scenarios.

6. Study Goals and Objectives

The goal is to have a 20 year transmission plan covering the entire SATS area assuming transmission and distribution facilities are owned and operated as a "single system". Note that SATS participants may have transmission assets outside of the SATS study boundary, and therefore not included in the scope of the SATS study. Key objectives include:

6.1. A transmission plan that provides Load Serving Capability, attempting to minimize investment, to serve SATS area customer needs supplied from remote resources. Adequate capability is measured by meeting applicable North American Electric Reliability Corporation (NERC), WECC and local reliability standards and criteria.

6.2. A transmission plan consisting of alternative projects that offer mutual benefits, and therefore an opportunity to minimize cost through joint ownership. Joint projects can minimize aesthetic and environmental impacts by avoiding construction of redundant facilities. Projects are to be divided into categories to indicate which are planned for the near term (e.g. five year planning horizon) and most likely to be implemented versus a "catalog of projects" that are under consideration among others and potentially competing for selection beyond the five year planning horizon.

6.3. An inherently flexible transmission plan that responds to future uncertainties such as load forecast error, ability to site new transmission projects, decisions

and timing for large generation and/or transmission projects, plus related technical or financial risk.

6.4. A sound basis for developing individual Transmission Provider long-range transmission plans. A key objective is to develop and compare joint SATS strategies against plans that individual Transmission Providers might otherwise prepare independently.

6.5. A transmission planning document and process that facilitates ongoing assessment of future opportunities to further optimize long-range strategies. Future opportunities, including those that may defer or eliminate transmission investment include local or regional renewable resources; demand side technologies; clean and efficient advanced distributed energy conversion technologies; potential load management and remedial action schemes (RAS); and others.

TEP and SWTC are preparing individual twenty year transmission plans which will be informed by this SATS planning effort. Each recognizes that the contiguous nature of their service territories and interconnected transmission facilities must be considered in their respective long-range transmission plans. Each is interested in identifying projects that offer mutual benefits and therefore may be candidates for potential joint projects.

APS, CAP and WESTERN own and operate 115kV transmission facilities in the SATS area. They are preparing long range transmission plans recognizing that interconnected facilities present similar opportunities for integration into joint projects that may provide mutual benefits.

7. Study Scope and Schedule

The SATS study area encompasses the southeastern portion of Pinal, southern Graham, most of Pima and all of Cochise and Santa Cruz Counties. There are transmission and generation facilities owned and operated by various entities including Arizona Electric Power Cooperative (AEPCO), WESTERN, CAP, and APS in addition to SWTC, TEP and UNS Electric in the SATS study area. There are also possible generation and transmission project proponents within the area, such as the Bowie Power Station generation project and the SunZia Southwest Transmission Project, who

participate in SATS. Other stakeholders included the Arizona Corporation Commission (ACC), Fort Huachuca, vendors and consultants.

Figure 1: SATS Study Footprint shows the geographic area and transmission systems to be included in the study.

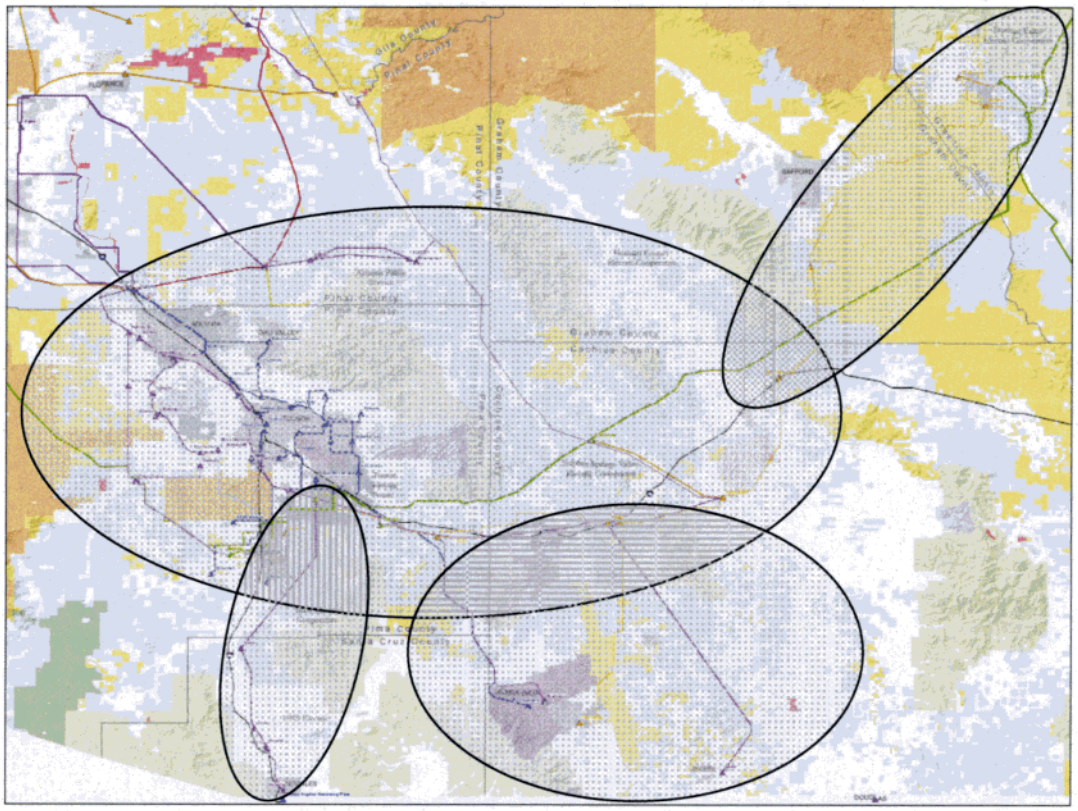

Figure 1. SATS Study Footprint

Note that the SATS footprint encompasses a broad range of land uses, jurisdictions and system challenges. For example, the Tucson and surrounding metropolitan area is undergoing rapid growth and development, and becoming a higher density urban environment. The communities south of Tucson and in Cochise County are also experiencing development pressures but do not have the extensive existing infrastructure normally associated with more highly populated regions. Therefore SATS must view its understanding of issues and potential solutions from these differing perspectives. Sub-studies were undertaken to address these special circumstances, and are addressed in other sections of this report.

The initial schedule for the study is shown in Figure 2: Original SATS Schedule below:

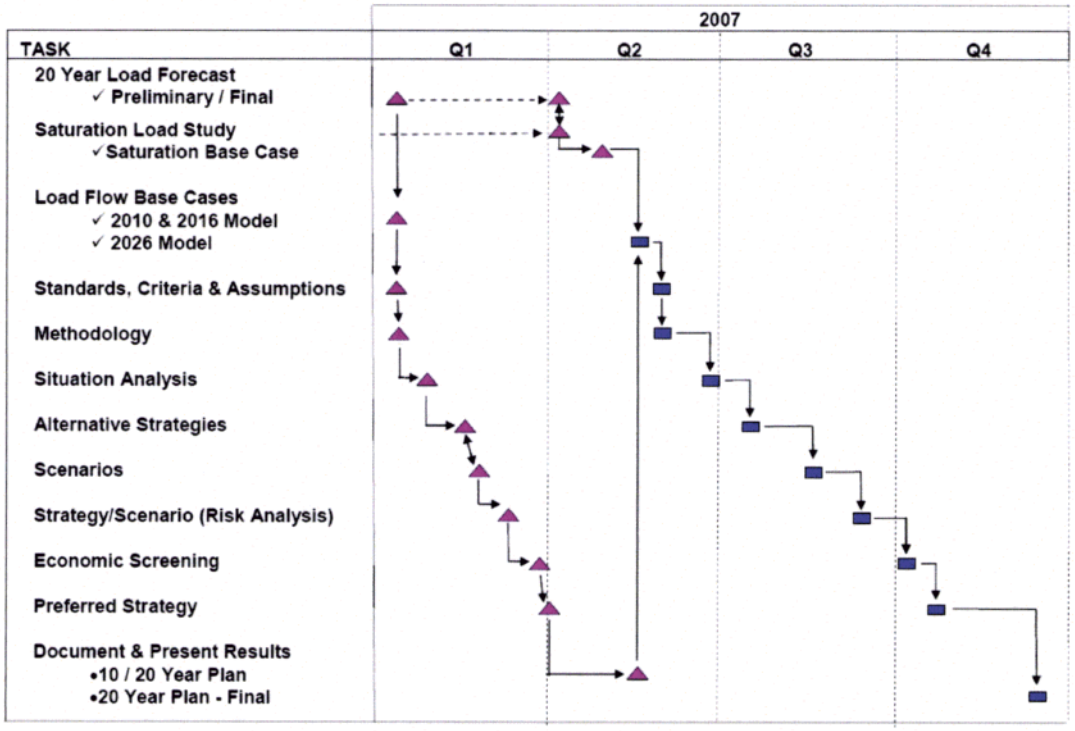

Figure 2. Original SATS Schedule

The actual sequence and timing of activities has not been precisely followed. Revisions to the scope such as addition of cases for 2018 and changing from 2026 to 2028 for the twenty year planning horizon came about as a result of lessons learned while conducting the saturation study. The saturated load study (described in Section 10), particularly power flow case and alternative strategy development also took significantly longer than expected. Most of the work based on the original 2016 case was redone to take the addition of as many as 40 potential new load serving substations and associated 138kV infrastructure for the TEP system into account. A summary showing the number of existing and potential new substations is included in Section 9.7 Table 5. TEP Load Serving Substations. Significant progress was made in 2007 with a great deal accomplished in 2008 as outlined in the SATS 2008 Transmission Study Plan. The revised schedule is shown in the following Figure 3. 2008 SATS Schedule.

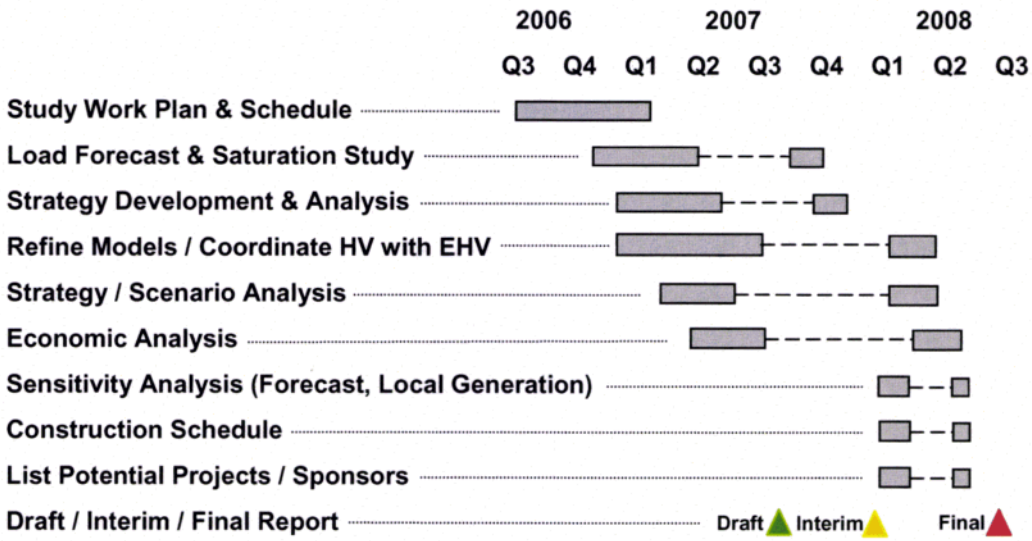

Figure 3. 2008 SATS Schedule

The first three tasks, Study Work Plan & Schedule, Load Forecast & Saturation Study and Strategy Development & Analysis, were essentially completed by the end of 2007. The next three tasks continued well into 2008. The power flow models were refined to incorporate transmission system topology changes that were identified during the Saturation Study and Strategy Development & Analysis phases. The revised models were such a significant improvement that all SATS participants agreed to extend the original schedule. This allowed the study to proceed based on much more sound information.

Economic Analysis consisted of alternative projects capital cost estimates that were prepared individually by the SATS Transmission Providers. However, the Transmission Providers decided to not disclose these preliminary estimates due to sensitivity over uncertainty associated with land and environmental costs as well as concerns that this information might influence actual land costs. Therefore the SATS 2009 Study Plan will include tasks to work with other subregional and regional planning entities in the Western Interconnection to arrive at cost estimates that are consistent throughout the west.

Limited sensitivity analysis was done to gain an understanding of the potential for deferring or eliminating transmission investment by changes in the demand for

electricity and/or the addition of generation within local load pockets. These initial findings suggest that more in-depth analysis should be pursued in 2009.

Lists of Potential Projects & Sponsors and their associated Construction Schedules were developed and included in this report. The list includes projects that are the most likely candidates to be incorporated into the individual SATS participating Transmission Providers' ten year transmission plans. A "catalog of projects" listing other alternatives that did not appear to be as likely to be developed was also prepared. The "catalog" is important to retain as some of these projects could become more viable candidates due to changing future circumstances. Thus the SATS study provides valuable information to help guide development of coordinated capital budgets and long range transmission plans of the individual Transmission Providers. This includes having a better understanding of projects that may be jointly pursued.

The SATS study report, which initially served as a guide for the study and documentation of the process, has evolved into this report.

7.1. The electrical interface between SATS and external systems was defined to provide as much clarity as possible about which transmission systems are included. This interface identifies the boundary between the long-range SATS planning model, and the external systems which are modeled only ten years into the future. The SATS interface is illustrated in Figure 4: SATS Transmission Interface below:

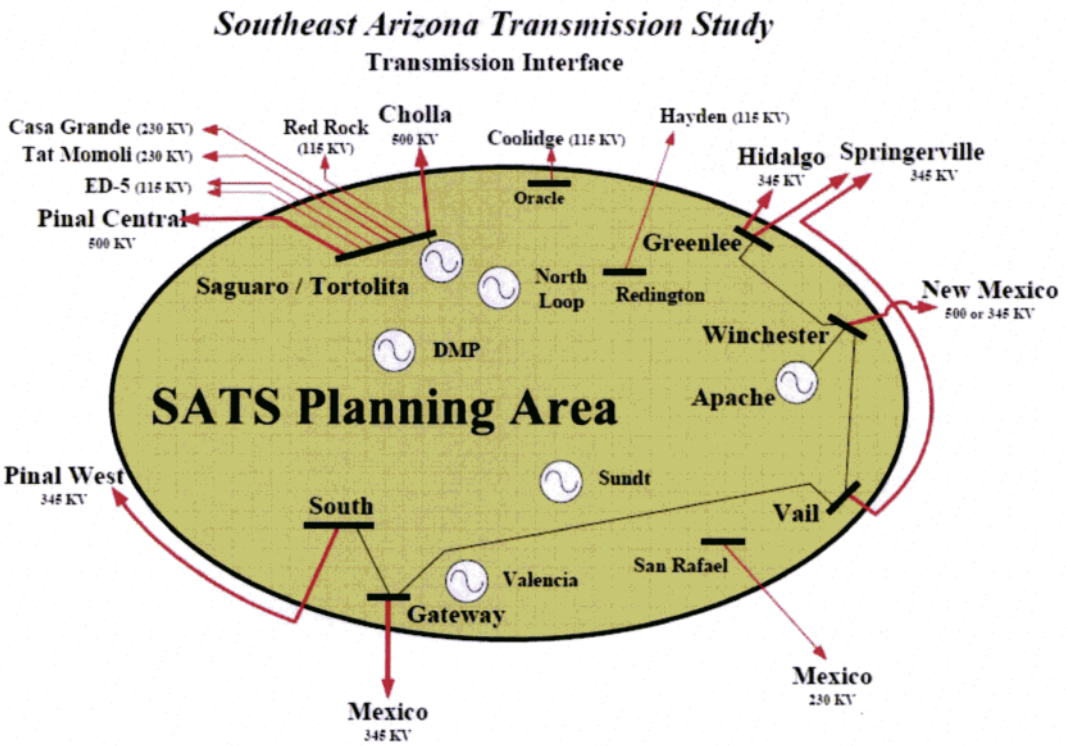

Figure 4. SATS Transmission Interface

Note that this diagram is intended to illustrate key transmission and/or generation interconnections only. It is not intended to serve as an accurate transmission system single line diagram. Hence no transformation among voltage levels is represented.

7.2. The planning horizon for this study covers the twenty year time frame from 2007 to 2028. However, the saturation study, in addition to geographically distributed loads, provided insights beyond the twenty year planning horizon. The primary purpose of the saturation study was to ensure that projects proposed for the twenty year planning horizon would continue to be technically and economically viable. Similarly project viability in the twenty year time frame helps to identify and prioritize which projects to include in the catalog. More detailed information is included in Section 10: Saturated Load Study.

7.3. Aggregate twenty year load forecasts were provided by the SATS load serving entities. These forecasts primarily serve as a guide for determining when SATS

area transmission additions would be required, and to determine the magnitude of incremental remote resources.

7.4. Development of power flow bases cases for 2010, 2016, 2026 and Saturation was proposed. The purpose of 2010 was to assess projects for the three-to-five year time frame to determine which, if any, issues required resolution using short-term measures. 2016 was chosen based on availability of a SWAT case to develop a ten year case. Scope changes were made as the study effort progressed and preliminary Saturation case results became available. A twenty year base case (2028) was prepared from the Saturation case by scaling loads down to approximately 75%, and additional ten year (2018) analysis was based on a greater than 50% Saturation case. Thereafter cases were developed to characterize the system at the approximate five year planning horizon and to test alternative projects. TEP utilized this information to prepare cases and to conduct analysis for the preliminary 2009-2013 capital budget. Note that percentages referenced to Saturation apply only to TEP.

7.5. Need for transmission line or substation projects is generally based upon a determination that existing facilities are not adequate to provide reliable services to customers at the lowest possible cost with due consideration to minimizing environmental and aesthetic impacts. SATS participants apply NERC and WECC Planning Standards, and individual utility specific criteria to analyses to make this determination. Transmission planning personnel endeavor to recommend projects that meet these standards and criteria, and those which make economic sense in the context of long-term transmission planning strategies. Long-term transmission planning covers a planning horizon of twenty years with consideration of ultimate build out scenarios that extend well beyond the twenty year horizon. In turn, having a catalog of alternative EHV and local area transmission projects for the twenty year planning horizon provides better information, influencing decisions about which projects to pursue in the ten year planning horizon. Hence the planning process involved evaluation of power flow system analysis results, development of alternative strategies (combination of possible upgrade projects), scenario (addressing uncertainties) development and strategy/scenario assessment over a broad range of load levels.

7.6. Generally EHV transmission reinforcements were developed to provide adequate transmission capacity to import power from remote resources. Most new resources to serve forecasted load within the SATS boundary were assumed to be located outside of the SATS area. A few exceptions including the proposed Bowie power plant and other relatively small local projects were considered. Remote resources that may be available beyond the ten year planning horizon had not been clearly defined at the time the SATS analysis was done. Therefore they were simulated by generation at appropriate interface locations as described in Section 12. Scenarios.

8. Study Criteria

Planning standards, criteria and assumptions have a profound impact on the study process, system performance evaluation and resulting planned upgrades. All of the SATS Participants agreed that NERC/WECC Planning Standards must be met. Therefore NERC and WECC Standards, with the effective date of April 1, 2005, existing as of the start of the SATS study were used in the analysis to determine the load serving capability of the SATS interconnected network. A copy of Table I. NERC Transmission Standards – Normal and Emergency Conditions is attached as Appendix B to this report.

Analysis was divided into SATS-wide and by individual participants' local area systems. The SATS-wide analysis consisted of All Lines In Service (ALIS) and N-1. SATS Participants relied on the following for SATS-wide and individual analysis:

8.1. Three to Five-Year Planning Horizon: Remedial Action Schemes (RAS), including load shedding (LS) when allowed, were modeled. SATS-wide analysis evaluated NERC/WECC Category A and Category B conditions. Individual transmission providers conducted analyses of Category C and D contingencies as appropriate on their respective local systems. Thermal limits, voltage deviation of 5%, and minimum voltage of 0.95 p.u. were identified through flagging conditions under which those limits are reached. Criteria for determining when upgrades are required, while conducting detailed area analysis, were based upon individual participants' policy.

8.2. Ten-Year Planning Horizon: Same as Five Year, except that RAS and LS were

not considered for SATS-wide analysis. Individual participants conducted Category C and D contingency analysis as appropriate per the NERC/WECC standards for detailed local area evaluations.

8.3. Twenty-Year Planning Horizon: RAS and LS were not considered for SATS-wide or individual participants' analysis. Individual participants conducted Category C and limited D contingency analysis.

8.4. The SATS-wide analysis was divided between TEP and SWTC. TEP analyzed the 2010 system and SWTC analyzed the 2016 system. In this analysis, system performance was evaluated for All Lines in Service (ALIS) and for single contingencies (N-1). Each transmission owner in the SATS area provided a list of contingencies (115kV and above) for this analysis. Each of these outages was evaluated against WECC and NERC Planning Standards. In the 2010 analysis, existing RAS were evaluated, if provided. For the 2016 time frame and beyond, it was agreed that RAS would not be evaluated for single contingencies.

TEP and SWTC also initially performed detailed analysis on their respective systems for the 2010 and 2016 cases. Emphasis was shifted to 2013 and 2018 cases as the study progressed to reflect lessons learned through the planning process. TEP's detailed analysis included Category C and D[6] contingencies as appropriate on the TEP EHV network. TEP's Category C and D outages were comprised of all pairs of EHV transmission lines and transformers and 138kV transmission outages that are included in TEP's Tie-Open Load Shed (TOLS) system. TEP's Category C outages are EHV transmission elements that share a common right-of-way, share a common breaker, and 138kV main-and-transfer busses. The Category D outages were all the remaining pairs of TEP EHV elements in the singles contingency list.

SWTC performed detailed analysis for normal and contingency conditions. The analysis covered Categories A, B, and C of the NERC/WECC Planning Standards.

[6] Category D analysis was limited to cases that modeled strategies that were deemed most likely to be pursued, but only, with limited application within the ten year planning horizon. Alternative strategies were initially screened based on Category B and C analysis.

8.5. Local criteria varied among the SATS participants. Criteria used by TEP and SWTC for transmission planning in their respective service areas are described in this section. TEP's local criteria, in addition to the NERC and WECC criteria, are shown in Table 1: TEP Pre-Contingency Local Criteria and Table 2: TEP Post-Contingency Local Criteria.

TEP Pre-Contingency Local Criteria	
EHV Voltage Range	1.03 – 1.04 pu, if possible
138kV Average Voltage	1.0210 – 1.0235 pu
Tortolita VAR Flow	Into Saguaro 500
Generator VAR Output	SVC – In Service 0 – 1 MVAr, All units SVC Out of Service 19 – 20 MVAr, Sundt Steam Units 0 – 1 MVAr, Local Combustion Turbines

Table 1. TEP Pre-Contingency Local Criteria

TEP Post-Contingency Local Criteria	
138kV Average Voltage	0.98 – 1.05 pu

Table 2. TEP Post-Contingency Local Criteria

SWTC's internal criteria and power flow analyses standard are shown next with Table 3 below identifying the SWTC voltage criteria used for the steady state voltage assessment.

Bus Voltage Limits for SOUTHWEST TRANSMISSION SYSTEM				
PRE-CONTINGENCY		POST-CONTINGENCY		
High Limit (pu)	Low Limit (pu)	High Limit (pu)	Low Limit (pu)	Delta V (%)
1.05	0.95	1.10	0.90	5

Table 3. SWTC Steady State Voltage Criteria

Table 4 below identifies the SWTC thermal criteria used for the steady state thermal assessment which is typically used in planning studies.

SYSTEM CONDITION	MAXIMUM ALLOWABLE FACILITY LOADING
Pre-contingency (All lines in)	100% of Normal rating
Post-contingency	110% of Normal rating

Table 4. SWTC Steady State Thermal Loading Criteria

The steady state analysis was performed with pre-contingency solution parameters that allowed adjustment of load tap-changing transformers (LTCs), static var devices (SVDs including switched capacitors) and phase shifting transformers. Post-contingency solution parameters only allowed adjustment of LTCs and SVDs (including switched capacitors).

9. Study Methodology and Assumptions

The SATS study is actually several coordinated studies designed to analyze and define the characteristics of the systems within the SATS footprint, and to determine the various options available to the companies prior to the urgent time crunch to meet reliability concerns. Since that is the case each scenario or case has a separate set of assumptions.

For example, long range electrical peak demand needs will have assumed build out to the levels that are presently envisioned by local city and county planners, developers, and other stakeholders. These require making assumptions about load locations and

magnitudes based on existing land use plans and new generation envisioned to support future year estimates. Another Loads and Resources application is the shorter term of lower projected loads and generation. By combining these two extremes the planner can demonstrate possible construction plans which will accommodate both extremes with the best use of scarce resources.

Another example is the application of through flow requirements associated with Renewable Generation under consideration to be developed north of Arizona and/or within Arizona and New Mexico. The current vision includes development of relatively large interstate transmission projects to transmit significant amounts of power through New Mexico, entering Southeast Arizona and continuing to markets west of Arizona. Some of this power is expected to be delivered within New Mexico and Arizona. The balance is assumed to be transmitted to the west across the SATS area. In this case the assumption of 500 MW to 1500 MW injection at Winchester was applied as a best guess of "reality" in the absence of clearly identified and committed power resource and transmission projects. When applied to the cases, this large injection was expected to create an added impact. Treatment of these uncertain proposals is described in greater detail in Section 12. Scenarios.

Coordination among the SWAT study subgroups will increase as more information about potential transmissions projects interconnecting the respective subgroup study boundaries becomes available. Examples include studies to assess the implications of flow-through caused by large transmission projects associated with possible large wind and other generation projects. Information provided through High Plains Express (HPX) and SunZia analyses, when it becomes available, will help to better define subgroup area interconnections. Another example is a proposal by the Southwest Public Power Resource (SPPR) group (described in Section 18) to deliver power from new generating projects to Load Serving Entities (LSEs) in Southern Pinal and Northern Pima Counties. All of these alternatives influence strategic choices and project decisions within the SATS study area.

Finally, concerns that exist today require study of sub-areas within the SATS footprint. These studies of local systems, such as in Cochise County and the Tucson metropolitan areas served by TEP and Trico were conducted with the interaction of all potentially impacted stakeholders in an open, cooperative and interactive mode. Study

assumptions in these cases were tailored to the needs of the specific area(s) under consideration.

Three planning horizon models (ten-year, twenty-year and saturated load level) were created, with assumptions including specified yearly projections of loads and resources. A few cases were also run at the thirty-year load level. Building saturated load power flow cases as the first step provided insights that were not otherwise available, wherein developing saturated models began with a "working hypothesis", running contingency tests, and iterating to reasonable alternative strategies. Using the resulting build-out information helped to identify necessary new substations and associated local interconnecting transmission needed to supply the new substations. In the TEP cases, the local 138kV topology included a few new network paths that were inspired by potential new substations that enhanced transfer capability that was not otherwise identified by building on pre-ten year model base cases. In other words, ultimate build-out as modeled in "Saturation" cases helped to identify projects with a greater likelihood of remaining sustainable beyond the ten and twenty year planning horizons. The specifics of methodology and assumptions follow:

9.1. The long range electrical peak demand needs of the SATS stakeholders were identified and documented. These forecasts were incorporated geographically into the power flow base cases that were initially acquired through SWAT. Individual load serving entities' aggregate peak demand forecasts were used to determine timing associated with load levels at which analysis indicated that system reinforcement would be needed. The sum of the individual aggregate peak forecasts, while not taking diversity into account, also helped to define the amount of new power supply resources needed within the SATS study area. More detail is included in Section 11: Load Forecast.

9.2. The Transmission Planning Process is interactive and iterative. Transmission system adequacy issues are typically identified by conducting power flow studies of the existing transmission network with greater than existing loads modeled. In an ideal world, system issues emerge within the latter part of and beyond the typical capital budget planning horizon. This would allow sufficient time to make informed capital investment decisions, obtain necessary regulatory permits, acquire right-of-way and substation sites, and otherwise facilitate timely and

cost-effective project design, construction and commissioning.

Pre-existing and/or anticipated transmission network limitations were identified through power flow contingency evaluation of network models with known or relatively certain[7] future upgrades represented in the SWAT cases for 2010. In TEP's case, some new capital budget projects were introduced beginning as early as 2010 to address local area thermal load issues. Beyond the capital budget horizon, evaluation of potential system enhancements begins with modeling possible projects as a working hypothesis. In these cases, analysis amounted to identification of system vulnerabilities as the basis to formulate additional logical and realistic reinforcement alternatives.

9.3. Emerging regulatory requirements and regional policies must be taken into consideration. For example, increasing support for renewable resources tends to accelerate changes in the placement and characteristics of new generation and associated transmission. As a result, work performed by the SWAT RTTF identified the potential for relatively large wind and solar projects that were not previously under consideration in Arizona.

In addition, regional studies involving interstate EHV transmission projects to transmit output from large renewable generation projects outside of Arizona are being addressed through the WECC Transmission Expansion Policy Planning Committee (TEPPC). WestConnect is actively involved in coordinating these study efforts between SWAT and adjacent regional groups such as the Colorado Coordinated Planning Group (CCPG) and a recently formed group called the Sierra Sub-regional Planning Group (SSPG) covering northern Nevada and northern California.

The SATS study plan is to continue developing a **transmission plan to serve load in Southeast Arizona**. However, close coordination will be needed to ensure that study assumptions for the SATS study are reasonable and consistent with sub-regional and regional efforts. The SATS Study is a reliability

[7] However, the topology changed significantly from the 2010 SWAT, case due in large part to the Saturated Load Study and related SATS analysis.

study which will feed into the TEPPC regional congestion study process, with TEPPC using their economic models to evaluate renewable resources on the Western Interconnection.

9.4. Ratings used in the Power Flow Cases. For base cases (all lines in service), flows on all facilities are to be less than the normal (or continuous) ratings. For N-1 analysis, post-contingency flows may exceed the continuous rating, but must always be below the emergency rating. Continuous ratings may also be used to screen or identify the first contingency of interest for N-1-1 study work. Those N-1 contingencies exceeding the continuous rating were then "system adjusted" to reduce post contingency flows to be within the continuous rating in preparation for the next contingency. Generally, facility loading should be less than continuous ratings with all lines in service. Loading may exceed continuous, but always be less than emergency under contingency conditions. N-1-1 criteria state that loading should be reduced to continuous following "system adjustment" (typically within 30 minutes) following the first outage (e.g.N-1) in anticipation of the next contingency.

9.5. Analysis based on the 2016 SWAT power flow case began with an assessment of the SATS area model. Alternative projects were considered, as the ten year case included projects that are under consideration but not necessarily committed. Hence the 2016 cases would incorporate a combination of "committed" and "planned" projects. Committed projects are those which may be in current capital budgets or otherwise approved by individual Transmission Providers (TP). Planned projects generally refer to those under consideration beyond the capital budget planning horizon, and which may be competing with other alternatives. The latter projects are included in the catalog of projects.

9.6. A 2018 base case was developed by TEP after substantial progress had been made on the EHV strategies described in Section 19 at the saturation load level. The intention was to prepare an approximate 50% of saturation load case, which correlates to about the year 2018 in the load forecast, to calibrate against the SWAT 2016 base case. This model turned out to be very different from the 2016 SWAT base case. The new case modeled at least eleven more TEP distribution substations with a materially different 138kV configuration resulting.

In January 2008, TEP shifted its focus to work on a 2018 base case based on Strategy C because it minimizes EHV construction within the City of Tucson. Analysis on Strategy C was initially given the highest priority for all load levels to determine the feasibility of this option meeting load serving capability at build-out. Strategy F, a variation of Strategy C was subsequently created as a possibly lower impact and more cost effective alternative. Both strategies are described in this report. These cases also incorporate TEP's revised (January 2008) long term distribution load allocation model to include the new substations that were identified in the Saturated Load Study. For instance, the TEP system has 28 load serving substations as of 2008, and there is a potential need for a total of 71 at build-out as shown in Table 5: TEP Load Serving Substations. The process of arriving at the new ten year base cases entailed creating a revised Saturated Load case, reducing loads to the 2018 forecast, and removing substations and associated transmission lines that were designated to be in service later than 2018. Saturation model and power flow case building are described in Section 10. Saturated Load Study. Generally, the Saturated Load and 2018 case analysis sequence started with N-1 to ensure no overload violations for the preliminary design. The next step was to conduct an N-2 analysis, using these results to decide on options to either mitigate overloads with strategic load shed[8], or other operating measures, assuming low probability independent events cause the overload. Otherwise system reinforcements were assumed to be in place. This SATS study identified potential alternative system additions that SWTC and TEP may consider in their respective ten year planning efforts. Regardless, the preference is to reinforce the system with additional projects in the ten year planning horizon.

9.7. The plan to develop a 2026 case was subsequently revised to 2028, to simulate and test alternative transmission upgrade strategies. Work on the 2028 case was less rigorous than on the ten year horizon analysis. Base cases were prepared emphasizing EHV Strategies C and F. Case building was similar to the method used for 2018, beginning with the Strategy C Saturation case, reducing

[8] Strategic load shed is intended to be operator initiated, or potentially automated load interruption to relieve thermal HV facility overloading caused by certain low probability multiple contingencies wherein there is sufficient time to system adjust by load shedding.

loads and eliminating substations and associated lines as appropriate. Most of this work was completed in early 2008 in accordance with the SATS 2008 Transmission Study Plan. Situation analysis for all cases consisted of iterative analysis of hypothesized transmission projects to arrive at alternative system configurations that satisfy N-1 criteria. Certain multiple contingencies were also evaluated to identify outages that should be evaluated further depending on impact and/or likelihood of the event. Developing models beyond the typical ten year planning horizon requires critical and innovative thinking about how to most realistically represent the system external to SATS. Information derived through strategy, scenario and saturation study base case development served as an important guide for 2028 and Saturation case development.

The following table shows the existing and potential new TEP load serving substations indicated as additions by load level:

TEP Load Serving Substations	
Planning Horizon	**Number Existing[9] & Potential New Substations**
Existing as of 2008	28
2013	11
2018	9
2028	17
2038	6
Total	71

Table 5. TEP Load Serving Substations

Projects needed to get power flow solutions for between double and triple the existing load level are very different from options that were previously under consideration for the ten year planning horizon. Therefore, reasonable saturation strategies offer valuable insights for projects to include in the 2028 and 2018 cases. More detail on strategy development is included in Section 19: Long-Term SATS and Individual Transmission Provider Strategies.

[9] Two new substations were added for a total of 28 in 2008.

10. Saturated Load Study

General land use information obtained from local jurisdictions in the TEP service territory was used to develop geographically distributed peak demand data assuming ultimate build-out. This data was analyzed to identify likely locations for new distribution substations as well as expansion of existing stations. Alternative local area transmission lines were then evaluated to interconnect these new and expanded substations and integrate them into the existing local network. This exercise helped to identify potential future substation locations and transmission corridors needed to serve local loads.

Saturation data are used in the power flow model, first to determine the feasibility and performance of options for interconnecting new substations. The next step was to evaluate the response of the local area network to alternative EHV strategies to ensure adequate load serving capability is available based on meeting NERC standards. Materially different alternative EHV strategies were prepared to respond to long-range future uncertainty. At this point in the study process it became necessary to integrate saturation with scenario and strategy development. The following *example* for the TEP system illustrates the interrelated nature of saturation/scenario/strategy development.

A hypothetical design for a saturation planning horizon 138kV configuration, or 138kV strategy, begins with the list of new and expanded substations identified in the saturated load study. This initial design provides service to all the load serving substations and meets the "all lines in service" and "N-1" criteria considering contingencies on the local network. However, it is necessary to simultaneously design the EHV system to have the capability to transmit over 3,000 MW from remote resources to load centers. This example assumes that certain "mega-projects" would inject 1,500 MW to 3,000 MW into the Tucson metropolitan area with 1,000 MW to 2,000 MW coming from the Phoenix direction, 1,000 MW to 1,500 MW injected at Winchester, and approximately 500 MW to 1,000 MW from hypothetical new generation south and/or southeast of Tucson. Transmission development assuming this "Balanced Resources" scenario (e.g. three scenario generation injections from the northwest, south and southeast of Tucson) would be significantly different from that required to import resources assuming a "NW & SE Resources" scenario, which would exclude generation south of Tucson. In the "NW & SE Resources" scenario, generation otherwise coming from south of Tucson would be allocated between the NW and SE.

The location of the postulated remote resources, and the EHV project(s) needed to deliver them influence the EHV design, while the EHV design in turn impacts the 138kV local system design. The following diagram, Figure 5: Example Scenario Influence Diagram illustrates the relationship among the various scenarios and suggests the dependence of HV system design on EHV design decisions.

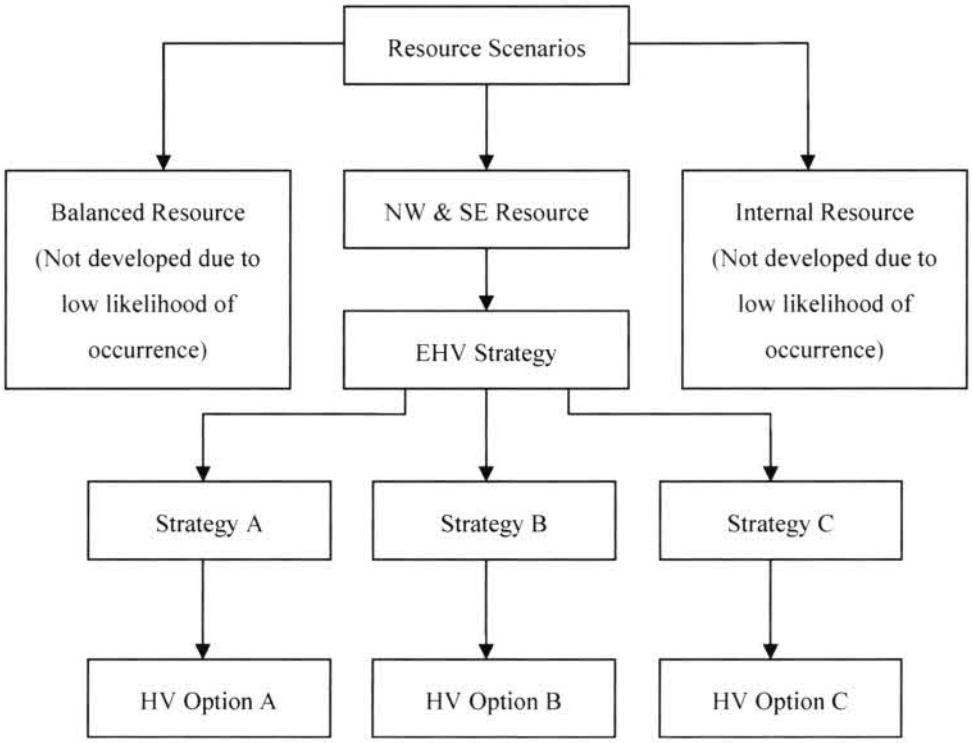

Figure 5. Example Scenario Influence Diagram

Full development of strategies assuming either the "Balanced Resources" or "Internal Resources" scenarios was not pursued at this time due to the relatively low probability that either scenario might occur. "Balanced Resources" was assigned a low probability because generation development south of Tucson was viewed as unlikely by the SATS participants. The "Internal Resources" scenario was deferred because emission restrictions could limit significant new generation development in the Tucson

metropolitan area. Also one of the SATS study objectives was to have a transmission plan based on importing power from remote resources. This plan would then be used as the benchmark to measure deferral or elimination of potential transmission upgrades associated with new local generation. Because of the perceived higher likelihood, a higher priority was placed on analyzing "NW & SE Resources", and sensitivity study of the "Balanced Resources" option was deferred. Refer to Section 12: Scenarios. Further analysis of the "Balanced Resources" scenario may be done if and when definitive plans to develop resources south of or internal to Tucson begin to materialize. However, limited sensitivity analysis was done to determine what impact various generation or "Internal Resources" scenarios may have on possible deferral or elimination of transmission projects.

With respect to the "NW & SE Resources" scenario, three possible decisions about which EHV design to consider are modeled in the decision node labeled "EHV Strategy" shown in Figure 5: Example Scenario Influence Diagram. Each of the EHV decisions, in turn, influence local HV system design (e.g. HV Option" decision node).

11. Load Forecast

Peak demand forecasts for the 10-Year and 20-Year Planning Horizons are required from each of the SATS participants to meet their respective internal strategic planning, regional planning and regulatory requirements. All participants with load serving responsibility provided "base" or "nominal" 20-Year peak demand forecasts including geographic allocation in the power flow databases. WESTERN does not prepare load forecasts because it does not serve retail customers directly, and therefore relies on the forecasts of the Load Serving Entities. Aggregate 20 year forecasts for loads in the SATS area that were provided by APS, CAP, SWTC and TEP are included in Appendix D. Load Forecasts. Note that Unisource Energy loads in Santa Cruz County that are currently supplied from the WESTERN system are planned to be served from the TEP network at the Vail substation by 2012. The peak demand forecast for this area ranges from approximately 90 MW in 2012 to about 125 MW in 2028.

Individual forecasts were summed, or "stacked" one on top of the other with TEP at the bottom, SWTC added on, and so on. The SATS forecast is shown in Figure 6 below. Note that summing the individual forecasts does not take diversity into account.

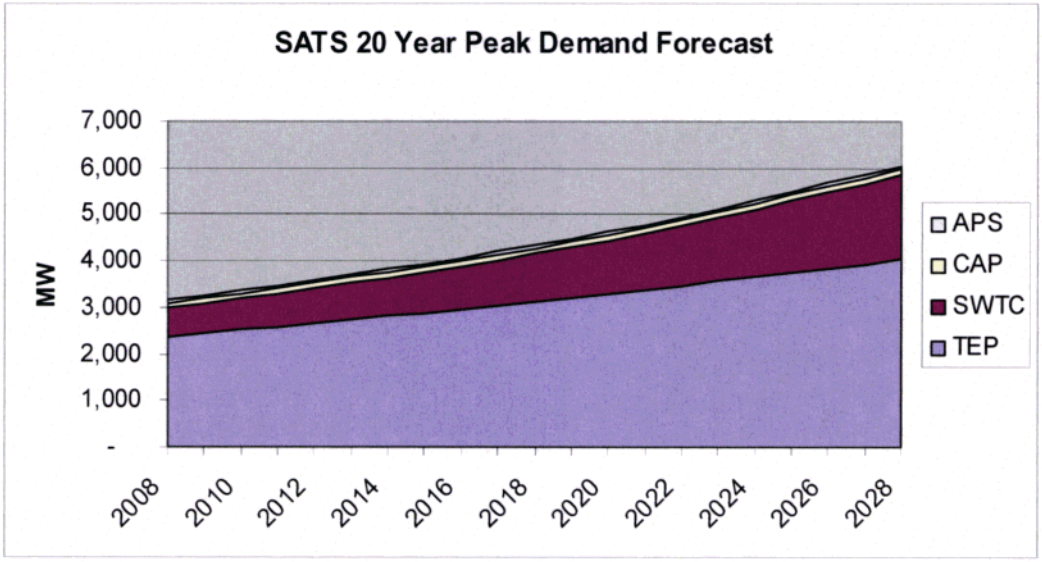

Figure 6. SATS 20 Year Peak Demand Forecast

A general observation is that the load in the SATS area is expected to nearly double in a little over twenty years. This indicates that new resources on the order of 3,000 MW will be needed to serve Southeast Arizona.

11.1. The validity of long-range load forecasts may be assessed by back-casting from saturation load levels and comparing those results against projections based solely on historical trends combined with econometric and other forecasting mechanisms. TEP compared results of the saturated load study against its trended 20-Year forecast. The 2008 TEP peak demand forecast for the Tucson area indicates the load will be approximately 4,000 MW by 2028, or about 170% of current demand. Trending the forecast beyond 2028 suggests that saturation could be achieved somewhere in the vicinity of forty years into the future. Generally the forecast and saturation study are consistent with each other, and both appear to be realistic.

Saturated Load Study correlation to TEP's load forecast is shown graphically in the following chart, Figure 7: TEP Peak Demand Forecast and Saturation Load for the Tucson Area.

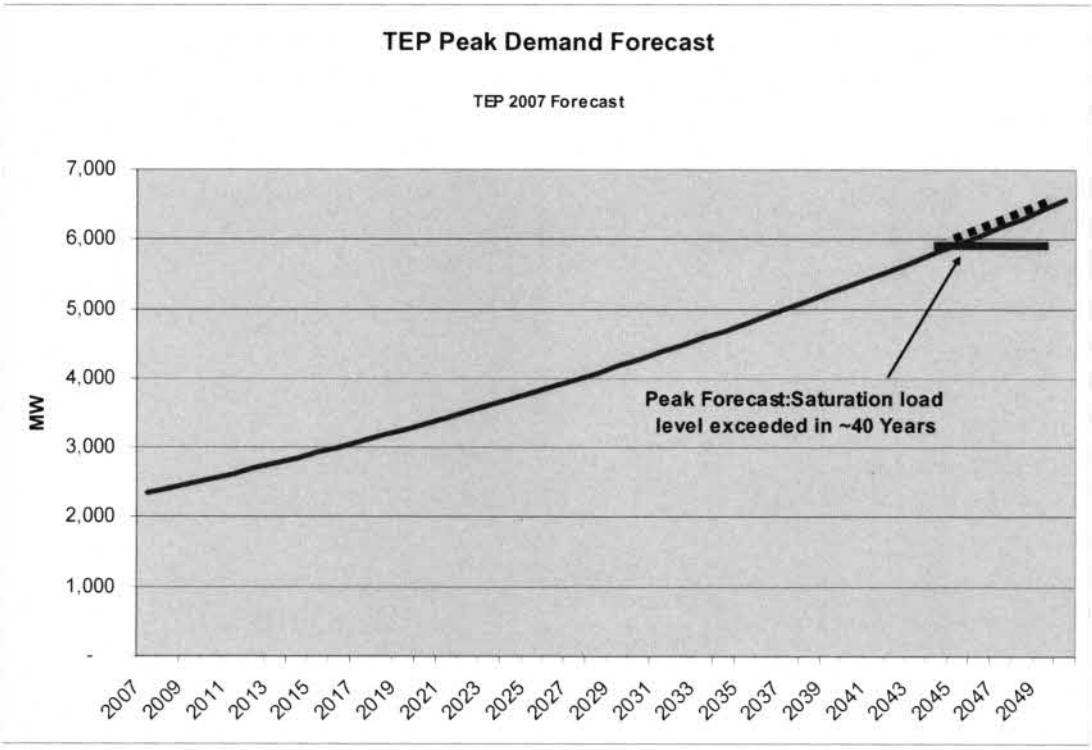

Figure 7. TEP Peak Demand Forecast and Saturation Load for the Tucson Area

There is substantial uncertainty in both the peak demand forecast and saturated loads. Note that Figure 7 shows the TEP peak demand forecast that was completed in 2007. This graphic was not updated to the 2008 forecast because it was very close to the 2007 forecast, and it accurately illustrates the point that saturated load may be achieved in the 40 year time frame. Forecast uncertainty is attributed to the assumption that the economy will continue to expand based on limited information about future events. The saturation study was based on existing jurisdictional land use plans, which the jurisdictions will most likely change as time goes on. Such changes will undoubtedly result in saturation loads being different, but whether they are higher or lower is unknown. Hence the need to conduct sensitivity analysis on load forecast and other assumptions.

A comparison of the TEP System[10] Peak demand forecast for January 2008

[10] Note that the TEP Retail System Peak is defined as the sum of power flows into the TEP Tucson area at the Tortolita, Vail and South Loop EHV points of interconnection plus local area generation. Hence Retail is distinguished from Bus Peak in that 138kV system losses are included in the former.

against a July 2008 revision wherein assumptions such as price elasticity and revised economic indicators shows that load growth may be depressed by a significant margin. These two forecasts provide a range for which projects slated to be in service beyond the five year planning horizon may be deferred. The project schedules in this study are based on the January 2008 forecast. Revisions to project schedules based on this and other subsequent revised forecasts will be provided in SATS and individual Transmission provider study updates.

The October 2008 forecast suggest that projects contemplated for construction by 2013, 2014 or 2015 could be reconsidered for earlier construction in view of slightly higher five-year term growth. However, new generation sited within local area load pockets, or aggressive efficiency improvement, could conceivably become financially feasible if their implementation were to defer a relatively high cost transmission investment. Such investments could make sense particularly if load growth beyond the five year planning horizon is significantly lower than previously forecasted as shown in Figure 8.

Addition of large industrial load such as new or expanded mining operations were not included in the load forecasts. Information indicating that such new load is possible within the five year planning horizon was received after analysis for this study was completed. Nevertheless, individual SATS Transmission Providers have begun to evaluate some of the proposed operations. These studies are a high priority because the magnitude of demand increase is equivalent to a year or more of forecasted load growth. Addition of such large load increments can materially impact project schedules and, depending of the point of interconnection, could dramatically influence the choice of projects.

These observations highlight the need for plan flexibility.

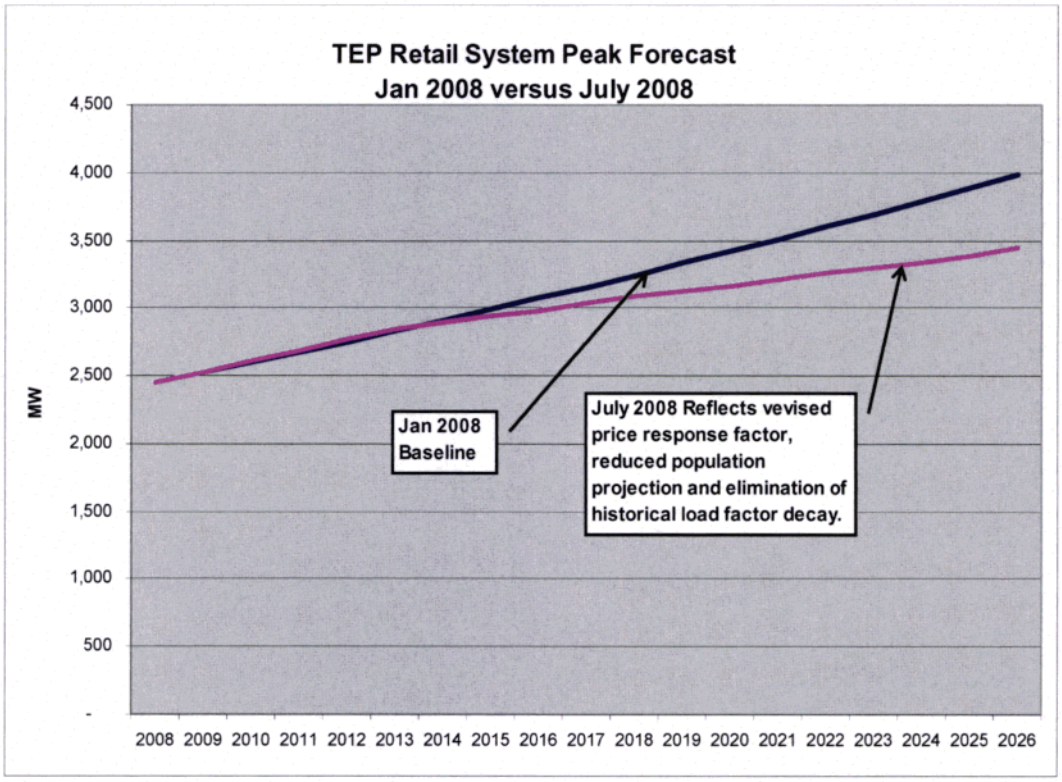

Figure 8. TEP Retail System Peak Demand Forecast Scenarios

Saturated loads were not available for all areas served by SWTC. Only Trico provided a saturated load projection for Marana and the other Trico areas surrounding TEP's service territory. In general, saturation load studies are not done for the SWTC cooperative utilities, as the Members are only required by the Rural Utilities Service (RUS) to do 20 year load forecasts. This requirement is not likely to change anytime soon.

SWTC used a 2025 load forecast for those members that did not provide a saturated load forecast. An econometric model methodology was used to develop the loads within the SWTC member service area. The methodology allowed for medium, low and high peak demand forecasts as shown in Figure 9. SWTC Peak Demand Forecast for the SATS Area. These three forecasted peak demands basically reflect three potential economic states. The SWTC transmission facility requirements were based on the medium economic load projections in this study. The issue of addressing transmission facility additions around a bandwidth of peak demands in a period was not directly taken up at this

time. However some load forecast sensitivities can be inferred from the study to-date since the study worked out a twenty year transmission plan of strategies for the medium load forecast which as seen in Figure 9, contains all but a few high economic peak demands.

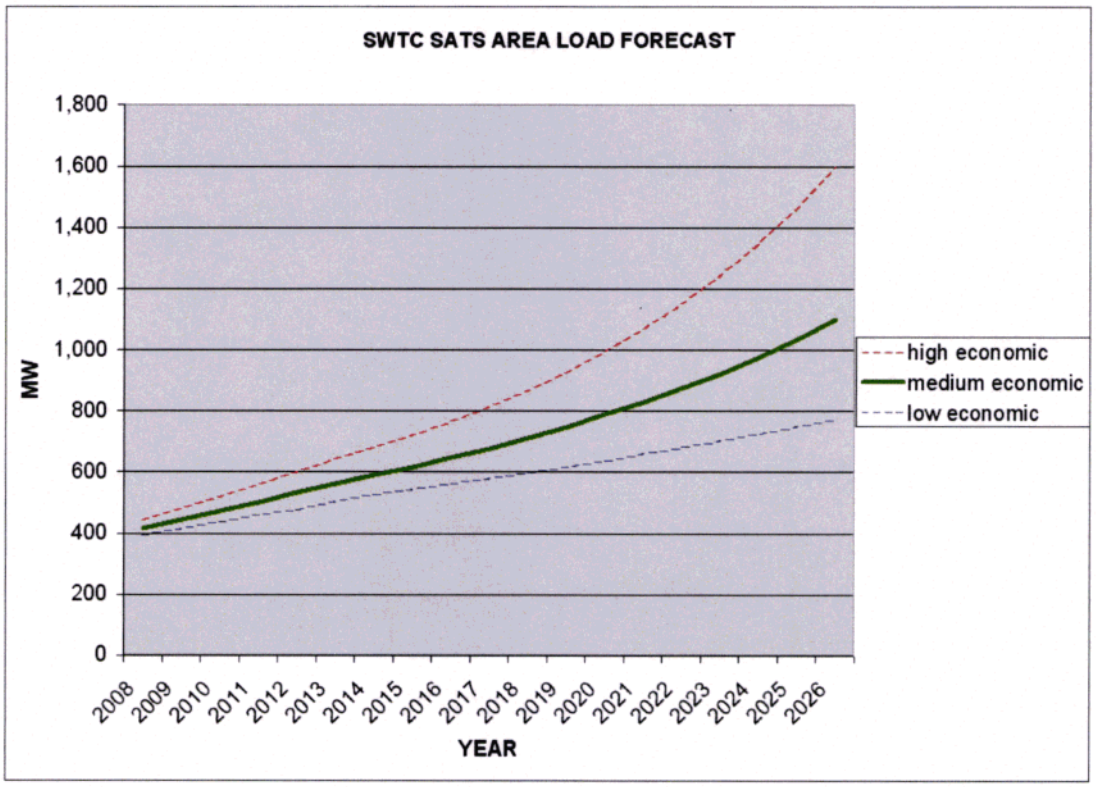

Figure 9. SWTC Peak Demand Forecast for the SATS Area

12. Scenarios

There is general recognition of the need to construct new EHV infrastructure to transmit additional power from new resources into Arizona. Whichever EHV project, or combination of projects is selected, there will be differing impacts on the local area systems in Southeast Arizona. For this reason multiple strategies were developed and modeled. At this time, which of the possible Mega-Projects (TransWest Express, HPX, SunZia, etc.) will be built is unknown. Hence they are treated as study uncertainties. These projects, represented as scenarios in the SATS study are shown below in Figure 10: Potential Mega-Projects Considered for SATS Scenario Import/Injection Locations.

Figure 10. Potential Mega-Projects Considered for SATS Scenario Import/Injection Locations

Scenario Description: Scenarios may be described as reasonably likely future states of the world (where "world" is the Western Interconnection in this case) that influence decisions about which projects or strategies should be pursued. Scenarios are typically characterized by critical uncertainties. The SATS group considers the following list of key uncertainties:

- Generation projects and associated transmission upgrades;
- Merchant or other major EHV transmission projects;
- Load forecast – considering High, Nominal and Low;
- Transmission Line/Substation ROW access;
- Environmental Impact;

- Aesthetic Impact;
- Climate change legislation.

Distinction Between "Scenario" and "Strategy": A sample scenario is presented next to help make the scenario concept clear and to distinguish "scenarios" from "strategies". As an example, assume there is a booming economy with high population growth in Arizona. This suggests a need for additional generation and transmission line projects. One may assume that such development occurs north of Arizona (versus from southern New Mexico) – such as the TransWest Express Project with a 3,000 MW DC terminal in the Las Vegas or Phoenix area. This sample scenario implies a strategy that expedites transmission projects that would supply Southeast Arizona from the Phoenix area. Thus a "scenario" that results in Phoenix becoming a stronger source results in a "strategy" to build transmission from Phoenix to Tucson. This is materially different from a strategy for a scenario that assumed southern New Mexico to be the stronger source.

The SATS group agreed to develop a manageable number of materially different scenarios, perhaps a total of three to aid in thinking about project creation and decisions. Scenarios representing major projects that may or may not be constructed are necessary to simulate projects that introduce new resources either directly into the SATS area or otherwise resources may be imported through potential EHV interconnection(s). Concepts for scenarios that influence strategic thinking are summarized below:

- Manageable Number of Significantly Different Scenarios
  - NW & SE Resources (None from S)
  - Internal Resources
  - Balanced Resources (NW, SE and S)
- Alternative Strategies
  - EHV Ring & EHV Through Urban Areas
  - EHV Ring & EHV Radials into Urban Areas
  - EHV Ring & Heavy HV into Urban Areas
  - Internal SATS Generation

The scenarios are represented as equivalent generators located at the nodes where these projects are likely to interconnect, or where flows from the projects are likely to

enter the SATS network. The potential Mega-Projects (refer to Figure 10) are in various stages of evaluation or possibly advancing toward commitments to develop. The locations where the various project scenarios are modeled are illustrated in Figure 11. SATS Scenario Import/Injection Locations.

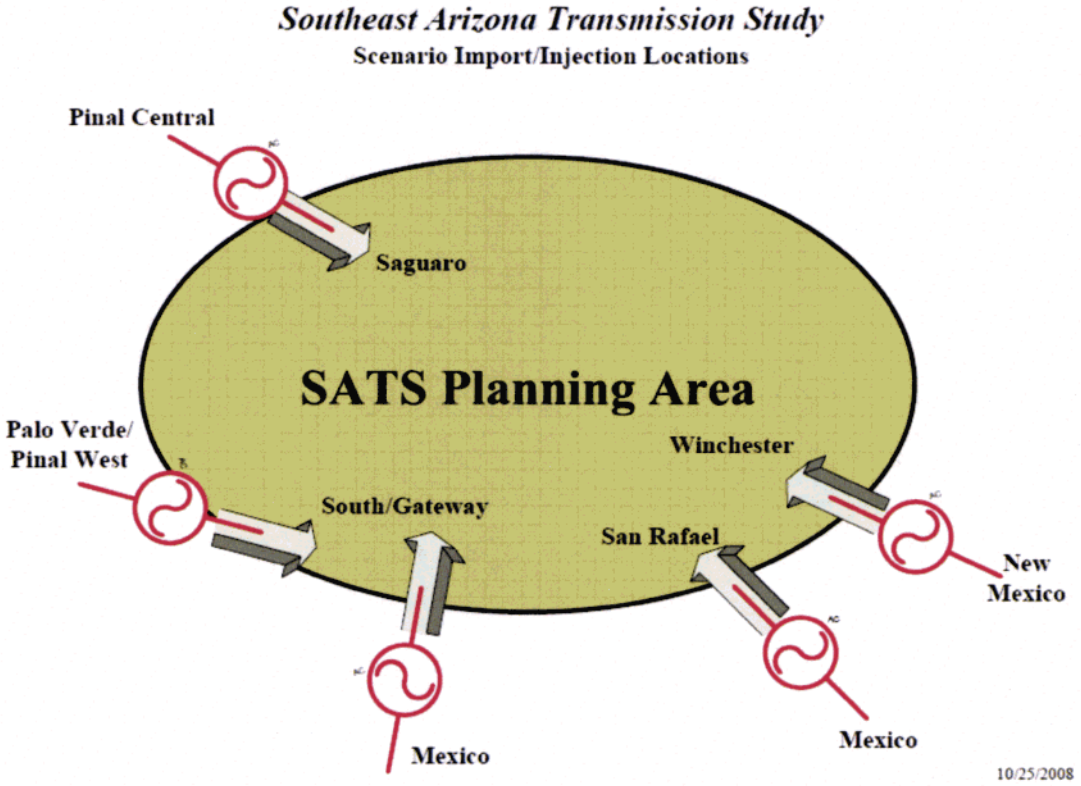

Figure 11. SATS Scenario Import/Injection Locations

The generator locations and magnitude of power output used to model the scenarios, as approved by the SWAT Steering Committee follow:

- Palo Verde (Hassaympa) — Up to 1,000 MW
- Pinal West — Up to 500+ MW
- Pinal Central — Up to 500+ MW
- Winchester — Up to 1,500+ MW
- Gateway/Aqua Prieta — 500 MW to 1,000 MW

All scenario generators were modeled in the "NW-SE Resources" scenario except Gateway/Aqua Prieta. All injection in this case was therefore assumed to be from

Phoenix and southeastern Arizona. Sensitivity analysis to determine the impact of mega-projects south of Tucson will be accomplished as necessary following this study by turning on Gateway and/or Aqua Prieta and reducing the NW and SE scenario generation.

13. Existing Generation and Maximum Unit Commitment

TEP operates a total of eleven generating units located within its Tucson service area. Four are steam cycles of which one is fueled primarily by coal and the remaining three fueled by natural gas. In addition there are seven combustion turbines fueled by natural gas with oil back up. These units and maximum output are summarized in Table 6. Existing TEP Local Generation.

Existing TEP Tucson Area Generation	
Generator	**Maximum Net Output (MW)**
Sundt Steam 1	77.5
Sundt Steam 2	77.5
Sundt Steam 3	105
Sundt Steam 4	125
Sundt/Irvington CT #1	22
Sundt/Irvington CT #2	22
N. Loop CT #1	22
N. Loop CT #2	22
N. Loop CT #3	22
N. Loop CT #4	17
DMP CT	73
Total	585

Table 6. Existing TEP Local Generation

The four steam units are designated as base load and the DMP CT is base loadable.

The study assumed that the existing four Sundt Steam units and the DMP[11] combustion turbine would be available and operating on peak. Generation from these five units is defined as Maximum Unit Commitment (MUC). Load Serving Capability (LSC) is

[11] DMP was assumed to be operated at reduced output to meet spinning reserve sharing requirements.

defined as the TEP load that could be served by the combination of local generation and transmission with MUC generation operating. Generation that is generally defined as MUC is shown in Table 7.

TEP Maximum Unit Commitment	
Generator	**Assumed Output (MW)**
Sundt Steam 1	77.5
Sundt Steam 2	77.5
Sundt Steam 3	105
Sundt Steam 4	120
DMP CT	44[2]
Total	424

Table 7. Maximum Unit Commitment (MUC) Generation

SWTC does not own or operate generating units. Table 8 shows the generating units that are connected to the SWTC transmission system at the Apache Generating Station. SWTC is required to deliver the output of these units to the participating AEPCO members.

Existing AEPCO[12] Apache Station Generation	
Generator	**Maximum Net Output (MW)**
Apache Steam 1	72
Apache Steam 2	175
Apache Steam 3	175
Apache GT 1	10
Apache GT 2	20
Apache GT 3	65
Apache GT 4	38
Total	555

Table 8. Existing AEPCO Apache Station Generation

[12] AEPCO is Arizona Electric Power Cooperative. SWTC provides transmission service and transmission planning for AEPCO. SWTC reports AEPCO generating unit data to WECC for system planning.

14. Existing Transmission

The SATS EHV, 230kV, 138kV and 115kV transmission system is shown below in Figure 12. SATS EHV and Local Area Transmission. This network includes 500kV and 345kV EHV plus 230kV transmission, with local area consisting of 138kV and 115kV transmission. This system is described and tabulated in detail in this section.

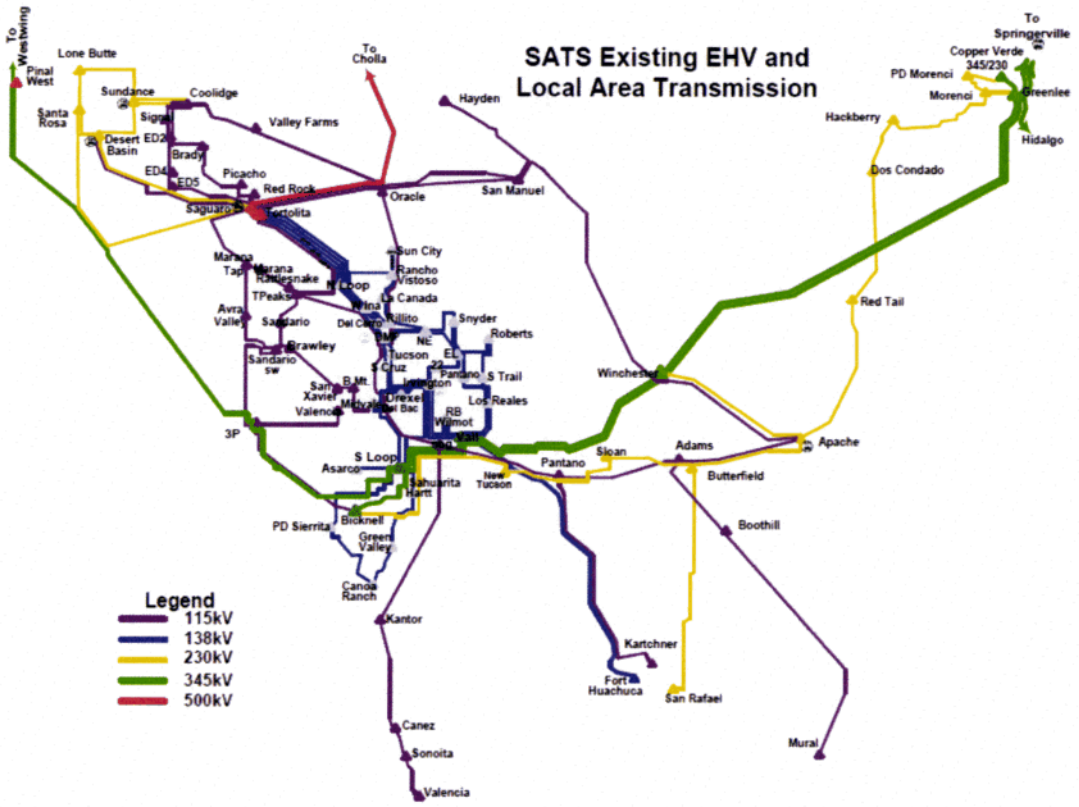

Figure 12. SATS EHV and Local Area Transmission

TEP's existing EHV transmission network, including jointly owned, consists of about 512 miles of 500kV and 1,098 miles of 345kV transmission of which approximately 2 miles and 239 miles of 500kV and 345kV respectively are wholly owned by TEP. The balance of 510 miles of 500kV and 859 miles of 345kV are jointly owned.

A breakdown of these assets is shown in Tables 9 and 10. Table 9 lists the 500kV assets while Table 10 shows the 345kV facilities.

Existing TEP 500kV Transmission Lines[13]		
Description	**Length (Miles)**	**Note**
Saguaro – Tortolita 500kV 1	1.02	TEP Owned
Saguaro – Tortolita 500kV 2	1.02	TEP Owned
Navajo – Moenkopi 500kV	76	Jointly Owned
Moenkopi - Westwing 500kV	179	Jointly Owned
Navajo – Westwing 500kV	255	Jointly Owned
Sub Total	510	Jointly Owned
Sub Total	2	TEP Owned
Total	512	TEP and Joint

Table 9. Existing TEP 500kV Transmission Lines

[13] Source: FERC Form 1 Mileage Report Year Ended December 31, 2007

Existing TEP 345kV Transmission Lines[14]		
Description	**Length (Miles)**	**Note**
San Juan - 4-Corners 345kV	10.5	Jointly Owned[15]
San Juan – McKinley 345kV	90.5	Jointly Owned - Circuit 1
San Juan – McKinley 345kV	90.5	Jointly Owned - Circuit 2
McKinley – Springerville 345kV	107.4	Jointly Owned - Circuit 1
McKinley – Springerville 345kV	107.4	Jointly Owned - Circuit 2
Springerville – Coronado 345kV	21.8	Jointly Owned
Springerville – Vail 345kV	239.1	Express Line – TEP Owned
Springerville – Greenlee 345kV	110.3	Jointly Owned
Greenlee – Winchester 345kV	88.2	Jointly Owned
Winchester – Vail 345kV	40.4	Jointly Owned
Westwing – South 345kV[16]	178.5	Jointly Owned
South – Vail 345kV	13.7	Jointly Owned
Sub Total	859	Jointly Owned
Sub Total	239	TEP Owned
Total	1098	TEP and Joint

Table 10. Existing TEP 345kV Transmission Lines

The particulars on the existing SWTC EHV and 230kV transmission lines are shown in Table 11.

[14] Source: FERC Form 1 Mileage Report Year Ended December 31, 2007
[15] TEP also has rights on the San Juan – Shiprock – Four Corners lines along with the Four Corners – San Juan line making up the 345kV triangle.
[16] The Pinal West project consisting of a Hassaympa to Pinal West 500kV line plus a new 500/345kV interconnection to the Westwing to South Loop 345kV is to be completed in 2008.

Existing SWTC EHV & 230kV Transmission Lines		
Description	**Length (Miles)**	**Note**
Westwing – South 345kV[11]	178.5	Jointly Owned
South – Vail 345kV	13.7	Jointly Owned
Bicknell – Vail 345kV	23.6	SWTC Owned
Greenlee – Greenlee 345kV	0.44	SWTC Owned
Greenlee – Morenci 230kV	6.4	SWTC Owned
Morenci – PD Morenci 230kV	6.8	SWTC Owned
Morenci – Hackberry 230kV	27.2	SWTC Owned
Hackberry – Dos Condado 230kV	7.5	SWTC Owned
Dos Condado – Red Tail 230kV	33.0	SWTC Owned
Red Tail – Apache 230kV	23.9	SWTC Owned
Apache – Winchester 230kV	20.9	SWTC Owned
Apache – Butterfield 230kV	16.0	SWTC Owned
Butterfield – Pantano 230kV	31.0	SWTC Owned
Pantano – Sahuarita 230kV	25.7	SWTC Owned
Sahuarita – Bicknell 230kV	12.0	SWTC Owned
Butterfield – San Rafael 230kV	37.0	SWTC Owned
Davis Dam – Riviera 230kV	8.9	SWTC Owned
Schrader - Corbell 230kV	7.8	Jointly Owned
Schrader – Santan 230kV	13.6	Jointly Owned
Sub Total	213.6[17]	Jointly Owned
Sub Total	280.3	SWTC Owned
Total	493.9[18]	SWTC and Joint

Table 11. Existing SWTC EHV & 230kV Transmission Lines

The integrated APS, SWTC and WESTERN 115kV transmission facilities interconnect with the adjoining SWTC 230kV system. A significant portion of the 115kV system is networked with and is parallel to the 230kV lines. However, there are also a number of radial lines serving loads in the SATS area.

[17] Of the total 213.6 miles SWTC portion is 46.7 miles. SWTC owned 24% of Westwing – South – Vail 345kV, 2.763% of Schrader – Corbell 230kV and Schrader – Santan 230kV lines.
[18] See footnote 3 for SWTC ownership explanation.

Existing CAP 115kV Transmission Lines		
Description	**Length (Miles)**	**Note**
Red Rock – Saguaro East	1.29	CAP – USBR
Picacho – Red Rock	17.59	CAP – USBR
Brady - Picacho	4.51	CAP – USBR
ED-2 - Brady	12.27	CAP – USBR
Rattlesnake – Black Mountain	23.9	CAP – USBR
Black Mountain – Del Bac	7.2	0.7 Miles to be completed
Total	66.67	CAP – USBR

Table 12. Existing CAP 115kV Transmission Lines

Existing WESTERN 115kV Transmission Lines		
Description	**Length (Miles)**	**Note**
Lone Butte – Test Track	20.5	Parker Davis - WESTERN
Test Track – Casa Grande	15.1	Parker Davis - WESTERN
Empire – Casa Grande	43.4	Parker Davis - WESTERN
ED-5 - Empire	9.2	Parker Davis - WESTERN
ED-4 – ED-5	9.2	Parker Davis - WESTERN
ED-2 – ED-4	9.3	Parker Davis - WESTERN
ED-2 - Signal	4.3	Parker Davis - WESTERN
Coolidge - Signal	7.9	Parker Davis - WESTERN
Saguaro West – ED-5	17.1	Parker Davis - WESTERN
Coolidge – ED-2	11.5	Parker Davis - WESTERN
Saguaro East - Oracle	19	Parker Davis - WESTERN
Valley Farms - Oracle	39.5	Parker Davis - WESTERN
Coolidge – Valley Farms	5.2	Parker Davis - WESTERN
Tucson - Oracle	25.37	Parker Davis - WESTERN
Saguaro East – Marana Tap	11.63	Parker Davis - WESTERN
Marana Tap - Rattlesnake	7.62	Parker Davis - WESTERN
Rattlesnake - Tucson	16	Parker Davis - WESTERN
Tucson – Del Bac	10	Parker Davis - WESTERN
Del Bac - Nogales	10.4	Parker Davis - WESTERN
Nogales - Adams	42.2	Parker Davis - WESTERN
Adams - Apache	17	Parker Davis - WESTERN
Sub Total	351.42	Parker Davis - WESTERN
Sub Total	35.66	CAP – USBR
Total	387.08	WESTERN and USBR

Table 13. Existing WESTERN 115kV Transmission Lines

TEP's local area network consists of 138kV facilities that supply the Tucson metropolitan region from 500kV and 345kV points of interconnection at the Tortolita, Vail and South Loop substations. Specific TEP 138kV line data are detailed in Table 14. Existing TEP 138kV Transmission Lines as shown in the FERC Form 1 Mileage Report dated December 31, 2007.

Existing TEP 138kV Transmission Lines		
Description	**Length (Miles)**	**Note**
Tortolita – North Loop Line 117	14.3	954 MCM ACSS
Tortolita – North Loop Line 118	14.3	954 MCM ACSS
Tortolita – North Loop Line 125	14.3	1365 MCM ACAR
North Loop – Rancho Vistoso Line 122	8.0	954 MCM ACSR
North Loop – West Ina	5.8	795 MCM ACSR
North Loop - Rillito	10.1	795 MCM ACSR
Rillito - Northeast	6.2	795 MCM ACSR
Northeast – East Loop	6.9	795 MCM ACSR
East Loop – Roberts Segment 1	2.5	795 MCM ACSR
East Loop – Roberts Segment 2	4.7	795 MCM ACSR
East Loop - Pantano	3.5	795 MCM ACSR
Pantano – Los Reales	8.7	795 MCM ACSR
Los Reales - Vail	4.6	1365 MCM ACAR
Spanish Trail - Vail	12.9	1365 MCM ACAR
Vail – Fort Huachuca Segment 1	8.1	795 MCM ACSR
Vail – Fort Huachuca Segment 1	43.9	477 MCM ACSR
Irvington – Robert Bills	7.5	795 MCM ACSR
Robert Bills - Vail	3.5	795 MCM ACSR
Irvington - Vail	11.1	795 MCM ACSR
Midvale – South Loop	12.4	795 MCM ACSR
Irvington – South Loop	16.1	795 MCM ACSR
Drexel - Irvington	2.5	795 MCM ACSR
South Loop – AS&R Mission	5.6	795 MCM ACSR
South Loop – Duval, Cyprus	15.1	795 MCM ACSR
Tucson Station - Irvington	10.9	795 MCM ACSR
Santa Cruz - DMP	3.9	795 MCM ACSR
North Loop – DMP	14.9	795 MCM ACSR
Saguaro – Tortolita 1	1.2	795 MCM ACSR
Saguaro – Tortolita 2	1.2	795 MCM ACSR

Existing TEP 138kV Transmission Lines		
Description	**Length (Miles)**	**Note**
West Ina – Tucson Station	10.6	795 MCM ACSR
DMP - Northeast	5.7	1365 MCM ACAR
Roberts – Spanish Trail Segment 1	3.2	795 MCM ACSR
Roberts – Spanish Trail Segment 2	2.5	795 MCM ACSR
Rillito – La Canada	5.4	954 MCM ACSR
Irvington – Santa Cruz	9.8	795 MCM ACSR
East Loop – Snyder Segment 1	3.4	954 MCM ACSR
East Loop – Snyder Segment 2	.8	477 MCM ACSR
East Loop – Snyder Segment 3	1.1	795 SSAC
Midvale - Drexel	6.4	954 MCM ACSR
Green Valley – Cyprus Raw Water	4.3	954 MCM ACSR
Irvington – 22nd Street	3.4	954 MCM ACSR
South Loop – Green Valley	14.7	954 MCM ACSR
La Canada – Rancho Vistoso	5.2	954 MCM ACSR
Northeast – Snyder Segment 1	2.5	477 MCM ACSS
Northeast – Snyder Segment 2	.3	795 MCM ACSR
Northeast – Snyder Segment 3	2.0	477 MCM ACSS
Northeast – Snyder Segment 4	2.0	477 MCM ACSR
Northeast – Snyder Segment 5	1.3	795 MCM ACSR
East Loop – 22nd Street	4.6	477 MCM ACSS
Total	362.5	

Table 14. Existing TEP 138kV Transmission Lines

Figures 13 and 14 show the current transmission configuration for the northern and southern portions respectively of TEP's existing 138kV system serving the Tucson area.

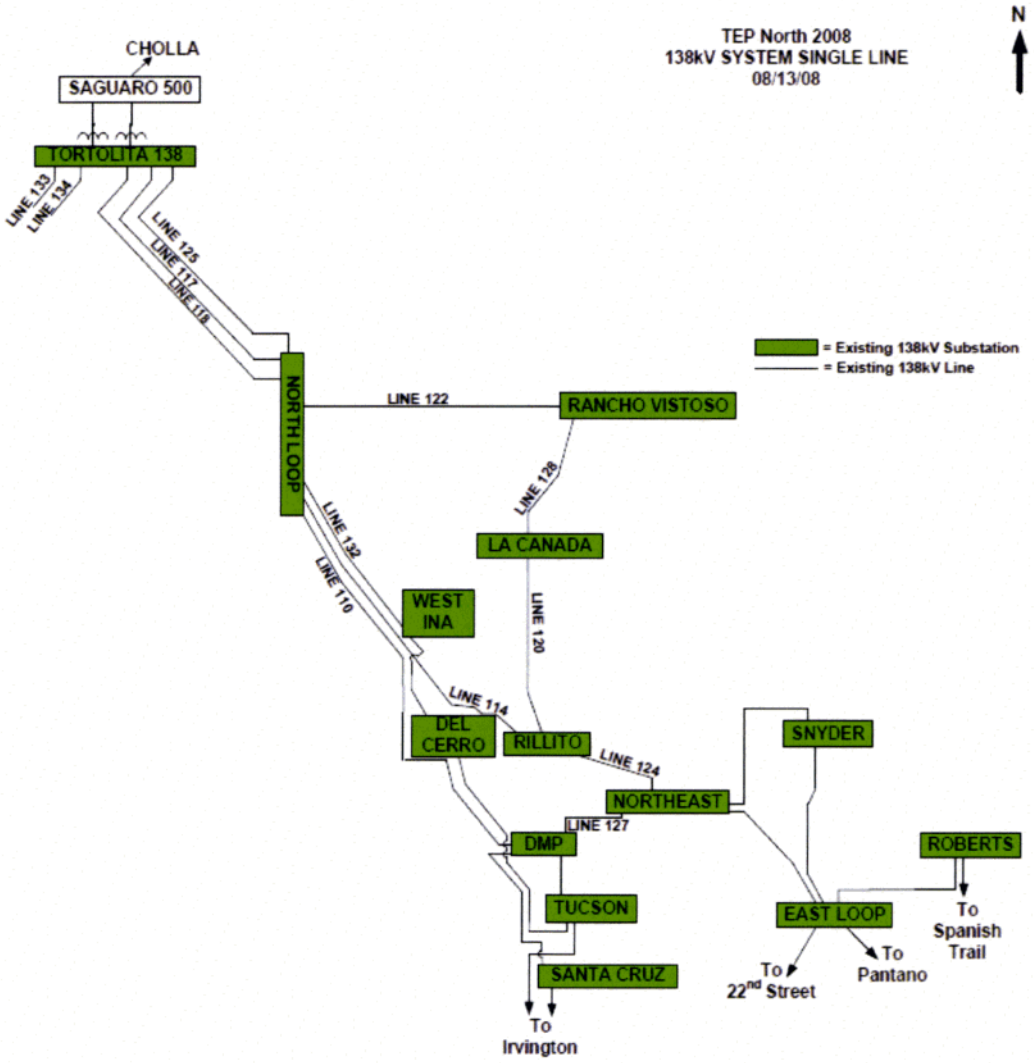

Figure 13. Northern TEP 138kV System as of 2008

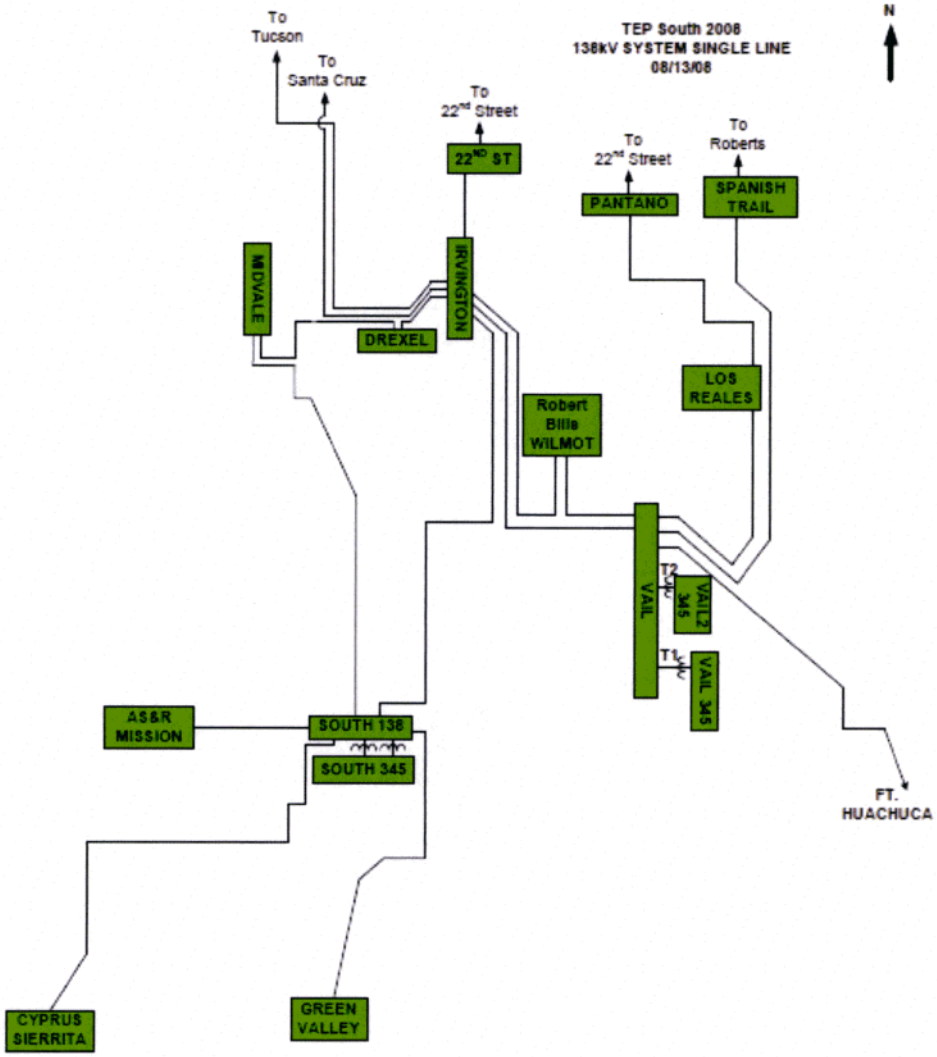

Figure 14. Southern TEP 138kV System as of 2008

15. Characteristics of SATS Transmission System

The SATS participants recognized that transmission loading issues, based on applicable load forecasts, will require relatively extensive upgrades in or about the five year planning horizon. There are a number of solution approaches and timing alternatives among which to choose. Therefore SATS formed a transmission planning subgroup to focus on understanding the issues and to begin formulating a means to identify optimal solutions and to help coordinate potential project decision making. The subgroup is generally looking at three areas, with the objective of integrating solutions among the three areas. The areas and their respective characteristics and potential

solutions are shown in Figure 15 and described in the narrative that follows:

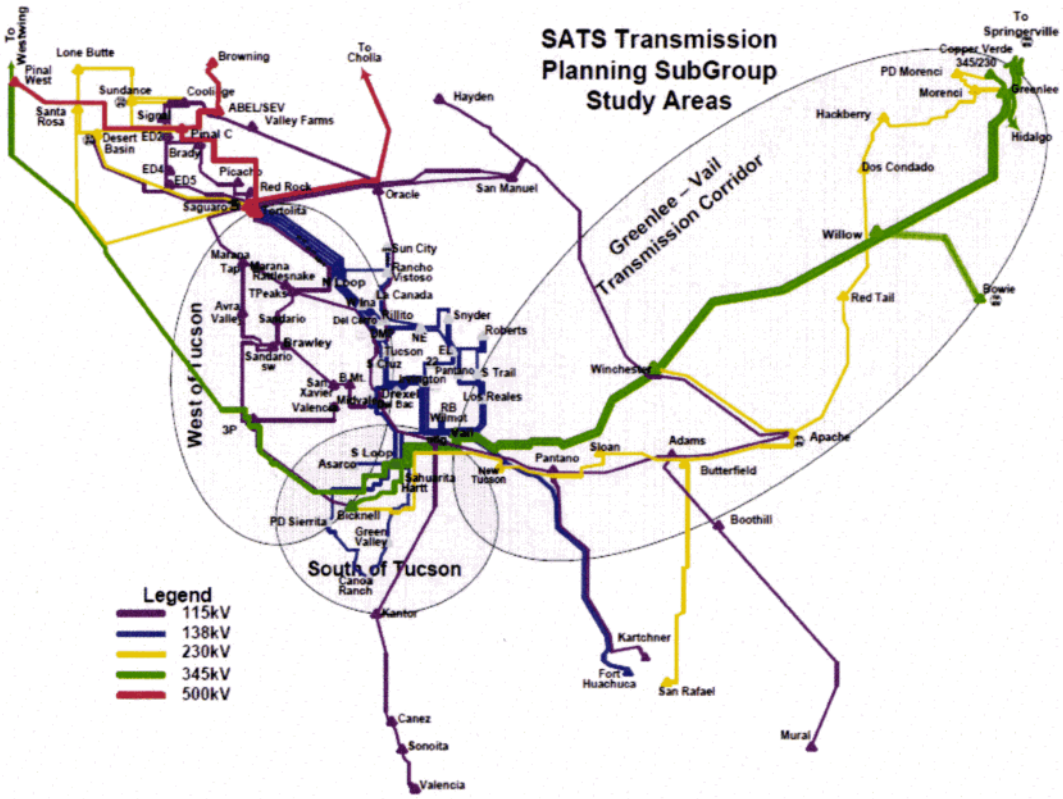

Figure 15. SATS Transmission Planning SubGroup Study Areas

15.1. Greenlee to Vail EHV and 230kV Corridor Area

Characteristics: This area includes two 345kV lines in parallel with an interconnected 230kV system. Key features are:

15.1.1. Loads are increasing stress on the parallel 345kV and 230kV transmission lines. Critical contingencies include the loss of various combinations of 345kV lines between Springerville and Vail.

15.1.2. WESTERN owns a significant portion of the 115kV system paralleling the SWTC 230kV lines from Apache into Tucson. Limitations associated with this 115kV system are not clearly understood at this time.

15.1.3. A new 500 MW generator is proposed to be interconnected at a new Willow 345kV switching station to be located on the Greenlee - Winchester 345kV line at the point where the Dos Condado - Red Tail

230kV line crosses. This power plant may become an important resource to supply growing area loads, but will require certain EHV, and possibly other local system reinforcements. Critical contingencies involve loss of the Express Line and any portion with either the Winchester - Vail 345kV, Willow - Winchester 345kV, Greenlee – Willow 345kV lines. Another critical outage combination is the Greenlee – Willow and Winchester – Vail 345kV lines. The SATS group will focus on solving these concerns in the 2009 SATS Study plan.

15.1.4. The Apache to Winchester portion of the115kV line from Apache to Hayden is constructed at 230kV. Conversion to 230kV operation may be accomplished by adding 230/115kV transformation at Winchester to supply SWTC load to Hayden, and possibly addition of a second 345/230kV transformer at Winchester.

15.1.5. The Copper Verde 345/230kV transformer overloads and is sensitive to outage of 345kV line segments north and south of Greenlee. Freeport McMoRan (FMI) plans to add a second parallel transformer in 2009.

15.1.6. FMI plans to increase Morenci area load. The Hackberry load is expected to be 100 MW by 2011. The PD Morenci load has been reported to increase from approximately 200 MW to 260-280 MW by 2008, and to 440-480 MW in the 2009/2010 time frame.

15.1.7. Apache generation station may be considered for generation expansion.

15.1.8. SunZia Project has announced plans to be in service by 2013. This project should be evaluated. Interconnection at Winchester, were it to occur, would require EHV reinforcement.

Potential Solutions: Alternatives to mitigate overloads caused by critical contingencies include the following:

15.1.9. New 345kV Winchester – Vail double circuit line

15.1.10. New 345kV Willow – Winchester double circuit

15.1.11. Winchester – Tortolita 500kV line

15.1.12. Uprate 230kV Apache – Bicknell line

15.1.13. Convert Apache – Winchester 115kV to 230kV (Includes 230/115kV transformation at Winchester)

15.1.14. Add 2nd 345/230kV transformer at Winchester

15.1.15. Add 345/230kV interconnection at Willow station (Possible mitigation for increasing PD Morenci load)

15.1.16. Add new 230kV San Rafael – Kartchner (or Ft Huachuca) line and rebuild to Pantano (or a new 230kV interconnection farther west, such as Bicknell).

15.1.17. Rebuild the WESTERN 115kV line to 230kV from Apache to a location somewhere in the vicinity of the Nogales Tap. A site is to be identified to terminate the proposed new 230kV line with transformation as appropriate to 115kV to maintain continuity of the Parker-Davis system. Options to integrate the new 230kV line with the SWTC, TEP, Trico and WESTERN systems include interconnection with existing 230kV and/or transformation to 345kV and 138kV facilities.

15.1.18. Measures being studied to mitigate overloads on the Apache to Bicknell 230kV line include:

15.1.18.1. Reconductoring portions of the 230kV line from Apache to Butterfield in combination with a loop-in at Pantano of the WESTERN 115kV line. The latter places the 115kV line in parallel with the Butterfield to Pantano line.

15.1.18.2. Install a Phase Shifting Transformer (PST) near Bicknell, Butterfield or other location on the 230kV line to regulate post-contingency flows on the Apache to Bicknell 230kV line.

15.1.18.3. Install a PAR on the Pinal West – South Loop 345kV line on the west side of the South Loop substation to regulate post-contingency flows on the Apache to Bicknell 230kV line.

15.1.18.4. Tripping the Bicknell transformer

15.1.18.5. Reducing or tripping Bowie generation

15.1.18.6. Looping-in the Springerville – Vail Express line in at Willow or Winchester for emergency operation only.

15.1.18.7. Other options.

15.2. South of Tucson Area

Characteristics: Service to this area is relatively evenly divided between TEP and Trico. Therefore opportunities for cost-effective joint load serving substation expansion within this area appear to be greatest. This area includes two parallel

345kV lines, with a 230kV line parallel to the 345kV lines. Key features are:

15.2.1. The Vail – Bicknell 345kV SWTC line passes close by the South Loop substation. A critical contingency is loss of the Vail – South Loop 345kV line, potentially causing overloads on the parallel 138kV system.

15.2.2. A 230kV line from Pantano, which parallels a significant portion of the WESTERN 115kV line to Del Bac, terminates at the Bicknell station. Possible loop-in at South at either 230kV or 345kV could provide mutual benefits.

15.2.3. There are two transformations at Bicknell, 345/230kV and two 230/115kV. The 115kV terminal supplies the SWTC line to proposed CS1 located near Three Points.

Potential Solutions: A new 345kV or 230kV transmission interconnection to the local area 138kV or 115kV transmission could be cost effect alternatives to expanding local area transmission to serve increasing local load. This proposal may be a jointly owned project. Looping-in 345kV or 230kV could defer or eliminate the need for additional new 345kV or 230kV transmission. Alternatives follow:

15.2.4. Loop-in the Vail – Bicknell 345kV line at South Loop. This relieves post-contingency loading on the 138kV system. Need to conduct detailed analysis and determine land availability and permitting requirements.

15.2.5. Loop Pantano – Sahuarita 230kV line into South Loop. Possible multiple benefits include loading relief on the Apache – Butterfield 230kV line, stronger source for Bicknell and/or new joint distribution substation east of Bicknell. Need to conduct detailed analysis and determine land availability and permitting requirements.

15.2.6. New Three Points – Bicknell 345kV or 230kV line. Possible benefits may be available through increased transfer capability between South of Tucson Area and West of Tucson Area during contingencies.

15.2.7. New joint load serving substation on the Vail – Bicknell 345kV line or the Sahuarita – Bicknell 230kV line.

15.2.8. Other options.

15.3. West of Tucson Area

Characteristics: The area west of Tucson is served by Trico and TEP. The TEP territory consists of a relatively narrow strip west of I-10 extending from Marana to the San Xavier District of the Tohono O'Odham Nation. The Trico territory is generally west and south west of the TEP service area. Transmission located west of Tucson is provided by CAP, WESTERN, SWTC and TEP. Key features are:

15.3.1. The WESTERN 115kV line, which is sourced from the APS Saguaro station, begins in a southwesterly direction and continues southeasterly through the WESTERN Tucson station to Del Bac and beyond into the South of Tucson Area. Continuity of the WESTERN 115kV system is necessary to meet contractual obligations to customers receiving transmission services from WESTERN.

15.3.2. Another WESTERN 115kV line connects Saguaro to Oracle and continues south to the Tucson station. This line is the third side of a 115kV triangle with vertices at the Saguaro, Oracle and Tucson stations.

15.3.3. The CAP system presently is a radial 115kV line supplied by the WESTERN system through an interconnection at Rattlesnake. CAP also has rights to the 115kV transmission facilities connected to the WESTERN system at Del Bac. Radial service subjects the CAP pumping system to N-1 outages.

15.3.4. The SWTC local 115kV system is interconnected to WESTERN at the Marana Tap and the SWTC Bicknell station.

15.3.5. SPPR has proposed a "Three Terminal Project" to deliver new generation output to its participants. One of the three terminals is proposed to connect to the SWTC and WESTERN 115kV systems through a 230/115kV transformation at the Marana Tap station.

Potential Solutions: SWTC and CAP are in the process of integrating their respective systems through planned interconnections at Sandario (near Brawley) and Valencia (near San Xavier). SWTC is also planning to construct a new 115kV line from Saguaro as the 4th circuit on the proposed TEP "Quad" circuit. This new line is to connect proposed intermediate distribution substations along the corridor

to the North Loop substation, and eventually terminate at the WESTERN Rattlesnake station. Alternatives follow:

15.3.6. Saturated load level (build-out) envisions a possible joint double circuit 345kV project between Tortolita and North Loop plus a Vail – Irvington (or SS NO30) – South Loop 345kV project. One of these EHV projects is anticipated to be in service by ~2014 (based on the current 2008 load forecast) unless a local Tucson area generation or other alternative project is identified to defer such an upgrade. A second EHV project would be required within the next 15 to 20 year time frame to maintain adequate load serving capability.

15.3.7. The SPPR Three Terminal proposal presents alternative strategy elements for SATS to develop and evaluate. Introduction of a new 230kV source at the Marana Tap location suggests that a 230kV line (possibly double circuit to retain the WESTERN 115kV line) continuing into Tucson and terminating at a yet-to-be-determined location in either the South of Tucson or Greenlee to Vail Corridor Areas should be evaluated. Intermediate 230/138kV and/or 230/115kV connections at North Loop, DMP, Del Bac, SS NO30 or other location may also be considered.

15.3.8. A new 345/115kV connection at Three Points is an option for reinforcing the integrated SWTC/CAP system.

15.3.9. A new 345 switching station at Three Points with a 345kV line replacing the existing 115kV line to Bicknell could strengthen the tie between the West of Tucson and South of Tucson Areas. An alternative is a new 345/230kV station at Three Points with a 230kV line replacing the existing 115kV line to Bicknell.

15.3.10. An emergency 138/115kV transmission interconnection that was previously considered in the Black Mountain Three Party Agreement may be reconsidered.

15.3.11. Others to be determined.

16. Potential Alternative Projects

Potential alternative projects are listed to provide as complete an inventory as possible of potential projects that may be evaluated individually or jointly as elements of alternative transmission planning strategies. Some may become an integral part of

multiple strategies while others may not receive further consideration at all. Figure 16. SATS EHV Potential Projects shows most of the transmission projects that were brainstormed and discussed in preparation for alternative strategy development. Note that this diagram depicts new 345kV lines from Willow to Winchester and Winchester to Vail plus Vail to Pinal West. While 345kV appears to be adequate to serve SATS load for the twenty to thirty year planning horizon, 500kV alternatives may prove to be feasible depending upon the rate of growth, ultimate build-out and on plans for integrating mega-projects into the SATS area transmission network.

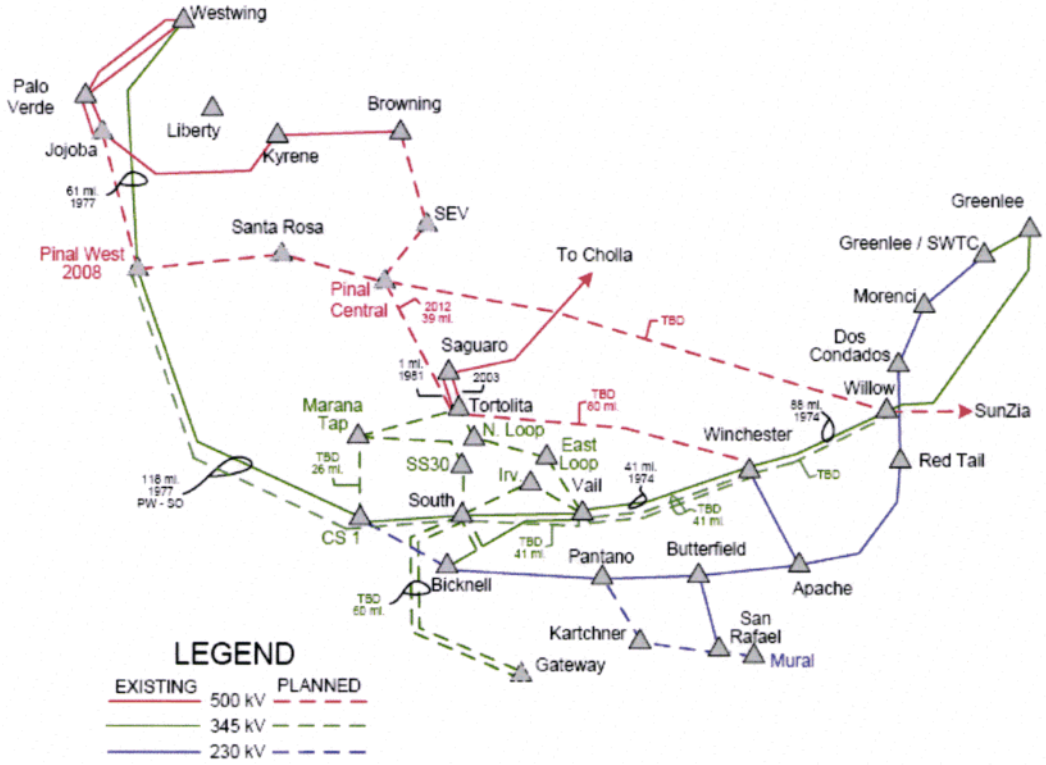

Figure 16. SATS EHV Potential Projects

The projects shown in the above map, and other projects are listed in the following tables.

500kV Potential Projects	
Pinal Central – Tortolita	Winchester/Willow – SunZia Interconnection
Tortolita – Winchester	Vail – South Loop
Pinal Central – Winchester	Pinal West – South Loop
Tortolita – South Loop	Pinal West – Three Points
Winchester – Vail Single Circuit	Three Points – Vail
Winchester – Vail Double Circuit	Willow - Winchester

Table 15. 500kV Potential Projects

Pinal Central – Tortolita 500kV: This project introduces a new 500kV connection to the system serving the Tucson metropolitan area. It also may integrate with future EHV projects needed to deliver proposed wind and solar renewable resources to potential markets in the southwest.

Winchester/Willow – SunZia Interconnection: This project may serve multiple purposes. The Willow 345kV switch yard provides an interconnection for the proposed Bowie Generating Station. Also, Willow is the preferred location for the SunZia project point of interconnection. Winchester may be considered as an alternative point of interconnection.

Tortolita – Winchester/Willow, Pinal Central – Winchester/Willow: These potentially competing projects may add a new 500kV link connecting the Tortolita or Pinal Central sources to the TEP 345kV lines serving Tucson. They are also options to integrate with the SunZia project.

Winchester – Vail Single Circuit, Winchester – Vail Double Circuit, Willow – Winchester: These projects, some of which may be competing, are options to reinforce the 345kV system between the Willow and Vail substations.

Vail – South Loop, Pinal West – South Loop, Pinal West – Three Points, Three Points – Vail: These projects are alternatives, some of which would be competing, that could become links in a larger project to provide a 500kV loop running south around Tucson.

345kV Potential Projects	
Tortolita – North Loop Double Circuit	Tortolita – Marana Tap
Tortolita – North Loop Single Circuit	Marana Tap – North Loop
Tortolita – Rillito	Marana Tap – DMP
Rillito – East Loop	DMP – SS 30
Rillito - Northeast	SS 30 – South Loop
Tortolita - East Loop	SS 30 – Vail
North Loop – Rillito	Three Points – SS 30
North Loop – Northeast	Marana Tap – Three Points
North Loop – East Loop	Three Points – Bicknell
Northeast – East Loop	Vail – South Loop – Bicknell (loop-in)
East Loop – Vail	Vail – Irvington
East Loop - Irvington	South Loop - Irvington
South Loop – Pinal West #2	Vail – South Loop #2
Winchester – Vail Single Circuit	Apache – Vail Single Circuit
Winchester – Vail Double Circuit	Apache – Vail Double Circuit
Willow - Winchester	Pinal West – South Loop PAR

Table 16. 345kV Potential Projects

Tortolita – North Loop Double Circuit, Tortolita – North Loop Single Circuit, Tortolita – Rillito, Rillito – East Loop, Rillito – Northeast, Tortolita - East Loop, North Loop – Rillito, North loop – Northeast, North Loop – East Loop, Northeast – East Loop, East Loop – Vail: These projects are alternatives, some of which are competing, to increase 345kV transfer capacity into the TEP system from the Tortolita and Vail EHV transmission sources. Some of these projects may be viable joint projects.

Tortolita – Marana Tap, Marana Tap – North Loop, Marana Tap – DMP, DMP – SS 30, SS 30 – South Loop: These projects make up alternative projects, some of which are competing, to increase 345kV transfer capacity into Tucson area. Some of these projects may be viable joint projects.

Three Points – SS 30: This project is an alternative to SS 30 – South Loop.

Marana Tap – Three Points: This project would effectively interconnect Tortolita to the Pinal West to South Loop 345kV line, assuming the Tortolita to Marana Tap project were to be built.

Three Points – Bicknell: This project, assuming the Three Points/SC1 345/115kV substation was constructed, would add a new 345kV path in parallel with the existing 345kV line from Vail to Three Points.

Vail – South Loop – Bicknell (loop-in): This project would effectively add a new parallel 345kV line between Vail and South Loop.

Vail – Irvington, South Loop – Irvington: This project would add a new parallel 345kV path between Vail and South Loop. It also is an essential part of a TEP "reach-in strategy" described in Section 19. Long-Term SATS and Individual EHV Transmission Provider Strategies.

Vail – South Loop #2, South Loop – Pinal West #2: These projects would add a new 345kV line in parallel with the existing Pinal West to Vail 345kV line.

Winchester – Vail Single Circuit, Winchester – Vail Double Circuit, Apache – Vail Single Circuit, Apache – Vail Double Circuit: These projects, some of which are competing projects, would add one or two new 345kV circuits in parallel with the existing Winchester to Vail and Springerville to Vail 345kV lines.

Willow – Winchester: This project would add a new 345kV line in parallel with the existing Greenlee to Winchester 345kV line. This project assumes the Willow switching station is in service on the Greenlee to Winchester line.

Pinal West – South Loop PST: This project would insert a phase shifting transformer into the Pinal West to South Loop 345kV line. The primary function of the PAR would be to reduce post contingency flows on the 230kV system that parallels the Greenlee to Vail 345kV line.

230kV Potential Projects	
Three Points – Bicknell	Winchester - Apache
Apache - Butterfield	Butterfield - Pantano
Pantano – Nogales Tap	Nogales Tap – Del Bac
Del Bac - DMP	DMP - Marana Tap
Vail – San Rafael	Pantano – Kartchner – San Rafael
Bicknell – San Rafael	Sloan – Huachuca City
San Rafael - Mural	Adams Tap - Mural
Bicknell – Sahuarita PAR	

Table 17. 230kV Potential Projects

Three Points – Bicknell: This project, assuming the Three Points/CS1 345/115kV line

were constructed, would add a new 230kV path in parallel with the existing 345kV line from Vail to Three Points.

Winchester – Apache (2nd circuit which is currently operated at 115kV), Apache – Butterfield, Butterfield – Pantano, Pantano – Nogales Tap, Nogales Tap – Del Bac, Del Bac – DMP, DMP - Marana Tap: These projects would involve conversion of existing 115kV lines to 230kV, most of which would be along the WESTERN right-of-way. It also appears to be dependent on the SPPR 230kV proposal for a 230kV terminating at the Marana Tap substation.

Vail – San Rafael, Pantano – Kartchner – San Rafael, Bicknell – San Rafael, Sloan – Huachuca City, Bicknell – San Rafael, Sloan – Huachuca City, San Rafael – Mural, Adams Tap – Mural: These projects are alternatives, some of which are competing, to improve reliability for entities in the Cochise County area.

Bicknell – Sahuarita PST: This project would insert a phase shifting transformer (PST) into the Bicknell to Sahuarita 230kV line. The primary function of the PST would be to reduce post contingency flows on the 230kV system that parallels the Greenlee to Vail 345kV line.

138kV Potential Projects	
Tortolita – North Loop Quad (3-138kV)	Marana – SS No 1
Tortolita – Rillito	SS No 1 – North Loop
Tortolita – Marana (TEP – New Corridor)	DMP - Tucson
Marana Double Circuit Tap	Orange Grove – SS NO6
North Loop – Naranja	SS NO6 – SS NO7
Naranja – Rancho Vistoso	SS NO7 – Northeast
Rancho Vistoso - Catalina	Twenty Second – SS NO15
Tortolita - Catalina	Twenty Second – SS NO14
Irvington – Kino	SS NO14 – East Loop
Kino – Downtown	SS NO14 – Northeast
Downtown - Tucson	SS NO4 Tap
SS NO13 Tap	SS NO8 Tap
SS NO16 Tap	Vail – SS NO17
Midvale – Spenser	SS NO15 - Irvington
Vail –SS NO33	SS NO20 Tap
SS NO33 – Swan Southlands	SS NO27 Tap
Swan Southlands – SS NO22	Canoa Ranch – Duval Clear
Hartt – SS NO29	SS NO28 Tap
Canoa Ranch – SS NO25	

Table 18. 138kV Potential Projects

Tortolita – North Loop Quad (3-138kV): This project is included in the TEP five year capital budget. Its primary purpose is to increase transfer capability from the Tortolita Substation into the northern portion of the TEP local area network. It has provisions to add a 115kV SWTC circuit (e.g. the 4th circuit on the Quad) to enhance reliability of the 115kV local area systems as well as to supply proposed new Trico load serving substations.

All other TEP 138kV Potential Projects: These projects are intended, primarily, to integrate new substations identified by the TEP saturated load study into the existing 138kV local area network. Some of these projects would also add new lines as needed to enhance local system transfer capability.

115kV HV Potential Projects	
Saguaro – Naviska – Adonis – Thornydale – Camino de Manana – North Loop	Marana – Naviska
Adonis - Rattlesnake	Sandario (SWTC) – Sandario (CAP)
Sandario (SWTC) - Brawley	Brawley – San Joaquin
San Joaquin – San Xavier	Valencia – Black Mountain
CS1 – Three Points	

Table 19. 115kV Potential Projects

Saguaro – Naviska – Adonis – Thornydale – Camino de Manana – North Loop: This project represents the possible ultimate configuration for the SWTC 115kV line that is described as the 4th circuit on the Tortilita – North Loop Quad project.

All remaining 115kV Potential Projects: These projects are intended to improve 115kV system reliability by effectively integrating the CAP, SWTC and WESTERN systems.

Possible Interconnections	
North Loop – Rattlesnake Tap 345/115kV	Vail 345/230kV
SS 30 345/115kV	Del Bac 345 or 230/115kV
Hartt 345 or 230/115kV	Three Points/CS1 345/230/115kV

Table 20. Potential Interconnections Projects

North Loop – Rattlesnake Tap 345/115kV: This project would provide a new 345/115kV transformation at the North Loop substation. This would become a new source to the area SWTC/CAP/WESTERN system.

Vail 345/230kV: This project would add new 345/230kV transformation at the Vail substation to allow interconnecting the SWTC 230kV line(s) between Pantano and Sahuarita.

SS 30 345/115kV, Del Bac 345 or 230/115kV: This project would add a new 345/115kV transformation at the proposed SS 30 substation which is in the vicinity of the existing WESTERN Del Bac switching station. A new 115kV source could possibly introduce a

new connection to the SWTC/CAP/WESTERN 115kV systems.

Three Points/CS1 345/230/115kV: This project would add a new source to supply the SWTC/CAP/WESTERN 115kV systems. It could also accommodate a new 345kV or 230kV line to the Bicknell substation.

Hartt 345 or 230/115kV: This project would represent a joint project among SWTC, TEP and Trico. The project is not necessarily to be constructed at the proposed location of TEP's load serving substation referred to as Hartt. Rather, the idea is to plan a joint project that meets the TEP and Trico load serving needs while improving EHV/230kV transmission network reliability.

17. WESTERN 115kV Transmission Corridor

The WESTERN 115kV transmission corridors within the SATS study area have been identified as valuable assets for a number of the alternative projects. A few 345kV projects have the potential for becoming viable assuming the ability to utilize the existing 115kV WESTERN transmission corridor from Saguaro through Marana Tap, continuing southeasterly into and through Tucson, terminating at South Loop. These WESTERN corridors and their potential utilization are shown below in Figure 17: WESTERN 115kV Corridors.

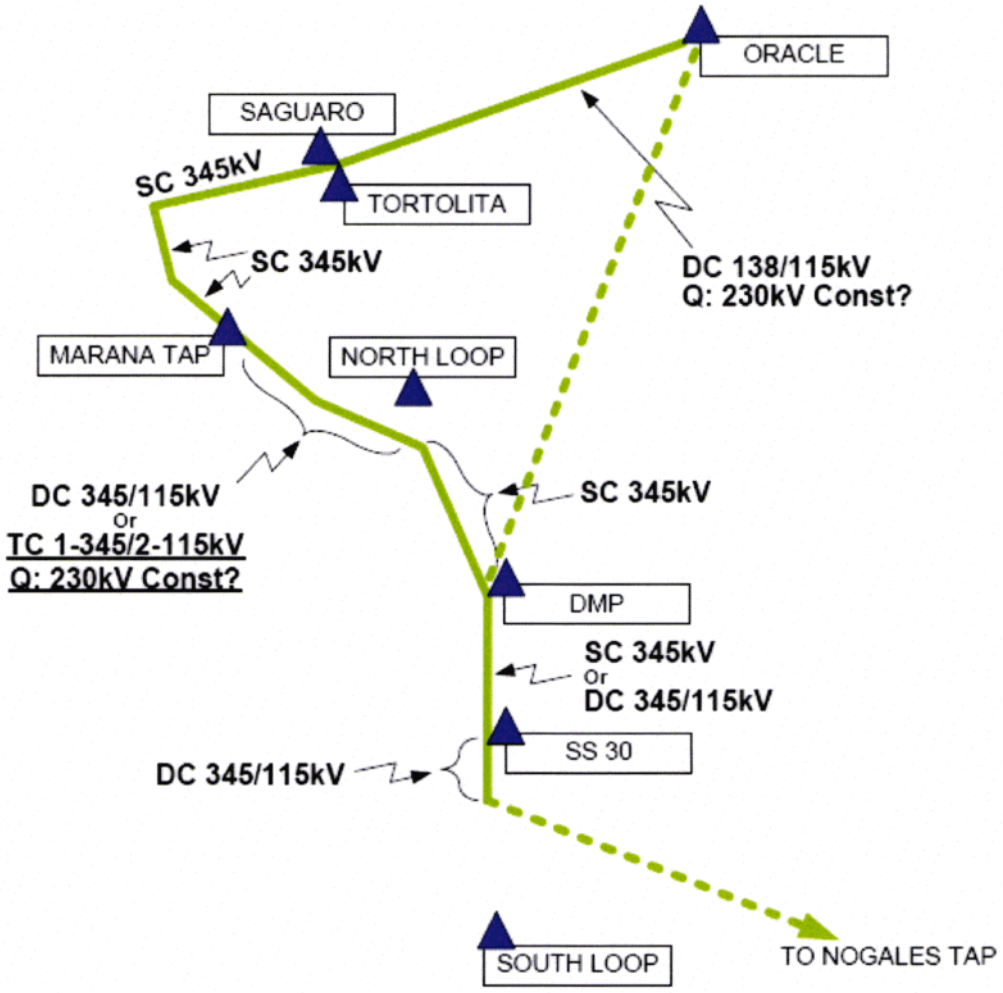

Figure 17. WESTERN 115kV Corridors

WESTERN was requested by the SATS participants to complete a study of its transmission corridor Right of Way (ROW) within the given study area south of APS'S Saguaro Substation as shown in Figure 17 above.

WESTERN's transmission corridor ROW study was broken down into three transmission line segments: 1. Saguaro Substation to Tucson Substation, 2. Saguaro

Substation to Oracle Substation to Tucson Substation, 3. Tucson Substation to Apache Substation.

17.1. Saguaro Substation to Tucson Substation:

ROW width: 100 FT
ROW restrictions: There is no voltage or construction restrictions as long as the new construction fits within the existing ROW width and the transmission poles are owned by the Federal Government.

17.2. Saguaro Substation to Oracle Substation to Tucson Substation:

ROW width: Corridor width is still under investigation
ROW restrictions:
a. There are no voltage or construction restrictions as long as the new construction fits within the existing ROW width and the transmission poles are owned by the Federal Government.
b. A portion of the given line is already double circuited with another utility between Oracle Substation and Tucson Substation.

17.3. Tucson Substation to Apache Substation:

ROW width: Corridor width is basically 100 FT with the exception just outside of Tucson Substation which WESTERN is reviewing to be sure the information provided on the ROW spreadsheets as provided to the SATS group is accurate.

ROW restrictions: There are no voltage or construction restrictions as long as the new construction fits within the existing ROW width and the transmission poles are owned by the Federal Government.

17.4. General Comments:

Any corridor width adjustments would require WESTERN to go back to the land owner and renegotiate a new ROW easement agreement. If

renegotiations with the perspective land owner are not successful, as a last resort the Federal Government can use its condemnation rights to obtain the necessary corridor.

There are mutual benefits to be gained by joint planning for transmission assets in these corridors. SATS participants may benefit through the ability to site high voltage transmission facilities, while WESTERN may benefit from improved reliability and load serving capability. All could be potentially more cost effective than each planning and developing their respective systems individually.

18. Southwest Public Power Resource (SPPR) "Three Terminal Plan"

The Southwest Public Power Resource (SPPR) group investigated a "Three Terminal Plan", shown in Figure 18 below, to develop and transmit power from proposed new generating resources in Pinal County while the SATS study was in process. This plan envisions three 230kV lines interconnecting the new generator to three transmission system points of interconnection, one of which would be the SWTC Marana Tap 115kV substation. The proposal calls for the existing WESTERN 115kV line from just west of the APS Saguaro station to Marana Tap to be replaced with a new double circuit 230kV constructed transmission line. One of the circuits would be operated at 115kV to restore the existing WESTERN 115kV topology. The other would serve as the 230kV path from the new generator to the Marana point of interconnection through a 230/115kV transformer.

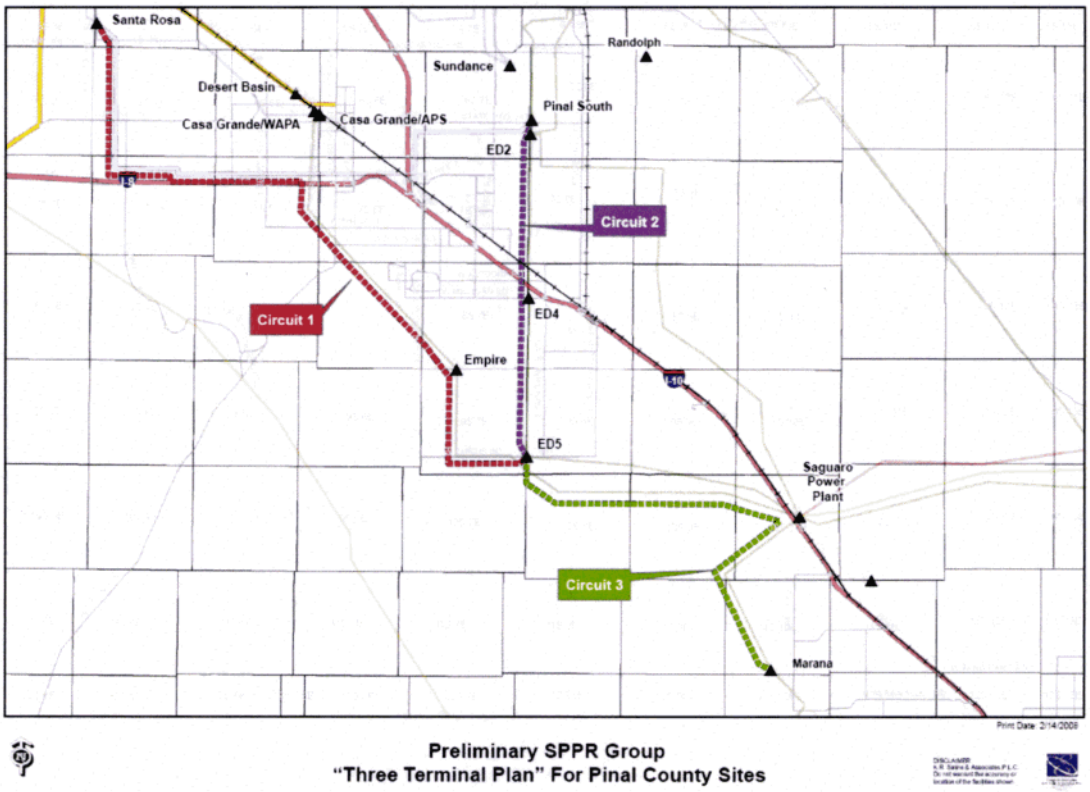

Figure 18. Preliminary SPPR Three Terminal Plan

The possibility of this new 230kV source at Marana presents an alternative that had not been previously explored. Therefore a "Task Force to analyze the common facilities within the individual plans and develop a joint plan for these common facilities" has been formed.

The status of this task force effort, along with the plan and schedule to complete the study is included in Appendix E to this report.

19. Long-Term SATS and Individual EHV Transmission Provider Strategies

Strategies were created by assembling appropriate combinations of the Projects listed in Section 16. Alternative Projects. The study scope calls for strategy designs to be based upon the "NW & SE Resources" scenario first, to be followed, in subsequent phases of this study, by sensitivity analysis to the "Balanced Resources" and "Internal Generation" scenarios. This sensitivity analysis may entail reducing imports from the northwest and southeast to accommodate imports up to 1,000 MW from south of

Tucson and/or south of Cochise County. The objective is to identify changes to the transmission configuration resulting from the shift in location of imports into the SATS area.

The SATS group investigated the projects listed in Section 16. Alternative Projects, and determined which of the EHV projects, based on N-1 analysis, are most likely to meet the objective of effectively delivering power from the SATS interface to the load centers within SATS.

Six EHV strategies were developed, each with the intention to supply the TEP and Trico systems assuming build-out in the Tucson area. Two of the options, that were intentionally very different from each other, were initially given high priority to be evaluated. However, options that minimize EHV construction through highly developed areas were subsequently assigned the highest priority due to their favorable technical, economic and aesthetic characteristics. Therefore analysis of a robust alternative that would entail constructing two new 345kV transmission lines through the City of Tucson and the surrounding densely populated area (Strategy A) was minimized. More concentrated effort was then directed toward alternatives that extend 345kV transmission from the existing EHV interconnections into the Tucson load center (Strategies C and F). All EHV strategies are described and shown graphically in this section.

The idea behind choosing strategies that are significantly different from each other was to make sure that all bases were covered considering long range uncertainty, of which load growth uncertainty is among the greatest of concerns. Hence the most robust option (Strategy A) was evaluated first to determine its ability to serve load reliably at saturation. Given the environmental, aesthetic and cost concerns associated with Strategy A, alternatives with lower impacts were developed and they also demonstrated the ability to supply load at saturation. While no analysis was done beyond the saturated load level, Strategy A appears to have the ability to serve loads greater than the amount that was projected at build-out based on existing land use plans. Therefore other strategies were selected in part based on the potential to transition to the Strategy A topology if loads greater than saturation appear to be imminent. In other words the relative merits of each alternative could help attain the objective of plan flexibility. Plan flexibility is examined in Section 25: Developing a Flexible Plan. As the analysis

progressed, a new strategy emerged and the study focus shifted to it. The new alternative, Strategy F, which effectively replaces SS NO30 with a similar facility at the Irvington location, and eliminates the Vail to East Loop 345kV and the East Loop 345kV yard, was viewed as a significant improvement over Strategy C.

The most salient difference between Strategy A and Strategies C or F is elimination of 345kV lines passing through Tucson. The other difference is that slightly more 138kV system reinforcement may be required in Strategies C or F because the EHV lines in Strategy C may reduce transfer across the 138kV under contingencies. Study effort was concentrated on Strategies C or F. Therefore no analysis was done to ascertain the difference in 138kV infrastructure between Strategy A and Strategies C and F. Note that, whether or not power transfer across Tucson occurs depends more on where new generation and/or mega-projects interconnect than the differences between strategies. More detail on strategies is included in this section.

Each of the strategies, at the saturated load level, examined new 500kV facilities interconnecting the Winchester and Pinal West substations, to include 500/345kV interconnections at the Vail and South Loop substations. The Winchester-to-Vail segment included two 500kV lines. Preliminary analysis indicates that 500kV will not be needed to serve SATS at the 20-year load level. Justification for investment in 500kV facilities will require further evaluation considering anticipated load growth rate, the potential for sponsors, possible mega-project interconnection requests, and other business factors. The decision on the choice of 345kV versus 500kV construction is on the project critical path since EHV additions in that corridor will likely be needed within the 5- to 10-year timeframe.

19.1. Project Assumptions

All strategies, at the saturated load level, assumed new 345kV lines from Tortolita to Marana Tap to Three Points with 345/115kV connections at Marana Tap and Three Points. They also assume a new 230kV Three Points to Bicknell line, which may be reconsidered at 345kV. Finally a 500kV Winchester to Tortolita line was common to all strategies. However, the need for these projects has not been confirmed. Studies of alternative configurations indicate that these projects may not be needed for SATS area load serving capability within the twenty year planning horizon. Therefore sensitivity studies removing these projects were done within the ten year planning horizon.

As the study progressed, an assessment of "Committed" and "Planned" projects was done in light of information that was not available at the time decisions were made to pursue them. Among others, the Pinal Central to Tortolita 500kV project, which was scheduled to be permitted, constructed and placed into service by 2011 prior to the beginning of the SATS study was reviewed considering the impact of projects that may interconnect southeast of Tucson. Recent information suggests that projects such as Bowie generation and SunZia may be put into service within the same five year time frame. Generally, these projects change the magnitude of power flows into the TEP EHV points of interconnection by a large margin. These projects therefore have the potential to influence the timing, and possibly the technical and economic viability of alternative EHV interconnections.

Table 21 demonstrates the impact of various projects interconnecting with the SATS system. For example, removal of the two-circuit 345kV Tortolita to North Loop project reduces flow entering at Tortolita and accordingly increases flow through the Vail and South Loop delivery points. Connecting the 500 MW Bowie generating station at the proposed Willow 345kV point of interconnection further reduces flow through Tortolita. Adding 500 MW of generation at the Winchester 500kV station, in addition to Bowie, simulating a SunZia interconnection at a relatively low power output effectively substitutes Vail for Tortolita as the strongest source. The purpose of this table is only to demonstrate the heavy influence that major projects such as Bowie generation and SunZia have on power flows into the TEP system in Tucson. There was no attempt to optimize transmission system design for both of these new facilities. This scenario analysis was done simply to gain a better understanding of the benefits and impacts of these proposed projects.

10 Year Horizon	Tortolita		Vail		South		Hartt		Total Import
New EHV Project	MW	%	MW	%	MW	%	MW	%	MW
PC – TO 500kV & 2 TO – NL 345kV	1354	46	945	32	428	15	209	7	2936
PC – TO 500kV	1209	41	1017	35	482	15	215	7	2923
Bowie 500 MW	1098	37	1136	38	498	17	228	8	2960
Bowie & SunZia	1014	34	1218	41	518	17	242	8	2992

Table 21. Flow Impacts of Major EHV Projects on TEP System

Large impacts caused by such projects interconnecting to the TEP EHV network presents a significant planning challenge. Emerging information indicates that the likelihood of Bowie and SunZia being in service by 2011 and 2013 respectively has recently increased by a significant margin. Nevertheless, these projects continue to be treated as uncertainties since none are firmly committed as of this time. As a result, prior analysis which assumed the Pinal Central to Tortolita 500kV project to be in service in 2011, with little likelihood of Bowie and SunZia interconnecting within the same time frame, favored the North Loop 345kV injection proposal as the next EHV upgrade. Therefore all prior analysis had to be repeated with SunZia and Bowie interconnected. The results indicate that a Tortolita to North Loop 345kV project may be deferred, and a 345kV project at either SS NO30 or Irvington could be considered more feasible as the next major EHV upgrade. More analysis will be required within the five to ten year planning horizon to optimize system investments considering the uncertainty associated with these projects. Since neither of the Bowie or SunZia projects is absolutely committed at the time of this writing, the possibility of multiple outcomes must be evaluated.

Following is a description and discussion of Strategies A through F:

19.2. Strategy A

Strategy A, shown in Figure 19. TEP EHV Strategy A envisions the addition of two new 345kV lines effectively going through the Tucson metropolitan area with three new 345/138kV interconnections to the local area 138kV network. One 345kV line would begin at Tortolita, extend to North Loop continue to East Loop and terminate at Vail,

with two new 345/138kV interconnections at North Loop and East Loop. The second 345kV would begin at Tortolita, follow the WESTERN 115kV right-of-way to the SWTC Marana Tap, continue along the WESTERN ROW into Tucson to a new 345/138kV substation (SS30) and terminate at South Loop. The WESTERN 115kV corridor would be utilized to minimize impact cost, environmental and aesthetic impact. A disadvantage however, is that the 100 foot right-of-way is less than TEP's existing standard as required for 345kV construction. Note that justification for investigating two 345kV lines along separate corridors was based on the assumption that they would be pursued jointly by SWTC, TEP and possibly other parties.

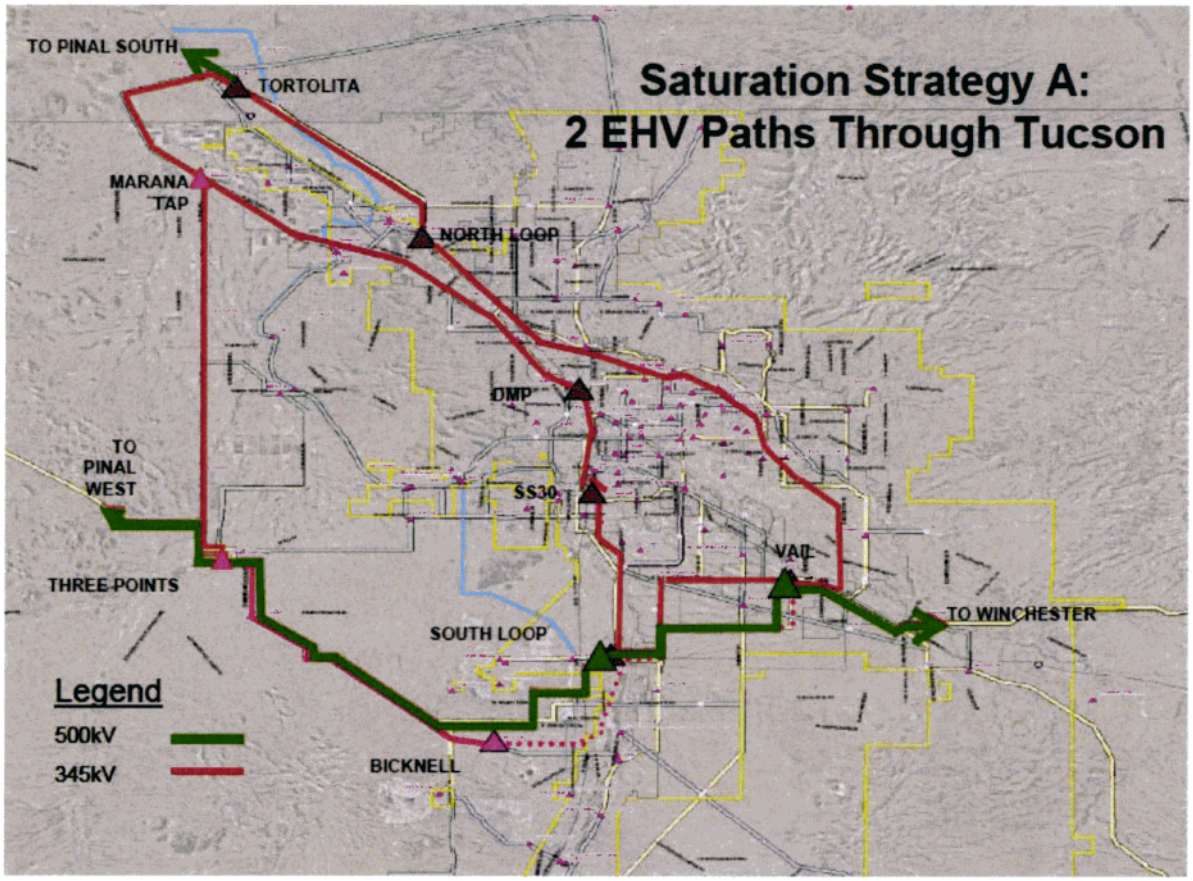

Figure 19. TEP EHV Strategy A

Strategy A is the most robust among the five alternatives. It has the potential for the greatest load serving capability, with the highest probability to serve loads in excess of the saturated load level. It envisions the largest amount of new 345kV construction

(~110 Miles), much of which passes through the relatively densely populated Tucson area. Therefore Strategy A involves the highest EHV capital investment and potentially has the greatest associated aesthetic and environmental issues.

19.3. Strategy B

Strategy B was developed with the intention of minimizing the number of new transmission lines needed through Tucson, and to minimize impact by utilizing the WESTERN 115kV corridor. However, as in Strategy A, the 100 foot right-of-way is less than TEP's existing standard as required for 345kV construction.

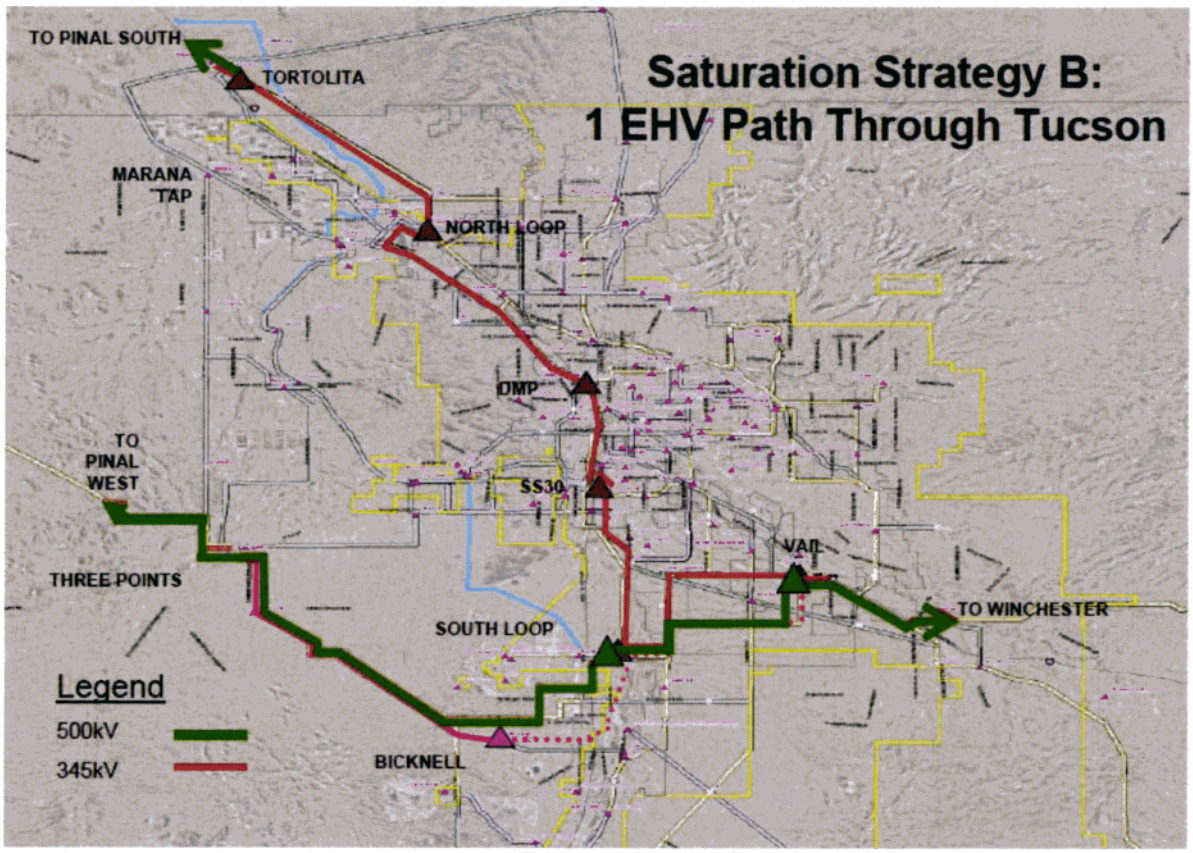

Figure 20. TEP EHV Strategy B

Strategy B EHV is less robust than Strategy A. It has the potential for somewhat less load serving capability, with lower probability to serve loads in excess of the saturation load level. It envisions a more moderate amount of new 345kV construction, with one new 345kV line passing through the relatively densely populated Tucson area. Strategy B intuitively requires a lower EHV capital investment than Strategy A. Its associated

aesthetic and environmental impact could also be significantly lower because most of the new 345kV construction would occupy the existing WESTERN 115kV corridor. However, the relatively narrow WESTERN corridor poses challenges in those segments where double circuit construction would be necessary. The other alternative in those segments would be to secure additional right-of-way, which would increase cost and require regulatory approval.

Strategy B envisions three new 345/138kV delivery points, all of which would be on the western side of Tucson. There would be approximately 60 miles of new 345kV lines, with some segments requiring double circuit.

Construction of local 138kV facilities required for Strategy B is expected to be somewhat greater than for Strategy A. No analysis was done to determine precise differences in 138kV design attributed to each of the EHV strategies.

19.4. **Strategy C**

Strategy C, also referred to as "Reach-In", entails construction of two new 345kV lines to the North Loop Substation, two new 345kV lines to the new SS30 from South Loop and Vail respectively, plus a new radial 345kV line from Vail to East Loop. Thus Strategy C includes the same new 345/138kV injection points as Strategy A. Also, similar to Strategy A, justification for investigating two 345kV lines along separate corridors was based on the assumption that they would be pursued jointly by SWTC, TEP and possible other parties.

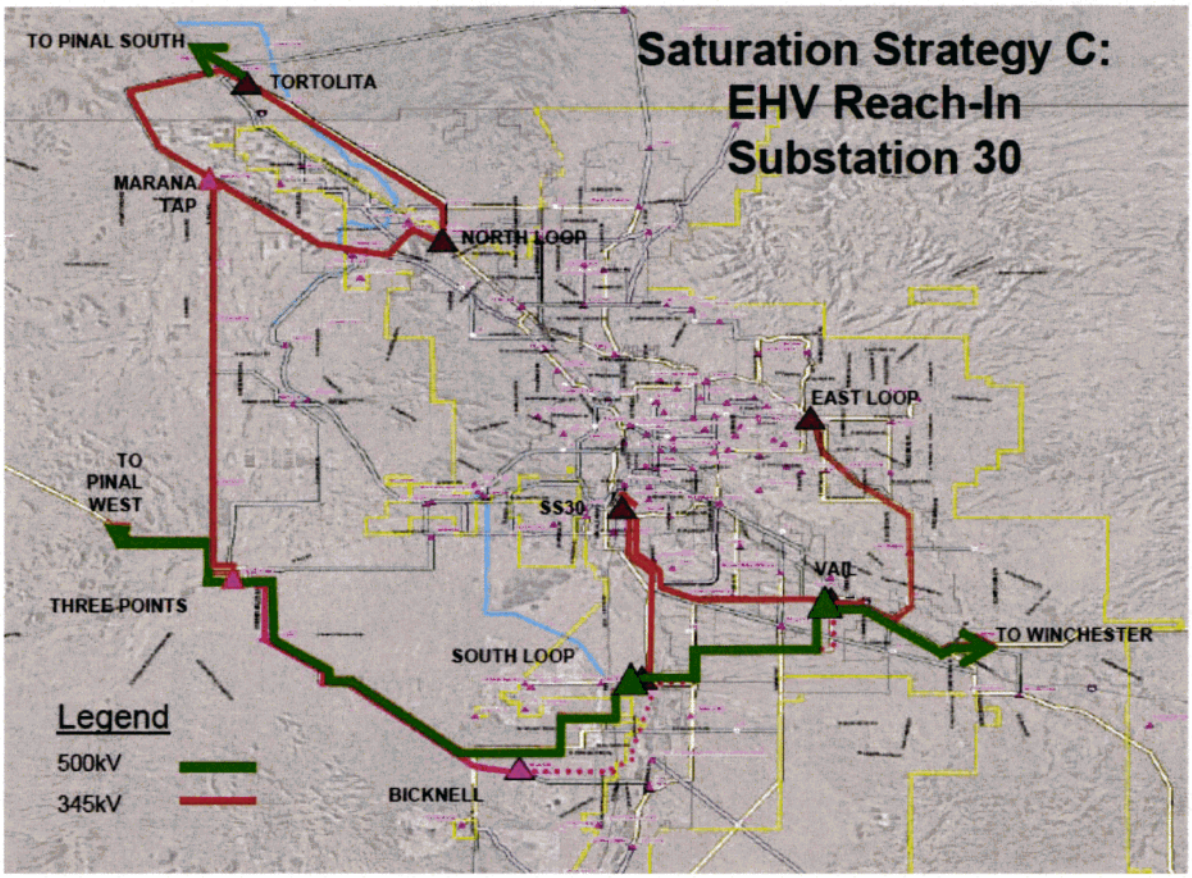

Figure 21. TEP EHV Strategy C

Strategy C EHV is less robust than Strategy A. It has the potential for lower long-term load serving capability and potentially could have limitations requiring some reinforcement to serve loads in excess of the saturated load level. It envisions less new 345kV construction than Strategy A. New 345kV lines would pass through much less of the relatively densely populated Tucson area. Strategy C involves a lower EHV capital investment than Strategy A, but possibly slightly greater than B. Its associated aesthetic and environmental impact would clearly be lower than Strategy A, but closer to Strategy B. Much less of the new 345kV construction would occupy the WESTERN 115kV corridor. However, over 30 miles of new line could potentially be built in existing TEP corridors[19] that are presently or planned to be occupied by 138kV. Approximately 28

[19] The determination of actual corridors to be selected if Strategy C is pursued will require a detailed land and environmental assessment.

miles would be in WESTERN corridors. Therefore challenges will also exist in those segments where double circuit construction would be necessary.

Strategy C envisions the addition of three new 345/138kV delivery points in the same locations as Strategy A. Approximately 75 miles of new 345kV lines would be required.

19.5. Strategy D

Strategy D was developed to address possible right-of-way acquisition and permitting issues associated with the South Loop to SS30 345kV line proposed in Strategy C.

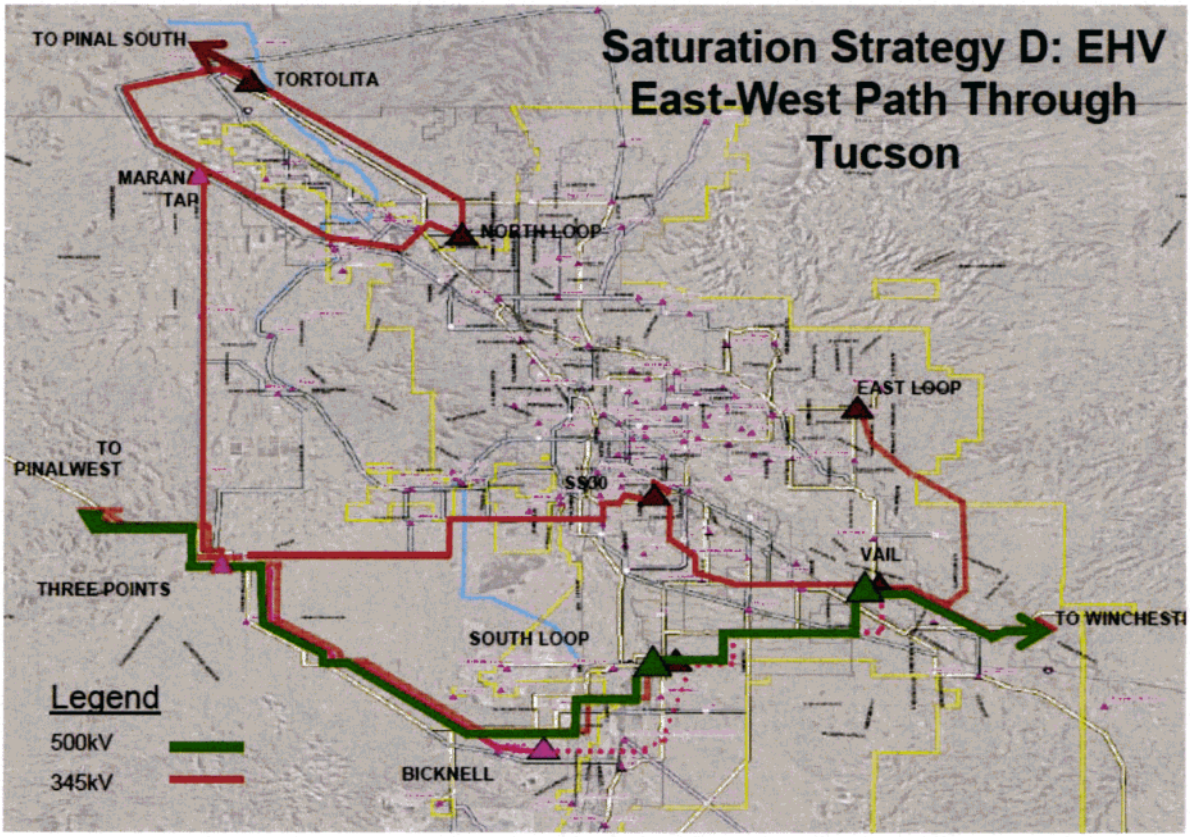

Figure 22. TEP EHV Strategy D

Thus, Strategy D functionally is anticipated to be very similar to Strategy C. The key difference is that the South Loop to SS30 345kV line is replaced by a Three Points to SS30 345kV line. However, there may be significant aesthetic issues in the Three Points to SS30 corridor. Evaluation of this option will be pursued if either Strategy C or F is found to not be feasible.

138kV system design is expected to be very similar, if not identical to that which would be associated with Strategy C.

19.6. Strategy E

Strategy E assumes no new 345kV construction from the current EHV delivery points into Tucson as shown in Figure 23.

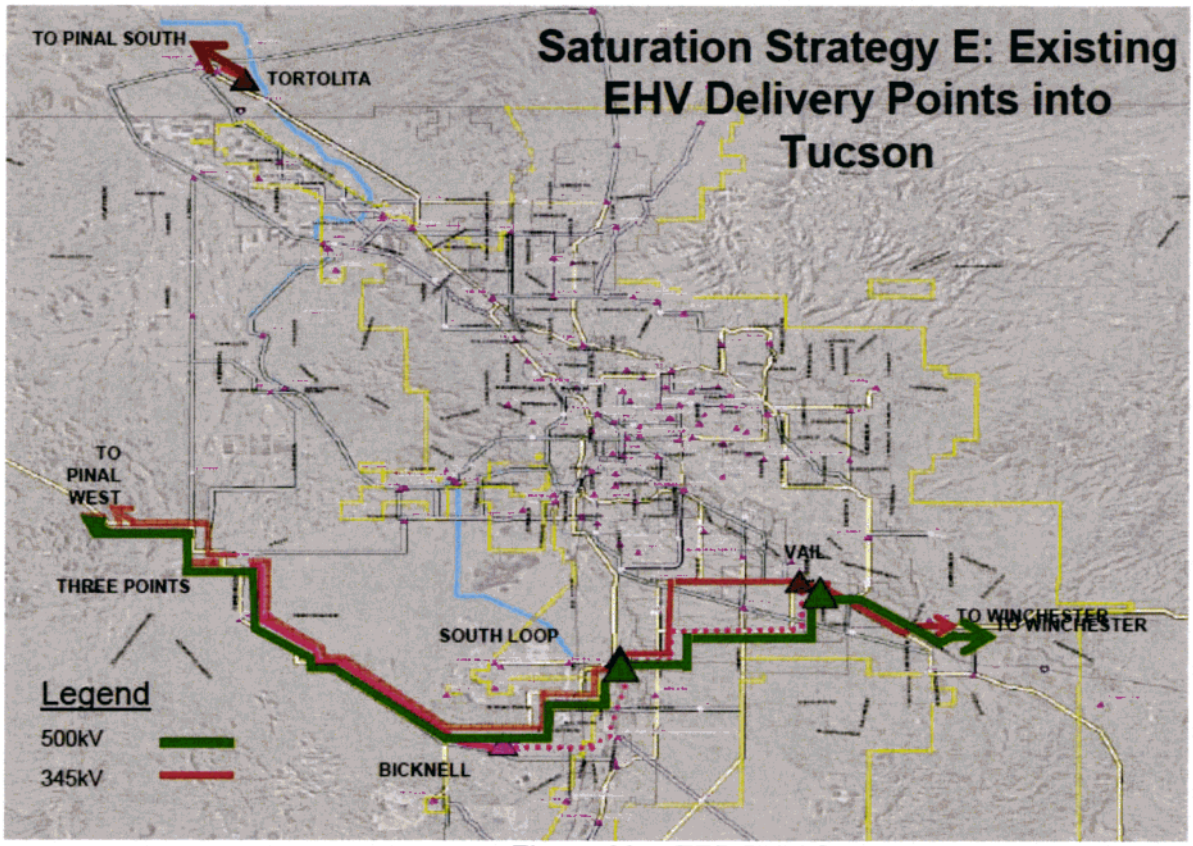

Figure 23. TEP EHV Strategy E

Substantially more 138kV construction would be required for Strategy E than any other option. Analysis done to date on Strategy C suggests that an option without EHV system reinforcement is not technically feasible. No detailed 138kV design was done for Strategy E.

19.7. Strategy F

Strategy F, shown in Figure 24. TEP EHV Strategy F, is a variation of Strategy C,

wherein SS30 would be replaced by a 345/138kV substation at Irvington with 345kV lines connecting it to the Vail and South Loop stations. Also, the radial line from Vail to East Loop and the East Loop 345kv station would be eliminated.

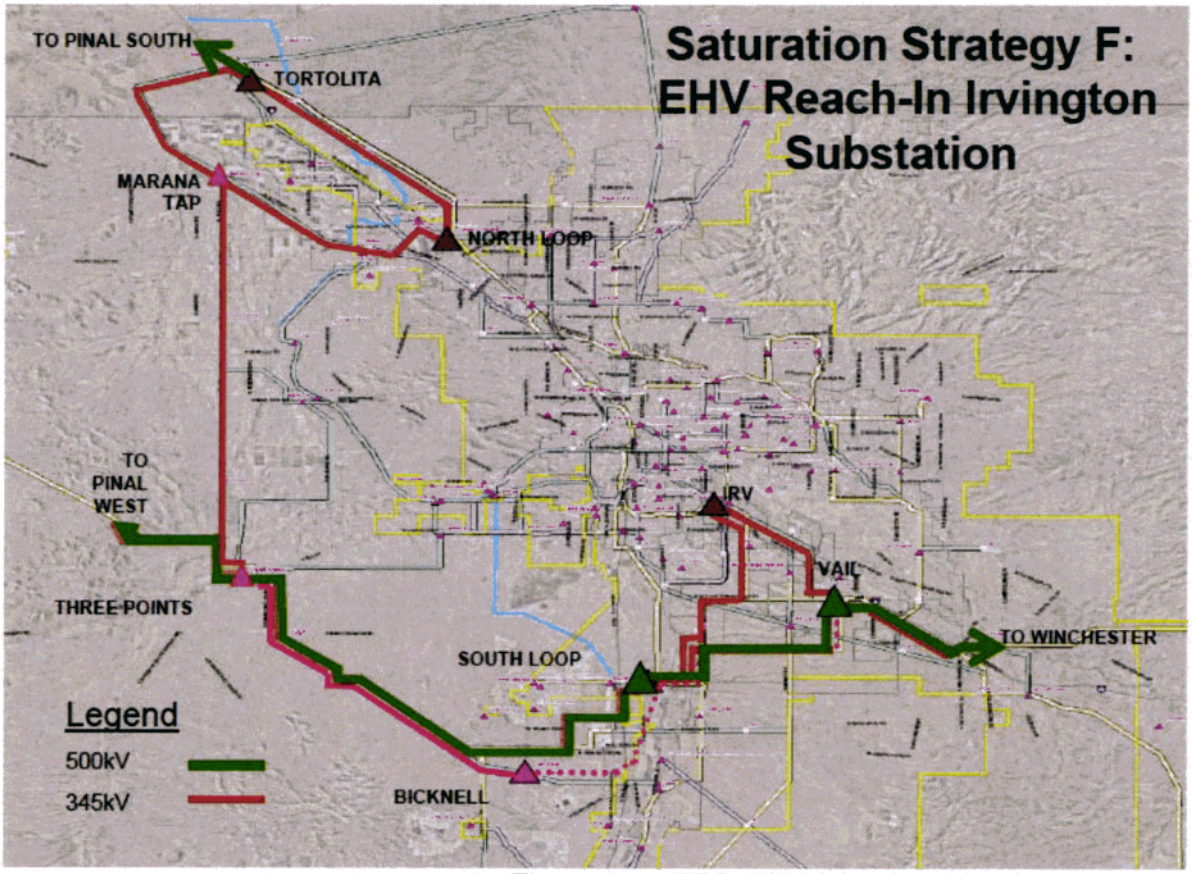

Figure 24. TEP EHV Strategy E

Strategy F Incorporates the two 345kV lines from Tortolita to North Loop and the new North Loop substation shown in Strategy C. It differs from Strategy C in that Irvington is the only new 345kV substation needed with new 345kV connections from Irvington to Vail and South Loop. The East Loop 345kV substation and radial line to the Vail station are not anticipated to be needed due to the more central location of Irvington.

138kV system design generally envisions rebuilding or reconductoring existing multiple circuits between the EHV delivery points and the load centers within Tucson. TEP 138kV system plans are described in Section 20. TEP 138kV Future System Strategy.

20. TEP 138kV Future System Strategy

As the study evolved, Strategy F was emphasized as the basis on which the TEP 138kV system would be designed. During the course of the study it was learned that the transmission system in southeast Arizona generally does not experience "flow-through". This characteristic is a major factor that allows the "reach-in" EHV strategies (C or F) to provide adequate load serving capability within the SATS load pocket[20]. Therefore 138kV configuration alternatives for any of the "reach-in" strategies would be quite similar. TEP's planning approach is to reinforce the Tucson area 138kV network by upgrading existing lines and in some cases adding new lines, thereby increasing transfer capacity into the load center from existing EHV delivery points. This tactic helps to defer the need for extension of new EHV into Tucson for as long as possible.

Several alternative 138kV configurations were postulated for the saturated load level, then reduced to the twenty year planning horizon and then to the 2018 load level. The following series of single line diagrams show the alternatives that were considered with the 2018 prominently displayed while facilities contemplated for later years are subdued.

Figure 25. TEP Transmission Location Reference is a master diagram which identifies where the subsequent single line representations are geographically located. Note that there are several 138kV alternative configurations for each of the areas shown.

The single line diagrams following the master diagram show alternative 138kV configurations within each of the defined areas shown on the master. These alternative projects were screened through a combination of judgment; land use, environmental and perceived cost considerations; and power flow modeling results. The result of this process is the 2018 project list.

[20] The phenomena of "no flow-through" is apparently due to the characteristics of the bulk transmission system with interconnected generation and load centers covering the southwestern portion of the Western Interconnection. Major new project interconnections could conceivably change the balance, potentially causing flow-through. SATS participants should consider this possibility in future system impact studies.

Options to defer all projects in this study will be continuously under investigation. The objective of the longer range study work is to identify system issues and determine alternatives that will likely be the ultimate solution. This provides an opportunity to address long lead-time activities such as right-of-way acquisition, permitting and so on.

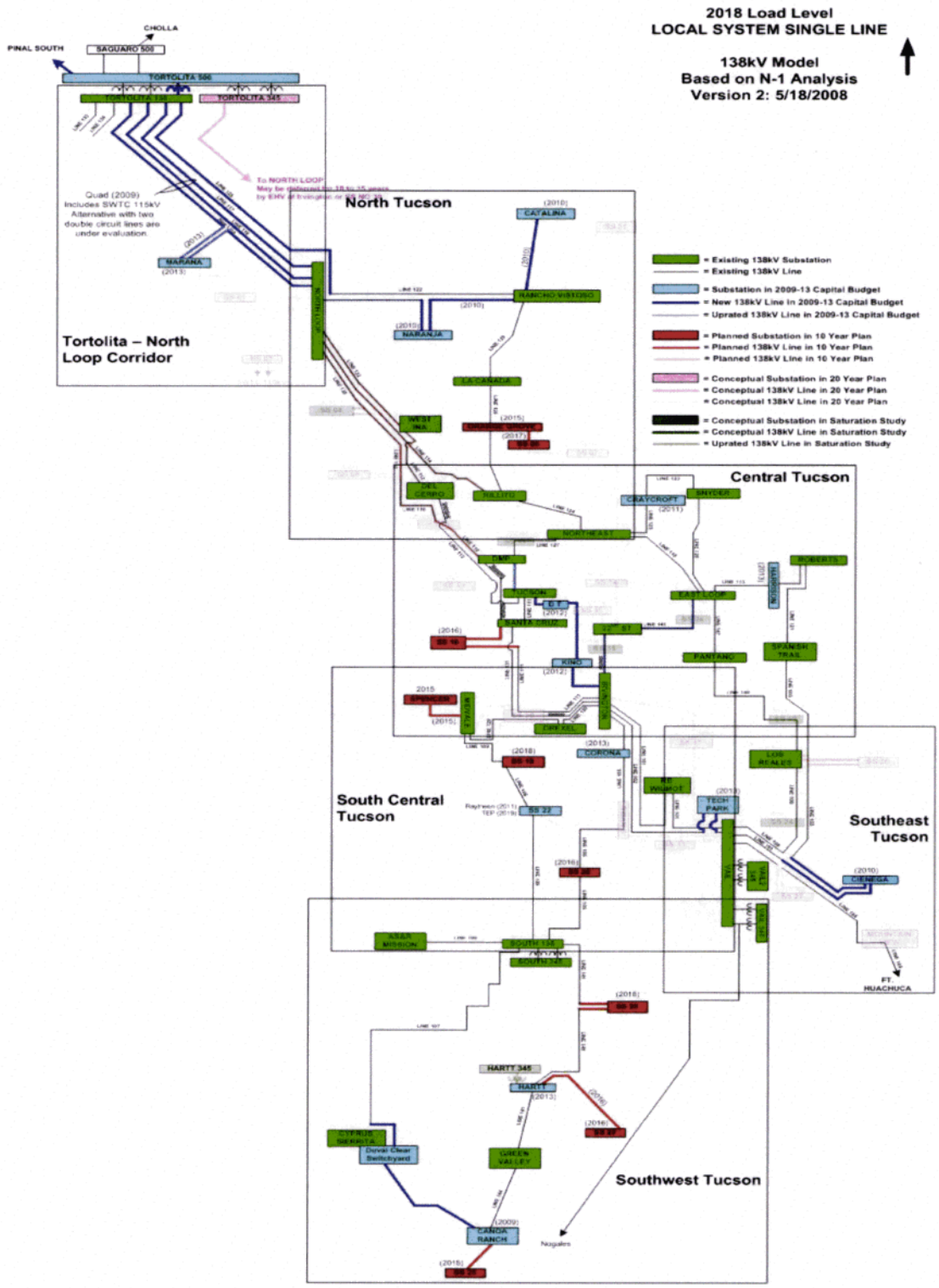

Figure 25. TEP 138kV Transmission Location Reference

= Existing 138kV Substation
= Existing 138kV Line

= Substation in 2009-13 Capital Budget
= New 138kV Line in 2009-13 Capital Budget
= Uprated 138kV Line in 2009-13 Capital Budget

= Planned Substation in 10 Year Plan
= Planned 138kV Line in 10 Year Plan
= Planned 138kV Line in 10 Year Plan

= Conceptual Substation in 20 Year Plan
= Conceptual 138kV Line in 20 Year Plan
= Conceptual 138kV Line in 20 Year Plan

= Conceptual Substation in Saturation Study
= Conceptual 138kV Line in Saturation Study
= Uprated 138kV Line in Saturation Study

Figure 26. Legend for 138kV Alternative Projects Single Line Diagrams

The following descriptions help to provide a basis for the five and ten year planning effort, leading to well thought out five year capital budget and ten year transmission plans. Among the insights gained through the SATS study is the conclusion that increasing the capacity of existing 138kV transmission facilities from the three existing EHV delivery points (Tortolita, Vail and South Loop) should be a high priority. The TEP five year capital budget and ten year plan therefore will recommend staged reconductoring or uprate projects emanating from Tortolita, Vail and South Loop.

Referring to the Legend in Figure 26, each of the figures describing the following alternative 138kV projects shows those designated as "Existing", "2009-13 Capital Budget" and "Planned in 10 Year Plan" in normal type. Those designated "Conceptual in the "20 Year Plan" and "Saturation Study" as shown subdued. This helps to visualize ten year planning horizon projects in the context of potential ultimate build-out.

Tortolita – North Loop Corridor: The bulk of the work, shown in Figure 27, in the Tortolita – North Loop corridor is expected to be completed by 2010. The main project consists of three TEP 138kV circuits and one SWTC 115kV circuit on new "Quad" structures. The existing Line 125 will also terminate at the North Loop substation in 2010. Future plans, possibly beyond ten years, are for Line 125 to terminate at the Rancho Vistoso substation, when a related project results in a new connection between North Loop and Rancho Vistoso through a new Naranja substation. Refer to description under North Tucson – Option 1 and 2. Also note that actual project in-service dates may be changed during the five year capital budget development process. For example, the in-service date for the Marana substation and the tap to the new line may be delayed to 2014 based on local development data that became available after the SATS analysis was completed.

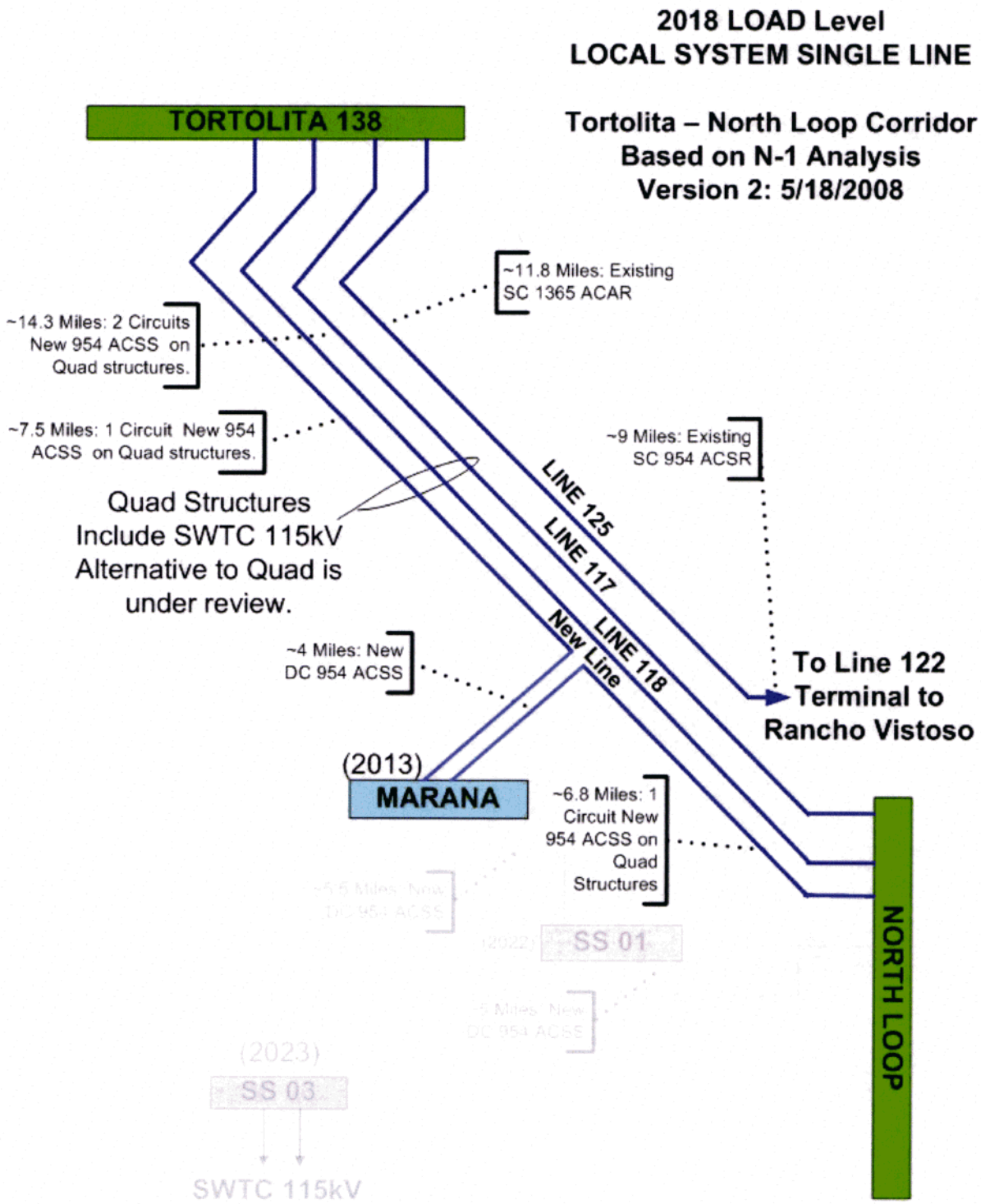

Figure 27. Tortolita – North Loop 138kV Corridor

North Tucson – Option 1 and Option 2: The Naranja substation is under investigation in either of the North Tucson options for the post-five year capital budget time frame. The current plan for 2010 indicates there will only be one 138kV line from North Loop to Rancho Vistoso. Staging evolution of upgrades in the Tortolita – North Loop Corridor such that a connection from Tortolita to Rancho Vistoso is deferred, also defers line upgrades from Rancho Vistoso to La Canada. Moreover, this allows the Naranja substation to be delayed until it is needed to serve local distribution load. The Naranja substation would otherwise have to be advanced to free up an existing 46kV line that is insulated for 138kV to allow the configuration shown in Figures 28 and 29.

The key feature of North Tucson – Option 1 is that the 138kV lines running south out of the North Loop substation are envisioned to be reconductored using advanced high temperature conductor. The advantage of doing so is the ability to utilize the existing triple circuit structures and avoid permitting and relatively high cost associated with a new North Loop to Rillito 138kV line as shown in Figure 29. North Tucson – Option 2.

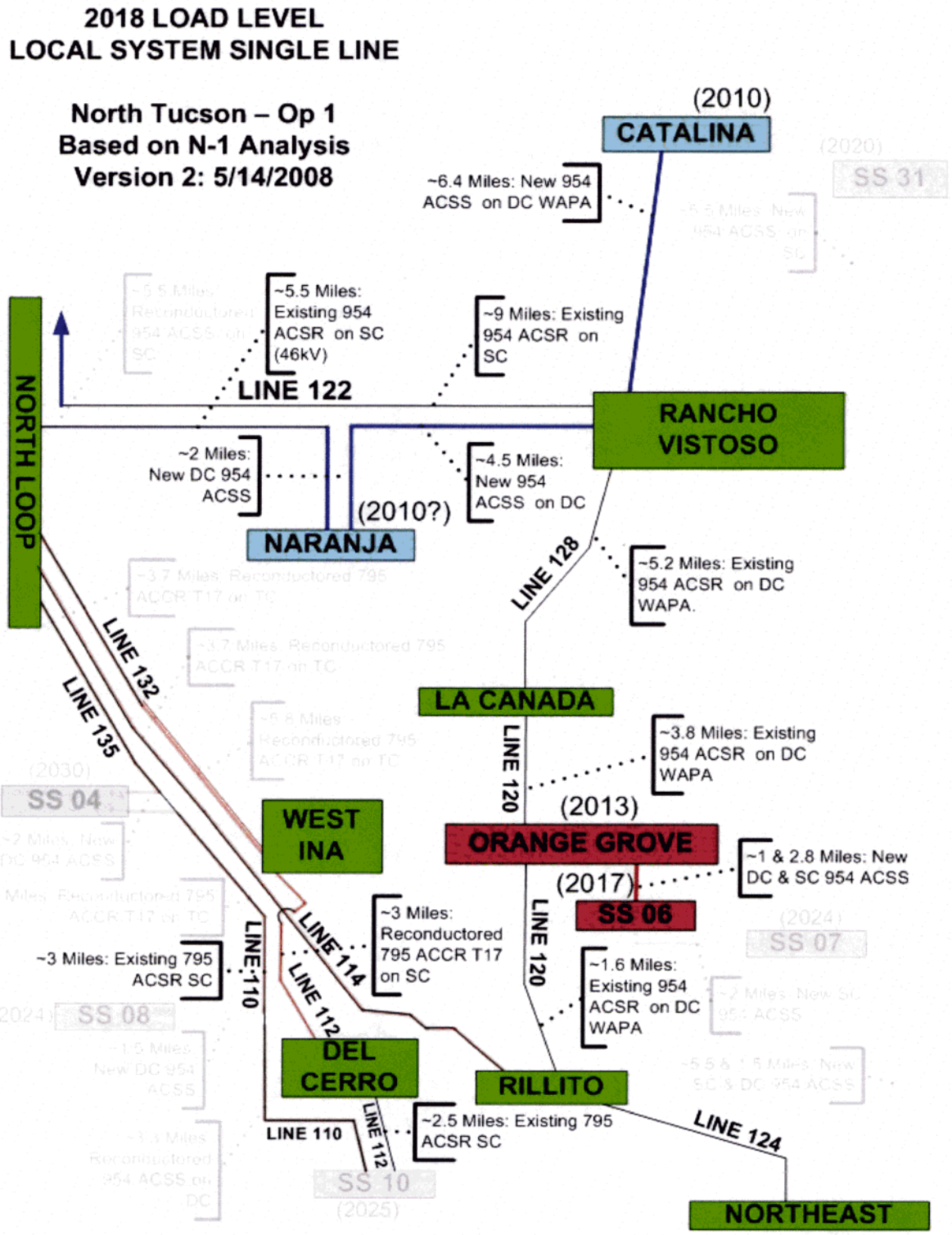

Figure 28. North Tucson – Option 1

A new 138kV line, such as North Loop to Rillito, that occupies a sensitive corridor could preclude the ability to site, permit and construct a future EHV line as envisioned in Strategy A. Thus a critical component needed for long term planning flexibility would be lost. In other words, reconductoring helps to maintain planning flexibility by minimizing construction of new facilities in a critical corridor, thereby improving the likelihood of siting a new EHV line in the event higher than anticipated load growth materializes in the future.

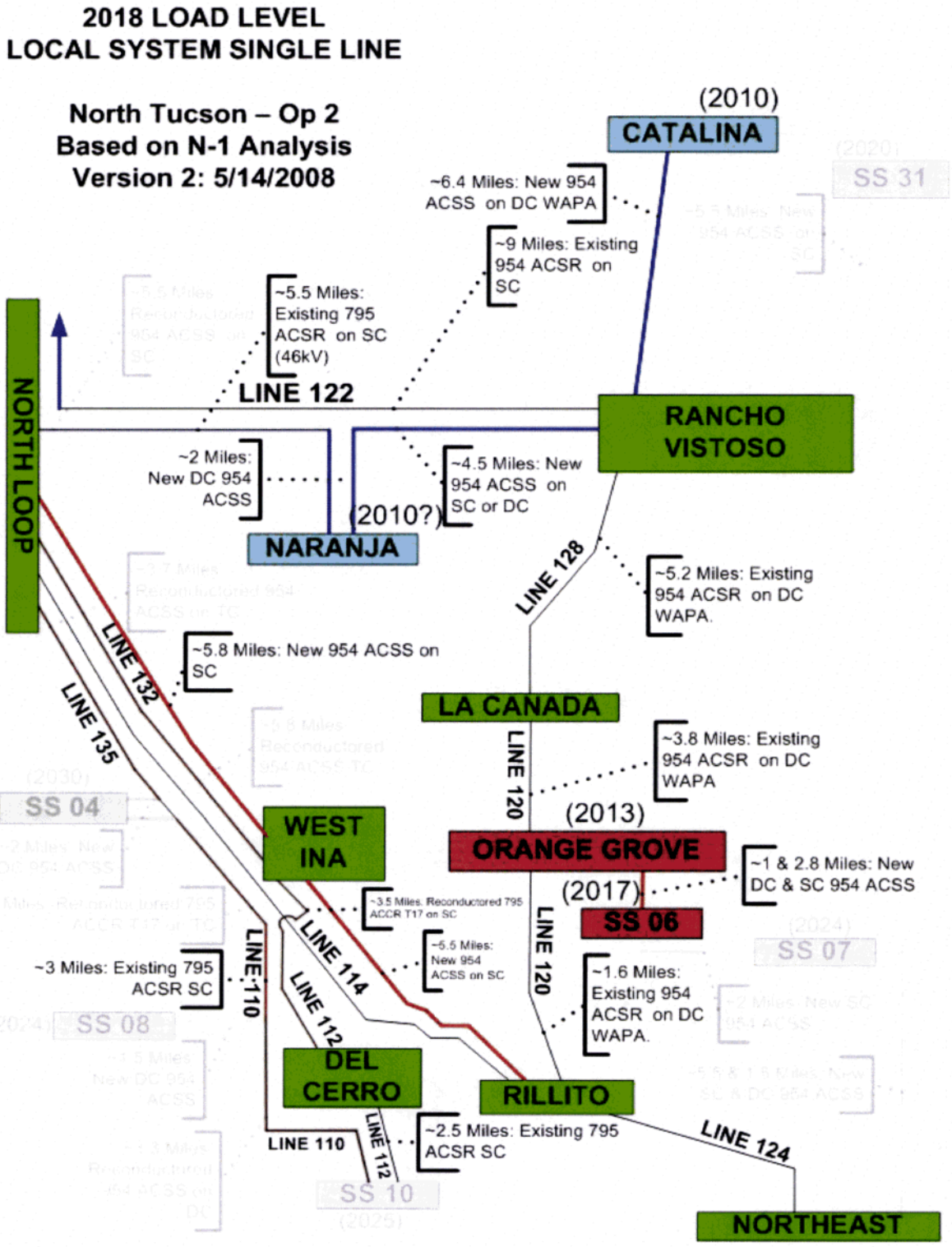

Figure 29. North Tucson – Option 2

Other long term considerations, such as the potential for load growth in areas where there is no existing transmission infrastructure should be taken into account. For instance, SS 06 and SS 07 could ultimately be served by a new 138kV line interconnecting the Orange Grove and Northeast substations. This new line would provide system benefits by introducing a parallel path between Rillito and Northeast. The value of this line would have to be weighed against the associated permitting effort and total cost. In either case, it makes sense to pursue a new line to serve SS 06 within the ten year planning horizon, and eventually SS 07 assuming development actually occurs in that area.

Central Tucson Area – Option 1 Through Option 5: The following five options consist of alternative 138kV local transmission system configurations that take advantage of opportunities provided by having a reasonable sense of the number and relative location of potential new substations that would eventually be needed at build-out. The Central Tucson Area is critical as it makes up a large portion of TEP's load center which interfaces with the primary interconnections from Tortolita (through North Loop), and Vail.

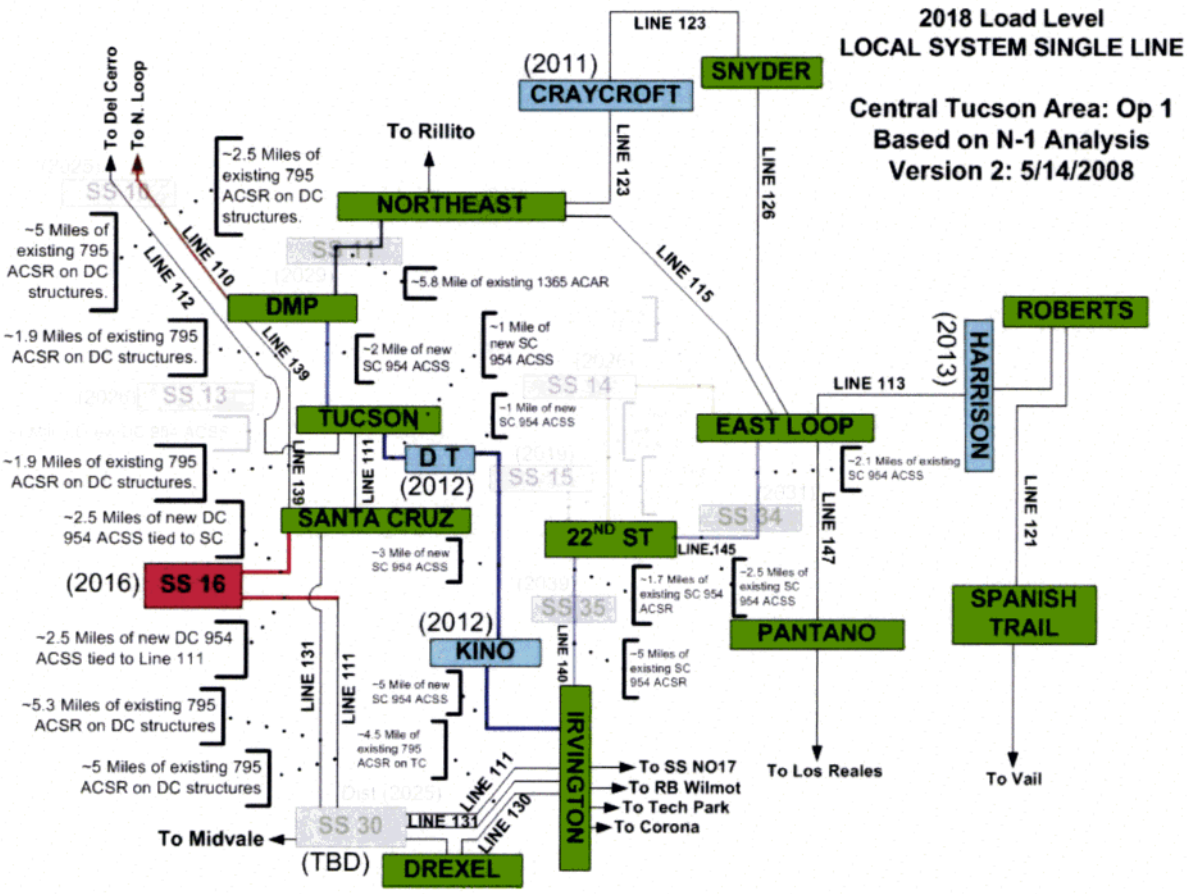

Figure 30. Central Tucson Area – Option 1

New lines, such as Irvington – Kino – D T (Downtown) – Tucson 138kV are shown in blue. This particular line shows up in all five options because it creates a new path from the strong source at Irvington into the load center. Part of the justification is that new substations may be supplied from this new line. Otherwise taps would have to be made to existing lines, which would in turn become more heavily loaded. Plus the cost of these taps could be contributed toward the new line. Therefore the new line provides multiple benefits by enhancing system transfer capacity as well as interconnecting new load serving substations.

Evaluation of the five Central Tucson Area options facilitated critical thinking and discussion among transmission and distribution system designers. For example, the proposal for the Downtown substation is being reconsidered in view of increasing

physical congestion as development becomes more concentrated in the business area of Tucson. The result is alternatives to eliminate the Downtown substation by expanding the Tucson substation using Gas Insulated Substation (GIS) technology and relocating and enlarging the proposed Kino substation are under investigation.

Uprate of the Irvington to Twenty Second Street to East Loop 139kV line was also common to all options. This project will consist of reconductoring with some structure rebuilding to increase the capacity needed to maintain reliable service to the portion of the TEP local area network east of the Davis-Monthan Air Force Base. This project will be addressed in the TEP five year capital budget. Longer term benefits of increasing the capacity of this line includes the ability to supply new load as shown by SS 34 and SS 35, when and if development occurs.

Additional facilities, looking at the twenty year planning horizon, would involve constructing new 138kV lines to integrate SS 14 and SS 15 as development continues just east of the downtown area. Options include opening new paths from Twenty Second Street to the Tucson substation (Options 1 – 5) and Twenty Second Street to the East Loop (Options 1, 4 and 5) or Northeast (Options 2 and 3) substations. All of these options strengthen and increase the 138kV system transfer capability needed to serve increasing load.

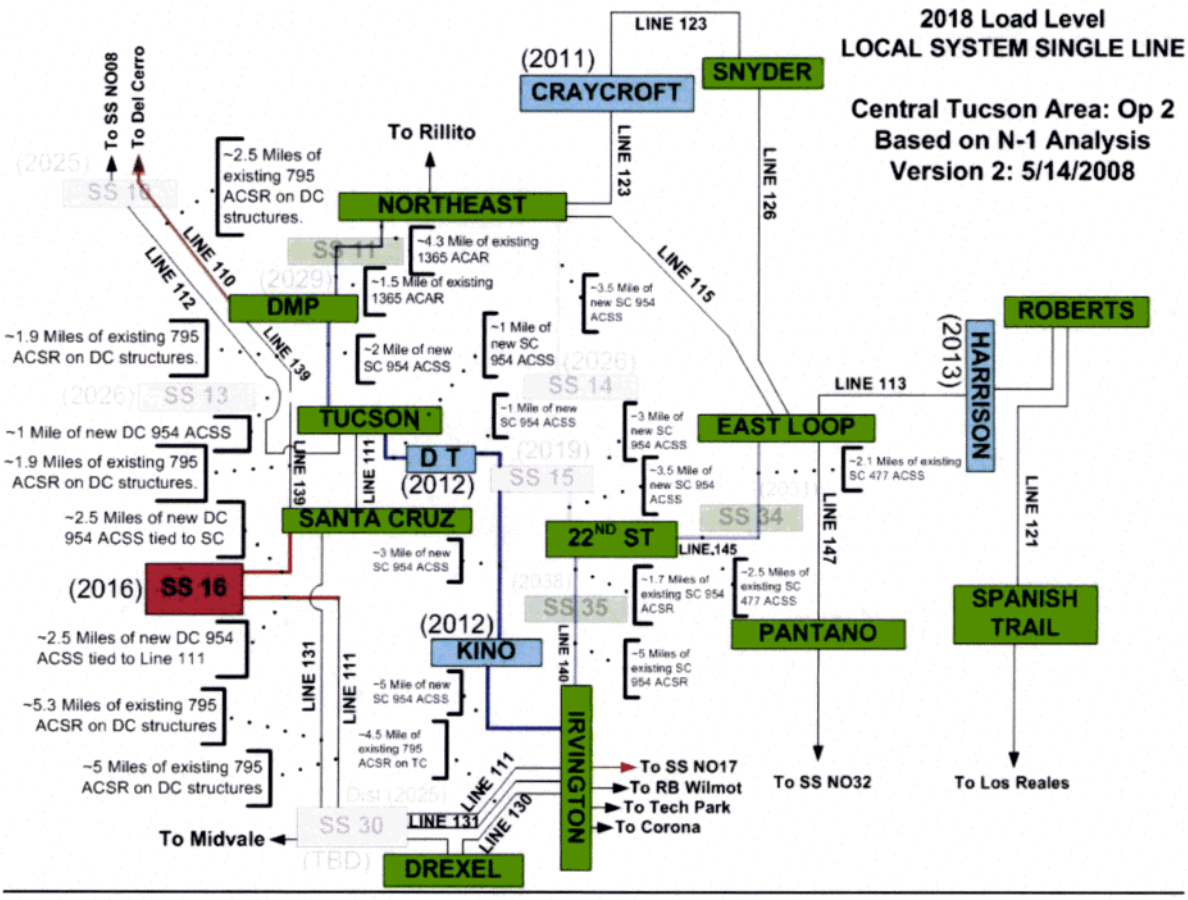

Figure 31. Central Tucson Area – Option 2

Anticipated economic development east of the Santa Cruz River would be met by the addition of new load serving substations including SS 16 within ten years, and SS 10 and SS 13 within twenty years. These substations would be sited relatively close to the WESTERN 115kV corridor. TEP's options for interconnecting these substations assumed the WESTERN corridor would be preserved for higher voltage transmission to maintain flexibility for the SATS planning area. Therefore, SS 16 and SS 13 were modeled as double circuit taps to existing TEP lines.

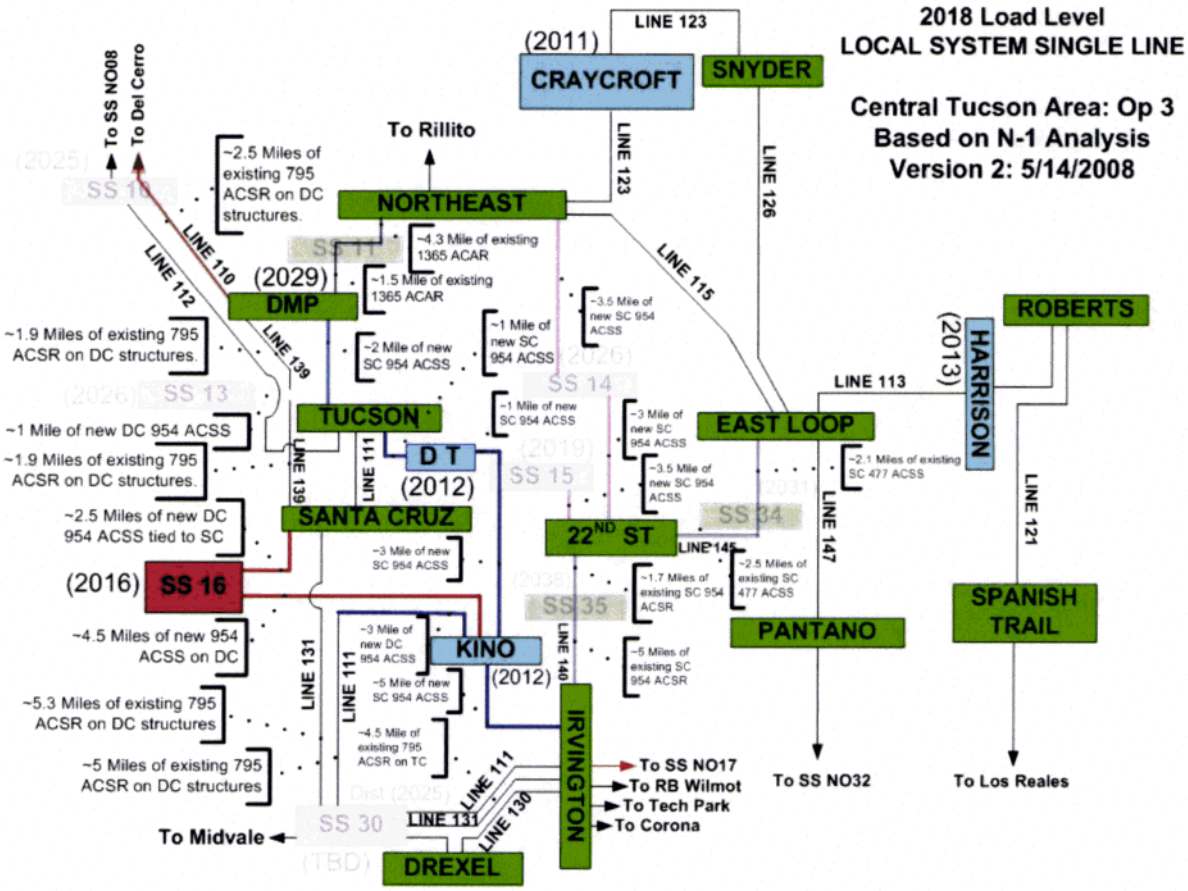

Figure 32. Central Tucson Area – Option 3

Alternatives to SS 16 tapping the Irvington to Santa Cruz line as in Options 1, 2 and 5 are shown in Options 3 and 4. The latter are less likely due to concerns over the ability to site east to west oriented lines extending from approximate location of the Kino substation. Hence the SS 16 interconnection configuration shown in Options 1 and 2 is preferred. Further analysis based on land and environmental considerations will be needed to make the decision regarding SS 16.

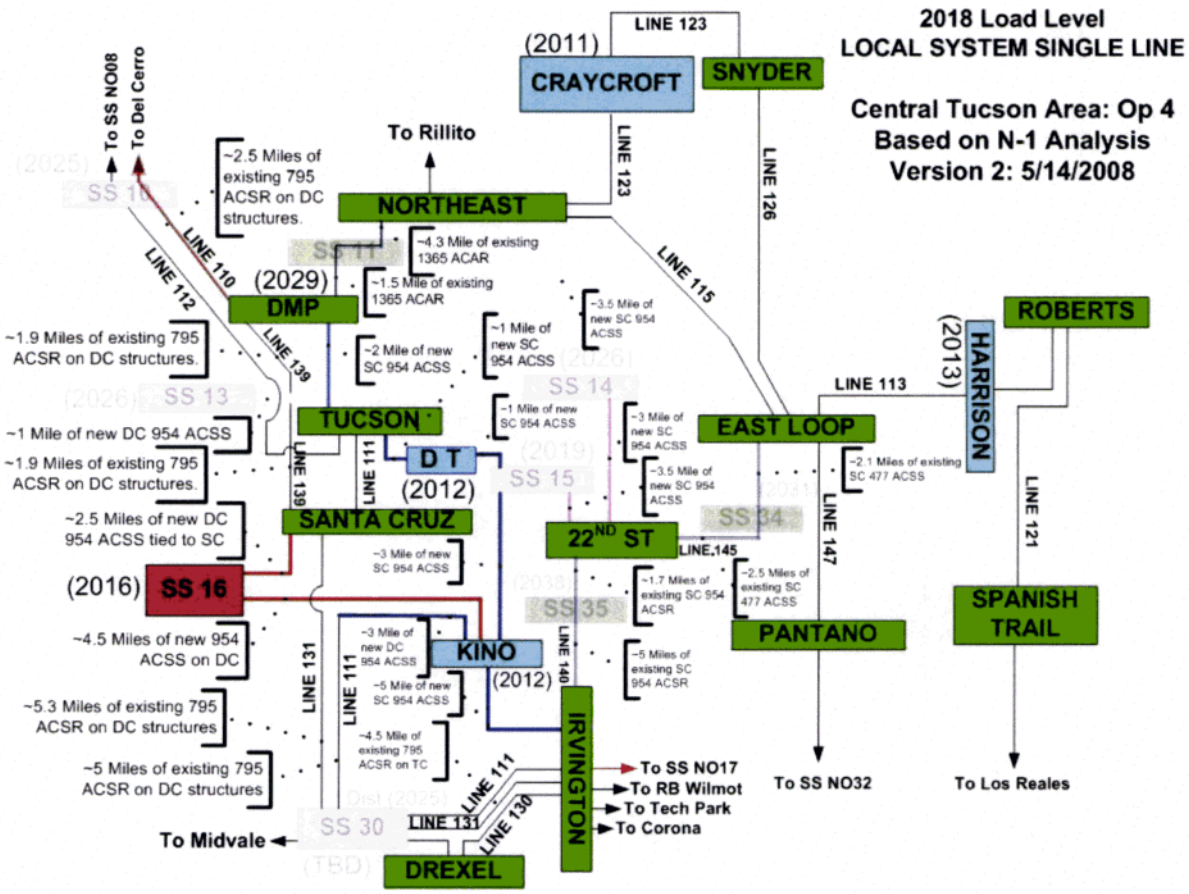

Figure 33. Central Tucson Area – Option 4

Option 5 was created to provide an alternative that could maximize transfer capability from Irvington into the downtown area. This would only be needed if downtown area load density were to increase significantly over applicable jurisdictions' existing land use plans.

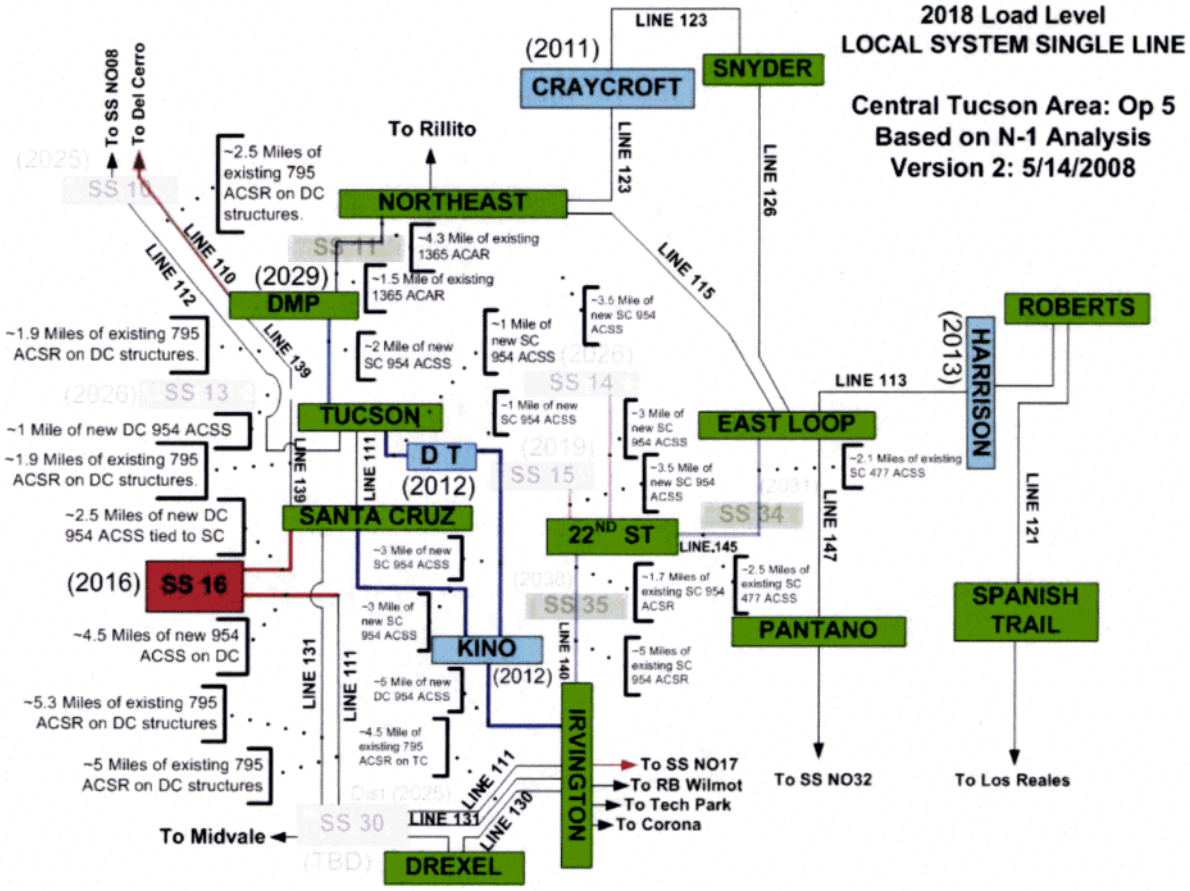

Figure 34. Central Tucson Area – Option 5

The SS 30 site was qualitatively evaluated in three potential contexts. One was as the site of a new EHV substation as defined by Strategies A, B, C and D. This is also a potential location for a new distribution substation. However other distribution substation locations will be pursued to limit the scale of any proposal involving EHV. The third alternative entailed construction of a 138kV switching station. The switching station however, did not offer sufficient benefits, such as deferral of elimination of new or uprated 138kV lines to justify the investment.

South Central Tucson Area: The South Central Tucson Area, shown in Figures 35 and 36, was investigated to identify viable alternatives to add new load serving substation capacity as well as options to ensure adequate 138kV system load serving capability. All new load serving substations may be sited close to existing 138kV lines except SS

17. Two distinctly different alternatives were proposed to supply SS 17. The first, shown in Figure 35 creates a new 138kV line from Vail to Irvington along the border of the Davis-Monthan Air Force Base.

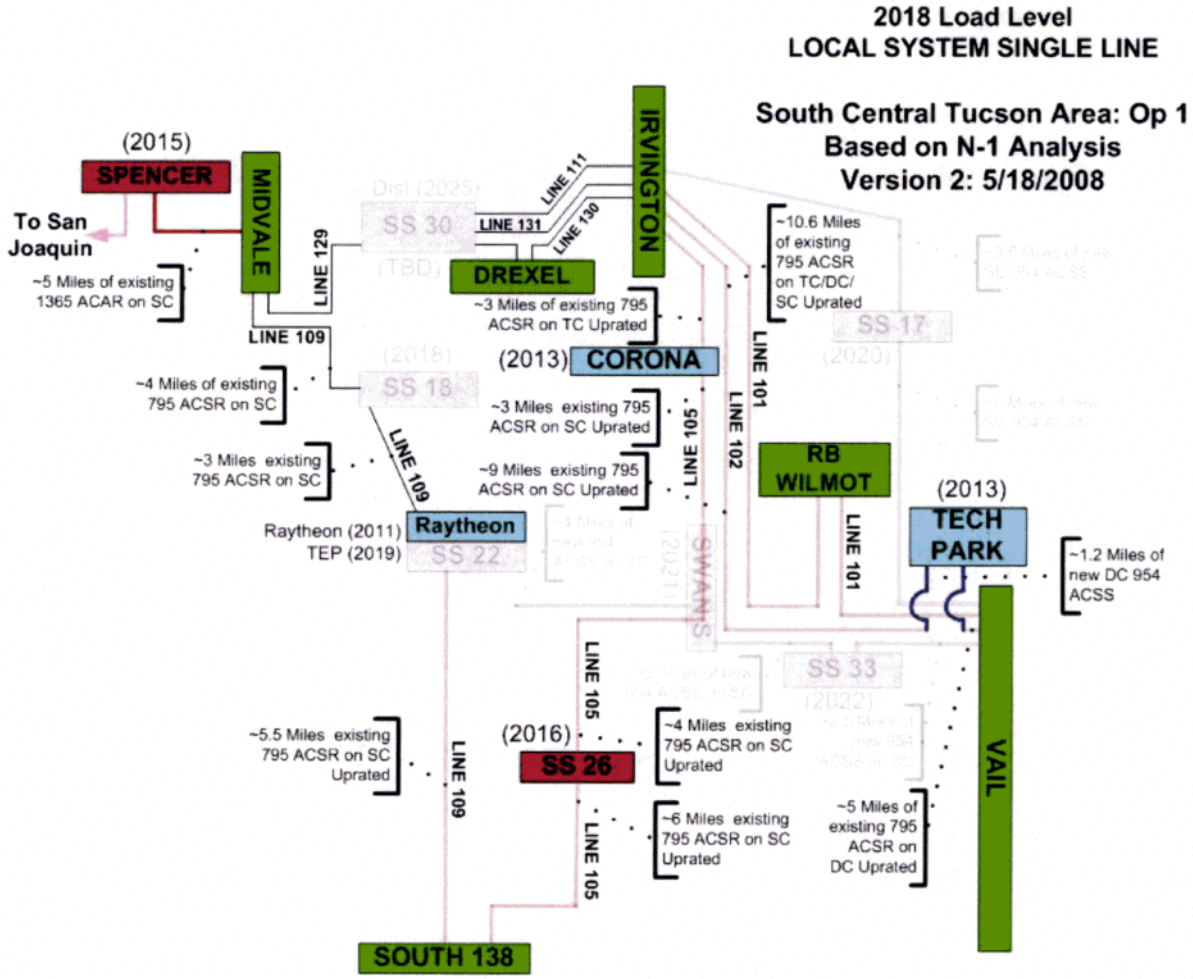

Figure 35. South Central Tucson Area – Option 1

The advantage of the new line is that it relieves loading on the existing 138kV lines between Vail and Irvington, and thereby increases capability into the load center. The problem is that the existing Vail to Irvington lines will need to be uprated within the five to ten year planning horizon. Hence there is less cost saving to justify the investment in a new 138kV line.

The main disadvantage of the new line is that, similar to the proposal for a new North

Loop to Rillito line, it would make siting a new Vail to Irvington 345kV line as contemplated in Strategy F much more challenging.

The second option shown in Figure 36 would supply SS 17 by a tap connected to Vail and RB Wilmot. Since these rather extensive facilities would be constructed primarily to supply the new substation, other options, including relocating the substation or supplying the growing load from distribution out of other substations should be investigated.

Both options envision uprating existing lines from Vail to Irvington, from South Loop to Irvington and from South Loop to Midvale. These uprates provide system benefits as well as connectivity to future load serving substations.

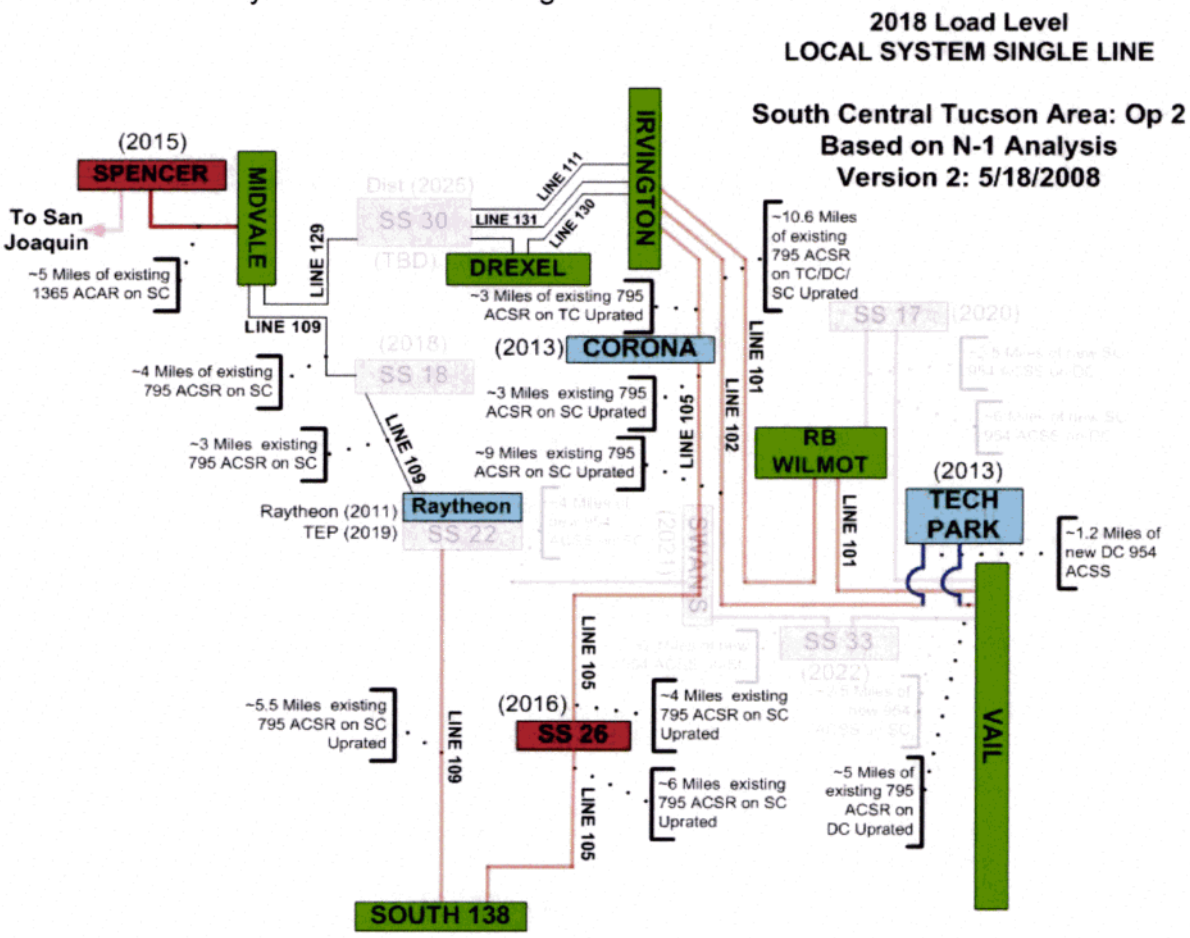

Figure 36. South Central Tucson Area – Option 2

Southeast Tucson Area: Four options were developed to try to address the complexities of serving the system east of the Davis-Monthan Air Force Base (D-M). The base is relatively large, with airspace restrictions, and therefore transmission facilities may not be constructed across the facility or within the flight paths. The impact is that line outages on either side result in overloads of lines transmitting power from the opposite side. For example, loss of Lines 108 and 103 from Vail shown in Figure 37 results in all of the system east of D-M being supplied from the East Loop substation (Refer to Figure 34 for the East Loop configuration). This outage therefore overloads the lines from Vail to Irvington, from Irvington to Twenty Second Street to East Loop, and from East Loop to Pantano to Los Reales.

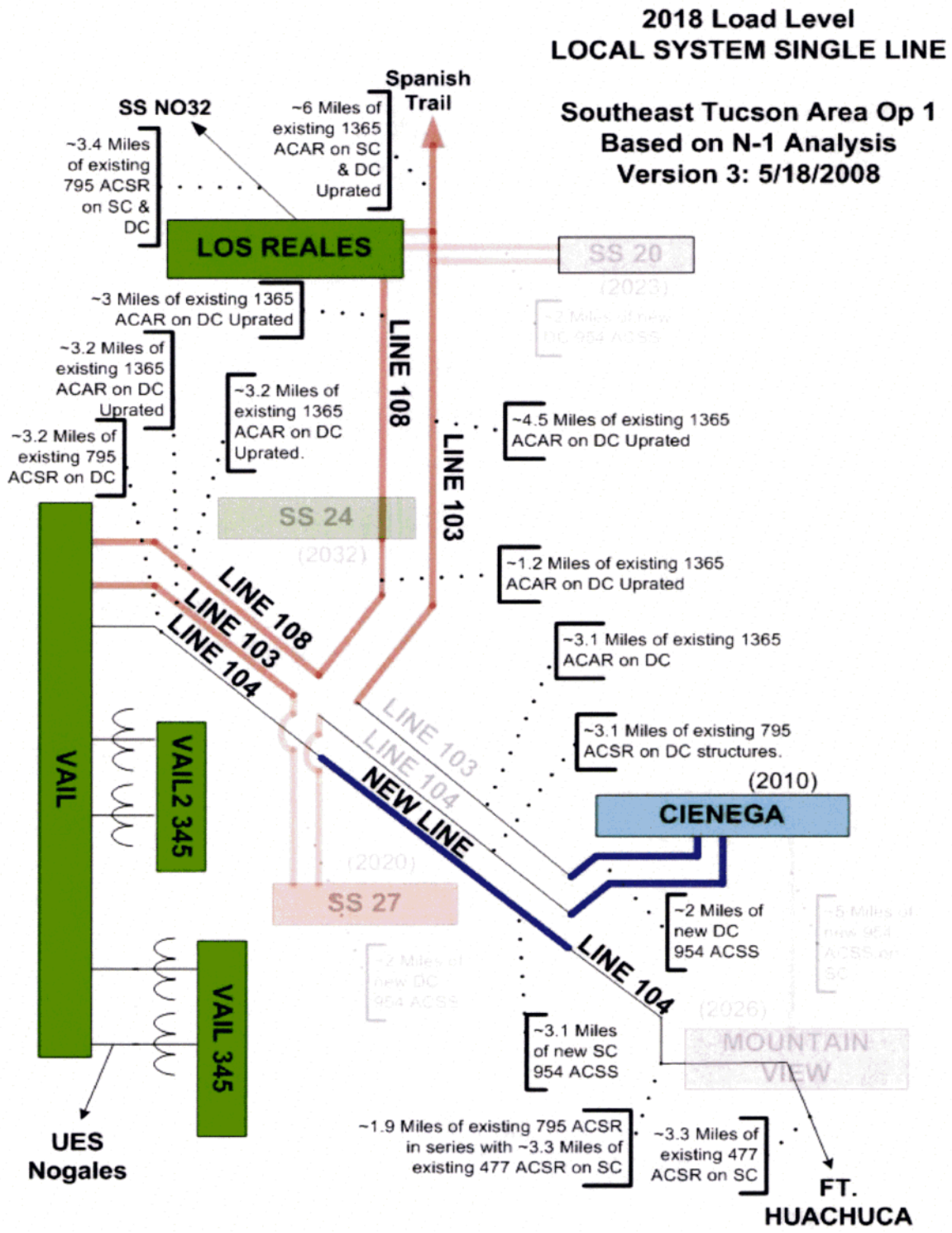

Figure 37. Southeast Tucson – Option 1

On the other hand, outage of the lines from Vail to Irvington or Irvington to Twenty Second Street cause stress on the lines from Vail to Cienega and Vail to Los Reales. There are also instances wherein the entire path from Vail to Los Reales to Pantano to East Loop becomes stressed. Additionally, a bus differential operation on the Irvington main-and-transfer bus will result in heavier overloading on the same 138kV lines between Vail and East Loop.

Variations of interconnecting new substations such as SS 27 to Line 104 versus Line 103 were considered and shown in Figures 37 and 38.

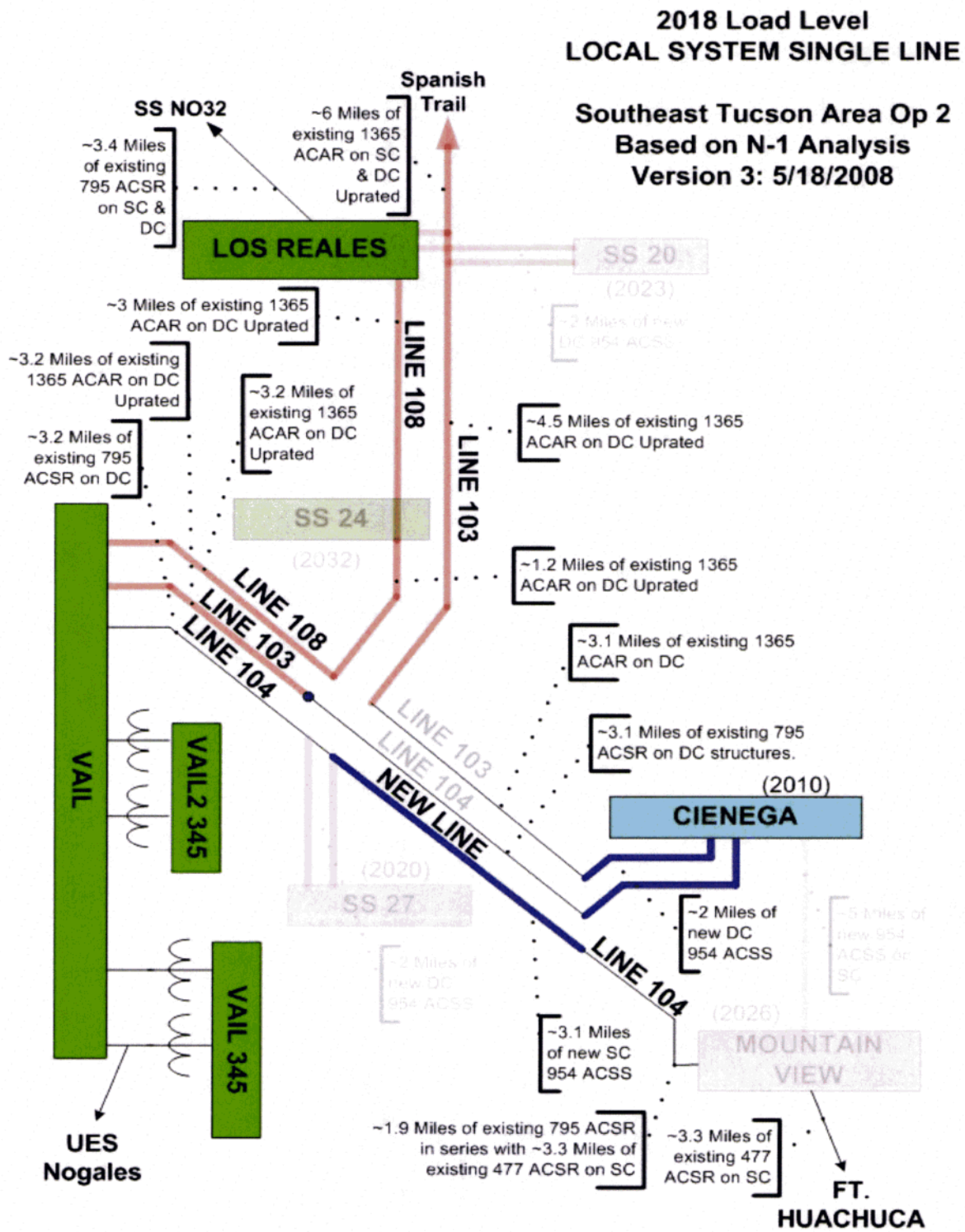

Figure 38. Southeast Tucson – Option 2

The actual configuration for SS 27, and SS 20 will be determined when time for need for either appears eminent within the ten year planning horizon.

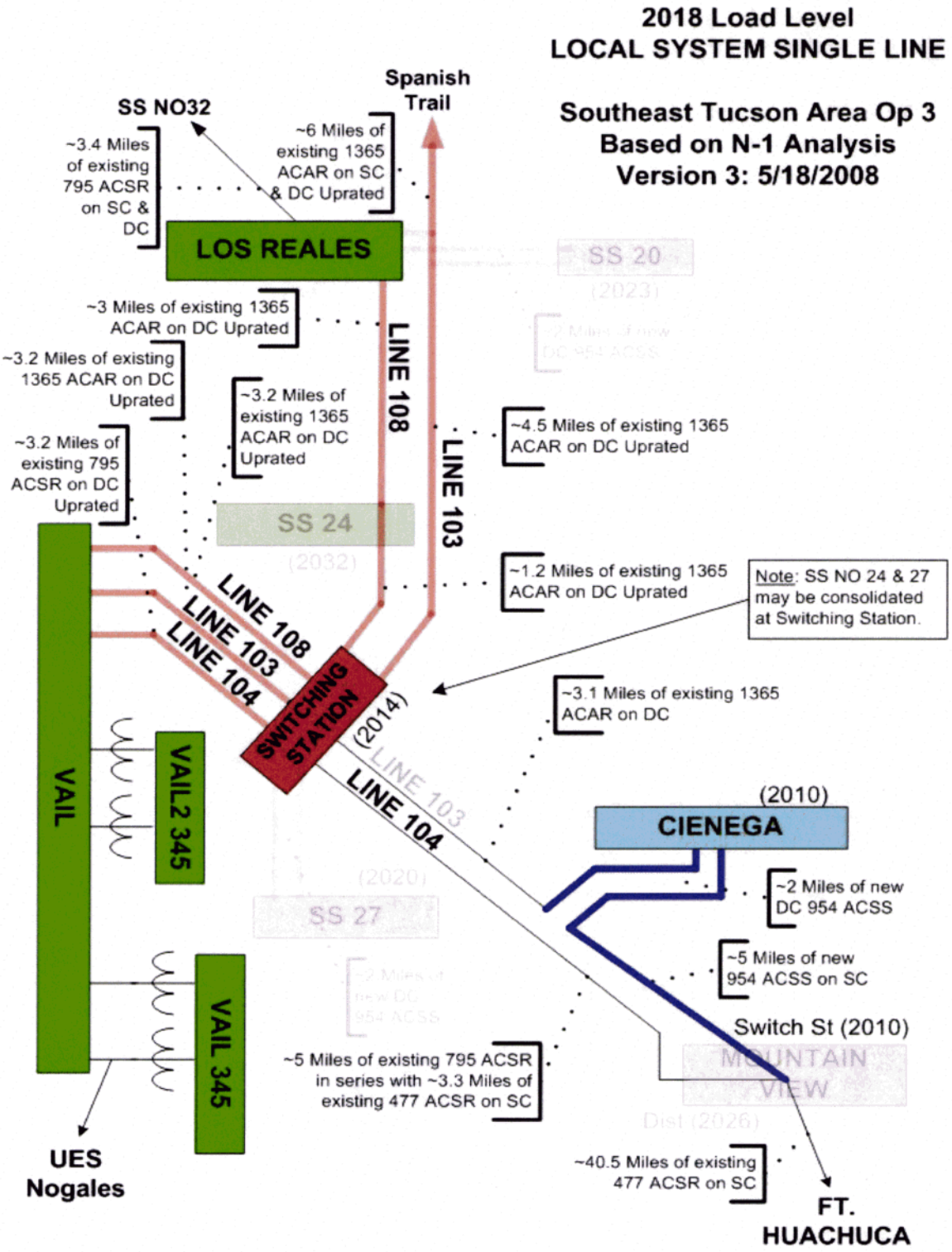

Figure 39. Southeast Tucson – Option 3

A 138kV switching station at the location where Lines 103 and 108 turn north from the line going to Ft. Huachuca was considered in an attempt to defer or possibly eliminate new line construction or uprates. While the switching station does not appear to be justified, it may make sense to consolidate SS 24 and SS 27 at that location.

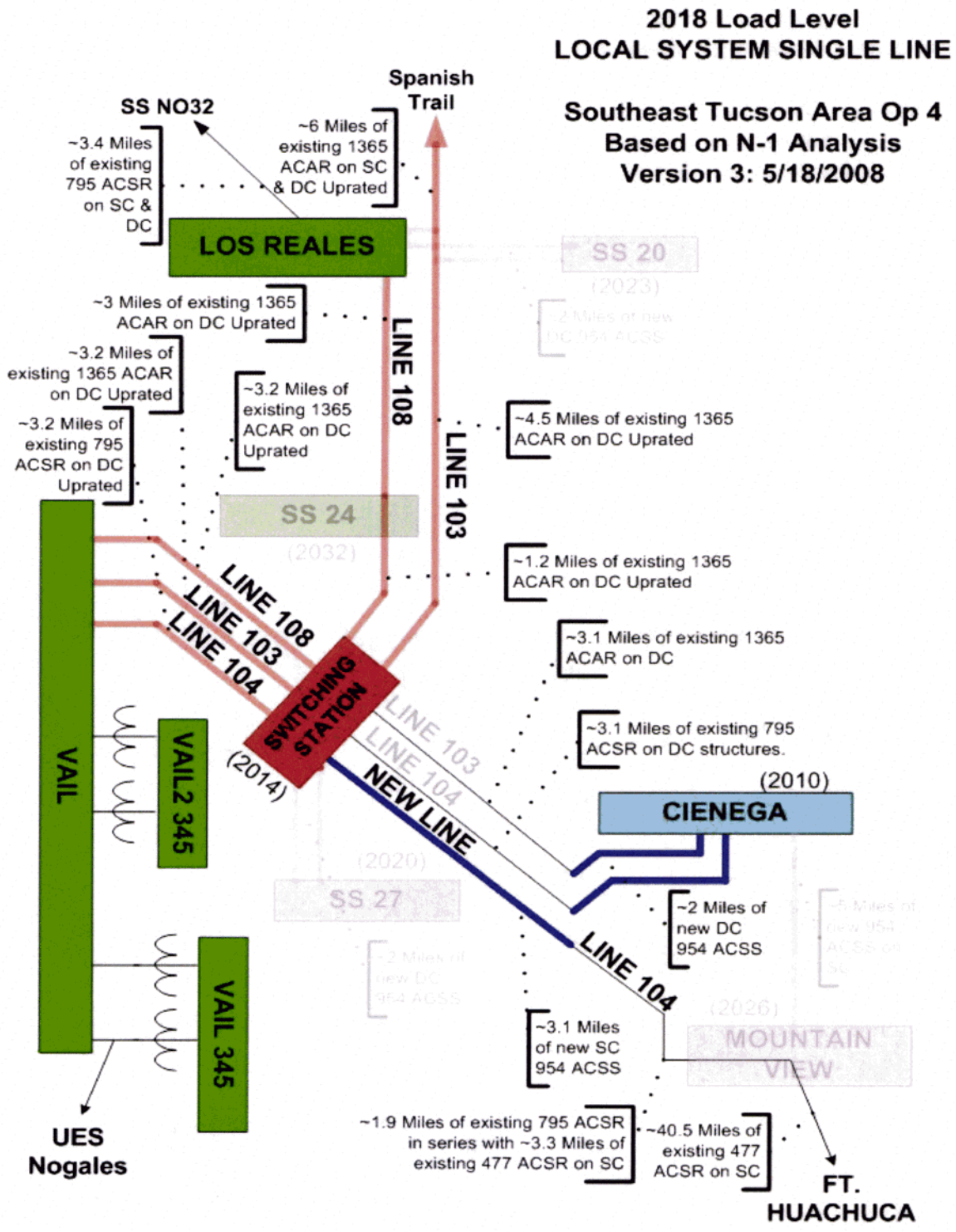

Figure 40. Southeast Tucson – Option 4

The Mountain View substation is located in an area that local jurisdictions are considering as conservation areas. As such, efforts to pursue this site or the Cienega to Mountain View corridor will be put on hold pending confirmation of land use plans for this area.

Southwest Tucson Area: This area will require in depth study to identify joint projects that may offer mutual benefits among TEP, Trico and SWTC.

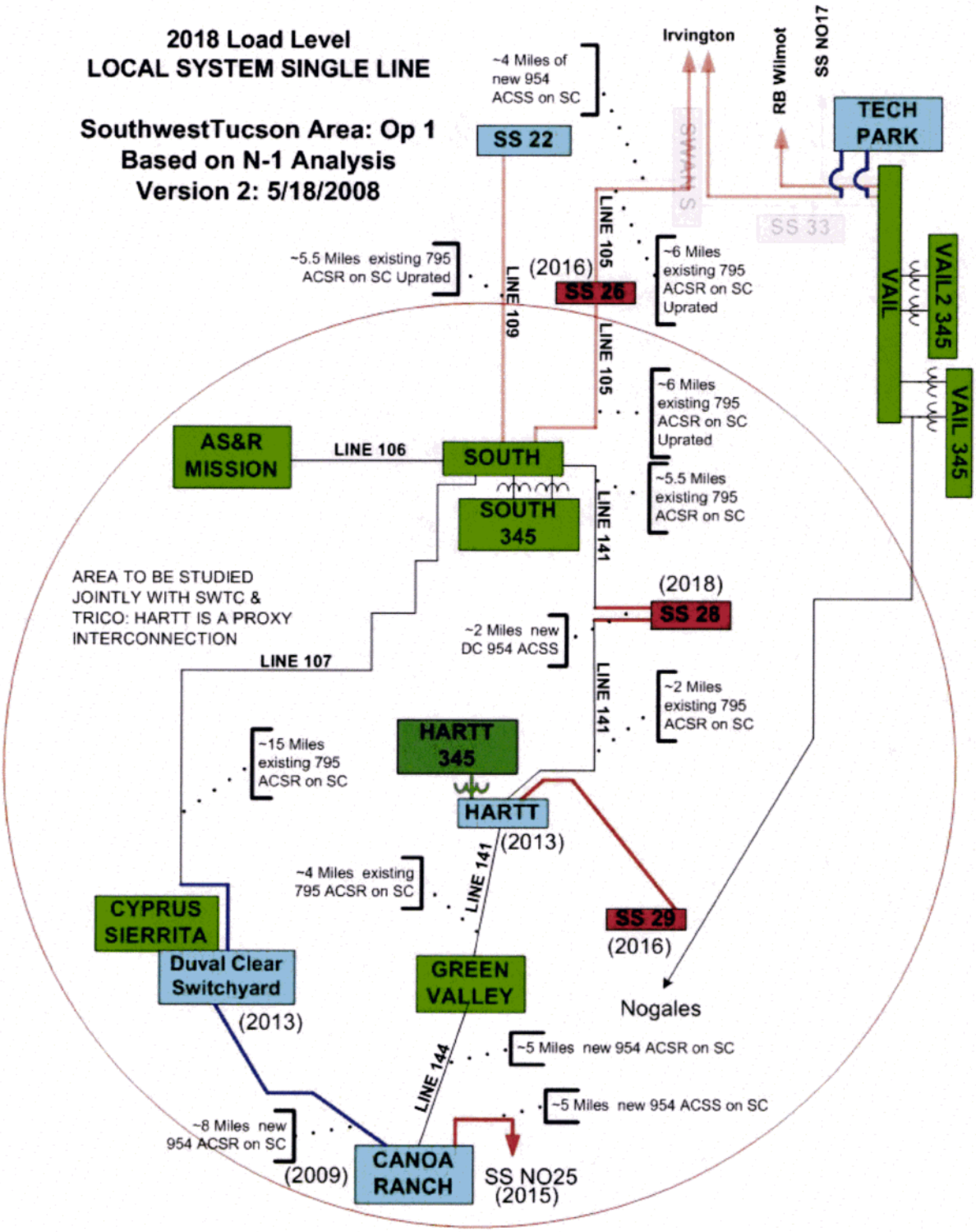

Figure 41. Southwest Tucson

An explanation of this area is included in Section 15.2 South of Tucson.

20.1. SWTC Strategies

SWTC does not anticipate sponsoring any major EHV projects, therefore its EHV strategies were dependent on other SATS participants EHV strategies. Since TEP was the only SATS participant with EHV strategies SWTC reviewed the TEP alternatives to evaluate which ones, if any, would be beneficial to the SWTC system. SWTC's backbone transmission system is composed of 230-kV and 115-kV lines originating from the Apache Switchyard (all generation at Apache is owned by Arizona Electric Power Cooperative). While WESTERN, APS, and TEP own transmission facilities in Cochise County, SWTC only has direct transmission interconnections in southeastern Arizona with TEP and WESTERN

This interconnected transmission system is used by TEP, Trico, SSVEC, GCEC, DVEC, APS, Safford, Thatcher, Avra Valley Irrigation and Drainage District, Silverbell Irrigation and Drainage District, and Morenci Water and Electric to serve their customers.

Fort Huachuca, a TEP retail customer in Cochise County, has expressed a need to improve service reliability. TEP, SSVEC, Fort Huachuca, and SWTC have discussed mutually beneficial projects, such as the Buffalo Soldier/Ft. Huachuca project, which may provide the additional backup service Fort Huachuca is seeking. Back up service, if interconnection facilities are constructed, would be provided under TEP contractual rights on the SWTC transmission system.

SWTC, SSVEC and APS have worked together to develop the present emergency tie at McNeal for backup service. Discussions between these companies to provide for joint participation in mutually beneficial projects continue today such as the future emergency ties at Hereford/Palominas.

For the purposes of the SATS work, SWTC divided its system into three areas. The three areas of the system and their selected strategies for the area were evaluated under normal conditions and line outage conditions with SWTC's "Internal Planning Criteria and Facility Ratings". Utilizing GE's PSLF power flow study program, the analysis was conducted with extrapolated 2027 (2008 to 2027, 20 year transmission

plan) summer peak loads for SSVEC, GCEC, DVEC, APS, Safford, Thatcher and Morenci since saturated loads were unavailable. TEP and Trico peak loads were at a saturated state. Due to the close proximity of the Trico and TEP loads a saturated scenario was beneficial. The transmission strategies for the Graham, the Cochise, and the Marana areas are the following.

20.1.1. Figure 42 Graham Area shows the DVEC, GCEC, SSVEC, Safford and Thatcher load areas that are identified by the study as the Graham Area. New facilities proposed in the next six years are identified in red. They are Hackberry to Thatcher, Hackberry to San Jose and Stewart to Mortenson 69kV lines and a second transformer at the Redtail Substation. The Graham Area load was 445 MW for the "2027 analysis". This analysis found that additional facilities and upgrades were needed to support the loads. Among the issues was the need to upgrade some 69kV lines, additional shunt capacitors and transformers. Table 21 shows the needed facilities.

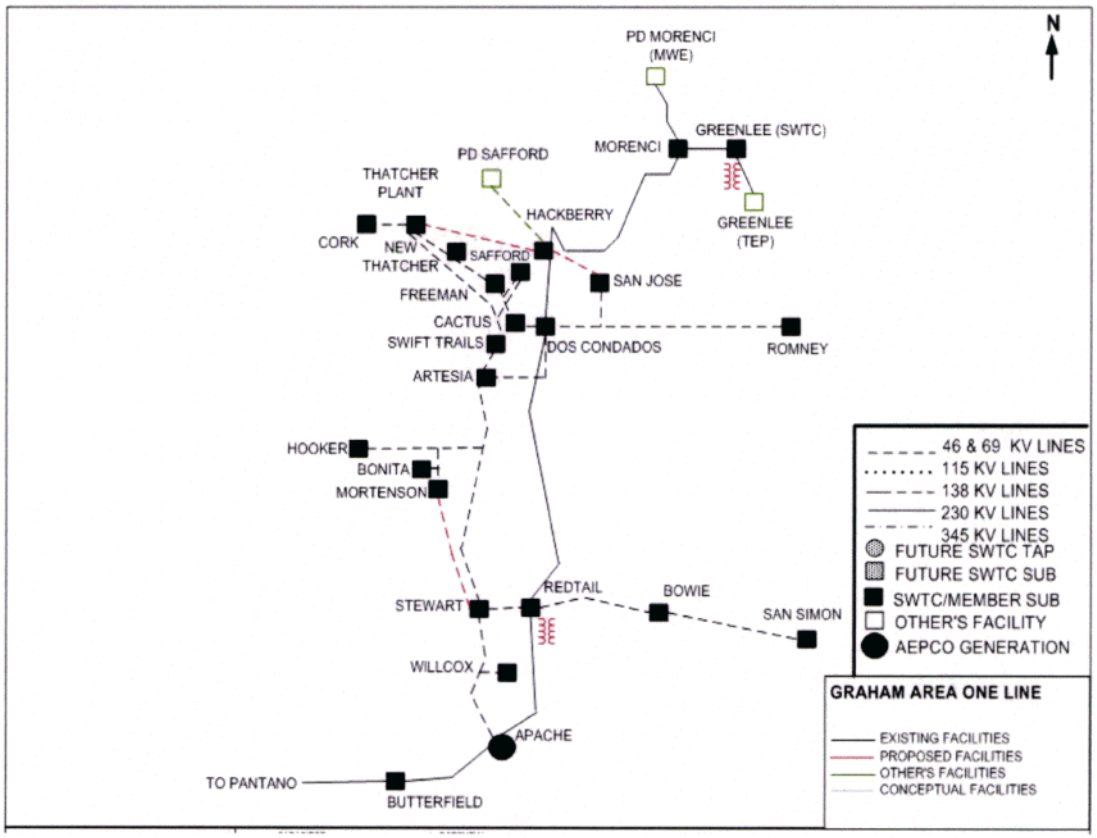

Figure 42. Graham Area

20.1.2. Figure 43 Cochise Area shows the SSVEC load areas that are identified by the study as the Cochise Area. The 69kV facilities under consideration by SSVEC, which are identified in red on the following figure, are:

- Stewart to Mortenson
- Sloan to Mescal[21]
- Sloan to Cottonwood
- Cottonwood to Guindani
- Guindani to St. David
- Kartchner to Sonoita
- Ramsey to Hereford
- Hereford to Palominas[22]

[21] The proposed Sloan 230kV substation would be constructed, owned and operated by SWTC. Any connections to this substation will be dependent upon the timing of its construction.

- A second transformer at Redtail Substation

Potential 69kV substations:

- Sunsites
- Cottonwood
- Guindani
- Sonoita
- Sierra Vista II
- Hereford

Figure 43 includes a SWTC placeholder (the 230kV line from Pantano to San Rafael, shown in blue) to address a reliability issue (loss of the San Rafael source) in the near-term. . A subcommittee of SATS was formed to determine the most economical, feasible and robust alternative. The result of that work is found in Section 22. Cochise County Study of this report. A long-term solution is given here for the Cochise Area load of 428 MW for the "2027 analysis". Additional facilities and upgrades were needed. They include 230kV line additions, 69kV line upgrades, additional shunt capacitors and transformers. Table 22 shows the needed facilities.

[22] This line will provide a second emergency tie with the APS system. As with the existing McNeal tie, this line will normally be open and require operator intervention to close in emergency situations.

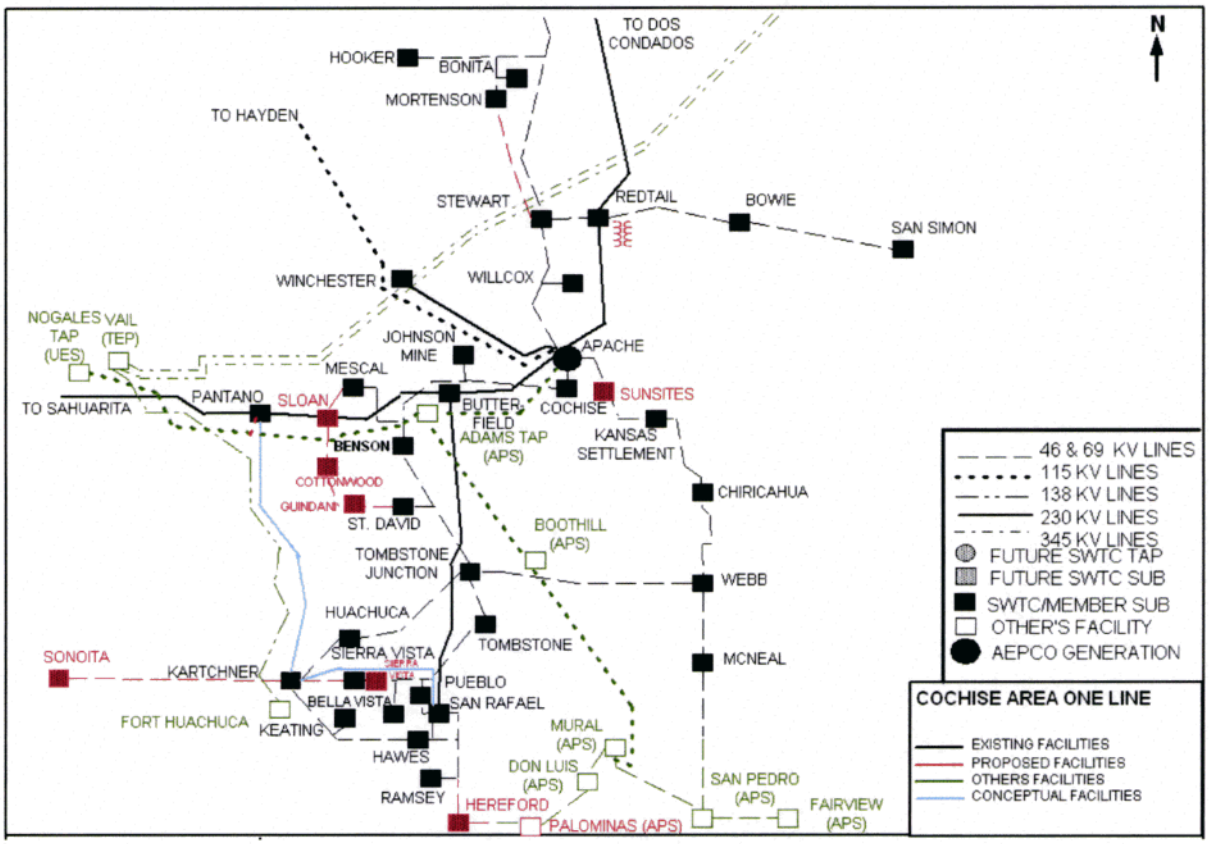

Figure 43. Cochise Area

20.1.3. Figure 44 Marana (Pima and Pinal County) Area shows the load areas that are identified by the study as the Marana Area. New facilities proposed in the next few years are identified in red. Conceptual facilities under study are identified in blue.

Proposed new substations include New Tucson 230/24.5kV, Adonis 115/24.9kV, and San Joaquin 115/24.9kV.

New 115kV lines include: (1) Saguaro to Adonis to Rattlesnake; (2) looping the existing CAP Sandario to Brawley line into SWTC Sandario Substation (SWTC Sandario to CAP Sandario and SWTC Sandario to Brawley); (3) looping the Rattlesnake to CAP Sandario line into the Picture Rocks Substation; (4) looping the Brawley to San Xavier line into San Joaquin Substation (Brawley to San Joaquin and San Joaquin to San Xavier); and (5)

constructing a new SWTC Valencia to Black Mountain line.

Additional new 115kV line projects also proposed include: (1) looping the existing SWTC Apache to Hayden line into the APS San Manuel Substation (Apache to San Manuel and San Manuel to Hayden); and (2) looping WESTERNs' 115kV line at both of the existing SWTC Marana and Pantano Substations.

Proposed 230kV line projects include construction to loop the Pantano to Sahuarita 230kV line into New Tucson. Potential new 69kV lines include Saddlebrooke Ranch to Willow Springs and Saddlebrooke Ranch to Eagle Crest.

Conceptual projects also include the potential CS1 project. This project includes: 345/230/115kV Substation; CS1 to Three Points line; additional conductor to loop the Pinal West to South 345kV line into CS1; and a new 230kV line from CS1 to Bicknell.

The Marana and surrounding Tucson Area load was 6,946 MW for the "saturated state analysis". TEP's load was modeled at 5,668 MW and Trico load was modeled as 1,247[23] MW. CAP's load was modeled at 31 MW. Additional facilities and upgrades examined include 500kV, 345kV or 230kV line additions, 115kV and 69kV line upgrades, additional shunt capacitors and transformers and new substations. Table 22 shows the needed facilities.

Of the three areas that SWTC provides transmission service in this study, the Marana Area was the one that SWTC saw potential benefits from the TEP EHV strategies. There were possible joint projects identified such as 345kV facilities connecting Tortolita, Marana, Three Points and Bicknell. A 345kV line between North Loop and Tortolita has possible benefits to SWTC. These EHV strategies will need to be thoroughly evaluated both

[23] Trico has revised its saturated load to 1465 MW. The new saturated load may be studied in the 2009 SATS Study Plan.

economically and technically.

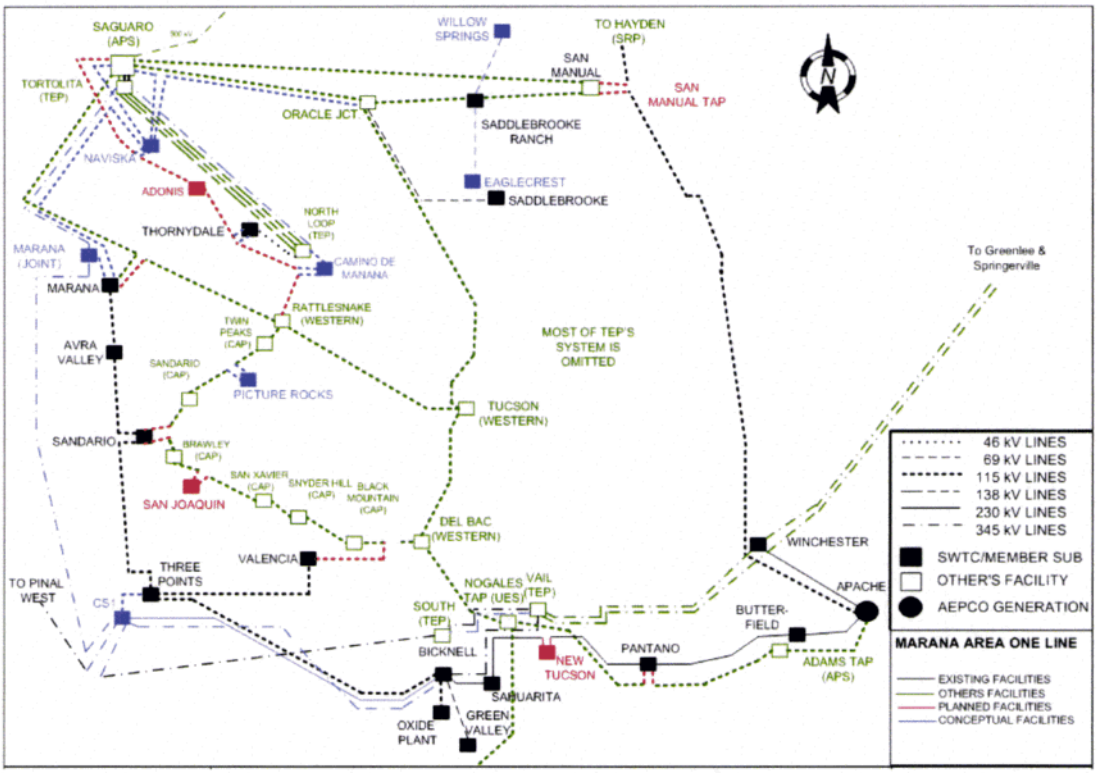

Figure 44. Marana Area

Facility	Line Upgrades and Additions	Shunt Capacitor	Transformer
Hackberry 230kV		50 MVAr	
Cork 69kV		30 MVAr	
Cork Tap to Cork 69kV line	11.2 miles		
Dos Condados Substation			230/69kV 50 MVA
Greenlee Substation			345/230kV 200MVA
Redtail to Stewart 69kV line	4.5 miles		

Facility	Line Upgrades and Additions	Shunt Capacitor	Transformer
Bonita to Bonita Tap to Mortenson 69kV line	3.0 miles		
Bonita 69kV		30 MVAr	
Kartchner to Sierra Vista 69kV line	1.3 miles		
San Rafael 69kV		36 MVAr	
Pantano to Kartchner 230kV line	36 miles		
Kartchner to San Rafael 230kV line (new line)	8 miles		
Boothill Substation			115/20.8kV
San Pedro Substation			69/12.5kV
Mural Substation			115/69/12.5kV
Don Luis Substation			69/12.5kV
Thornydale Substation			115/24.5kV 50 MVA
Thornydale 115kV		76.8 MVAr	
Adonis Substation			115/24.5kV 50 MVA
Naviska Substation			115/24.5kV 50 MVA
Saguaro to Naviska 115kV line (new 2nd circuit)	5.0 miles		
Oracle to Saddlebrooke 69kV line	12.5 miles		
Saddlebrooke Ranch Substation			115/24.5kV 50 MVA
Saddlebrooke Ranch Substation			3 @115/69kV 50 MVA
Saddlebrooke Ranch 115kV		76.8 MVAr	
Marana Substation			3 @115/24.9kV 50 MVA
Avra Valley Substation			115/24.5kV 50 MVA
Sandario Substation			2 @115/24.9kV 50 MVA
San Joaquin Substation			2 @115/24.9kV 50 MVA
San Joaquin 115kV		76.8 MVAr	
Valencia Substation			2 @115/24.9kV 50 MVA
Valencia 115kV		57.6 MVAr	
CS 4 Substation (Hodgers)			2 @115/24.9kV 50 MVA
CS 4 115kV (Hodgers)		38.4 MVAr	
Bicknell 115kV		38.4 MVAr	
Bicknell Substation			115/69kV 50 MVA

Facility	Line Upgrades and Additions	Shunt Capacitor	Transformer
Sahuarita Substation			2 @115/24.9kV 50 MVA
New Tucson Substation			115/24.5kV 50 MVA
New Tucson 230kV		100 MVAr	
New Joint Marana Substation			345/115kV 672 MVA
Tortolita to Marana 345kV line (new)	12.0 miles		
Marana to CS 1 345kV line (new)	29.0 miles		
Saguaro to Marana	12.0 miles		
Saguaro to Oracle	19.0 miles		
Coolidge to Valley Farms	5.2 miles		
Marana to Rattlesnake	7.7 miles		
Three Points to Valencia	11.5 miles		
SWTC Sandario to Brawley	1.2 miles		
CAP Sandario to SWTC Sandario	4.2 miles		
Oracle to Saddlebrooke Ranch	3.5 miles		
Rattlesnake to Twin Peaks	0.5 mile		
Twin Peaks to CAP Sandario	7.7 miles		
Brawley to San Joaquin	7.6 miles		
Adams to Boothill	19.2 miles		
Saguaro to Naviska circuit 1	5.0 miles		
Saguaro to Naviska circuit 2	5.0 miles		
Winchester to Vail circuit 1	39.9 miles		
Winchester to Vail circuit 2	39.9 miles		
Redtail Substation			230/69kV 50 MVA
Bicknell Substation			230/115kV 100 MVA
Tortolita Substation			500/345kV 672 MVA
Winchester Substation			500/345kV 900 MVA

Table 22. SWTC[24] Facility Additions

[24] The additions were not at solely owned SWTC facilities. Ownership resided within participants of SATS. Listing of facilities, new additions and upgrades, provided information needed for the long-term planning study.

21. Findings from Power Flow Analyses

21.1. 2010 Case Analysis: The 2010 cases assume that only those upgrades that are presently funded through approved capital improvement plans or other projects that are otherwise considered highly likely candidates to be funded and constructed by 2010, are in place.

- CAP has requested an interconnection with the SWTC system before December 2010. The CAP system has five pumping substations located in the Marana and surrounding Tucson area of Arizona with a peaking load of 60 MW. The CAP system is fed by a 115kV radial system from WESTERN's Rattlesnake Substation. The interconnection of the SWTC and CAP facilities has value to both the CAP system and the SWTC transmission system. Currently CAP has non-firm service from WESTERN and will be requesting firm transmission service in December of 2010. The radial configuration of the CAP load has proved to be an issue in contingency analysis preformed by SWTC. The interconnections will loop both the CAP and SWTC systems creating a more reliable configuration. An alternative may be an Interconnection with TEP (which will require a 138/115kV transformer).

Benefits for the SWTC system to interconnecting with the CAP system includes improved system reliability. The proposed interconnections will provide SWTC an additional source for its existing 115kV system. Currently SWTC's 115kV system has two sources one at Marana and one at Bicknell. By creating this loop it will allow SWTC to take outages in order to upgrade the existing system. The loop will allow SWTC to grow and meet its member and other customer load requirements. Other alternatives that may prove to be more costly and less beneficial to both SWTC and its members include:

- Upgrade of WESTERN's existing system
- A 138/115kV interconnection with TEP
- Construction of new transmission or sub-transmission lines.

As discussed above, interconnection between CAP and SWTC proved to be

beneficial to both entities. Facilities will be jointly owned, operated and maintained. The looped configuration will add increased reliability to both CAP and SWTC systems. It is important to recognize that the final 2009-10 Construction Work Plan may vary significantly depending upon more current assessments of the state of the economy and other critical factors.

21.2. 2010 TEP Case Analysis

TEP upgrades consist of the addition of a new 500/345kV substation at Pinal West plus an SVC at Northeast to provide voltage stability to the TEP 138kV network, both in 2008. The 138kV transmission projects in Figure 45 show the system additions that were presented for inclusion in the TEP preliminary 2009-13 Capital Budget. It is important to recognize that the final 2009-13 Capital Budget may vary significantly depending upon more current assessments of the state of the economy and other critical factors.

During the process of preparing the five year capital budget, TEP determined that existing 138kV facilities between Tortolita and North Loop would limit load serving capability from the relatively strong source at Tortolita. Therefore significant upgrades were proposed in the Tortolita to North Loop corridor. They were recommended because of relatively high load growth and the need to increase 138kV transfer capacity from Tortolita. These upgrades consisted of a series of projects staged over the three year period, 2008 – 2010:

- Prior to 2008 the Tortolita to North Loop and Tortolita to Rancho Vistoso corridor consisted of two 138kV lines between Tortolita and North Loop plus one additional circuit between Tortolita and Rancho Vistoso

- In 2008 the existing Tortolita to Rancho Vistoso line was modified to create a third Tortolita to North Loop circuit and a North Loop to Rancho Vistoso line.

- In 2010, the plan is to reconstruct the two original Tortolita to North Loop lines on a "quad" circuit pole-line, including an additional 138kV circuit and a 115kV circuit for SWTC to this structure. For the TEP system, this results in three Tortolita to North Loop circuits on the "quad" pole-line and one Tortolita to North Loop 138kV line as a single circuit pole-line.

Additional 138kV projects modeled in the 2010 case are listed below:

- Northeast 138kV Static VAR Compensator, 2008 – a detailed voltage stability study indicated the need for a -75/+200 MVAr SVC

- Del Cerro 138/13.8kV Substation, 2008 – a load serving substation served by tapping the existing West Ina-Tucson 138kV line.

- DMP-Tucson 138kV Circuit, 2010 – new 138kV transmission to mitigate a local instability condition under contingency conditions.

- Catalina, renamed the Sun City 138/13.8kV Substation, 2010 – a load serving substation served by a new 138kV transmission radial out of the existing Rancho Vistoso substation.

- Cienega 138/13.8kV Substation, 2010 – a load serving substation served by modifying the existing Vail-Spanish Trail and Vail-Fort Huachuca 138kV lines.

- Canoa Ranch 138/13.8kV Substation, 2009 – a load serving substation served by a new 138kV transmission radial out of the existing Green Valley substation.

- Kino 138/13.8kV Substation, 2012 (subsequently moved to 2014 during the 2009 capital budget process[25]) – a load serving substation served by tapping a new Irvington-Tucson 138kV line. Previously reviewed with a 2010 in-service date, this project was then deferred to 2012, and finally 2014.

These projects were modeled in cases beyond 2010, initially by TEP to prepare the five year capital budget, as well as all SATS cases.

[25] The analysis for SATS, and documented in this report does not reflect changes implemented during the 2008 five year capital budgeting process. However, the SATS analysis and results, as documented in this report provided the initial screening for the budget analysis.

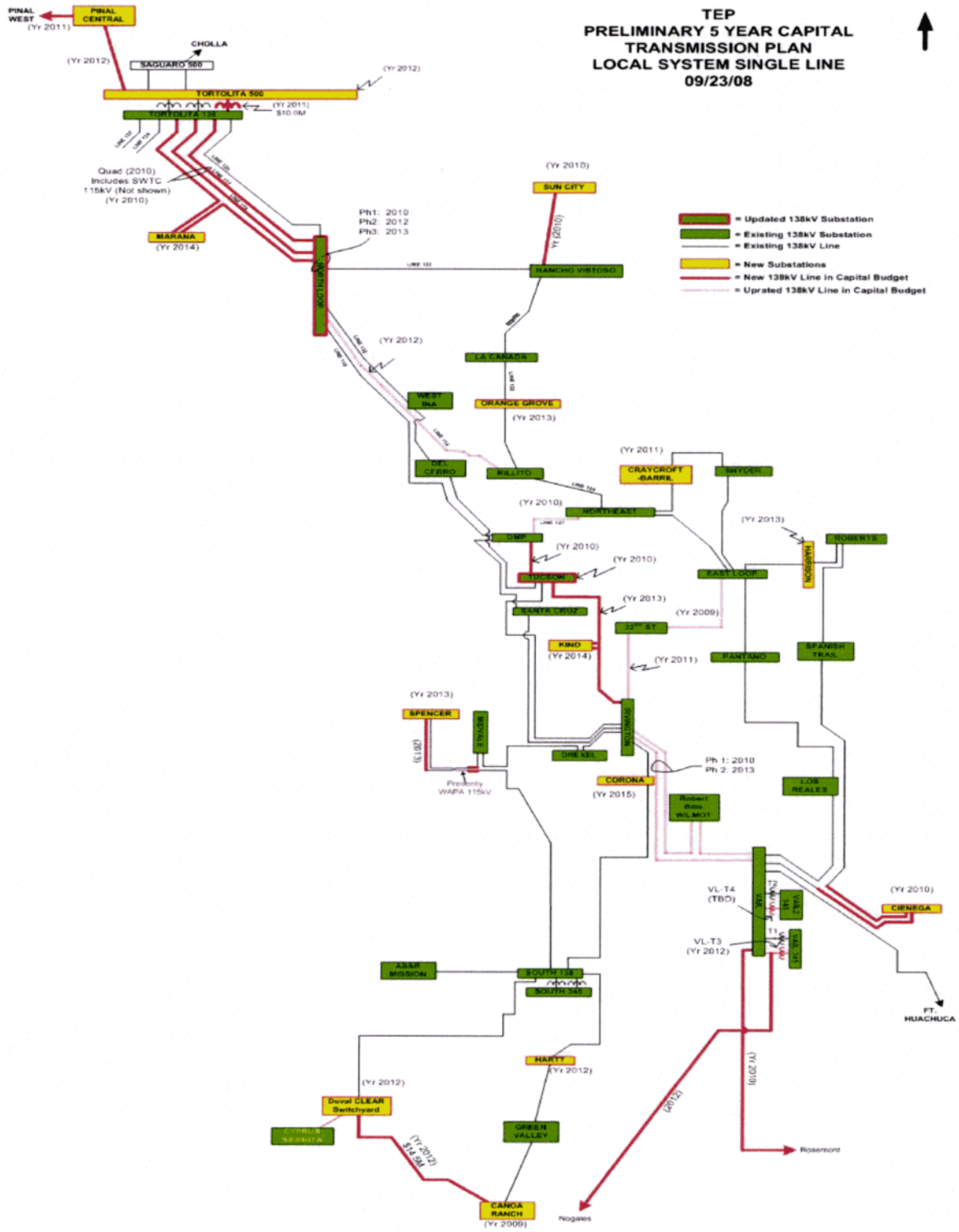

Figure 45. TEP 2009-2013 Preliminary Capital Projects

21.3. 2010 SWTC Case Analysis

2009-2010 Construction Work Plan (CWP) includes upgrades of SWTC's existing system as well as joint projects between SWTC and others.

Joint projects with CAP include the addition of two new substations, San Joaquin and Adonis, re-conductor of the existing Avra-Marana 115kV line and construction of a new 115kV line from Saguaro to Rattlesnake. Joint projects also include the SWTC and WESTERN construction of a new interconnection at the existing SWTC Pantano substation to the existing WESTERN 115kV line from Adams Tap to Nogales Tap.

The 115kV and 230kV projects in Figure 44, show the system additions that are described in the SWTC 2009-2010 CWP.

The joint projects between SWTC and CAP will improve reliability, as well as increase the capability of certain portions of the SWTC system by continuing to re-conductor older transmission lines. New delivery points were considered necessary due to the increasing loads within Southeast Arizona. The following describes the SWTC projects currently anticipated:

- Joint Projects related to the SWTC and CAP systems (2010)
    - Upgrade the SWTC Sandario substation
    - CAP system loop in at the SWTC Sandario substation
    - Construction of the San Joaquin substation
    - New 115kV line to loop the San Joaquin substation into the Brawley and San Xavier substation
    - New switchyard at SWTC Valencia substation
    - Construct a new 115kV line from the CAP line termination east of Black Mountain substation to the existing SWTC Valencia
    - New Saguaro to Rattlesnake 115kV line
    - New Adonis substation
    - Upgrade of the Rattlesnake substation
- New Tucson substation (2010) and loop in of SWTC existing 230kV line between Pantano and Sahuarita substations
- Marana to Avra Valley 115kV line upgrade to 1272 ACSR (2010)

Using the findings of the SATS 2010 base case SWTC has since modeled cases with these upgrades in order to prepare documentation for the 2009-2010 CWP.

WESTERN upgrades consist of the list of projects Shown in Table 23. WESTERN SATS Construction Potential.

Western SATS Construction Potential	
Project	**Energize**
Empire Tap Upgrade	2010
ED5 Sub Upgrade	2013
Casa Grande-Empire Upgrade	2014
ED4 Sub Ugrade	2015
Tucson Sub	2015
ED5 to Empire 115kV TL	2016
ED2 Sub Upgrade	2016
Coolidge to ED2 No 1 15 kV TL	2018
Coolidge to ED2 No 2 115 kV TL	2017
UPGRADE 9.2 MILES OF POLES AND CONDUCTOR ED4-ED5 115 KV TL	2018
UPGRADE 9.2 MILES OF POLES AND CONDUCTOR ED2 - ED4 115KV TL	2018
ORACLE-SAGAURO 115kV UPGRADE	2018

Table 23. WESTERN SATS Construction Potential

21.4. 2016 Case Analysis: Combinations of EHV and local area transmission projects that made sense based on the experience and judgment of TEP and SWTC transmission planners were added to the 2016 cases. This was to make reasonable efforts to identify which projects would be required for load serving capability based on information available at that time. This work was done prior to development and analysis of any saturation load level cases. Development of the 2016 case resulted in a nominal transmission configuration to establish a benchmark upon which to build a revised 10-year (2018) planning horizon case.

TEP upgrades consist of the participating Pinal West to Pinal Central and SEV 500kV project and adding a new Pinal Central to Tortolita 500kV line plus a third 500/138kV transformer at Tortolita. Additional 345kV transmission will also be needed to increase load serving capability into Tucson. While a decision as to which EHV project had not been made, TEP modeled a new Tortolita to East Loop 345kV with a new 345/138kV substation at East Loop. Tortolita to East loop was modeled as it was included in the TEP Preliminary EHV Transmission Plan. As the SATS study progressed, TEP switched its focus to Strategies C and F in the 2018 cases that replaced the 2016 work. The following projects are part of the 2016 case in addition to those that are represented in the 2010 case:

- Corona 138/13.8kV Substation, 2013 – a load serving substation served by tapping the existing Irvington to South 138kV line.

- U of A Tech Park 138/13.8kV Substation, 2013 (subsequently moved beyond the 5 year capital budget time frame) – a load serving substation served by tapping the existing Vail to Irvington 138kV line.

- Spencer 138/47.2/13.8kV Substation, 2013 – a load serving substation served by extending the existing Midvale to South 138kV line west ~8 miles along Valencia Rd.

- Marana 138/13.8kV Substation, 2013 (subsequently moved to 2014) – a load serving substation served by tapping one of the Tortolita to North Loop 138kV circuits and extending it as a double-circuit pole-line west across I-10 to the substation.

- Craycroft-Barril 138/13.8kV Substation, 2011 – a load serving substation served by tapping the existing Northeast-Snyder 138kV line.

- Hartt 138/13.8kV Substation, 2012 – a load serving substation served by tapping the existing South to Green Valley 138kV line.

- Harrison 138/13.8kV Substation, 2013 – a load serving substation served by

tapping the existing East Loop to Roberts 138kV line.

- Tucson 138/13.8kV Transformer Replacement, 2008 – replace the existing transformer at Tucson Station with a higher rated unit.

2016 SWTC Case Analysis: Potential upgrades considered by SWTC consisted of:

- Participation in the Pinal West to Pinal Central 500kV project and the Pinal Central to Tortolita 500kV project;
- Interconnection of TEP's line from Pinal West to South 345kV line;
- A 230kV injection point or loop into the SSVEC area;
- Upgrade of the 115kV lines from Bicknell to Three Points and Avra to Sandario to Three Points.

Using the 2016 SATS base case, SWTC identified a number of potential upgrades as well as a number of possible interconnection points to evaluate in the 2011-2013 CWP process. Projects beyond the 2010 planning period remain conceptual and subject to change as future demands increase or decrease during evaluation.

<u>2011-2013</u>

- Avra Valley to Sandario Tap 115kV line upgrade to 1272 ACSR
- Marana Tap to Marana 115kV line and Marana substation upgrade
- Pinal West to Pinal Central Transmission Line Project
- Pinal Central to Tortolita Transmission Line Project
- Redtail Substation Upgrade
- Sandario Tap to Three Points 115kV line upgrade to 1272 ACSR
- Second 230/69kV Transformer at San Rafael

<u>2014-2026</u>

- Picture Rocks and Naviska substations
- CS1 Substation
  - New substation with 345/115kV transformer
  - Line tap from Pinal West to South 345kV line
- SSVEC 230kV line project

21.5. 2018 Case Analysis: The 2018 base cases evolved from the Saturation cases. The first to be completed modeled the Strategy A EHV topology with a complementary 138kV configuration. Strategy C and F were also evaluated. In order to maintain flexibility, TEP 138kV local area system plans include reinforcement of the double and triple circuit lines emanating form the Tortolita and Vail EHV delivery points. Other critical 138kV paths such as those supplied from the Irvington substation are also designated for uprates, plus at least one new line from Irvington to Tucson, within the ten year horizon. Because of these plans, and the observation that there is no evidence of flow-through on the 138kV system, there is little difference in the 138kV system design among the alternative EHV strategies.

Modeling for the Strategy A 2018 case began with the observation that the forecast load at 50% of saturation approaches the load forecast for the 2016 time-frame. This observation was used to determine that portion of the substation and/or transformer capacity identified at saturation that would be required to serve load at the 50% point and subsequently the 10-year planning horizon, 2018. Only the EHV upgrades that were required to serve the load in 2018 were included. Initially two EHV options that yielded comparable Load Serving Capability were evaluated; the first being Tortolita to North Loop, and the second Tortolita to East Loop 345kV. Evaluation of these two options indicates that there are significantly greater impacts to the underlying 138kV system by terminating the EHV at North Loop than at East Loop.

Analysis of Strategy C and F indicates that the issues identified in Section 15.1 Greenlee to Vail EHV and 230kV Corridor Area must be resolved prior to 2018, with interim solutions implemented in the 2014 time frame, assuming the 2008 load forecasts. The most critical outage is loss of the Springerville – Vail 345kV (Express) line and the Winchester – Vail 345kV line which causes excessive loading on the parallel 230kV system. Other critical outages include loss of the Willow – Winchester 345kV line along with loss of the Greenlee – Willow 345kV line or the Express line or the Winchester – Vail 345kV line. Other outages involving the Vail T2 transformer, cause results similar to outage of the Express line.

Alternative EHV solutions include addition of a new double circuit 345kV line between Winchester and Vail, plus a new single circuit 345kV line from Winchester to Willow. The new lines between Winchester and Vail may be constructed along the existing corridor or parallel the SWTC 230kV facilities, perhaps involving reconstruction of the WESTERN 115kV lines.

These issues and solutions in the Greenlee - Vail corridor assume the Bowie generating station will be typically operating at 500 MW. Interim solutions, perhaps implemented in the 2014 time frame, that may be considered include tripping part or all of Bowie, a remedial action scheme involving tripping of the Bicknell transformer or adding new local generation in the Tucson area to reduce net load served by EHV and 230kV transmission. The 2018 case included higher than existing rating on the Apache to Butterfield 230kV plus loop-in at Pantano of the WESTERN 115kV line. These projects would partially mitigate post-contingency 230kV line overloads. Therefore these projects will be considered among the other alternatives in the 2009 SATS Study Plan.

If the Bowie project is not in service within the five year planning horizon (e.g. by 2012), then emphasis should be shifted to increasing transmission capacity into Tortolita from the west and northwest and reinforcing North Loop with EHV or 230kV. Alternatives coordinating with the SPPR project should be investigated wherein new 230kV facilities extending into Tucson from the Marana Tap could interconnect with the local area 115kV 138kV systems. Otherwise, the two 345kV joint project lines from Tortolita to North Loop along the TEP 138kV corridor plus the Tortolita to Marana Tap to North Loop utilizing the WESTERN 115kV corridor as in either Strategy C or Strategy F would meet the needs in the 2018 time frame.

21.6. 2028 Case Analysis: The cases modeling 2028 conditions assumed a relatively high bias toward resources supplied from southeast of the Tucson metropolitan area. The Bowie plant was operated at 500 MW and 400 MW of generation was added at the Winchester substation. The generation at Winchester simulated a relatively modest injection from the SunZia transmission project. The remaining resources were modeled by 120 MW and 150 MW

modeled at Pinal Central and Pinal West respectively.

The results indicate that a fourth 500/138kV transformer will be needed at the Tortolita substation. Also the major components of the "reach-in" strategies should be in service at about the twenty year planning horizon. Reinforcement into the northwestern Tucson area, whether it be two 345kV lines to North Loop as in Strategies C and F, or a variation involving 230kV as described in the 2018 case analysis above. Based on currently available information, TEP's preference would be for new 345kV lines from Vail to Irvington to South Loop with 345/138kV transformation at Irvington, or Strategy F. Otherwise Strategy C would be technically effective. Additional 345/138kV, 345 or 230/115kV and 345/230kV transformers will be need as well. More detailed analysis will be necessary to determine the number, size and timing for these various transformer additions.

At the 2028 load level, based on the 2008 load forecast, EHV reinforcement consisting of 345kV transmission additions into Vail from the east or into North Loop from the northwest would be adequate to serve SATS area load.

21.7. Saturation Case Analysis: The cases modeling saturated load conditions assumed a relative balance between resources supplied from northwest and southeast of the Tucson metropolitan area. Resources from the northwest were modeled as 1,000 MW at Hassaympa, 300 MW at Pinal Central and 300 MW at Pinal West. The generation at Winchester was increased to 1,500 MW and the Bowie plant was assumed off due to the higher level of uncertainty about Bowie at the time the analysis was done. Nevertheless, this case is still reasonable since Bowie and Winchester are relatively close to each other. The generation at Winchester simulated a higher level of injection from the SunZia transmission project than assumed for the 2028 base case.

Initial results indicated that the 345kV additions described in the 2028 case analysis would not be adequate to serve saturated loads. Therefore extensive 500kV additions were modeled, to include a second Pinal Central to Tortolita line, two Winchester to Vail lines and a Vail to South Loop to Pinal West line. Multiple 500/345kV transformers were required at the Winchester, Vail, South

Loop and Pinal West substations. Note that the Tortolita to Winchester 500kV line was modeled in the 2028 cases, and remained in the saturated load cases. These extensive 500kV system upgrades technically meet the SATS area load serving needs. However no analysis was performed to optimize the system or to determine if other options might have extended the life of the 345kV upgrades modeled at the 2028 load level.

22. Cochise County

22.1. Summary

A sub-committee of the SATS group was formed to address the transmission and load serving concerns specific to the Cochise County area. Of particular concern to this sub-committee was the transmission system serving loads in and surrounding the City of Sierra Vista. Although these concerns have been raised in prior transmission planning activities, a series of outages experienced in the Sierra Vista area, during the period of October 9th through October 11th of 2007, emphasized the need to formalize the discussions and try to find an acceptable solution. When an ACC Staff member characterized the issue as; "one that is very serious and needs to be dealt with ASAP,"[26] SATS responded by creating the Cochise County Study Group. Leadership of the Group was assigned to SSVEC. SWTC agreed to perform the technical studies associated with the Group's efforts.

Cochise County comprises the southeastern corner of Arizona and is bordered by New Mexico to the east and Mexico to the south. The major cities in this area include Benson, Bisbee, Douglas, Sierra Vista, Tombstone and Willcox. Adjacent to the City of Sierra Vista is Fort Huachuca, a major U.S. military installation. The sub-committee's study effort included the participation of representatives from each of the load serving entities and transmission service providers in Cochise County as well as a representative from Fort Huachuca.

Transmission service in Cochise County consists principally of radial lines which feed into the underlying sub-transmission system. SWTC provides transmission service to SSVEC's Sierra Vista area loads principally via two radial lines; a

[26] See page 12 of October 24, 2007 SATS meeting notes.

115kV line from Pantano to Kartchner substations and a 230kV line from Butterfield to San Rafael substations. Some additional capacity can be imported into the Sierra Vista area over SSVEC's 69kV sub-transmission system from their tie to SWTC's Apache substation. WESTERN provides transmission service to Arizona Public Service (APS) which then delivers power, via a radial 115kV transmission line from the Adams Tap substation to its Mural substation, to serve its loads in the south-central and far southeastern corner of Cochise County. TEP serves Fort Huachuca via a radial 138kV line which emanates from its Vail substation. An alternative path for up to approximately 16 MW to Fort Huachuca is provided by a TEP 46kV sub-transmission line connected to the TEP 138kV bus at the South Loop substation. Alternatives for supplemental emergency service are under consideration in this study. The issue presented for resolution to this subcommittee was that, under various load conditions, an outage of any one of these radial transmission lines (an N-1 condition) could result in the loss of load.

The subcommittee members held their meetings over the period of November, 2007 through January, 2008. The members of this subcommittee agreed that the objective of the study group would be:

To determine and recommend transmission solution(s) using 115, 138, and 230kV lines and substations to solve existing N-1 transmission problems within southern Cochise County.[27]

The study also considered and evaluated local area 69kV sub-transmission alternatives, as well as options to either interconnect or provide emergency ties among the radial transmission lines serving the load entities in Cochise County.

During this period SWTC conducted a technical evaluation on seven transmission options proposed by the subcommittee. These seven options, which included upgrades to both the area's transmission and sub-transmission systems, were:

- Pantano-Kartchner-San Rafael-Butterfield 230kV loop.

[27] See November 26, 2007 South of SATS meeting notes contained in Appendix E of this report.

- San Rafael to Mural 230kV Extension.
- Sloan to Huachuca East Radial 230kV.[28]
- Tie of TEP 138kV to SWTC 115kV Lines.
- Apache-Tombstone-Kartchner 115kV.
- Emergency Tie to TEP 138kV at Fort Huachuca.
- San Rafael to North Kartchner 230/115/69kV.

The technical results of these seven options are described in a subsequent section of this report titled "Description of Options Studied and Results." A significant amount of effort was committed to pursuing the goal of this subcommittee, especially by SWTC's technical staff. There was agreement by the subcommittee that a 230kV loop through the Sierra Vista area would be the preferred long-term technical solution. The future loop would not only eliminate reliability issues in the Sierra Vista area, but could also address future load serving issues for APS. What remained an issue within the subcommittee was the timing and economics of this 230kV loop. The group also agreed that it would be appropriate to wait for the results of a right-of-way study, commissioned by SWTC and which will include the Fort's concerns, before continuing their efforts. However, no final conclusion, beyond the need for a 230kV loop, was reached in this initial phase of the Group's study process. SSVEC supported the first of the seven transmission alternatives listed above. This option entailed upgrading the existing Pantano-Kartchner 115kV line to 230kV and connecting the Kartchner and San Rafael substations. This would create a 230kV loop into the Sierra Vista area allowing for continuity of service in the event of an outage of either circuit (N-1 contingency). SWTC supported building a third transmission line into the Sierra Vista area which would ultimately tie into the San Rafael Substation, forming a 230kV loop. Both APS and TEP felt that their respective existing transmission systems were sufficient to meet their load serving obligations in the study area for at least the next ten years.

22.2. Description of Companies and Transmission System

[28] Sloan is a surrogate for a tap of the Butterfield to Pantano 230kV transmission line and Huachuca is a surrogate for a new 230/69kV substation in the Sierra Vista area. SSVEC's position was that the southern terminus needed to be located within the Sierra Vista load pocket rather than potentially north of the Fort Huachuca military reservation.

APS, TEP and SSVEC are the three load serving entities within Cochise County. Transmission service into this area is provided by SWTC, TEP and WESTERN. Following is a description of each of these entities' respective service areas and transmission facilities. At the end of this section of the report is a map which illustrates the service territories and transmission system within the Cochise County Study area.

Arizona Public Service (APS)

APS' service territory, included in this study, covers the south-central and far southeastern portion of Cochise County. It includes the cities of Bisbee, Douglas, and Tombstone. Transmission service to this area consists of an APS owned radial 115kV line which connects at the Adams Tap switchyard to Western's Nogales-Apache 115kV line. The APS 115kV line connects to the Mural substation southeast of Bisbee at which the APS 69kV sub-transmission system provides service to its loads in the study area.

Southwest Transmission Cooperative (SWTC)

SWTC's main transmission facilities in Cochise County emanate from AEPCO's Apache generation facility located in north-central Cochise County. From the Apache facility SWTC's transmission lines go north to the Redtail substation, northwest to the Winchester substation and west to the Bicknell substation. Connected to SWTC's Apache-Bicknell 230kV line are three substations, two of which have radial transmission circuits which serve SSVEC's loads in the Sierra Vista area. These are the Butterfield-San Rafael 230kV line and the Pantano-Kartchner 115kV line. At both San Rafael and Kartchner are 100 MVA transformers that drop the voltage down to 69kV which then feed into the SSVEC 69kV sub-transmission system in the Sierra Vista area. The following map illustrates SWTC's transmission facilities serving the Sierra Vista area.

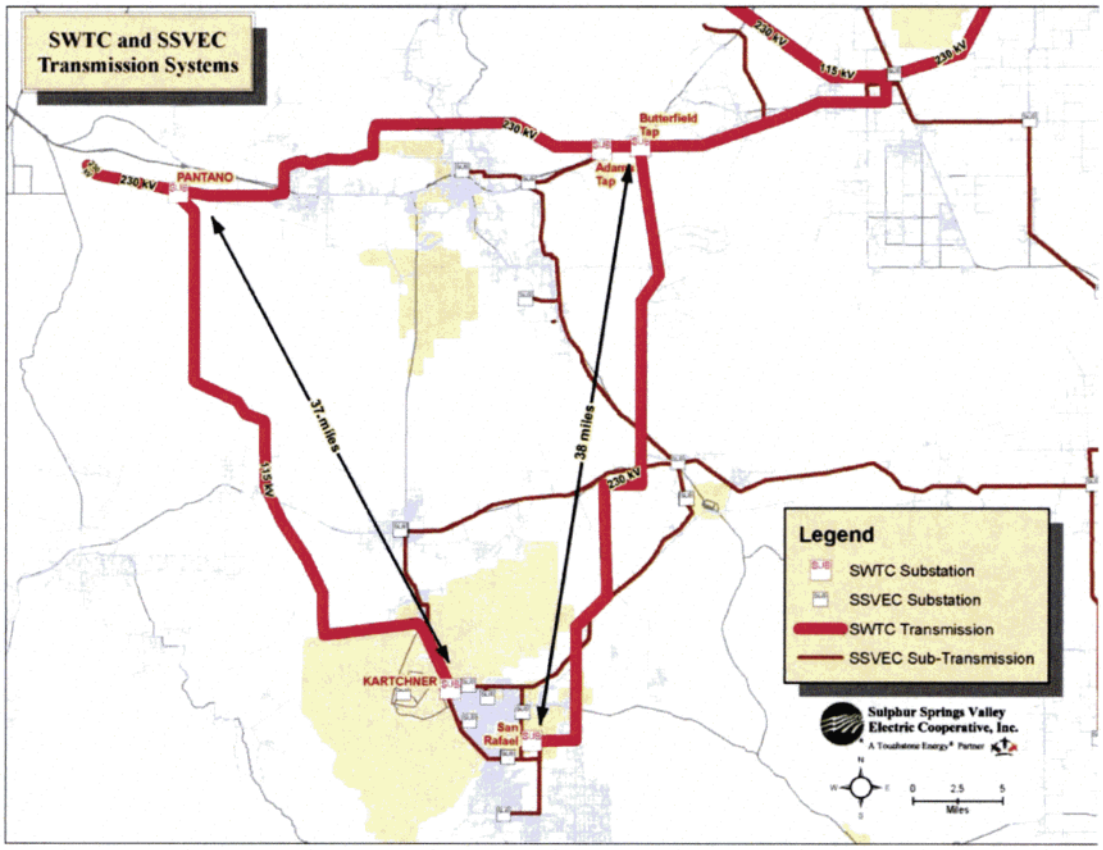

Figure 46. SWTC and SSVEC Transmission System

Sulphur Springs Valley Electric Cooperative (SSVEC)

SSVEC is the load serving entity for the majority of Cochise County. Its major loads in the County consist of the Sierra Vista area, at just over 100 MW, followed by the Benson area, at approximately 30 MW. Other communities served by SSVEC, in the study area, include Elfrida, Huachuca City, Patagonia, Sonoita, and Willcox. Transmission service into the Sierra Vista area consists of SWTC's Pantano-Kartchner 115kV and Butterfield-San Rafael 230kV transmission lines. From the Kartchner and San Rafael substations power is distributed throughout the Sierra Vista area via SSVEC's 69kV sub-transmission system. SSVEC's 69kV sub-transmission system is normally operated in an "open loop" configuration because its system was not designed to, nor can it withstand to, operate in a "closed loop" configuration other than for brief periods in response to emergency conditions.

Tucson Electric Power Company (TEP)

TEP's load serving obligation in Cochise County is limited to providing for Fort Huachuca's power requirements. Fort Huachuca is a major Army installation which borders the City of Sierra Vista to both the north and west. This facility is equivalent to a city of 15,000 and is one of the largest employers in Southern Arizona. The Fort's current peak demand is approximately 22 MW. The principal means of serving the Fort is via a 138kV line emanating from TEP's Vail substation. A 46kV line, which was the original means of supply, continues to be maintained by TEP and serves as a back-up to the 138kV line. This 46kV line has demonstrated the capability of supplying up to 16 MW of Fort load and may be capable of more. Provisions for additional back-up service through TEP's rights on the SWTC system may be implemented upon agreement of appropriate parties, according to the terms established in a Power Service Agreement and Letter Agreement between TEP and SWTC

Western Area Power Administration (WESTERN)

WESTERN is a Federal entity under the Department of Energy. Its Parker-Davis transmission system reaches throughout western, central and south-central Arizona. WESTERN's transmission system in the study area consists of a single 115kV line from its Nogales substation to the Apache substation. This 115kV line is the single source of transmission service to the APS service area in southeastern Cochise County.

Service Area Map

The following map illustrates the service areas and transmission system within Cochise County.

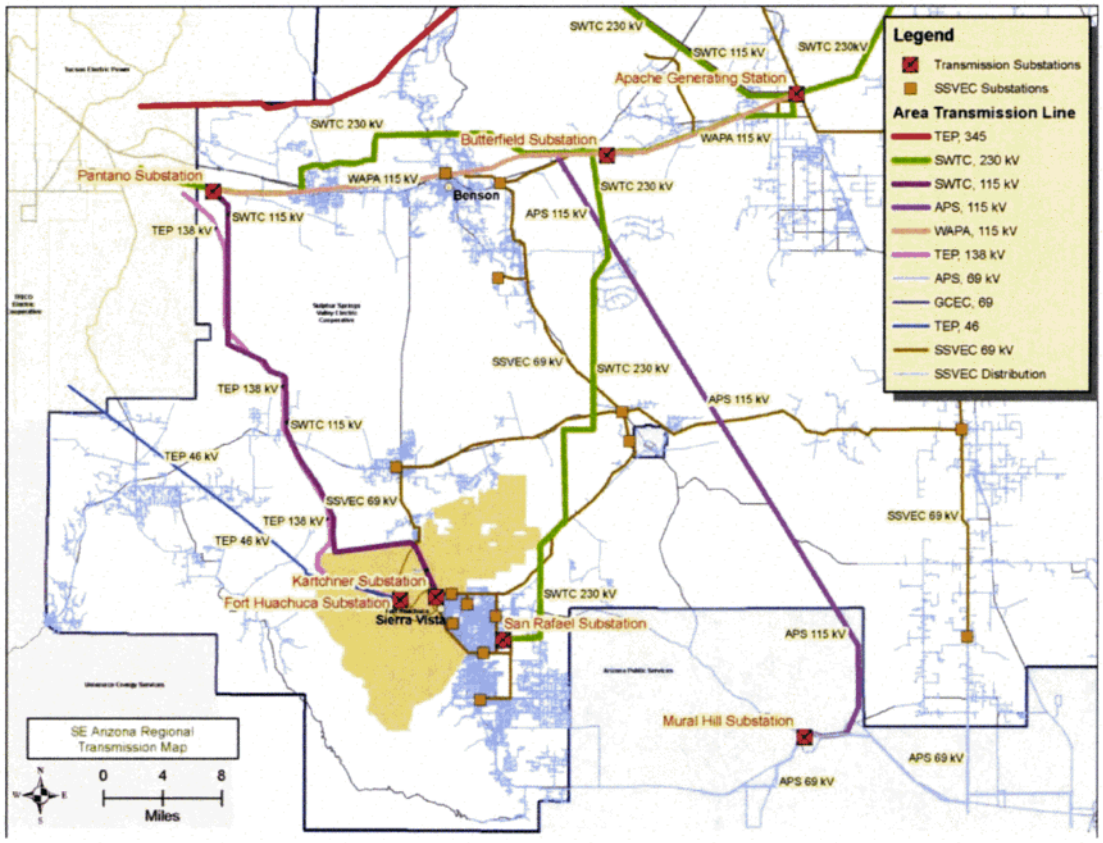

Figure 47. Cochise County Service area Map

22.3. Summary of Issues

The basis for creating the Cochise County study group was to address the issue of service reliability associated with loads served off of radial transmission lines. Although the County has multiple transmission lines feeding into the area, none of these lines are interconnected except via the underlying 69kV sub-transmission system. An outage of any one of these facilities normally results in the loss of load fed by that particular circuit. Each of the load serving entities must then invoke an emergency response in an effort to restore the affected service. Following is a brief description of the transmission issues faced by each of the three load serving entities in the County.

APS – In the event of an outage on the Adams Tap to Mural 115kV line APS will lose service to its loads in Cochise County. APS can restore service to its customers by turning on its Douglas generation and closing its 69kV emergency

tie with SSVEC at the McNeal substation. However, assuming there is available transmission capacity, closing this tie requires verbal communication and mutual agreement between the APS, SWTC, AEPCO, WESTERN and SSVEC operators. At present APS does not expect significant load growth in its Cochise County service area. Beyond pursuing a second emergency tie with SSVEC, just south of the Sierra Vista area near Palominas, APS believes that the current transmission system is sufficient to meet its load serving obligations in Cochise County. The only caveat to this position is if a significant spot-load should develop in the APS service area. Such an event would require an additional transmission connection in order to serve the total APS load in the study area.

SSVEC – An outage of either of the Pantano-Kartchner or Butterfield-San Rafael transmission lines will result in an immediate loss of service in the Sierra Vista area that may be restored by 69kV sub-transmission switching. It may not be possible to restore all loads during peak load times. Both the Pantano-Kartchner 115kV line and the Kartchner 115/69kV transformer are rated at 100 MVA. Under an outage of the Butterfield-San Rafael 230kV line the Pantano-Kartchner circuit is incapable of serving the Sierra Vista area loads for a portion of the year. This same condition exists under an outage of the Pantano-Kartchner line since the San Rafael 230/69kV transformer is also rated at 100 MVA. Under an N-1 of either transmission circuit service restoration to the Sierra Vista area entails SSVEC closing-in its normally open 69kV sub-transmission tie to its Tombstone Junction connection and possibly the need to close its emergency tie with APS at McNeal. This permits load to be fed from both the remaining transmission circuit and SSVEC's 69kV sub-transmission system. However, due to the intricacies of closing-in the 69kV sub-transmission system, principally due to voltage issues, this process can result in certain portions of the service area being without service for several hours.

TEP - An outage of the TEP 138kV line results in automatic throw-over of the Fort Huachuca facility to TEP's 46kV line. It is possible, depending on the level of the Fort's load, that brown out conditions may occur and/or some portion of the Fort's load may be curtailed until the 138kV line is brought back in service. The Fort's twenty year projection indicates virtually no growth in demand. Thus, increased system reliability as well as load serving capability are the primary concerns for

Fort Huachuca. To address this issue the Fort is pursuing an emergency tie with SSVEC. Although this tie will normally be operated as an open connection, under an outage of the 138kV line, and assuming the 46kV line cannot provide for Fort Huachuca's full load and that there is capacity on the SWTC and SSVEC system, closing the tie will permit TEP to supply the Fort's full load under emergency conditions. However, due to the need for operator intervention to close the emergency tie, a portion of the Fort load may be interrupted for some period of time. Closing this proposed tie will require verbal communication and mutual agreement between the TEP, SWTC, AEPCO, and SSVEC operators. Isolation of the Fort's critical loads that could be backed up by a combination of UPS and emergency generation have been discussed as a potential solution considering the relative lack of load growth.

22.4. Description of Options Studied and Results

Technical analysis was performed on seven transmission alternatives. These options included:

1. Pantano-Kartchner-San Rafael-Butterfield 230kV loop.
2. San Rafael to Mural 230kV Extension.
3. Sloan to Huachuca East Radial 230kV.
4. Tie of TEP 138kV to SWTC 115kV Lines.
5. Apache-Tombstone-Kartchner 115kV.
6. Emergency Tie to TEP 138kV at Fort Huachuca.
7. San Rafael to North Kartchner 230/115/69kV.

The technical analysis was performed by SWTC using the General Electric Positive Sequence Load Flow (PSLF) program. An approved 2016 Southeast Arizona Transmission Study (SATS) base case was used for the studies. All line and transformer outages that affected the SSVEC service area were evaluated, however only the major outages that produced issues in the Sierra Vista area are documented in this section of the report. Using the base case, the study also evaluated a load increase in the SSVEC's Sierra Vista service area of 10%, 20%, 30%, and 40% above the 2016 base load levels. The Fort's and APS' loads were not adjusted during this analysis. This was done in an effort to determine the implications of load growth on each of the proposed system modifications. The

following illustrates the varying load levels which are referenced in the subsequent option descriptions.

Load Levels:

*Sierra Vista area load forecast based on SSVEC 2005 substation data.

Base - 134.42 MW (projected 2016 base load)
10% - 147.86 MW (comparable to 2019-2020 projected load)
20% - 161.30 MW (comparable to 2022-2023 projected load)
30% - 174.75 MW (comparable to >2024 projected load)
40% - 188.19 MW (comparable to >2026 projected load)

A description of each option, along with the technical study results, is provided below. Note that the analysis was conducted under two scenarios - "Open Configuration" and "Closed Configuration". Following is the background to explain the rationale for these scenarios. SSVEC has 4 primary load centers which are the Sierra Vista, Benson, Elfrida, and the Willcox areas. These load centers are geographically spaced at the ends of an "X" that has legs 40 miles to the center of the "X" or 80 miles point to point. Within each load center, there is a SWTC delivery point [except Benson] from which SSVEC's 69kV sub-transmission system distributes the energy within the load center. Each of the legs of the "X" is a 60+ year old, small wire, 69kV sub-transmission line. At the center of the "X" SSVEC has its Tombstone Junction Switching Station. The "X" was the original 1940's to 1950's method of distributing power within Cochise County for those areas without local generation but which did have a need for electricity. Under today's loads, this "X" of a 69kV sub-transmission system cannot provide complete back-up from one end of the "X" to another.

All of SSVEC's 69kV sub-transmission, whether within the load center or as part of the "X", was designed, built, sectionalized, and therefore operated as radial lines or "open" configuration. The center of the "X", Tombstone Junction Switching Station, is normally opened in all directions except one to provide the switching station its needed station power. During emergency conditions, Tombstone Junction's breakers can be closed so that some amount of power can flow between the load centers. This creates a looped or "close" configuration. The looped configuration provides voltage support and very limited capacity from a

load center to another load center. The difficulty is that the sectionalizing [relaying, breaker location, number of breakers, etc] was not designed or built to operate as a loop. A fault on any part of the "X" during a looped configuration would likely cause a wide spread outage for most, if not all, load centers.

Option 1—Pantano-Kartchner-San Rafael 230kV Loop

Description of Project

This option would entail upgrading the existing Pantano to Kartchner 115kV line by installing a new 36 mile 1272 ACSR 230kV line from the Pantano Switchyard to tie to a new Kartchner 230/69kV transformer. The existing Kartchner 115/69kV transformer would be retired. A new 8.3 mile 1272 ACSR 230kV line would be constructed which would connect the existing San Rafael 230kV Substation to tie to the Kartchner Substation. The San Rafael Substation would be upgraded with another breaker to accommodate the new 230kV line to Kartchner.

Initial Results

- Studies determined that under a Butterfield to San Rafael outage there were few issues found regarding line loading and low voltages in the Sierra Vista area. Low voltages were present in the Benson/Wilcox section of the SSVEC loads under certain outages

More Results

- -Open Configuration-
  - **Base** No issues were seen in Sierra Vista
  - **10% -** Under a Kartchner 230/69kV transformer outage, line loading over 100% occurred on the Keating Jct.-Hawes 69kV line.
  - **20% -** Under a Kartchner 230/69kV transformer outage, line loading over 100% occurred on the Keating Jct.-Hawes, Hawes-Ramsey Tap1 and San Rafael-Ramsey Tap1 69kV lines.
  - **30%-** Under a Kartchner 230/69kV transformer outage, line loading over 100% occurred on the Kartchner-Keating Jct., Keating Jct.-Hawes, Hawes-Ramsey Tap1 and San Rafael-Ramsey Tap1 69kV lines. Low voltage (~0.88 p.u) is present at the Sonoita Bus.
  - **40%-** Under a Kartchner 230/69kV transformer outage, line loading over 100% occurred on the Kartchner-Sierra Vista, Kartchner-Keating Jct.,

Keating Jct.-Hawes, Hawes-Ramsey Tap1 and San Rafael-Ramsey Tap1 69kV lines. The Kartchner-Sierra Vista 69kV line loads under the Butterfield-San Rafael, Apache-Butterfield and Apache-Red Tail 230kV outages. Low voltages (~.88 p.u.) was present at the Sonoita, Huachuca East and Huachuca West 69kV buses.

- -Closed Configuration-
  - **Base – 30%-** Under certain outages within the Sierra Vista area, line loading over 100% occurred on the Kartchner-Sierra Vista, Sierra Vista-Bella Vista, and Bella Vista-Charleston 69kV lines. Low voltages (~0.85 p.u.) is present at Sonoita, Huachuca East and Huachuca West 69kV lines.
  - **40%-** Under N-0, low voltages exist in the Benson/Southeast area. Under a Butterfield-San Rafael outage case will not solve due to severely low voltages.

Option 2 – San Rafael to Mural 230kV Extension

Description of Project

This option was studied as an augmentation to Option 1. The intent is to study the increase in load serving capability associated with a 230kV extension into the APS service area. It assumes that the 230kV loop is in place. In addition, this option assumes installation of a new 32 mile, 1272 ACSR 230kV line from the San Rafael Substation to tie to the existing APS Mural Substation. San Rafael Substation would be upgraded with another breaker to accommodate the new 230kV line. The APS Mural 115/69kV substation would be upgraded to accommodate the 230kV line from San Rafael.

Initial Results

- Studies determined that under an outage of the Butterfield to San Rafael 230kV lines there were few issues found regarding line loading and low voltages within the Sierra Vista area. Low voltages were found in the Benson/Wilcox section of the SSVEC service area under certain outages. Results of this study are similar to those of the San Rafael to Kartchner to Pantano 230kV loop.

Option 3--Sloan to Huachuca East Radial 230kV Line

Description of Project

This option entailed installation of a new 24 mile, 1272 ACSR 230kV line from the proposed Sloan Substation to tie to the existing Huachuca East 69kV Substation. The existing Huachuca East Substation would be upgraded to include a new 230/69kV transformer to be served out of a new 230kV bay position.

Initial Results

- Studies determined that under an outage of the Butterfield to San Rafael 230kV line that few issues were found regarding line loading and low voltages within the Sierra Vista area. Low voltages were found in the Benson/Wilcox section of the SSVEC service area under certain outages.

More Results

- -Open Configuration-
  - **BASE, 10%, 20% & 30%-** Issues found in the Sierra Vista area were line loadings of over 100% of the emergency rating on the Kartchner to Keating Jct. 69kV line and the Kartchner/Sonoita/Huachuca East 69kV lines. Low voltage of ~0.8 p.u. was found at the Kartchner 115kV bus.
  - **40%-**Line loading exists at Huachuca Jct.-Huachuca East. Low voltages of ~0.75-0.8 p.u. were present at several Sierra Vista area buses. At this load level SWTC/SSVEC would suggest a larger capacitor bank under the open configuration.

- Closed Configuration-
  - **BASE-** Line load over 100% of emergency rating occurred at the Sonoita-Huachuca East and Kartchner-Sierra Vista 69kV lines.
  - **10%-** Line loadings over 100% of emergency rating occurred at the Kartchner-Sonoita, Sonoita-Huachuca East, Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines.
  - **20%-** Line loadings over 100% of emergency rating occurred at the Kartchner-Sonoita, Sonoita-Huachuca East, Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines. Low voltage of ~0.8 p.u. was present at the Kartchner 115kV bus.
  - **30%**-Line loadings over 100% of emergency rating occurred at the

Kartchner-Sonoita, Sonoita-Huachuca East, Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines. Low voltages of ~0.8 p.u. were present at five Sierra Vista area buses.

- **40%-** Line loadings over 100% of emergency rating occurred at the Kartchner-Sonoita, Sonoita-Huachuca East, Kartchner-Sierra Vista, Sierra Vista-Bella Vista and Keating Jct.-Hawes 69kV lines. Low voltages of ~0.8 p.u. were present at several Sierra Vista area buses. An additional capacitor bank at San Rafael would help raise the voltages at some surrounding buses and alleviate line loading on the Keating Jct.-Hawes 69kV line.

Option 4—Tie of TEP 138kV to SWTC 115kV Lines

Description of Project

The TEP Vail to Ft. Huachuca 138kV line and the SWTC Pantano to Kartchner 115kV line share a common corridor until they reach a point just north of Fort Huachuca. At this point of divergence the two lines would be tied via a new 138/115kV substation containing a 138/115kV 100/133/167 MVA transformer. A three breaker-ring bus 138kV configuration would be built to loop in the Vail to Ft. Huachuca line as well as accommodate a 138/115kV transformer. Another three breaker-ring bus would be built on the 115kV side to loop in the Pantano to Kartchner 115kV line as well as to accommodate a 115kV line to the 138kV switchyard.

Under this TEP/SWTC tie configuration various lines within the Sierra Vista service area would remain open in order to restrict any flow from entering Santa Cruz County. This arrangement is intended to mitigate concerns related to TEP's "2 county bonds." In this study it was assumed that under the Butterfield to San Rafael 230kV line outage, these normally open lines would be closed. An initial look only considered impacts on the SSVEC system. The TEP system buses in the Ft. Huachuca area were monitored during the contingency analysis and no adverse impacts were found. Once more consideration is given to the emergency tie additional study work will be done to assess the impacts of certain outages on both the TEP and SSVEC systems.

Results

- -Open Configuration-
  - None of the cases would solve for a Butterfield to San Rafael 230kV line outage.
- -Closed Configuration-
  - **BASE-** Line loadings over 100% occurred at Kartchner-Sierra Vista 69kV line and at the Kartchner 115/69kV transformer. Low voltage of ~0.85 p.u. was present at the Kartchner 115kV bus.
  - **10%-** Line loadings over 100% occurred at Kartchner-Sierra Vista, Sierra Vista-Bella Vista 69kV lines and at the Kartchner 115/69kV transformer. Low voltage of ~0.8 p.u. was present at the Kartchner 115kV bus.
  - **20%-** Line loadings over 100% occurred at Kartchner-Sierra Vista, Sierra Vista-Bella Vista 69kV lines and at the Kartchner 115/69kV transformer. Low voltages of ~0.7 p.u. were present at all Sierra Vista area buses.
  - **30% & 40%-** Case would not solve due to severely low voltages of 0.6 & 0.7 p.u. within the Sierra Vista area. With the addition of a second capacitor bank at San Rafael, the possibility of raising some of the bus voltages is possible but would still be below the WECC/NERC standards.

Option 5—Apache-Tombstone-Kartchner 115kV Line

Description of Project

A new 115kV line would double circuit with various segments of SSVEC's existing 69kV sub-transmission system. A 42.5 mile run from Apache Substation to Tombstone Junction would consist of six segments (Apache/ Cochise/ Johnson Jct/ Mescal/Benson/ David Jct/ Tombstone Jct.). The additional 21.1 mile run from Tombstone Junction to Kartchner would consist of five segments (Tombstone Jct/ Tombstone/ Charleston/ Bella Vista/ Sierra Vista/ Kartchner). By creating this loop it would allow for SSVEC to upgrade their 69kV system as well as having a loop within the SSVEC service territory.

Initial Results

- During a Butterfield to San Rafael 230kV line outage the program would not solve under an islanded configuration for any of the cases studied.

More Results

- -Closed Configuration-
  - **Base-** Line loadings of over 100% of the emergency rating on the Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines.
  - **10%-** Line loading of over 100% of the emergency rating on the Kartchner 115/69kV transformer and the Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines. Low voltage of ~0.89 p.u. was present at the Kartchner 115kV line.
  - **20%-** Line loading of over 100% of the emergency rating on the Kartchner 115/69kV transformer and the Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines. Low voltage of ~0.80 p.u. was present at all Sierra Vista area buses. (*assumption- two capacitors 14.4 & 18.0 MVAR)
  - **30%&40%-** Case would not solve due to severely low voltages.

Option 6--Emergency Tie (EMTIE) to TEP 138kV at Fort Huachuca

Description of Project

The option entails building a new 138kV yard named EMTIE_2 substation looping in the Vail to Ft. Huachuca 138kV line at Fort Huachuca. From the EMTIE substation a new 2.3 mile, 795 ACSR, 138kV line will run to SSVEC's Buffalo Soldier Substation. This tie would normally be operated in an open condition and only closed in response to a system emergency.

Initial Results

- It is recognized that this option will not solve major issues beyond the 2016 timeframe. It had been identified that the combination of this emergency tie with TEP, in combination with the emergency tie with APS, will allow SSVEC to restore service to portions of their Sierra Vista loads under an outage of the Butterfield-San Rafael 230kV line.

More Results

- Case utilizes closed configuration of system. APS emergency tie is placed in service along with TEP emergency tie.
  - **BASE-** Line loading of over 100% of the emergency rating was present at the Kartchner-Sierra Vista 69kV line.
  - **10%-** It was assumed that a 14.4 & 18.0 MVAR capacitor was placed at the San Rafael 69kV bus. Line loading of over 100% of the emergency

rating was found at Kartchner-Sierra Vista and Sierra Vista-Bella Vista 69kV lines. Low voltages of ~.80 p.u. were present at all Sierra Vista area buses.

- **>20%**- At a 20%, 30% and 40% load increase, in the Sierra Vista area the case would not solve.

Option 7—San Rafael to North Kartchner 230/115/69kV

Description of Project

This option entails construction of a new 230kV line from the existing San Rafael Substation to a new North Kartchner Substation which would be adjacent to the existing Kartchner Substation. The Kartchner and North Kartchner substations would be connected via a new 0.5 mile 1272 ACSR 115kV line. A 230/115/69kV transformer will be installed at North Kartchner. From North Kartchner a new 1.3 mile 69kV line will tie to the existing Sierra Vista Substation.

Initial Results

- This option includes a line upgrade of approximately 55.4 miles of SSVEC 69kV line from Apache to Sierra Vista.
- During a Butterfield to San Rafael 230kV line outage, the program will not solve under an islanded configuration for any of the cases studied. It has been identified that the emergency ties with APS at McNeal and Palominas will allow SSVEC to maintain continued service to portions of their Sierra Vista loads.

More Results

- Case utilizes closed configuration of system. APS emergency ties at McNeal and Palominas are placed in service. Two capacitor banks of 19.2 MVAR were placed at the San Rafael 69kV bus.
  - **BASE-** No issues seen in the Sierra Vista area however a recommendation for the Tap settings at the Pantano 230/115kV transformer be adjusted to accommodate this outage.
  - **10%-** There were no line loadings present for this outage. Low voltages of ~.85 p.u. were present at the Kartchner buses and at Sonoita. A recommendation for the Tap settings at the Pantano 230/115kV transformer to be adjusted to accommodate this outage.

- **>20-40%**- At a 20%, 30% and 40% load increase, in the Sierra Vista area the case would not solve.

22.5. Recommendation

The Cochise County Study Group agreed that an additional 230kV transmission line into the Sierra Vista area would be necessary to address system reliability and provide for expected future load growth. There was also agreement by the subcommittee that a 230kV loop through the Sierra Vista area is the preferred long-term technical solution[29]. The future loop would not only eliminate reliability issues in the Sierra Vista area, but could also address future load serving issues for APS. What remained an issue within the subcommittee was the timing of this 230kV loop. However, no final conclusion, beyond the need for a 230kV loop, was reached in this initial phase of the Group's study process.

The recommendation of the Cochise County Study Group was to suspend its activities until the completion of a right-of-way study to be commissioned by SWTC. This study is intended to determine the probability of creating a new transmission corridor into the Sierra Vista area.

23. Sensitivity Analysis

Sensitivity analysis was conducted using a 2015 base case that was based on the 2018 case that evolved from the saturated load study. This case included an increased rating for the Apache – Butterfield 230kV line plus loop-in of the 115kV WESTERN line at Pantano. These projects effectively increased the line rating from Apache to Pantano. Hence the need for a project to mitigate post-contingency overloads on the 230kV lines was deferred to the 2014 time frame without the need to trip the Bowie generator or the Bicknell transformer. This configuration also enhances the ability of additional generation within the TEP load pocket to defer the next EHV project. The purpose of the sensitivity analysis was to obtain a sense of the impact of local Tucson generation on need and timing for proposed EHV projects discussed in this report.

[29] This agreement assumes that an initial looped and/or emergency tie utilizing the capability of existing local area transmission could be implemented as the first step. Provisions would be made to preserve the ability to install or upgrade existing facilities as load in the Sierra Vista area grows to the extent that 230kV infrastructure may be justified.

Table 24 indicates that addition of 150 MW of generation at the Irvington location effectively reduces the net load to be served from external resources that are imported by EHV transmission. Load Serving Capability (LSC) increases by a significant margin in excess of the amount of generation added within the TEP load pocket.

Generation @ Irvington Assumed Projects	Year	Pre-Project LSC (MW)	Post-Project LSC (MW)	Incremental LSC (MW)
Pinal Central - Tortolita	2011	2490	2750	260
150 MW at Irvington	2014	2750	3100	350
2nd 150 MW at Irvington	2018	3100	3200	100
Next Project Needed	2018	3200		

Table 24. Sensitivity to 300 MW Generation Added at Irvington 138kV

The net effect is that investment in EHV transmission may be deferred by four years, assuming the January 2008 load forecast. The second 150 MW increment of generation does not further increase LSC significantly. Deferral of EHV by addition of such generation is much less effective if the 230kV projects (e.g. Apache – Butterfield Reconductor and Pantano loop-in) are not included in the case. To explain, these specific 230kV projects increase the rating of the 230kV line from Apache to Pantano. This increase is important because controlled load shed in response to Category C contingencies within the TEP system continues to be effective at reducing post-contingency flows on the Apache to Pantano segment of the SWTC 230kV system up to the load level forecasted for the 2013 time frame. Increasing local generation extends the effectiveness of load shed by reducing net load within the TEP load pocket.

Otherwise, assuming the existing 230kV facility ratings, load shed cannot reduce post-contingency 230kV flows below the emergency rating for the same contingencies prior to 2013. Moreover, reducing net load by approximately 300 MW has not been demonstrated to be sufficient to make load shed effective.

The second sensitivity case which divides the new generation between Irvington and the DMP substation site appears to more effectively balance the reduction of imports between Vail and Tortolita. The result is that addition of approximately 300 MW of generation is more effective if divided within the TEP 138kV system. Table 25 shows that addition of the same amount of generation increases LSC by approximately 100

MW more than generation concentrated at Irvington.

Generation @ DMP & Irvington Assumed Projects	Year	Pre-Project LSC (MW)	Post-Project LSC (MW)	Incremental LSC (MW)
Pinal Central - Tortolita	2011	2490	2750	260
155 MW at DMP & 150 MW at Irvington	2014	2750	3300	550
Next Project Needed	2021	3300		

Table 25. Sensitivity to 155 MW Generation Added at DMP Plus 150 MW Added at Irvington 138kV

Generally, the sensitivity analysis indicates that addition of new generation within the TEP local area network may provide flexibility in making decisions related to EHV transmission system investments.

24. Economic Analysis

Economic Analysis consisted of alternative projects capital cost estimates that were prepared individually by the SATS Transmission Providers. However, the Transmission Providers decided to not disclose these preliminary estimates due to sensitivity over uncertainty associated with land and environmental costs as well as concerns that this information might influence actual land costs. Therefore the SATS 2009 Study Plan will include tasks to work with other subregional and regional planning entities in the Western Interconnection to arrive at cost estimates that are consistent throughout the west.

25. Developing a Flexible Plan

A flexible plan has built-in features that take uncertainty about future events into account. For example, Strategy A may ultimately offer the greatest load serving capability. However, it requires the most new 345kV facility construction to implement at a relatively higher cost, and possibly also has the greatest risk associated with obtaining the permits to build. There may be further financial risk of potential stranded investment if projected load growth fails to materialize, or if the actual growth rate is significantly lower than currently forecasted. The uncertainties that may influence thinking about which strategy to pursue are illustrated in the following Figure 48: Example Decision Influence Diagram.

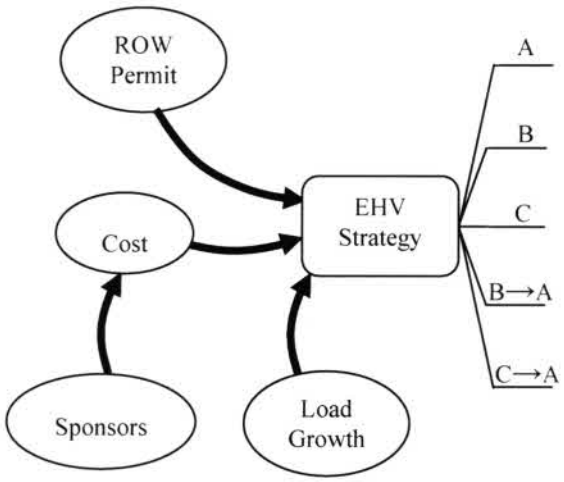

Figure 48. Example Decision Influence Diagram

Thinking about these uncertainties leads to the addition of variations to the basic strategies to attempt to mitigate regulatory and financial risks. For instance, Strategy B may be modified to preserve the option of switching to Strategy A by acquiring ROW or obtaining options on the rights-of-way needed to add the 345kV lines that would not otherwise be necessary in Strategy B. Modifications would also be considered for the Strategy B local area HV transmission plan, again to preserve the option to make the switch to Strategy A. This option is referred to as "B→A" in the above influence diagram.

An example of a possible plan is shown in Figure 49: Sample Flexible Plan Decision Tree. The decision on the left side is to embark upon a plan to build only those components that are common to each of the strategies in the near term. For example, following the upper branch of the tree, the next EHV project would be the Vail – East Loop 345kV line, with the associated 138kV upgrades as required to implement Vail – East Loop. As load increases and need for the next EHV reinforcement is established, a decision may be made to build Tortolita – North Loop, and additional 138kV complementary improvements. At this point, only one common project remains and the decision is when to implement. Eventually, as the future unfolds, decision makers will have more information, such as high growth has occurred and Strategy A must be implemented. On the other hand, growth has been sluggish and Strategy B or C may be appropriate.

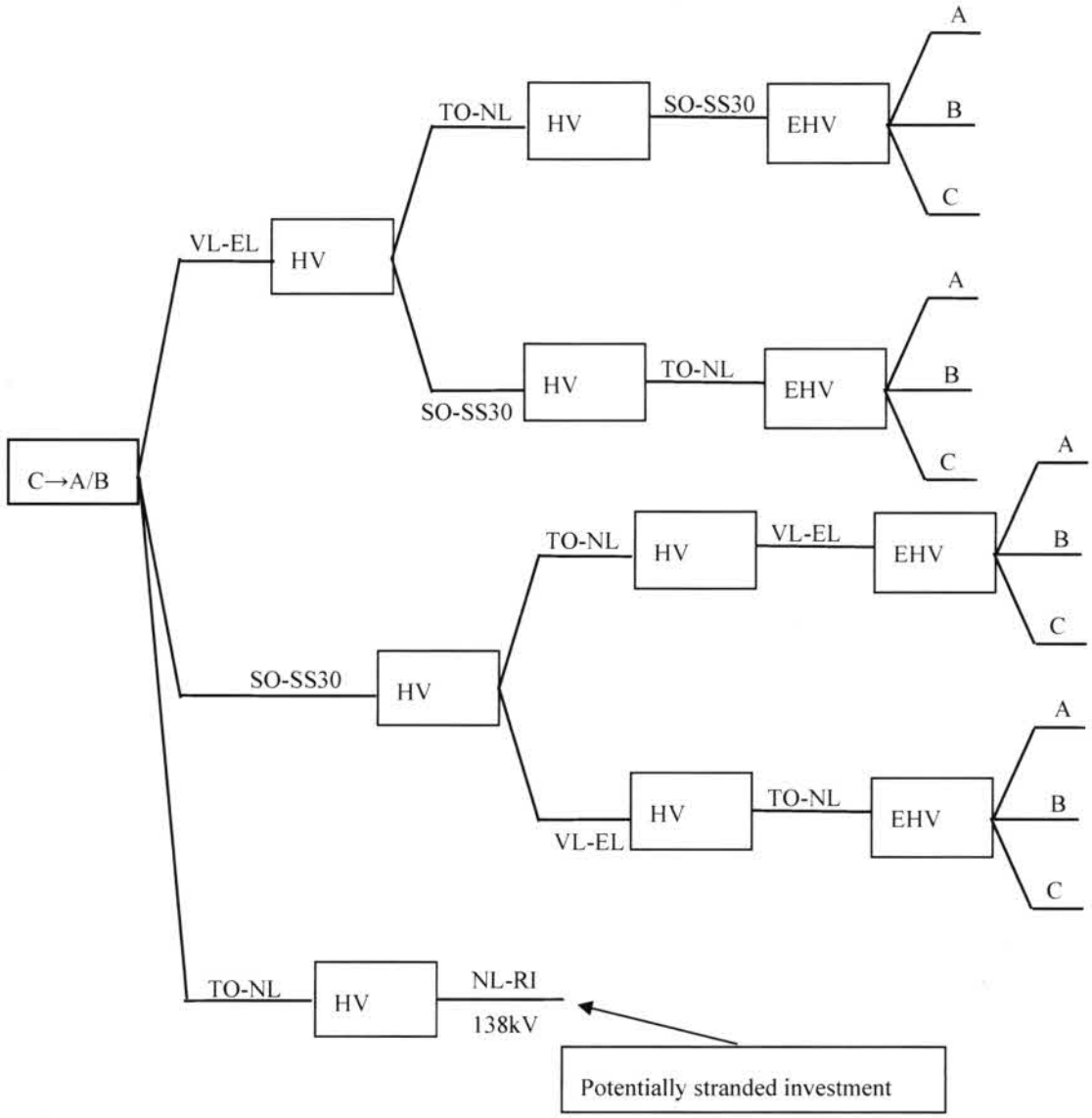

Figure 49. Sample Flexible Plan Decision Tree

Strategy C (or Strategy F may be substituted for Strategy C) may be similarly modified to ensure flexibility to change strategy in the event load growth is higher than expected, sponsors become interested in joint participation such that the financial risks are reduced, or other factors change. This strategy is represented as "C→A", and modification to the basic Strategy C would entail measures similar to B, but tailored to

those specific circumstances.

Additional cost, in excess of the basic Strategies A, B and C cost would be incurred in either case. The amount of incremental investment required to gain flexibility depends on each transmission providers' risk tolerance and their respective views of the future.

26. List of Projects for Ten Year Planning Horizon

The projects listed in the following tables are preliminary estimates only. All projects and their respective schedules are subject to change based on more detailed and more current analyses to be performed for five year capital budgets and subsequent ten year plans. Note that some projects will be listed in the ten year and twenty year planning horizons to account for uncertainty of projects that may or may not be completed within ten years.

More analysis to be conducted according to the 2009 SATS Study Plan will also likely result in significant changes as discussed in this report.

EHV Projects – Ten Year Planning Horizon	
500kV Projects	**Comments**
Tortolita Transformer No. 3	2011
Pinal West – Pinal Central[30]	2012 – Joint Project Deferral Possible
Pinal Central - Tortolita	2012 – Joint Project Deferral Possible
345kV Projects	**Comments**
Vail 345/138kV Transformer No. 3	2012
Bicknell 345/230kV Transformer Replacement	2012
Greenlee 345/230kV Transformer 2	2012
Winchester – Vail Double Circuit	2014 - Possible Joint Project Deferral Possible or Substitution
Willow - Winchester	2014 - Possible Joint Project Deferral Possible or Substitution
Vail 345/138kV Transformer 4	2014
Irvington 345/138kV Transformer	2018 – Deferral Possible
Vail – Irvington	2018 – Deferral Possible
South Loop - Irvington	2018 – Deferral Possible
Vail – South Loop – Bicknell (loop-in)	TBD - Possible Joint Project

Table 26. EHV Projects – Ten Year Planning Horizon

Tortolita Transformer No. 3: Included in preliminary TEP 2009-13 capital budget.

Pinal West – Pinal Central 500 kV Line: Joint project involving several participants. To be included in SWTC's 2011-2013 Construction Work Plan (CWP).

Pinal Central - Tortolita 500kV Line: Included in preliminary TEP 2009-13 capital budget.

Vail 345/138kV Transformer No. 3: Included in preliminary TEP 2009-13 capital budget.

[30] Southeast Valley Project participants are investigating deferral of the project from 2012 to 2013 due to the significant reduction in economic expansion as of November 2008.

The need for this project is subject to further analysis.

Bicknell 345/230 kV Transformer Replacement: Replaces the existing 90/120/150/193 MVA unit with a 225/300/420 MVA unit. To be included in SWTC's 2011-2013 CWP.

Greenlee 345/230 kV Transformer 2: The existing 90/120/150/193 MVA unit that is being replaced at Bicknell will be moved to Greenlee. To be included in SWTC's 2011-2013 CWP.

Winchester – Vail Double Circuit: Refer to Section 15.1 Greenlee to Vail EHV and 230kV Corridor Area and Section 23 Sensitivity Analysis for a description of conditions necessitating this project, and for a discussion of alternatives that may defer or be substituted for this project.

Willow – Winchester: Same comment as for the Winchester – Vail Double Circuit project.

Vail 345/138kV Transformer 4: The need for this project is subject to further analysis.

Irvington 345/138kV Transformer, Vail – Irvington and South Loop – Irvington: Refer to Section 15 Characteristics of SATS Transmission System and Section 23 Sensitivity Analysis and Section for factors that may influence the choice and/or sequencing of this project.

Vail – South Loop – Bicknell (loop-in): Refer to Section 15.2 South of Tucson Area for a description of area characteristics, possible alternative solutions and a preliminary plan for study.

230kV Projects – Ten Year Planning Horizon	
230kV Projects	**Comments**
Pantano to Sahuarita 230 kV Line Loop-in to New Tucson	2010
San Rafael 230/69kV Transformer 2	2011
Pinal Central 230/115kV Transformer	2013 – Joint Project
Apache - Butterfield	2014
Butterfield - Bicknell	2015 – Deferral Possible
Pantano – Kartchner	2018 – Deferral Possible
Kartchner – CS2	2018 – Deferral Possible
San Rafael – CS2	2018 – Deferral Possible

Table 27. 230kV Projects – Ten Year Planning Horizon

Pantano to Sahuarita 230 kV Line Loop-in to New Tucson: Loop the Pantano to Sahuarita 230 kV Line into a new SWTC New Tucson Substation. Included in SWTC's 2009-2010 CWP.

San Rafael 230/69kV Transformer 2: See section 22 Cochise County for more details. Add second 230/69kV transformer at San Rafael. To be included in SWTC's 2011-2013 CWP.

Pinal Central 230/115 kV Transformer: Add a 230/115 kV transformer at Pinal Central. Joint project involving several participants. To be included in SWTC's 2011-2013 CWP.

Apache – Butterfield 230kV Line: Upgrade the existing 795 ACSR line to one with higher capacity. The line capacity needed is being determined with additional analysis. This is the first of the 230kV lines from Apache to Bicknell that were identified in the SATS study needing upgrade. To be included in a future SWTC CWP.

Butterfield - Bicknell 230kV Line: Upgrade the existing 795 ACSR line to one with higher capacity. The line capacity needed is being determined with additional analysis. This was the second of the 230kV lines from Apache to Bicknell that were identified in the SATS study needing upgrade. To be included in a future SWTC CWP.

Pantano – Kartchner 230kV Line: See section 22 Cochise county for more details. This line and related substation construction have ongoing investigation into what can be built. Possibilities include a new 230 kV line being built or a rebuild of the existing Pantano – Kartchner 115 kV line. To be included in a future SWTC CWP.

Kartchner – CS2 230kV Line: See section 22 Cochise County for more details. This line and related substation construction have ongoing investigation into what can be built. To be included in a future SWTC CWP.

San Rafael – CS2 230kV Line: See section 22 Cochise County for more details. This line and related substation construction have ongoing investigation into what can be built. To be included in a future SWTC CWP.

138kV Projects – Ten Year Planning Horizon	
138kV Line Projects	**Comments**
22nd – East Loop New Line	2009
Tortolita – North Loop Quad	2010
North Loop – Rillito Reconductor	2012
Vail – Irvington 1 Reconductor	2010
Vail – Irvington 2 Reconductor	2010
DMP – Tucson New Line	2010
DMP – Northeast Uprate	2010
Cienega Double Circuit Tap New Line	2010
Vail – Los Reales Uprate	2010
Los Reales – Pantano Uprate	2011
Pantano – East Loop Uprate	2012
Canoa Ranch – Duval CLEAR New Line	2012
Rillito – Northeast Uprate	2012
Irvington – Tucson New Line	2013
Vail - Valencia 138kV Conversion	2013
North Loop – West Ina Reconductor	2014
North Loop – DMP Reconductor	2014
South Loop – Irvington Reconductor	2018
South Loop – Midvale Reconductor	2018

Table 28. 138kV Projects – Ten Year Planning Horizon

22nd – East Loop New Line: Included in preliminary 2009-13 capital budget. Capacity upgrade replaces the existing circuit with pole-line upgrade from 477 ACSS to 954 ACSS.

Tortolita – North Loop Quad: Included in preliminary 2009-13 capital budget. This project rebuilds three existing 138kV circuits between the Tortolita and North Loop substations to increase capacity through the use of 954 ACSS conductor and to accommodate a 115kV circuit for SWTC.

North Loop – Rillito Reconductor: Included in preliminary 2009-13 capital budget. Schedule is subject to revision. This project is to increase capacity to mitigate

contingency overload by upgrading the existing 795 ACSR with advanced conductor technology of similar mechanical, but increased thermal, characteristics that allows use of existing tower structures. This is the first phase of a plan to reconductor all three circuits on the triple circuit structure line between North Loop to West Ina. Completion of the North Loop to Rillito phase will help to provide continuity while the next phase requiring outage of the two remaining circuits.

Vail – Irvington 1 and 2 Reconductor: This project to be done in phases. Phase 1 is to remove clearance issues to allow operation at higher temperatures; therefore, achieving a higher rating. Phase 2 consists of reconductoring using advanced conductor technology that allows use of existing tower structures when it is needed for load growth.

DMP – Tucson New Line: Included in preliminary 2009-13 capital budget. This project provides an update to 138kV of an existing 46kV tie between the DMP and Tucson stations to improve voltage stability during contingency conditions.

DMP – Northeast Rating Increase: Included in preliminary 2009-13 capital budget. Schedule is subject to revision. Increases circuit rating as part of a pole replacement project for this line. Substation terminal upgrade at the Northeast substation is required as well.

Cienega Double Circuit Tap New Line: Extends the existing Vail – Spanish Trail line to serve the new load serving Cienega substation. This project involves reconfiguration of circuits on the right-of-way connecting Vail to Fort Huachuca,. The segment to Spanish Trail includes approximately 3 miles of new single-circuit 138kV pole line and extension of 0.7 miles of new double-circuit 138kV pole-line to the Cienega station.

Vail – Los Reales – Pantano – East Loop Rating Increase: This project and schedule are subject to revision. The project increases clearance to allow conductor operation at higher temperature and hence higher rating.

Canoa Ranch – Duval CLEAR New Line: Included in preliminary 2009-13 capital budget. Increases load serving capability and continuity of service in the Green Valley area. The project extends the South-Green Valley-Canoa Ranch circuit through a

renovated substation on the FMI Sierrita Mine site. Here the circuit ties to another existing 138kV circuit out of South substation.

Rillito – Northeast Rating Increase: Project and schedule are subject to revision. This project mitigates contingency overloads of this 138kV circuit by upgrading the existing 795 ACSR with advanced conductor technology of similar mechanical, but increased thermal, characteristics that allows use of the existing tower structures.

Irvington – Tucson New Line: Project and schedule are subject to revision. This project consists of a new 138kV single-circuit pole-line on new right-of-way. The project mitigates contingency overloads of existing 138kV circuits out of the Irvington substation and anticipates construction of a new load serving substation in the vicinity of Kino Parkway southeast of the existing Santa Cruz substation.

Vail-Valencia 138kV Conversion: Included in preliminary 2009-13 capital budget. This project increases load serving capability in the UNSE-Santa Cruz district by relocating the source from WESTERN's Nogales 115kV switching station to the TEP Vail 345/138kV substation. A new 138kV circuit will be extended from Vail to the vicinity of the Nogales substation where it will tie into the existing pole-line to Nogales. The existing line that extends south to the Valencia substation in Nogales, AZ will be upgraded from 115kV to 138kV. All existing 115kV substations will be upgraded to 138kV to accommodate the new primary voltage.

North Loop – West Ina and North Loop – DMP Reconductor: Under consideration for post-five year capital budget. Both projects are to be done at the same time as described in the "North Loop – Rillito Reconductor Project" because they are on triple-circuit structures. Having increased capacity on the North Loop – Rillito line is needed to allow the remaining North Loop to West Ina and DMP circuits to be reconductored. The capacity increase for both circuits is needed to mitigate contingency overloads. This project consists of replacing the existing 795 ACSR with advanced conductor technology of similar mechanical, but increased thermal, characteristics that allows use of existing tower structures.

South Loop – Irvington and South Loop – Midvale Reconductor: Project and schedule are subject to revision. The capacity increase is needed to mitigate contingency

overloads. The project consists of upgrade of existing 795 ACSR with advanced conductor technology of similar mechanical, but increased thermal, characteristics that allows use of existing tower structures.

115kV Projects – Ten Year Planning Horizon	
115kV Line Projects	**Comments**
Saguaro – North Loop	2010
North Loop – Rattlesnake	2010
CAP system loop into Sandario	2010
CAP system loop into San Joaquin	2010
Valencia – Black Mountain	2010
Marana – Avra Valley	2010
Apache – Hayden loop into San Manuel	2010
Avra Valley – Sandario Tap	2011
Sandario Tap – Three Points	2011
Marana Tap – Marana	2012
Pinal Central – ED2	2013 – Joint Project
Saguaro to Adonis 115 kV Line Loop-in to Naviska	2015 – Deferral Possible
CAP system loop into Picture Rocks	2018 – Deferral Possible

Table 29. 115kV Projects – Ten Year Planning Horizon

Saguaro – North Loop[31] 115kV Line: A part of constructing a new 115 kV line from Saguaro to Rattlesnake (joint project with CAP) that includes the addition of a new substation, Adonis. Included in SWTC's 2009-2010 CWP.

North Loop – Rattlesnake 115kV Line: A part of constructing a new 115 kV line from Saguaro to Rattlesnake (joint project with CAP) that includes the addition of a new substation, Adonis. Included in SWTC's 2009-2010 CWP.

CAP system loop into Sandario 115kV Lines: Loop the CAP Sandario to Brawley 115kV line to SWTC Sandario Substation (joint project with CAP). Included in SWTC's 2009-

[31] The Saguaro to North Loop segment is part of the joint Tortolita – North Loop Quad circuit. There is no planned 115kV termination at Tortolita or North Loop.

2010CWP.

CAP system loop into San Joaquin 115kV Lines: Loop the CAP Brawley to San Xavier 115kV line to a new SWTC San Joaquin Substation (joint project with CAP). Included in SWTC's 2009-2010 CWP.

Valencia – Black Mountain 115kV Line: Construct a new 115 kV line from the CAP line termination east of Black Mountain substation to the existing SWTC Valencia (joint projects with CAP). Included in SWTC's 2009-2010 CWP.

Marana – Avra Valley 115 kV Line: Upgrade the existing line to 1272 ACSR conductor. Included in the SWTC's 2009-2010 CWP.

Apache – Hayden loop into San Manuel 115kV Line: Loop the SWTC Apache to Hayden 115kV line to APS San Manuel Substation. Included in SWTC's 2009-2010 CWP.

Avra Valley – Sandario Tap 115kV Line: Upgrade the existing line to 1272 ACSR conductor. To be included in SWTC's 2011-2013 CWP.

Sandario Tap – Three Points 115kV Line: Upgrade the existing line to 1272 ACSR conductor. To be included in SWTC's 2011-2013 CWP.

Marana Tap – Marana 115 kV Line: Upgrade the existing line to 1272 ACSR conductor. To be included in SWTC's 2011-2013 CWP.

Pinal Central – ED2 Substation 115 kV Line: Construct a new 15 kV line from Pinal Central to the existing ED2 Substation. To be included in SWTC's 2011-2013 CWP.

Saguaro to Adonis 115 kV Line Loop-in to Naviska: Loop the Saguaro to Adonis 115 kV Line into a new SWTC Naviska Substation. To be Included in a future SWTC CWP.

CAP system loop into Picture Rocks 115kV Lines: Loop the CAP Twin Peaks to Sandario 115kV line to a new SWTC Picture Rocks Substation (joint project with CAP). To be Included in a future SWTC CWP.

Catalog of 500kV Projects - Twenty Year Planning Horizon	
Winchester/Willow – SunZia Interconnection	Willow – Winchester
Tortolita – Winchester	Pinal Central – Winchester
Winchester – Vail Single Circuit	Winchester – Vail Double Circuit
Vail – South Loop	South Loop – Three Points
Pinal West – Three Points	Tortolita – North Loop Double Circuit

Table 30. Catalog of 500kV Projects – Twenty Year Planning Horizon

Catalog of 345kV Projects - Twenty Year Planning Horizon	
Tortolita – North Loop Double Circuit	Tortolita – Marana Tap
Tortolita – North Loop Single Circuit	Marana Tap – North Loop
North Loop – Rillito	Marana Tap – DMP
Rillito - Northeast	DMP – SS 30
Northeast – East Loop	SS 30 – South Loop
East Loop – Vail	SS 30 – Vail
East Loop - Irvington	Three Points – SS 30
South Loop – Pinal West 2	Marana Tap – Three Points
Winchester – Vail Single Circuit	Three Points – Bicknell
Winchester – Vail Double Circuit	Vail – South Loop – Bicknell (loop-in)
Willow - Winchester	Apache – Vail Single Circuit
Vail – Irvington	Apache – Vail Double Circuit
South Loop - Irvington	Pinal West – South Loop PST
Vail – South Loop 2	

Table 31. Catalog of 345kV Projects – Twenty Year Planning Horizon

Catalog of 230kV Projects - Twenty Year Planning Horizon	
Apache - Butterfield	Winchester - Apache
Adams Tap to Pantano	Butterfield - Bicknell
Pantano – Nogales Tap	Nogales Tap – Del Bac
Del Bac - DMP	DMP - Marana Tap
Vail – San Rafael	Pantano – Kartchner
Bicknell – San Rafael	San Rafael – CS2
San Rafael - Mural	Adams Tap – Mural
Bicknell – Sahuarita PST	Kartchner – CS2
Apache – Adams Tap	Pantano – South Loop – Sahuarita (loop-in)

Table 32. Catalog of 230kV Projects – Twenty Year Planning Horizon

Catalog of 138kV Projects – Twenty Year Planning Horizon	
Tortolita – Marana (TEP – New Corridor)	Marana – SS No 1
Marana Double Circuit Tap	SS No 1 – North Loop
North Loop – Naranja	Orange Grove – SS NO6
Naranja – Rancho Vistoso	SS NO6 – SS NO7
Rancho Vistoso - Catalina	SS NO7 – Northeast
Irvington – Kino	Twenty Second – SS NO15
Kino – Downtown	Twenty Second – SS NO14
Downtown - Tucson	SS NO14 – East Loop
Midvale – Spenser	SS NO14 – Northeast
Vail –SS NO33	Vail – SS NO17
SS NO33 – Swan Southlands	SS NO15 - Irvington
Swan Southlands – SS NO22	Canoa Ranch – Duval Clear
Hartt – SS NO29	Canoa Ranch – SS NO25

Table 33. Catalog of 138kV Projects – Twenty Year Planning Horizon

Catalog of 115kV Projects – Twenty Year Planning Horizon	
115kV Projects	**Comments**
Avra – Sandario Tap	Sandario Tap – Three Points
Three Points - Bicknell	Saguaro - Naviska
Naviska - Marana	

Table 34. Catalog of 115kV Projects – Twenty Year Planning Horizon

27. Conclusions

The primary objective of SATS is to have a 20 year transmission plan covering the SATS footprint. Agreement to conduct the study as a "single system" is a key principle for the study. A work plan to achieve this objective, which includes the study scope and schedule, plus guidance on the study process, methodology, planning assumptions and criteria was jointly developed by the entire group of participants. The following are key conclusions and observations of the SATS study effort:

There are significant benefits of a coordinated subregional study effort using a single system approach. The SATS participants directly involved in developing the study scope; in developing alternative strategies; in modeling and analysis; and documenting results gained a much better understanding of current and emerging system issues than would have been otherwise possible by working independently. Participants who diligently participated in the many meetings and teleconferences, and who reviewed the documentation provided excellent feedback, valuable information and insights that could not have been accessed otherwise.

Specific benefits of joint planning include the following:

- Provides a framework for SATS Transmission Providers to prepare capital budgets and ten year plans
- SATS provides a forum to ensure accuracy of planning models, and to identify system issues involving interconnected transmission facilities, and to jointly develop mutually beneficial solutions;
- Provides a protocol for establishing "need" during project siting activities before regulators;
- Potentially higher reliability, through the use of multiple corridors versus multi-

circuits in single corridors wherever possible;

- Identification of potential joint projects which could result in lower overall construction requirements;
- Working with adjacent subregional study groups provides an effective means to resolve seams issues;
- Lower individual technical and financial risk through better information and creative group thinking;
- Lower cost, aesthetic and environmental impacts through pursuit of possible joint projects.

Conducting a subregional study looking out beyond the ten year planning horizon creates a sound basis for developing short-term plans in the context of a long-term view. Key findings include:

- Identified key EHV strategies to serve saturated load at ultimate buildout;
- Identified potential future transmission corridors and substation sites;
- The plan recommends flexibility in view of uncertainty considering alternatives to minimize long term risk;
- Worked collaboratively with the Cochise County stakeholders in the pursuit of developing a short-term (3 to 5 year) plan to address existing contingency issues which will provide a long-term solution;

Establishing a subregional study group facilitates an on-going process to solve remaining or emerging issues:

- Five year planning horizon dilemma, described in Section 15, is to be addressed in the SATS 2009 study plan. The problem has been relatively well defined and divided into discrete geographical study areas within SATS;
- Ongoing effort will continue to guide and inform the public in stakeholder forums as well as Transmission Providers' capital budgets and ten year plans

28. Recommendations and 2009 SATS Study Plan

Recommendations for the SATS study are documented as a list of actions in the proposed 2009 SATS Study Plan as follows:

Proposed 2009 SATS Study Plan

- Present plan & subsequent findings to SWAT, WestConnect and to local stakeholders
- Revise load forecasts
- Engage SATS in early case building to ensure accuracy of database for 2009 ten year planning cases:
  - Focus on Arizona for ten year planning to include cases for years 1 through 5 plus year ten;
  - Preparation for ACC ten year plans, RMR, BTA and compliance studies;
  - Provide support and documentation to other regulatory agencies such as FERC and Rural Utility Services (RUS);
- Investigate implications of increased FMI loads in SATS study footprint:
  - Seek input from, and participation by FMI to address their anticipated plant expansion;
- Investigate alternative configurations to mitigate high flows on the Winchester 345/230kV transformer, Apache – Bicknell 230kV line and 230/345kV Bicknell transformer caused by EHV system contingencies;
- Develop and evaluate alternatives to the two joint Tortolita – North Loop 345kV proposal based on the SPPR Three Terminal proposal;
- Investigate impact of SunZia in coordination with CATS EHV, NM, SWAT RTTF and other entities;
- Develop and evaluate alternatives for joint SWTC/TEP substation(s) to supply TEP/Trico loads south of Tucson;
- Continue Cochise County planning in an effort to comply with ACC recommendations;
- May conduct studies to accommodate renewable projects;
- Complete capital cost estimates and economic analysis, including losses;
- Identify potential projects;
- Conduct Scenario Sensitivity analysis, such as Load Forecast, Efficiency, Local Renewable Resources, Local & Distributed Generation, and location of external resources.

29. Appendices

29.1. Appendix A: Study Scope and Schedule

29.2. Appendix B: Table I. NERC Transmission System Standards:

Table I. Transmission System Standards – Normal and Emergency Conditions

Category	Contingencies	System Limits or Impacts		
	Initiating Event(s) and Contingency Element(s)	System Stable and both Thermal and Voltage Limits within Applicable Rating [a]	Loss of Demand or Curtailed Firm Transfers	Cascading Outages
A No Contingencies	All Facilities in Service	Yes	No	No
B Event resulting in the loss of a single element.	Single Line Ground (SLG) or 3-Phase (3Ø) Fault, with Normal Clearing: 1. Generator 2. Transmission Circuit 3. Transformer Loss of an Element without a Fault	Yes Yes Yes Yes	No [b] No [b] No [b] No [b]	No No No No
	Single Pole Block, Normal Clearing[e]: 4. Single Pole (dc) Line	Yes	No[b]	No
C Event(s) resulting in the loss of two or more (multiple) elements.	SLG Fault, with Normal Clearing[e]: 1. Bus Section 2. Breaker (failure or internal Fault)	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG or 3Ø Fault, with Normal Clearing[e], Manual System Adjustments, followed by another SLG or 3Ø Fault, with Normal Clearing[e]: 3. Category B (B1, B2, B3, or B4) contingency, manual system adjustments, followed by another Category B (B1, B2, B3, or B4) contingency	Yes	Planned/ Controlled[c]	No
	Bipolar Block, with Normal Clearing[e]: 4. Bipolar (dc) Line Fault (non 3Ø), with Normal Clearing[e]: 5. Any two circuits of a multiple circuit towerline[f]	Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c]	No No
	SLG Fault, with Delayed Clearing[e] (stuck breaker or protection system failure): 6. Generator 7. Transformer 8. Transmission Circuit 9. Bus Section	Yes Yes Yes Yes	Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c] Planned/ Controlled[c]	No No No No

D [d] Extreme event resulting in two or more (multiple) elements removed or Cascading out of service.	3Ø Fault, with Delayed Clearing [e] (stuck breaker or protection system failure): 1. Generator 2. Transmission Circuit 3. Transformer 4. Bus Section 3Ø Fault, with Normal Clearing [e]: 5. Breaker (failure or internal Fault) 6. Loss of towerline with three or more circuits 7. All transmission lines on a common right-of way 8. Loss of a substation (one voltage level plus transformers) 9. Loss of a switching station (one voltage level plus transformers) 10. Loss of all generating units at a station 11. Loss of a large Load or major Load center 12. Failure of a fully redundant Special Protection System (or remedial action scheme) to operate when required 13. Operation, partial operation, or misoperation of a fully redundant Special Protection System (or Remedial Action Scheme) in response to an event or abnormal system condition for which it was not intended to operate 14. Impact of severe power swings or oscillations from Disturbances in another Regional Reliability Organization.	Evaluate for risks and consequences. • May involve substantial loss of customer Demand and generation in a widespread area or areas. • Portions or all of the interconnected systems may or may not achieve a new, stable operating point. • Evaluation of these events may require joint studies with neighboring systems.

a) Applicable rating refers to the applicable Normal and Emergency facility thermal Rating or system voltage limit as determined and consistently applied by the system or facility owner. Applicable Ratings may include Emergency Ratings applicable for short durations as required to permit operating steps necessary to maintain system control. All Ratings must be established consistent with applicable NERC Reliability Standards addressing Facility Ratings.

b) Planned or controlled interruption of electric supply to radial customers or some local Network customers, connected to or supplied by the Faulted element or by the affected area, may occur in certain areas without impacting the overall reliability of the interconnected transmission systems. To prepare for the next contingency, system adjustments are permitted, including curtailments of contracted Firm (non-recallable reserved) electric power Transfers.

c) Depending on system design and expected system impacts, the controlled interruption of electric supply to customers (load shedding), the planned removal from service of certain generators, and/or the curtailment of contracted Firm (non-recallable reserved) electric power Transfers may be necessary to maintain the overall reliability of the interconnected transmission systems.

d) A number of extreme contingencies that are listed under Category D and judged to be critical by the transmission planning entity(ies) will be selected for evaluation. It is not expected that all possible facility outages under each listed contingency of Category D will be evaluated.

e) Normal clearing is when the protection system operates as designed and the Fault is cleared in the time normally expected with proper functioning of the installed protection systems. Delayed clearing of a Fault is due to failure of any protection system component such as a relay, circuit breaker, or current transformer, and not because of an intentional design delay.

f) System assessments may exclude these events where multiple circuit towers are used over short distances (e.g., station entrance, river crossings) in accordance with Regional exemption criteria.

29.3. Appendix C: Study Models

29.4. Appendix D: Load Forecast

MW

Year	SWTC	TEP	CAP	APS	Total
2008	605	2,369	124	46	3144
2009	638	2,439	124	47	3248
2010	675	2,509	124	49	3357
2011	713	2,582	124	50	3468
2012	756	2,656	124	51	3587
2013	797	2,731	124	52	3705
2014	839	2,807	124	54	3824
2015	878	2,886	124	55	3943
2016	923	2,966	124	56	4069
2017	972	3,047	124	57	4200
2018	1024	3,130	124	59	4337
2019	1082	3,213	124	60	4479
2020	1144	3,299	124	62	4629
2021	1211	3,386	124	63	4784
2022	1284	3,474	124	65	4947
2023	1364	3,564	124	66	5118
2024	1452	3,655	124	68	5299
2025	1547	3,748	124	70	5489
2026	1636	3,842	124	72	5674
2027	1725	3,938	124	73	5860
2028	1814	4,035	124	75	6048

TEP 10 Y Increase	420	761	-	12	1193
TEP 20 Y Increase	1,209	1,666	-	29	2904

29.5. Appendix E: SATS-SPPR Taskforce Study Plan

SATS-SPPR Taskforce

Study Plan:

A study plan has been developed and approved to study the following four scenarios:

1. Study the SPPR option using the SATS study cases to determine if the SPPR option will work within the SATS Transmission Plan.

2. Study a hybrid option using the SATS 345kV option with appropriate 345/230/115 transformation to maintain the current voltage levels at the appropriate buses.

3. Study a hybrid option which allows for double circuit 230/345 on the same structures (known right-of-way issues.)

4. Study a short term 230kV option (SPPR Plan) with the capability of converting to 345kV (SATS Plan) at a future point in time.

Study Plan Schedule:

		Status	Date
I.	Study Plan development	Completed	9/08
II.	Base Case Development	In process	11/15/08
III.	Power flow Analysis	To be Completed	11/30/08
IV.	Final Report	To be Completed	12/30/08

29.6. Appendix F: Cochise County Study Group Meeting Notes

November 8, 2007 Meeting Notes

Main Points

The group agreed its objective would be:

To determine and recommend transmission solution[s] using 115, 138,

and 230 kV lines and substations to solve existing N-1 transmission problems within southern Cochise County. The recommendation[s] will be made November 26, 2007 and January 31, 2008.

Issues that the group agreed needs to be discussed at a later date:

- *Saturation study for Cochise County*
- *Short term solutions*
- *Funding*

Notes

Modeling guidelines:

1) Will use SATS' 20 year case
2) Will not model TEP's 44 kV or APS generators

Possible transmission solutions:

1) 230 kV from San Rafael to Mural and then at a much later date, 230 kV from Mural north toward the I-10 corridor.
2) 230 kV from the I-10 corridor south to a new 230/69 kV substation north of Sierra Vista.
3) Tie TEP's 138 kV to SWTC's 115 kV
4) Tie radial transmissions together using transmission lines and substations
    a. San Rafael to Kartchner using a 230 kV line and 230/115 kV substation

Possible short term solutions:

1) APS to SSVEC 69 kV
2) Capacitors at San Rafael
3) Upgrade SSVEC's 69 kV lines
4) SSVEC to TEP 69 kV

Action Items

1) SSVEC to describe proposed TEP 138 to SWTC 115 kV tie so that TEP's bond counsel can provide comments and viability per TEP's "2 county" bond requirements.

2) SSVEC to investigate possible 138 kV corridors across Ft. Huachuca Military.
3) SWTC to do load flow analysis for possible solutions and present them at November 20 SATS meeting.
4) Agenda for next South of SATS meeting to be determined at November 20 SATS meeting.
5) Next South of SATS meeting will be at TEP on Monday, November 26, starting at 9 AM.

Technical Meeting
South of SATS

Thurs
11/8

NAME	COMPANY	EMAIL
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6)

November 26, 2007 Meeting Notes

To determine and recommend transmission solution[s] using 115, 138, and 230 kV lines and substations to solve existing N-1 transmission problems within southern Cochise County. The recommendation[s] will be made November 26, 2007 and January 31, 2008.

1. Introductions – see sign in sheet in Appendix A
2. Agenda Modifications – none
3. Review and approval of objective and notes – none
4. Review of possible transmission solutions – EvaMarie King
    a. EvaMarie presented her study as shown in Appendix B.
    b. There was discussion and questions on each of the options.
    c. David Bryan discussed the results of a few analyses he had done.
    d. Detailed cost estimates were received after the meeting and included in Appendix C.
5. Possible Transmission Solutions to Carry Forward
    a. SWTC 230 kV Kartchner Loop
        i. Description of Proposed Solution
            1. Build 230 kV line from SWTC's San Rafael to SWTC's Kartchner
            2. Add 230/69 kV substation at Kartchner
            3. Rebuild Pantano to Kartchner from 115 kV to 230 kV
            4. Convert Pantano from 230/115 kV substation to 230 kV breaker station.
            5. Retire Kartchner 115 kV and Pantano 115 kV
        ii. APS Comments
            1. By 2023, APS will take radial 230 kV line from San Rafael to Mural. APS will install 230/69 kV substation at that time.
            2. APS will not participate in 230 kV loop until radial 230 kV line is built.

iii. TEP and Ft. Huachuca were not present to provide comments.

iv. WAPA will not participate.

v. "Ballpark" cost is $40 million.

vi. Minimum of 7 years to engineer and construct.

b. SWTC 230 kV Cooperative #2 230 kV Loop

i. Description of Proposed Solution

1. Build 230 kV line from SWTC's San Rafael to new Cooperative #2 substation, a 230/69 kV substation, located north-central Sierra Vista.
2. Build 230 kV line from Cooperative #2 to Sloan or Pantano.

ii. APS Comments

1. By 2023, APS will take radial 230 kV from San Rafael to Mural. APS will install 230/69 kV substation at that time.
2. APS will not participate in 230 kV loop until radial 230 kV line is built.

iii. TEP and Ft. Huachuca not present to provide comments.

iv. WAPA will not participate.

v. "Ballpark" cost is $34 million.

vi. Minimum of 7 years to engineer and construct.

c. Short Term Solutions

i. Solutions currently being done

1. APS to SSVEC 69 kV tie in Sierra Vista
2. SSVEC 69 kV line upgrades
3. SWTC 69 kV capacitors in Sierra Vista and Benson

ii. Other Solutions to consider

1. TEP 138 to SWTC 115 tie line and substation
2. Generation in Sierra Vista
3. SSVEC 69 kV line upgrades

6. Rewriting Objective

a. It was pointed out that our proposed solutions don't match the SSATS' objective statement.
b. It was agreed that the objective statement would go from:

To determine and recommend transmission solution[s] using 115, 138, and 230 kV lines and substations to solve existing N-1 transmission problems within southern Cochise County. The recommendation[s] will be made November 26, 2007 and January 31, 2008.

To determine and recommend short and long term transmission solution[s] to solve existing N-1 transmission problems within Cochise County. The recommendation[s] will be made November 26, 2007 and January 31, 2008.

7. Report Outline
    a. Items/discussion to be put in the report of this group was discussed.
    b. The report will have the following sections.
        i. Summary
        ii. Description of companies & transmission system in Cochise County, which will come from SATS report and SSATS group.
        iii. Summary of issues in Cochise County, which will come from 2007 ACC BTA, notes from SATS, and SSATS group.
        iv. Description of options studied, which will come from SWTC.
        v. Summary of loadflows & results, which will come from SWTC.
        vi. Recommendation, which will come from SSATS group
        vii. Appendix A, meeting notes
        viii. Appendix B, loadflows, which will be available in PDF format on a CD but not printed
8. Action Items
    a. SSVEC to do action items from last meeting, which are listed below

i. SSVEC to describe proposed TEP 138 to SWTC 115 kV tie so that TEP's bond counsel can provide comments and viability per TEP's "2 county" bond requirements.

ii. SSVEC to investigate possible 138 kV corridors across Ft. Huachuca Military.

b. Detail cost estimates of two proposed solutions

9. Next meeting

a. **Wednesday, January 9, 2008** at location and time TBD

b. Agenda

i. Review details of two long term solutions.

ii. Review short term solutions.

South of SATS
November 26, 2007

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January 9, 2008 Meeting

No notes were prepared for this meeting. Below is the meeting summary provided to SATS by David Bryan on January 14, 2008.

5) Cochise County Study Update

David Bryan was asked to provide an update of the Cochise County Studies.

The notes of the Cochise County meeting held on January 9th have not been transcribed and were not available for this meeting. The focus of the meeting was to discuss the two known high voltage (HV) options that were determined to be viable for study (230 kV loop from Pantano to Kartchner to San Rafael and a 230 kV loop from Sloan to San Rafael) along with a new option that was provided for study only recently by SSVEC's consultant. This new option involves the construction of a new 230 kV line from San Rafael to a new 230/115/69 kV substation located next to Kartchner Substation. A 115 kV tie from this new substation to Kartchner would be made, along with a 69 kV tie to the SSVEC 69 kV system. SSVEC would in turn, rebuild certain existing 69 kV lines back to Apache Generation, to 795 ACSR conductor. However, further review for this 3rd option showed a transformer with the capacity ratings envisioned was extremely unusual, and would make the transformer expensive and difficult to integrate into the system. Therefore, this option was dropped. The studies also revealed limitations with this option, in the 2019/2020 time frame for the loss of Butterfield to San Rafael.

Participants at the Cochise County meeting agreed that some kind of 230 kV loop is the solution in this area. The proposed solution presented to the group by SWTC consisted of a new 230 kV line from Sloan Substation to Huachuca Substation, operated radially initially, but looped from Huachuca to San Rafael after 2020. However allocation of the $40M cost of 230 kV reinforcement requires further discussion. According to SWTC's Board Policy 7.12, SSVEC would pay for the first part of the 230 kV loop as a Direct Assignment Facility. When a loop that integrates these proposed facilities into the area bulk network is completed, it would then become a System Facility. SSVEC argued that building over 37+ miles of radial 230 kV transmission to a new substation, without

completing the loop does not make sense. There will be minimum distance separating any new transmission substation and San Rafael and efforts should be made to construct the 230 kV loop, as one project, instead of an initial radial transmission line and substation, that SSVEC would be required to bear the costs of before it is integrated into the transmission system. SSVEC would like to see some kind of formal cost-sharing agreement in the project.

David noted that APS and Fort Huachuca were also in attendance at the meeting, but Western was not. At this time, no other entities have expressed an interest in participating in the cost of a 230 kV loop in the area.

EXHIBIT STL-24 – Southline Customer Answers

Pursuant to the October 24, 2016 Procedural Order, Applicant Southline Transmission, L.L.C. provides the following exhibit.

EXHIBIT
STL-24
ADMITTED

Southline Transmission Project

Parker-Davis Project Customer Outreach Meeting May 28, 2015

Questions/Comments and Responses

1. Question/concern over Del Bac being an option. Would appreciate if it was not an option but rather a part of the Project.

   Response: The Del Bac addition is currently an option and we appreciate the input as to P-DP stakeholder interests.

2. Are you aware that the EIS is being delayed? There is congressional interest and speaker of the house interest in the wine grower interests in the area.

   Response: Western is aware of broad interest in the EIS and is working in collaboration with stakeholders to find amenable solutions to the issues raised in the EIS process.

3. What's the breakdown of state land between New Mexico and Arizona? Have the ROW applications been filed with the state land departments?

   Response: Land ownership across the project is approximately 1/3rd each state, private, and Federal. State lands are predominately located in New Mexico. ROW applications have not yet been filed with state land departments; however, Southline has been in communication with the state land departments to keep them apprised as the project develops.

4. On what basis are the participation strawman and principles documents being held confidential?

   Response: Elements within the documents are considered confidential commercial or financial information and therefore are exempt from FOIA disclosure under 5 U.S. C. 552(b)(4). Concepts contained in the document were presented at the customer meeting. In the event a FOIA request is received, the project developer will be consulted as to what information is considered confidential before the document is evaluated for release under FOIA.

5. Can you provide an example of a new facility on the Upgrade Segment that would be owned by Southline?

   Response: Connection into the Vail Substation would be an example of a new facility within the Upgrade Segment that is currently not part of the existing infrastructure. These facilities would be owned by Southline on lands acquired by Southline. All facilities currently owned by Western on the Upgrade Segment would continue to be owned by Western.

6. Would Southline acquire land with utilities and federal agencies?

   Response: Yes, Southline would acquire land rights associated with Southline owned new facilities within the Upgrade Segment that are controlled by an electric utility, and New Build Segment lands owned by electric utilities and Federal agencies such as the Bureau of Land Management.

7. Would Western apply to the state land agencies?

   Response: It is assumed on the Upgrade Segment that Western would take the lead, which may entail applications with state land agencies. Further discussion is needed on who would work with state land agencies on the New Build Segment.

8. What is the authority for Western to acquire lands beyond Apache Substation?

Response: Western believes it has authority under Section 402 of the Recovery Act to acquire lands beyond Apache Substation in the Southline project.

9. Would the New Build Segment be made part of the P-DP?

   Response: This has not yet been decided. Western is seeking input from P-DP stakeholders as to their desire to incorporate Western acquired New Build Segment capacity into the P-DP. In the event it is not, P-DP will not be responsible for the associated O&M costs. If New Build Segment capacity is incorporated into P-DP it is assumed that the associated O&M costs will be incurred by P-DP in the same proportion as the Western capacity share.

10. Can Western provide further analysis of estimated O&M costs associated to the New Build Segment if adopted by P-DP assuming no additional transmission sales?

    Response: Yes, please see Attachment #1 to this document for requested information.

11. Does O&M include future capital expenditures?

    Response: Yes, but only within the duration of the lease term.

12. Does the O&M at Del Bac get assigned to CAP?

    Response: No. Assets and associated costs related to this project are within the P-DP system. In the event direct benefits to CAP are identified, pro-rata portions of the Del Bac facilities may be assigned to CAP.

13. What is the term of the arrangement (long-term arrangement between Southline & Western)?

    Response: The term is not yet determined. It is anticipated to be long-term. The term and any renewal provisions shall be determined within the contracting process.

14. Do you anticipate marketing ahead of time to get off-takers on the New Build Segment?

    Response: Western has not anticipated an open season process for its share of New Build Segment capacity, however, would be open to soliciting interest from potential off-takers on the New Build Segment.

15. Would the Project owners (SL & Western) be competing for transmission sales?

    Response: In some facets, yes, as each would have similar transmission capacity in the area. However, as the capacity is incorporated into area transmission systems, the nature of the overall transmission that is marketed will inevitably lead to distinct differences in the transmission available to the marketplace, which will limit the direct competition of capacity that is made available.

16. Is Western going to intervene in Southline's FERC filing?

    Response: Western does not anticipate intervening in Southline's FERC filing.

17. Is there a decision to be made on Apache to Afton as a stand-alone and whether it would be a P-DP rate or a stand-alone rate?

    Response: The project as defined encompasses both New Build and Upgrade Segments. There is still a decision to be made as to Western's capacity interest and disposition of New Build Segment capacity. Options may include:

    i) Acquire proposed New Build Segment capacity and either:
        a. Incorporate into P-DP; or

b. Establish it as a stand-alone system

ii) Acquire a reduced quantity of New Build Segment capacity and either:
   a. Incorporate into P-DP; or
   b. Establish it as a stand-alone system

18. Would there be capital cost incurred by Western on the New Build Segment?

    Response: No.

19. What are the current reservations on Apache to Saguaro?

    Response: The Apache to Saguaro line is fully subscribed.

20. Does the anticipated 250 MW of capacity include the existing 120 MW or is it incremental?

    Response: The 250 MW is inclusive of the 120 MW. Western would acquire approximately 130 MW of additional capacity on the Upgrade Segment.

21. Are there any requests for capacity for the existing Saguaro-Apache line in the queue? This includes capacity requests impacted by or associated to the Saguaro-Apache segments.

    Response: Yes. A customer request of 40 MW is currently processing and is in the facility study phase.

22. Suggest Western to review the 120 MW of existing Upgrade Segment capacity and verify that amount.

    Response: Western has confirmed that existing capacity between Apache and Saguaro is 120 MW. There is additional capacity available between Saguaro and Tucson when factoring in the redundancy through Oracle Substation.

23. Where does the 40 percent on the capacity allocations come from?

    Response: The 40 percent is the percentage share of the Saguaro to Apache upgraded capacity Western would need to acquire, based on current rated capacity estimates, to acquire the approximate amount of upgraded P-DP capacity that would result from constructing the Upgrade Segment elements within Western's 10-Year Plan.

24. Are Hidalgo and Afton within the current P-DP marketing area?

    Response: No.

25. What is the relationship between Southline and SU FERC?

    Response: Southline Transmission, L.L.C. is an indirect wholly-owned subsidiary of Hunt Power, LP, which in turn is a subsidiary of Hunt Consolidated, Inc., a diversified holding company for a privately-owned group of entities based in Dallas, Texas. Hunt Power, LP develops and invests in entrepreneurial electric and gas opportunities, and is part of a larger privately-owned group of companies managed by the Ray L. Hunt family that engages in oil and gas exploration, refining, power, real estate, ranching and private equity investments. Southline Transmission, L.L.C. will own the non-Western assets and lease them to SU FERC, which will administer the non-Western capacity rights.

    SU FERC, L.L.C. is a wholly-owned subsidiary of Sharyland Utilities, LP. Shary Holdings, LLC is a 1 percent owner and the general partner of Sharyland Utilities, LP and SU Investment Partners, LP owns the remaining 99 percent. Both Shary Holdings and SU Investment Partners are owned by members of the Hunt family.

26. How critical is the success of the whole Project on the New Build segment?

    Response: The Project is defined to include the New Build and Upgrade Segments. All previous studies, ratings, EIS, ROW, technical, and commercial work has been accomplished with the Project as defined. The viability of the project in a segregated platform has not been studied and speculating on the success of one segment without the other would be premature.

27. Is the $3.10/kW-year savings over the 40-year period?

    Response: Yes.

28. Do the $3.10/kW-year savings include additional capacity sales?

    Response: No. Capacity sales were assumed constant at today's levels when calculating the $3.10/kW-year estimated rate savings.

29. Please provide a worksheet showing how Western got to these savings figures.

    Response: Please see Attachment #2 to this document for a worksheet depiction of how Western calculated the $3.10/kW-year figure.

30. When would Western conduct an Open Season?

    Response: Western has not currently established an open season for anticipated capacity it may acquire. However, Western will consider either an open season or other means of gauging potential transmission sales associated with project capacity it may acquire.

31. There is concern that if Western obtained capacity in the New Build Segment that it would have increased costs without the benefit of additional revenue from capacity sales.

    Response: Western appreciates this input and recognizes the need for a sufficient recovery mechanism.

32. What is the timeline for in-service?

    Response: It is preferred to be in-service in 2017; however, 2018 is more likely. It is anticipated to be at least partially in service during this timeframe.

33. Is it anticipated that it would be a 2-year construction window?

    Response: Yes.

34. When does Southline anticipate going to the Arizona Corporation Commission?

    Response: That has not yet been determined.

35. Please provide a list of segments where the expansion of the Upgrade Segment ROW is planned.

    Response: For the Saguaro–Tucson and Tucson–Apache transmission line segment, the existing 100-foot ROW would be utilized, with an expansion of 50 feet of adjacent ROW where possible. No expansion of ROW would be required through Bar V Ranch (a local conservation area east of Tucson) or in congested suburban areas such as from the Del Bac Substation through Tucson to the Rattlesnake Substation, or near J-6 Ranch and Mescal.
    There would be approximately two miles of new ROW to accommodate the construction of the new transmission line that will interconnect with the existing Tucson Electric Power Company (TEP) Vail Substation, located southeast of Tucson and just north of the existing 115-kV Tucson–Apache line; and U3aPC is a variation of the proposed Project in the Upgrade Segment and was developed to shift segment U3a of the Proponent's Preferred Alternative

away from potential conflicts with Pima County economic development efforts. U3aPC was also developed to minimize ROW encroachment conflicts and dense development around the existing Western line in the Summit area. Realigning the existing Western line along U3aPC would allow for safer and easier maintenance of the line in this area.

36. Please provide a more detailed timeline of the Project.

    Response: The milestones provided in the presentation (listed below) will be expanded, and a more detailed schedule provided, following the conclusion of the NEPA process as much of the subsequent schedule is contingent upon the NEPA process.

    May 2015 – Provide Project proposal and seek customer input
    June 30, 2015 – Comment and input due
    Q3 2015 – Record of Decision published (EIS)
    Q3 2015 – Southline open solicitation initiated
    Q3 2015 – Customer update and feedback
    Q4 2015 – Western evaluation to continue pursuing Project
    Q4 2015 – Contract negotiations
    2016 – Initiate design and construction.

ATTACHMENT #1

Parker-Davis Project
New Build O&M Rate Estimate
(For Southline Project)

New Build O&M Costs	
New Build O&M Estimate	$5,500,000
Western % Share	15.000%
Western $ Share	$825,000
Costs to Rate	
Annual Costs to Rate	$825,000
Rate Impact	
Annual Cost to Rate	$825,000
Typical Project-Wide Sales (kW)	2,750,000
Rate Impact - $/kW-Year	$0.30
Rate Impact - $/kW-Month	$0.025

ATTACHMENT #2

Parker-Davis Project
Saguaro-Apache Incremental Rate Estimate
(For Southline Project)

Construction Costs						
Facility	Estimated IDC Rate	Year 1	Year 2	Year 3	Year 4	Close-Out Year 5
Saguaro-Tucson 115kV Rebuild	4.875%	-	39,597,000	-	-	-
Apache-Tucson 115kV Rebuild Phase 1	4.875%	20,000,000	-	-	-	-
Apache-Tucson 115kV Rebuild Phase 2	4.875%	-	-	32,588,000	-	-
Apache-Tucson 115kV Rebuild Phase 3	4.875%	-	-	-	34,308,000	-
		$20,000,000	**$39,597,000**	**$32,588,000**	**$34,308,000**	**$0**

Estimated Construction Costs: $126,493,000

Interest During Construction (IDC)						
	Estimated IDC Rate	Year 1	Year 2	Year 3	Year 4	Close-Out Year 5
Saguaro-Tucson 115kV Rebuild	4.875%	-	965,177	1,977,406	2,073,805	2,174,903
Apache-Tucson 115kV Rebuild Phase 1	4.875%	487,500	998,766	1,047,455	1,098,519	1,152,072
Apache-Tucson 115kV Rebuild Phase 2	4.875%	-	-	794,333	1,627,389	1,706,724
Apache-Tucson 115kV Rebuild Phase 3	4.875%	-	-	-	836,258	1,713,283
		$487,500	**$1,963,943**	**$3,819,194**	**5,635,971**	**$ 6,746,982**

Estimated IDC: $18,653,590

Construction Costs w/IDC						
	Estimated IDC Rate	Year 1	Year 2	Year 3	Year 4	Close-Out Year 5
Saguaro-Tucson 115kV Rebuild	4.875%	-	40,562,177	1,977,406	2,073,805	2,174,903
Apache-Tucson 115kV Rebuild Phase 1	4.875%	20,487,500	998,766	1,047,455	1,098,519	1,152,072
Apache-Tucson 115kV Rebuild Phase 2	4.875%	-	-	33,382,333	1,627,389	1,706,724
Apache-Tucson 115kV Rebuild Phase 3	4.875%	-	-	-	35,144,258	1,713,283
		$20,487,500	**$41,560,943**	**$36,407,194**	**$39,943,971**	**$6,746,982**

Estimated Construction Costs (w/IDC): $145,146,590

Principal & Interest	
Construction Costs (w/IDC)	$145,146,590
Projected Interest Rate	4.875%
Repayment Period (yrs)	40
Resultant Annual P&I	$8,314,583
Costs to Rate	
Resultant Annual P&I	$8,314,583
Additional O&M	$220,408
Annual Costs to Rate	$8,534,991
Rate Impact	
Annual Cost to Rate	$8,534,991
Typical Project-Wide Sales (kW)	2,750,000
Rate Impact - $/kW-Year	$3.10
Rate Impact - $/kW-Month	$0.258

EXHIBIT STL-25 – Southline Customer Update

Pursuant to the October 24, 2016 Procedural Order, Applicant Southline Transmission, L.L.C. provides the following exhibit.

EXHIBIT
STL-25
ADMITTED

Western AREA POWER ADMINISTRATION

SOUTHLINE TRANSMISSION PROJECT

Southline Transmission Project

Parker-Davis Project Customer Outreach

May 28, 2015

Agenda

SOUTHLINE TRANSMISSION PROJECT

- Purpose of Meeting
- Introduction of Presenters
- Background Information
- Project Proposal
- Potential Impacts to the PDP
- Proposed Timeline
- Discussion / Comments

Western AREA POWER ADMINISTRATION

Purpose of Meeting

SOUTHLINE TRANSMISSION PROJECT

- Provide background information
- Provide updates from November 2012 customer meeting
- Discuss the Southline/Western developed proposal and potential impact to PDP transmission customers
- Present preliminary analysis
- Obtain customer feedback on proposal

Western AREA POWER ADMINISTRATION

Presenters

SOUTHLINE TRANSMISSION PROJECT

- Project background information – Doug Patterson, Black Forest Partners, Southline Project Manager
- Western participation & updates – Todd Rhoades, Western Technical Lead
- Project proposal & impacts – Mike Simonton, Western Commercial Lead

Western AREA POWER ADMINISTRATION

Background – Sponsors

SOUTHLINE TRANSMISSION PROJECT

- Southline Transmission, L.L.C., a subsidiary of Hunt Power L.P., is the Project Sponsor
  - Hunt Power, L.P. is part of a larger privately-owned group of entities managed by the Ray L. Hunt family that engages in oil and gas exploration and production, refining, power, real estate, ranching, and private equity
  - Hunt Power, L.P. develops and invests in large scale entrepreneurial electric and gas utility opportunities, and has played a major role in numerous innovative projects within the energy industry
- Black Forest Partners L.P. serves as the Project Manager for Southline Transmission, L.L.C.
  - Black Forest is a private investment and development firm focused on electric infrastructure including transmission, efficiency and storage

Western AREA POWER ADMINISTRATION

Background – Project Overview

SOUTHLINE TRANSMISSION PROJECT

Two Segments, Totaling 360 Miles

- New Build — 345kV double-circuit Afton-Apache, 240 Miles
- Upgrade — 230kV double-circuit Apache-Saguaro/Tortolita, 120 Miles

The Project will have a right-of-way up to 200 feet wide. The Project may include development of a substation in Luna County, New Mexico, with precise location determined when Project route is confirmed.

LEGEND

- Agency Preferred Route
- Alternative Routes
- Substation End Point
- Intermediate Substation Location
- City/Town

0 12.5 25 50 MILES

N

Western AREA POWER ADMINISTRATION

Background – Project Overview

SOUTHLINE TRANSMISSION PROJECT

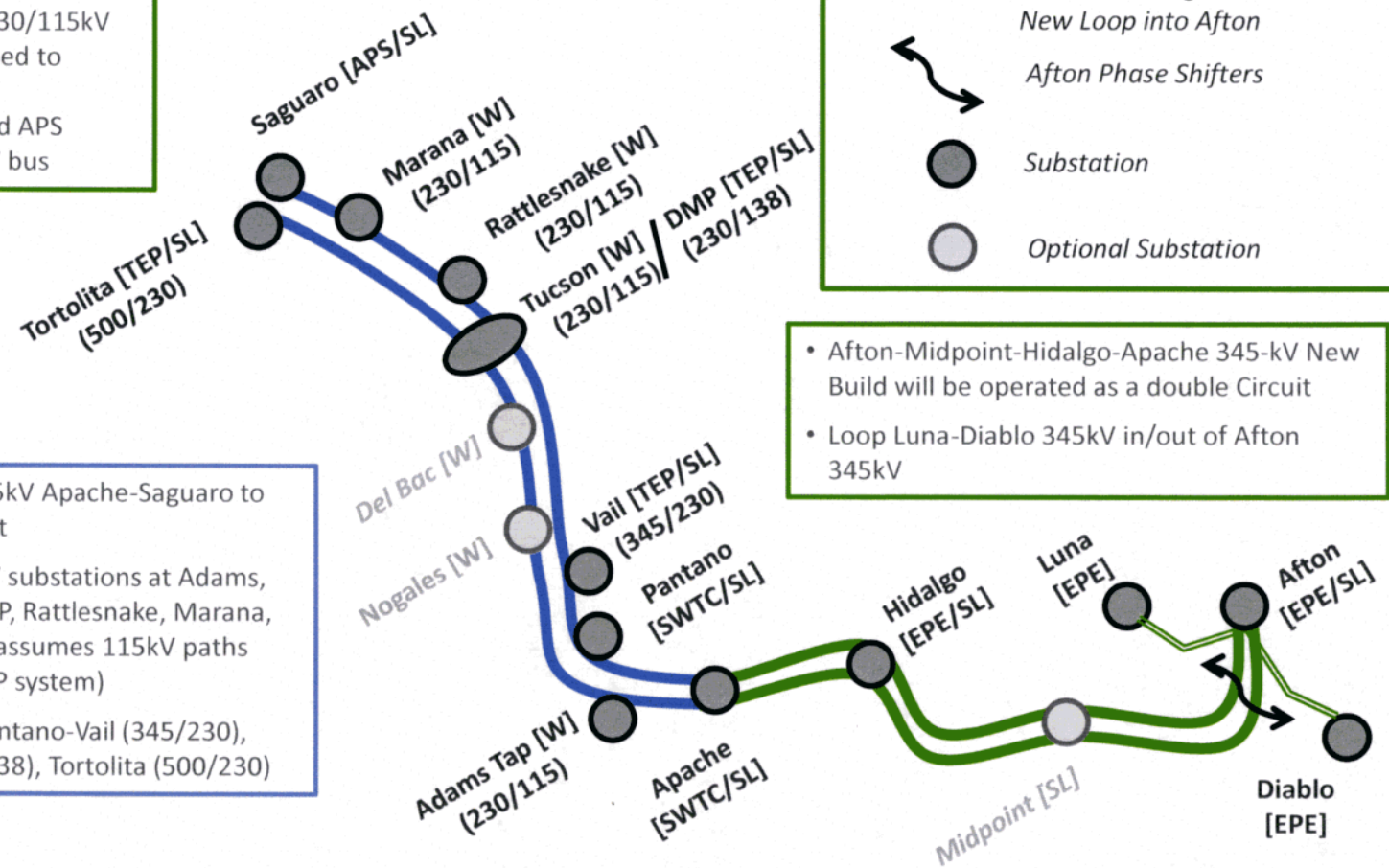
- Bi-directional Capacity WECC Phase 3 Accepted Rating dated March 23, 2015
  - Afton to Apache: 1,037 MW
  - Apache to Saguaro/Tortolita: 1,000 MW
  - Tortolita/Saguaro to Apache: 430 MW
    (715 MW with potential Tucson-Oracle re-conductored)
  - Apache to Afton: 971 MW
- Multiple interconnections to existing transmission system
- Maintains existing PDP 115kV contract paths
- ROW on approximately equal parts BLM, State and private land
  - Upgrade existing system and follow existing corridors to minimize impacts
- Project Need
  - Improve Reliability
  - Relieve Congestion
  - Support Growth
  - Facilitate Access to Renewable Resources

Western AREA POWER ADMINISTRATION

Background—Project Overview

SOUTHLINE TRANSMISSION PROJECT

- Southline Ties to APS Saguaro will be through a new electrically isolated 230kV bus via two step down 230/115kV Transformer banks tied to existing APS Saguaro East and APS Saguaro West 115kV bus



- Afton-Midpoint-Hidalgo-Apache 345-kV New Build will be operated as a double Circuit
- Loop Luna-Diablo 345kV in/out of Afton 345kV

- Rebuild Western 115kV Apache-Saguaro to 230kV Double Circuit
- Circuit 1: 230/115kV substations at Adams, Del Bac, Tucson/DMP, Rattlesnake, Marana, Saguaro (230/115) (assumes 115kV paths maintained for PDP system)
- Circuit 2: Apache-Pantano-Vail (345/230), Tucson/DMP (230/138), Tortolita (500/230)

Background – Western's Current Participation

SOUTHLINE TRANSMISSION PROJECT

- The Southline Transmission Project has been identified by Western for further review, evaluation, and consideration of participation and potential Transmission Infrastructure Program (TIP) funding
- Western's current participation is through an advance funding agreement to isolate project costs from current customers, including reimbursement for Western employee's time
- Western is considering participation in the Project and is serving as co-lead Federal agency for the Environmental Impact Statement ("EIS") that will be part of its decisional process
- Western and Southline Transmission have executed basic initial agreements, including :
  1. July 18, 2011, Memorandum of Understanding
  2. March 16, 2012, Advanced Funding Agreement for Southline to fund Western's efforts
- Ownership and roles discussions have been advanced through a confidential, non-binding participation principles document that sets forth the anticipated terms of a "Participation Agreement" yet to be negotiated to govern their respective rights and obligations to the Project
- Separate financing discussions are in early stages

Western AREA POWER ADMINISTRATION

SOUTHLINE TRANSMISSION PROJECT

PDP Upgrade Segment Need

- Existing segment is comprised of infrastructure that is past its useful life
- Evidenced by FY13 wood pole study demonstrating that ~21% of the Upgrade Segment's wood pole inventory is below 65% of design strength which is the American National Standards Institutes recommended replacement strength.
- Access to capital for needed rehabilitation projects such as these has been extremely limited
- Failing and aged infrastructure puts added cost and rate pressure on the PDP system and customers.
- Investment in this part of the PDP system is needed to minimize the increasing probability of extended and costly unplanned outages on over-stressed facilities

Western AREA POWER ADMINISTRATION

Environmental Activity

SOUTHLINE TRANSMISSION PROJECT

- Notice Of Intent Published in Federal Register - April 2012
- NEPA Public Scoping Begins – April 2012
- Draft Environmental Impact Statement – Published in Federal Register – April 2014
- Public Comment Period Closed – July 2014
- Final Environmental Impact Statement – Anticipated Publication in the Federal Register -- Q3 2015
- Record of Decision Anticipated – Q3 2015

Western AREA POWER ADMINISTRATION

Technical Activity

SOUTHLINE TRANSMISSION PROJECT

- WestConnect Regional Planning Initiated -- 2009
- WECC Path Rating, Phase 1 Report Approved – March 2012
- Facility Study (New Build) Complete – December 2012
- Facility Study (Upgrade) Phase 1 Complete – September 2013
- Facility Study (Upgrade) Phase 2 Complete – December 2014
- WECC Path Rating, Phase 2 Report Approved – January 2015
- WECC Path Rating, Phase 3 Status Granted – March 2015

Western AREA POWER ADMINISTRATION

Commercial Activity

SOUTHLINE TRANSMISSION PROJECT

- PDP Outreach Effort Begins – November 2012
- Participation Strawman Approved by Management Committee – September 2013
- Preliminary Financial Model Developed – September 2013
- Participation Principles Finalized – March 2015
- **PDP Customer Project Proposal – May 2015** ← **We are here**
- Customer dialogue and input

Western AREA POWER ADMINISTRATION

Project Proposal – Participation Principles

SOUTHLINE TRANSMISSION PROJECT

- Financial Contributions
  - Western would not have a financial obligation for the construction of the Project
  - Southline would fund all land acquisitions, construction of new facilities, and improvements to existing facilities within the project scope of work
- Ownership of Physical Assets
  - Western would own all upgraded facilities (i.e. existing Western-owned facilities that are modified, improved, or replaced)
  - Southline would own the new facilities constructed within the Upgrade Segment and all the New Build facilities
  - No joint ownership of assets. Terms would provide for avoidance of stranded assets and/or patchwork ownership at termination of contracts

Western AREA POWER ADMINISTRATION

Project Proposal – Participation Principles

SOUTHLINE TRANSMISSION PROJECT

- Lands
  - Western would:
    - Use its current ROW as a basis for lands on the Upgrade Segment
    - Manage the overall land acquisition process
    - Acquire and own land rights required to complete the Upgrade Segment (with exception)
    - Acquire and own land rights required to complete the New Build segment (with exception)
  - Southline would:
    - Acquire and own land rights associated with Southline owned new facilities within the Upgrade Segment that are controlled by an electric utility
    - Acquire and own land rights within the New Build Segment that are owned by electric utilities and Federal agencies
  - Operating Lease:
    - Western would lease to Southline designated Western lands
    - Southline would own facilities on leased Western lands through a tenant improvement arrangement
    - Tenant improvement facilities within the Upgrade Segment revert to Western at the expiration of the lease pending any necessary financial settlement and closeout

Western AREA POWER ADMINISTRATION

Project Proposal – Participation Principles

SOUTHLINE TRANSMISSION PROJECT

- Construction Management
  - Western would be the construction manager for the Upgrade Segment
  - Southline would be responsible for construction management for the New Build Segment
- Operations & Maintenance
  - Western would maintain O&M responsibilities for the Upgrade Segment
  - O&M provider for the New Build segment is to be determined by the Parties
  - Project O&M costs and expenses would be shared between the parties in proportion to their respective capacity rights

Western AREA POWER ADMINISTRATION

Project Proposal – Participation Principles

SOUTHLINE TRANSMISSION PROJECT

Capacity Rights

- Western and Southline will obtain capacity rights in the project commensurate with their contributions
- Western would retain its existing capacity on the Upgraded Segment and acquire percentage shares of any additional capacity yields; Southline would acquire percentage shares of additional capacity per segment

Segment	Western Static MW	Western Upgrade %
Apache to Saguaro	120	15%
Saguaro to Apache	120	40%
Afton to Apache		15%
Apache to Afton		15%

	Participant		Segment Capacity				Continuous Capacity
E->W	Western	SAG	250	APE	156	AFT	156
	Southline		750		881		750
	Total>>		1000		1037		
W->E	Western	SAG	244	APE	146	AFT	146
	Southline		186		825		186
	Total>>		430		971		

*Approximate MW figures, final percentages and MW to be rounded as necessary

Western AREA POWER ADMINISTRATION

Project Proposal – Participation Principles

SOUTHLINE TRANSMISSION PROJECT

- Western Capacity
  - All Western acquired Upgrade Segment capacity would be incorporated as a PDP transmission asset and marketed as such
  - Western acquired New Build Segment capacity options for consideration are as follows:
    - Allocate transmission capacity to PDP
    - Establish as a stand alone asset
  - Existing contract rights will be honored, all remaining capacity will be marketed through Western's Open Access Transmission Tariff
- Southline Capacity
  - Southline may lease or reassign its capacity rights to third parties
  - Market capacity through an open solicitation process

Western AREA POWER ADMINISTRATION

Potential Impacts to PDP

SOUTHLINE TRANSMISSION PROJECT

- Anticipated Benefits:
  - Alternative Source of Capital
  - Mitigate Rate Cost Components
  - Improve Reliability
  - Maintain Ownership and Control of Existing Infrastructure
  - Increase Available Capacity
  - Additional POR/POD Combinations
  - Shared O&M Costs
  - Enables re-allocation of funding for other needed initiatives
  - Potential synergy with other Western assets/efforts
- Potential Risks:
  - Unwinding in the event of a Southline default

Western AREA POWER ADMINISTRATION

Potential Impacts to PDP

SOUTHLINE TRANSMISSION PROJECT

- Assumptions:
  - No additional transmission sales (remain constant)
  - 4.875% Interest rate
  - 40 year repayment period
- Cost Savings:
  - Capital Expense:
    - $145M of PDP initial investment
      - $126M capital investment
      - $19M interest during construction
    - $187M of interest
    - Total P&I of $332M or $8.3M per year
  - Operations & Maintenance
    - $220K per year
- Rate Savings Estimate:
  - Avoids upward rate pressure of $3.10 kW-year or $0.258 kW-month

Western AREA POWER ADMINISTRATION

Project Proposal Summary

SOUTHLINE TRANSMISSION PROJECT

- Western is seeking PDP customer input and dialogue
- Western proposes that participation in the Southline project as described within has ample benefits with minimal risks for the PDP
- Anticipated Timeline:
  - May 2015 – Provide project proposal and seek customer input
  - **June 30, 2015 – Comment and input due**
  - Q3 2015 – Record of decision published (EIS)
  - Q3 2015 – Southline open solicitation initiated
  - Q3 2015 – Customer update and feedback
  - Q4 2015 – Western evaluation to continue pursuing project
  - Q4 2015 – Contract negotiations
  - 2016 – Initiate design and construction

Western AREA POWER ADMINISTRATION

Contacts

SOUTHLINE TRANSMISSION PROJECT

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TIP Project Manager

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wieringa@wapa.gov
CSO Environment

Submit Input to:

DSW-SouthlineComments@wapa.gov

Western's Southline website
http://ww2.wapa.gov/sites/western/transmission/infrastruct/Pages/Southline.aspx

Southline Project website www.southlinetransmissionproject.com

Western AREA POWER ADMINISTRATION

SOUTHLINE TRANSMISSION PROJECT

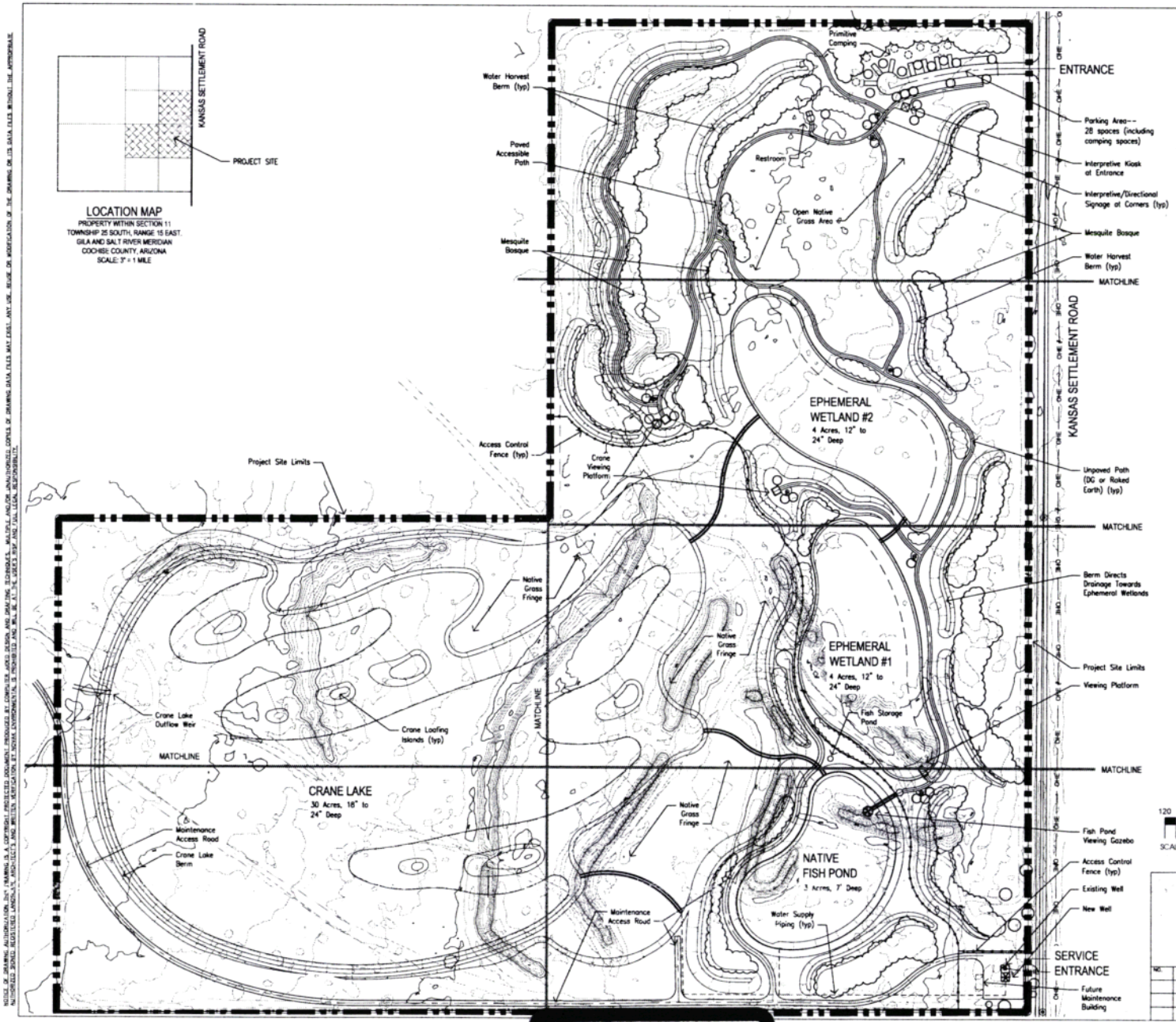
Questions / Comments

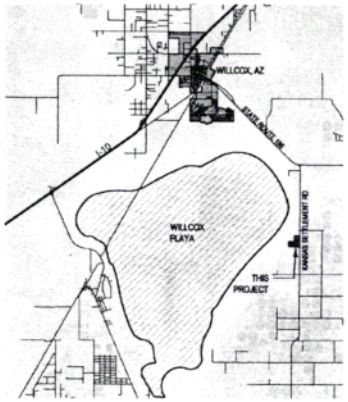
Western AREA POWER ADMINISTRATION

CRANE LAKE RELOCATION PROJECT

WILLCOX, ARIZONA

LOCATION MAP
PROPERTY WITHIN SECTION 11
TOWNSHIP 25 SOUTH, RANGE 15 EAST
GILA AND SALT RIVER MERIDIAN
COCHISE COUNTY, ARIZONA
SCALE: 3" = 1 MILE





VICINITY MAP
No Scale

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Site Plan Sheet SP-2	3
Site Plan Sheet SP-3	4
Site Plan Sheet SP-4	5
Site Plan Sheet SP-5	6
Site Plan Sheet SP-6	7
Well Details	8

120 60 0 120 240
SCALE: 1"=120'-0"

Novak Environmental, Inc.
4574 North First Avenue #100 • Tucson, AZ 85718
Phone 520 206 0591 Fax 520 882 3006
Landscape Architecture • Natural Resources • Planning • Mitigation

CRANE LAKE RELOCATION
COVER PLAN
PROPERTY WITHIN SECTION 11,
TOWNSHIP 25 SOUTH, RANGE 15 EAST,
GASRM, COCHISE COUNTY, ARIZONA

NO.	REVISION	DATE

DESIGNED:	DRAWN:	CHECKED:	SHEET
TC	TC	KC	COVER
DATE: NOVEMBER 2016	PROJECT NO.: 16026	SCALE:	1 of 8

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EXHIBIT
tabbies
STL-26
ADMITTED

Southline Transmission Project

Routing Report

Submitted to:

Bureau of Land Management and Western Area Power Administration

Submitted by:

Southline Transmission, L.L.C.

1900 North Akard Street

Dallas, TX 75201

April 2012

EXHIBIT

tabbies

STL-27

ADMITTED

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Acronyms and Abbreviations

ACEC	Area of Critical Environmental Concern
Applicant	Southline Transmission, L.L.C.
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
DMP	DeMoss Petrie
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FAQs	frequently asked questions
FLPMA	Federal Land Policy and Management Act
GIS	geographic information system
NM 9	New Mexico State Road 9
NM 11	New Mexico State Road 11
I-10	Interstate 10
IBWC	International Boundary and Water Commission
IFNM	Ironwood Forest National Monument
kV	kilovolt
MW	megawatt
NAIP	National Agricultural Imagery Program
NEPA	National Environmental Policy Act
NGO	non-governmental organization
OHV	off-highway vehicle
POD	Plan of Development
project	Southline Transmission Project
ROW	right-of-way
SEZ	Solar Energy Zone
study	Routing and Siting Study
SWTC	Southwest Transmission Cooperative, Inc.
USBR	U.S. Bureau of Reclamation

USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
Western	Western Area Power Administration
WREZs	Western Renewable Energy Zones
WWEC PEIS	West-Wide Energy Corridor Programmatic Environmental Impact Statement

Executive Summary

Southline Transmission, LLC proposes to construct a high-voltage transmission project to transmit electricity across southern New Mexico and southern Arizona. This Routing Report provides documentation of the routing and siting study (study) performed to identify the proposed route and viable alternatives.

The Southline Transmission Project (project) is designed to provide up to 1,000 megawatts (MW) of initial bidirectional transmission capacity. The project will increase grid reliability, mitigate existing congestion, increase the ability to meet demand growth in the region, and facilitate renewable generation development and public policy goals.

Since 2009, the team has worked closely with the Bureau of Land Management (BLM), Western Area Power Administration (Western), State agencies, local utilities, private landowners, and other stakeholders throughout the design and route selection process to ensure the project meets stakeholder needs and improves the regional transmission system. The project has been designed to minimize environmental and cultural impacts by selecting segments along existing linear corridors, where feasible, such as transmission lines, natural gas pipeline rights-of-way (ROWs), and abandoned rail lines along the route.

The goal of the routing study was to identify viable route options, evaluate potential environmental and land use constraints associated with those routes, and identify the optimal route alternatives for the project. An iterative screening process was conducted for the routing study to identify the optimal route for the project. To accomplish this objective, the routing process focused on identifying and evaluating, to the extent practicable, existing linear facilities that could present opportunities for locating the project. Once candidate routes were identified, they were vetted by the team using the routing criteria. The team narrowed the initial list down to best-fit options, which were evaluated again by the team to determine the proposed route and alternatives. More than 150 individual route segments were evaluated as part of the routing study.

The routing process identified proposed and alternative routes for each of the project's two sections: the New Build Section between Afton and Apache and the Upgrade Section between Apache and Saguaro/Tortolita. The proposed route for New Build Section begins at the Afton substation, follows an existing 345-kilovolt (kV) transmission line northwest to Interstate 10 (I-10), and continues primarily north of I-10 across the state past Deming to the Hidalgo substation. After Lordsburg, the New Build route crosses I-10 and continues around Willcox to terminate at the Apache substation. The Upgrade Section will rebuild Western's existing 115-kV line between the Apache and Saguaro substations in Arizona, and connect that line to additional existing substations.

Combined, the project has a total length of approximately 360 miles. In addition to the route for the double-circuit 345-kV New Build Section (approximately 205 miles) and the project's double-circuit 230-kV Upgrade Section from Apache to Saguaro (approximately 120 miles), the project also includes Segment R5, a 230-kV line that will be required to interconnect with the existing Vail substation (approximately 2.2 miles); Segment B1 between New Mexico State Road 9 (NM 9) and I-10 (approximately 30 miles); and Segment A2, a 230-kV line connecting the Afton substation and the existing Luna-Diablo 345-kV transmission line (approximately 5.2 miles).

The routing study identified both a northern route option and a southern route option for the New Build Section between Afton and Apache. The northern route was ultimately selected as the proposed route based on the overall shorter distance of that route, fewer impacts to previously undeveloped areas, and

the ability to parallel multiple existing linear facilities. The southern route option provides an alternative to the proposed northern route between the Afton substation and the point where the proposed and alternative routes merge at a location approximately 10 miles east of Lordsburg. A number of additional alternative route segments labeled Alternative Route Segments A-H were identified during the routing study that could be used instead of the proposed segments if found to be environmentally preferable.

For the Upgrade Section between Apache and Saguaro/Tortolita, the routing study did not identify any viable alternatives to the proposed upgrade of the existing Western line. Alternative Upgrade Route Segment H, however, could be used as an option to rebuild the Western line in the Benson area.

In addition to providing the results of the routing study, this document presents a summary of the methodologies used to select the proposed and alternative routes, a description of the geographic information system (GIS) database that was developed to support the routing study, and a summary of the public engagement process that was implemented concurrently with and in support of the route selection process. This document also presents a description of the currently proposed transmission line and substation interconnections and as well as a summary of the purpose and need and benefits of the proposed line consistent with the Plan of Development (POD) filed with the BLM for the project.

1 INTRODUCTION

1.1 Overview

Since 2009, the Southline Transmission Project (project) team has worked closely with the Bureau of Land Management (BLM), Western Area Power Administration (Western), State agencies, local utilities, private landowners, and other stakeholders throughout the design and route selection process to ensure the project meets stakeholder needs and improves the regional transmission system.

This Routing Report provides documentation of the routing and siting study (study) performed, including a description of

- The methodology used;
- The routes investigated and carried forward for consideration;
- The routes rejected from further consideration due to environmental, stakeholder, or design consideration;
- The public outreach efforts conducted to develop the proposed project; and
- Routes presented at Applicant-sponsored public meetings held between September and November 2011, and the evolution of those routes based on the stakeholder comments received.

1.1.1 Project Summary

The project is a proposed transmission line designed to collect and transmit electricity across southern New Mexico and southern Arizona. The project will increase grid reliability, mitigate existing congestion, increase the ability to meet demand growth in the region, and facilitate renewable generation development and public policy goals.

The project has been designed to minimize environmental and cultural impacts by selecting segments along existing linear corridors, where feasible, such as transmission lines, natural gas pipeline rights-of-way (ROWs), and abandoned rail lines along the route. In addition, the project includes the upgrade of an existing transmission line owned and operated by Western, thereby minimizing the need for new transmission ROW in the region.

The total length of the project is approximately 360 miles. Please see section 4 of the Plan of Development (POD) for a full project description.

Land Ownership

The project will cross private and State-owned lands as well as public lands under the jurisdiction of the BLM and other Federal agencies. In total, approximately 34 percent of the lands to be crossed by the project are administered by the BLM, less than 1 percent by other Federal entities, 31 percent by private entities, and 35 percent by the State of Arizona and the State of New Mexico. "Other Federal entities" include the U.S. Forest Service (USFS), U.S. Department of Defense (DoD), U.S. Bureau of Reclamation (USBR), and Bureau of Indian Affairs (BIA).

1.1.2 Purpose, Need, and Objectives

The Applicant (Southline Transmission, L.L.C.) proposes to construct a high-voltage electric transmission line in southern New Mexico and southern Arizona (the project). The project would also involve related substation and communications facilities. Although the project would cross some private and State-owned lands, much of the line would traverse public lands controlled by the BLM. A portion of the

project may involve upgrading existing Western transmission facilities. The Applicant and Western have executed a memorandum of understanding (MOU) to provide for the negotiation of an agreement for the joint ownership and development of transmission facilities.

1.1.3 Applicant's Purpose for the Proposed Action

The project has been designed to improve the electric transmission infrastructure in southern New Mexico and southern Arizona in order to strengthen the existing system and to cost effectively provide up to 1,000 megawatts (MW) of initial bidirectional transmission capacity between southern New Mexico and southern Arizona.

The project has been developed to meet the following principal needs:

- *Improve reliability in southern New Mexico and southern Arizona* - There is limited existing electrical transmission capacity in the region, which causes grid reliability risks;
- *Mitigate Existing Congestion* - Existing transmission capacity is fully utilized, and additional capacity in the region is needed to help to relieve congestion and, thereby, increase grid efficiency;
- *Increase the ability to meet demand growth in the region* - The Desert Southwest area is expected to experience substantial long-term growth, thereby creating demand for additional electric transmission capacity; and
- *Facilitate renewable generation development and public policy goals* - Satisfying the renewable portfolio standard requirements of western states will require access by renewable energy facilities to adequate electrical transmission facilities.

To meet these principal needs, the project has been designed to achieve the following project-specific objectives:

a) Create a link that provides benefits to population load centers on both ends of the line by connecting the Las Cruces and El Paso areas on the eastern portion of the line with the Tucson and Phoenix areas on the western portion.

b) Provide multiple intermediate access points with proposed connections to more than 10 existing substations, whose inclusion is prioritized by regional planning.

c) Provide a solution that fits with broader regional utility planning and needs. Provide for the efficient, cost-effective, and bidirectional transmission of up to 1,000 MW of initial rated capacity.

d) Utilize an innovative public-private partnership to select lines for upgrade that would create effective transmission capacity additions.

e) Maximize the use of existing ROWs and designated utility corridors in order to help minimize environmental and social impacts.

f) Meet North American Electric Reliability Corporation and Western Electricity Coordinating Council standards and guidelines.

g) Provide a path consistent with renewable resource land use efforts.

1.1.4 Agencies' Need for the Proposed Action

On December 4, 2009, and as amended on December 22, 2010, the Applicant submitted to the BLM an SF-299 *Application for Transportation and Utility Systems and Facilities on Federal Lands.* The BLM is required by the Federal Land Policy and Management Act (FLPMA) to respond to SF-299 applications for ROW grants. The BLM is authorized to grant ROW for electrical transmission lines under FLPMA Title V (43 U.S.C. 1761 – 1771).

Western's need for the proposed action is to facilitate the construction of transmission facilities that will help ensure reliability of the electric transmission grid needed to carry out Western's core functions. Additionally, the proposed action furthers Western's strategic goal of constructing transmission facilities and entering into public-private partnerships.

1.1.5 Project Siting

The project team's goal in siting the project is to meet the purpose and need while minimizing environmental and cultural impacts. For the routing study, the team chose to focus on possible appropriate options for the transmission line that would follow existing linear facilities to the maximum extent possible to minimize potential adverse impacts to both environmental and social resources. Using this approach, the project team conducted an iterative routing study process whereby all reasonable options for construction of the proposed transmission line within the designated study area shown in figure 1-1 were identified and evaluated through a geographic information system (GIS)-based screening process.

The screening process was augmented by a public engagement program that was designed to identify stakeholders and to work closely with these stakeholders to discuss the project and obtain their input to the routing study process through direct interaction with the project team. This approach was used for both the New Build Section of the line as well as for the Upgrade Section, and resulted in the identification of proposed and alternative routes that represent the optimal routes for the project.

The basis for the study area was the location of the defined end points and a geographic area in between that would offer a reasonable range of geographically diverse options for connecting the two end points. Secondarily, the location of the existing linear facilities, including roads, transmission and distribution lines, railroads, and pipelines, were defined as routing opportunities and helped define the reasonable geographic boundary of the study area as shown in figure 1-1. In the eastern part of the study area, the U.S./Mexico border also served as a study area boundary.

Development of the New Build Section

For the New Build Section, the defined end points were the existing Afton (New Mexico) substation to the east and the existing Apache (Arizona) substation to the west. This portion of the transmission line will consist of a newly constructed 345-kilovolt (kV) transmission line that will be located in parallel to existing linear facilities where practical. The study area for the New Build Section was defined between these two end points and encompassed all reasonable existing linear facilities between these two points. An analysis of potential constraints was then conducted for the study area that identified environmental and land use resources with varying levels of compatibility/constraint with the project. Areas of constraints included such resources as proposed wilderness study areas, areas of high residential development, ecologically and culturally sensitive lands, and other resources. Through an iterative screening process, including input from stakeholders obtained at Applicant-sponsored public meetings and workshops, routing opportunities and constraints were evaluated and a series of viable routing options were identified. Following additional database development and additional analysis, including input from the BLM, Western, and other stakeholders, the proposed and alternative routes for the New Build Section were selected.

Development of the Upgrade Section

The fixed end points for the Upgrade Section consisted of the Apache substation to the east and the Saguaro substation to the west. Based upon results of regional planning and technical studies, two existing transmission lines were considered for upgrading: an existing Western 115-kV line and an existing Southwest Transmission Cooperative, Inc. (SWTC) path consisting of 230-kV and 115-kV lines. No additional options were considered because these were the only routes that met the technical needs of the project. Both Upgrade Section options were evaluated for constraints. Due to the number and complexity of environmental constraints associated with the SWTC option that were identified through the stakeholder outreach process, and the additional electrical advantages associated with upgrading the existing Western line, the SWTC route was eliminated from further consideration and the Western route was selected as the proposed route.

1.2 Project Description

1.2.1 Applicant-Proposed Route

The Applicant-proposed and alternative routes are summarized in figures 1-2 through 1-4. Please see the project's POD for more information.

Proposed New Build Section (Afton to Apache)

The New Build Section would begin at the Afton substation and follow an existing 345-kV transmission line northwest to Interstate 10 (I-10) (see figure 1-3), past the Aden Hills off-highway vehicle (OHV) area. From there, the route would cross I-10 just past Doña, and continue north of I-10 to Carne. Approaching Deming from the east, the route would run north of Deming and then follow existing roads west. The route would head northwest to the Hidalgo substation. From the Hidalgo substation, the route would continue due west, north around Lordsburg, and south to follow an existing pipeline ROW. The project route would then cross I-10 west of San Simon and follow an existing pipeline route south of the highway and north of the Dos Cabezas Peaks Area of Critical Environmental Concern (ACEC). The route would then turn south (east of the Town of Willcox) and along existing transmission facilities, east of the Willcox Playa, to the Apache substation. The termination point at the Apache substation would be the western extent of the project's New Build Section. The total length of the transmission line using the proposed northern route from the Afton substation to the Apache substation would be approximately 205 miles.

The project route would also include an approximately 30-mile segment between New Mexico State Road 9 (NM 9) and I-10, which would enable potential access to the rich renewable resource areas of southern New Mexico.

The project's proposed plan of service would also include a 5-mile in-and-out loop between the existing Afton substation and the existing Luna-Diablo 345-kV transmission line. The in-and-out loop of the Luna-Diablo line into the Afton substation is a technical requirement of the project and serves to strengthen the existing system.

Total New Build length, including all proposed segments, is approximately 240 miles.

Proposed Upgrade Section (Apache to Saguaro)

The Upgrade Section is approximately 120 miles in length, and would start at the Apache substation and terminate at the Saguaro substation (see figure 1-4). This section of the project route is a rebuild and upgrade of the existing Western 115-kV transmission line through Cochise, Pima, and Pinal counties, and will interconnect with more than 10 existing substations along the route. The Applicant anticipates following the same path as the existing transmission line. A new line segment approximately 2 miles in

length will be required to interconnect with the existing Tucson Electric Power Vail substation, located just north of the Western line.

1.3 Substations

More than 10 existing substations will interconnect with the project along the route. In addition, the project anticipates developing one new substation in Luna, Grant, or Hidalgo County, New Mexico. Further technical and construction detail can be found in the project's POD.

1.3.1 Substations on or Adjacent to BLM Lands

There are three substations that may require BLM ROW grants. Those substations include: 1) the existing Afton substation in New Mexico; 2) a potential newly constructed station in Luna, Grant, or Hidalgo County, New Mexico (referred to as intermediate substation below); and 3) the Nogales substation in Arizona.

1.3.2 Substations Related to the New Build Section

Afton Substation

The Afton substation is an existing station. A new yard would be built adjacent to the existing switchyard, and would accommodate two-phase shift transformers. In addition, two line positions from the Luna and Diablo substations would be looped into the new yard.

Intermediate Substation

An intermediate new station may be located between the Afton and Hidalgo substations. Four transmission lines would be terminated at that station.

Hidalgo Substation

The Hidalgo substation is an existing station. Existing main buses would be expanded to accommodate one additional line position. A new yard would be built adjacent to the existing switchyard, and would accommodate four line positions. Transmission lines from the Intermediate or Afton substations and the Apache substation would be terminated at Hidalgo.

1.3.3 Substations Related to the Upgrade Section

Apache Substation

The Apache substation is an existing station. A new yard would be built adjacent to the existing 230-kV switchyard and would accommodate line positions from the Adams Tap and Pantano substations.

Adams Tap Substation

The Adams tap substation is an existing station. A new yard would be built adjacent to the existing switchyard, and would accommodate line positions from the Apache and Nogales substations.

Pantano Substation

The Pantano substation is an existing station. The existing 230-kV yard would be expanded to accommodate additional line positions from the Apache and Vail substations.

Vail Substation

The Vail substation is an existing station. A new yard would be built to accommodate line positions from the Pantano and Tucson substations.

Nogales Substation

The Nogales substation is an existing station. A new yard would be built that would accommodate line positions from the Adams tap and Del Bac substations.

Del Bac Substation

The Del Bac substation is an existing station, and an optional stop for the project. This existing station would be rebuilt to accommodate line positions from the Nogales and Tucson substations.

Tucson Substation

The Tucson substation is an existing facility. A new yard would be built to accommodate eight line positions from the Vail, Del Bac, Rattlesnake, Saguaro, and Tortolita substations.

DeMoss Petrie (DMP) Substation

The DMP substation is an existing station. The buses would be expanded for two additional transformer positions.

Rattlesnake Substation

The Rattlesnake substation is an existing station. A new yard would be built to accommodate line positions from the Tucson and Marana substations.

Marana Substation

The Marana substation is an existing station. A new yard would accommodate line positions from the Rattlesnake and Saguaro substations.

Tortolita Substation

The Tortolita substation is an existing station. A new yard would accommodate line positions from the Marana and Tucson substations

Saguaro Substation

The Saguaro substation is an existing station. A new yard would accommodate line positions from the Marana and Tucson substations.

1.4 Fiber Optic Communications and Regeneration Sites

The project would include a communications system consisting of a fiber optic network necessary for control and protection of the transmission system (referred to as supervisory control and data acquisition). The fiber optic network would require regeneration sites at periodic distances along the transmission line, as determined in the detailed engineering studies. In general, these regeneration sites would be within the transmission line ROW.

1.5 Access Roads

Surface access roads would be required in order to reach each transmission line tower, each substation, and each regeneration site. The project has been designed to use existing access roads where possible. In some cases, the existing roads would require improvement. Engineering studies are ongoing to determine the location(s) of new access roads.

1.6 Temporary Work Areas

During construction, there would be requirements for temporary workspace, including wire splicing and pulling sites, and construction yards. While final locations for temporary workspace have not yet been determined, it is envisioned that these sites would most likely be located in or adjacent to the ROW.

2 ALTERNATIVES DEVELOPMENT

2.1 Overview of the Routing Process

2.1.1 Route Selection Objectives

The goal of the routing study was to identify viable route options, evaluate potential environmental and land use constraints associated with those routes, and identify the optimal route alternatives for the project. The specific criteria used for the routing study are identified in section 2.1.4, Routing Criteria. The overarching goals were to minimize potential impacts and conflicts between the project and other existing infrastructure, environmentally and culturally sensitive areas, and human activities by routing along existing linear facilities to the extent practical, avoiding unreasonable circuitous routes, avoiding extreme costs, and minimizing nonstandard design requirements. The routing objectives were accomplished through the identification of the proposed segments that minimized potential impacts to environmental, social, and cultural resources while meeting the purpose and need for the project. The specific routes considered and either discarded or carried forward for analysis are discussed in sections 2.2.3, 2.2.4, and 2.2.5.

2.1.2 Summary of Routing Process

An iterative screening process was conducted for the routing study to identify the optimal route for the project. To accomplish this objective, the routing process focused on identifying and evaluating, to the extent practicable, existing linear facilities that could present opportunities for locating the project. Once candidate routes were identified, they were vetted by the team using the routing criteria. The team cast a wide net initially and then winnowed the list down to best-fit options, which were evaluated again by the team to determine the proposed route and alternatives.

The major steps undertaken as part of the study's routing process were:

- Step 1: Selection of the study area for the project that defined the extent of the geographical area within which feasible routes for the project were identified;
- Step 2: Development of the study's routing criteria (opportunities and constraints) that were used in evaluating potential routes;
- Step 3: Development of a geo-referenced database on a GIS platform to identify and analyze routing opportunities and constraints;
- Step 4: Identification of route options that minimized adverse impacts while maximizing use of the highest-value route opportunities, informed by public and agency feedback; and
- Step 5: Identification of the proposed route and reasonable alternatives based on an iterative analysis of the routing opportunities and constraints, which balanced engineering and economic costs with environmental and land use considerations identified through the public engagement process.

The steps implemented during the routing study are discussed further below.

2.1.3 Study Area Definition

The study area (see figure 1-1) for the project routing study was defined by the end points and by the characteristics of the New Build Section and Upgrade Section of the line.

Study Area for the New Build Section

The approach to routing the New Build Section was driven by the objective of minimizing potential environmental and land use impacts by routing the transmission line adjacent to existing linear facilities where practicable. Following this approach, the study area for the New Build Section encompassed the geographic area between the defined end points and existing linear facilities that presented a reasonable opportunity for the New Build Section to be located within close proximity. The two end points for the New Build Section are the existing Afton substation, located southwest of Las Cruces, in Doña Ana County, New Mexico, and the existing Apache substation, located south of Willcox, in Cochise County, Arizona. The New Build Section may also have an intermediate connection at or near the existing Hidalgo substation located near Lordsburg, New Mexico, and a potential new intermediate connection in Luna, Grant, or Hidalgo County. Existing linear facilities included transmission and distribution lines, roads, railroads, and pipelines.

Study Area Definition for the Upgrade Section

Unlike the New Build Section, the objective of the Upgrade Section of the project is to upgrade an existing transmission line, replacing the existing structures and conductors within the same ROW to the extent possible. Therefore, the study area for the Upgrade Section was selected based on the alignment of the two existing transmission lines that were considered for upgrading, i.e., an existing Western 115-kV line and an existing SWTC 230-kV line. Because no additional existing transmission lines offered viable opportunities for upgrading between the Apache and Saguaro substations, the study area focused only on the existing Western and SWTC transmission lines. The study area for the Upgrade Section consisted of a 4-mile-wide corridor, or 2 miles on either side of the existing Western and SWTC transmission lines. The selection of a 4-mile-wide corridor for the Upgrade Section study area provided adequate flexibility for the evaluation of potential modifications to the existing Western and SWTC ROWs.

2.1.4 Routing Criteria

Routing criteria were developed as part of the routing study to guide the identification and analysis of potentially viable routes for the New Build Section of the project. The study employed two general types of routing criteria for this portion of the project: routing opportunities and routing constraints (see table 2-1).

Opportunities – Routing opportunities were used as the basis for identifying potential optional route segments. Routing opportunities for the project's New Build Section consisted primarily of existing linear facilities such as transmission and distribution lines, roads, railroads, and pipelines. The use of existing linear features/corridors for routing purposes make it unnecessary to introduce a new linear feature into the land use patterns of an area and help minimize associated impacts. This approach to linear facility siting is generally consistent with the land use planning direction of Federal, State, and local land management agencies and siting authorities. As part of the routing study, all reasonable efforts were made to identify and analyze viable routing opportunities within the study area.

Constraints – Routing constraints are those resources and land use features that have differing levels of compatibility with new transmission line construction. Two general categories of constraints were identified:

- Avoidance Areas – These are areas where siting the line would be extremely difficult or nearly impossible for one or more reasons (economics, statutory prohibition, permitting timeframes, construction difficulty, etc.). These areas were excluded from consideration.

- Sensitive Areas – These are areas where siting the line would be possible but specific issues or conditions exist that could make developing the project more difficult, more time consuming, or more costly. These also included areas identified by stakeholders as those of greater concern.

The routing opportunities were used to identify potential optional routing segments for the project. The impact of these segments on the identified areas of routing constraints was then analyzed to identify potential routes with the least possible adverse impacts to the environment and human activities.

TABLE 2-1. ROUTING OPPORTUNITIES AND CONSTRAINTS

Opportunities and Constraints
Routing Opportunities
Existing Linear Facilities • Existing Transmission Line Corridors (69 kV and above) • Designated Federal Corridors • Railroads (Active and Abandoned) • Federal Interstate Highway ROWs • Pipeline ROWs • Undivided Highways • County Roads • Other Existing Utility ROWs • Section 368 Energy Corridors • Township, Section, and Range / Property Boundaries
Routing Constraints
Federal and State Special Use Lands • National Parks / Monuments / Recreation Areas / Landmarks • State Parks / Recreation Areas • Wilderness Areas / Wilderness Study Areas • Indian Lands (BIA) • Military Reservation / Installation (including the Fort Huachuca Electronics Testing Area) • Federal / State Wildlife Refuges BLM Designated Lands • ACECs • BLM Visual Resource Management (VRM) Class I Areas Cultural and Historic Resources • Cultural and Historical Resources • National Historic Districts / National Register Sites • Historic and Scenic Trails Privately Owned Protected Lands • Nature Conservancy Preserves (distinguish between areas of interest and owned/managed properties) • Private Lands Managed by Other Private Management Groups Land Use/Land Cover • Municipal Areas (towns / cities) • County Parks / Recreational Areas • Airports and Aviation Flight Paths • Sensitive Recreation Areas • Visually Sensitive Areas • Existing Residential Areas • Prime Farmlands

TABLE 2-1. ROUTING OPPORTUNITIES AND CONSTRAINTS

Opportunities and Constraints
• Waterfowl Nesting or Rearing Areas, including Playas • Pre-1955 Carbonate Mining Claims
Environmentally Sensitive Areas • State Scientific / Natural Areas • Designated Unique Habitats • Threatened and Endangered Species Critical Habitat • Wetlands and Waters of the United States

2.1.5 Data Collection for the Routing Study

Development of a comprehensive database was a key component of the project routing study because the database made it possible to efficiently identify, measure, label, and track the segments under consideration. The data obtained were primarily in electronic format and were obtained from various Federal, State, and local agencies as well as commercial and other sources. The Environmental Systems Research Institute (ESRI) ArcInfo™ GIS platform was used to manage the electronic data and analyze the various routing options under evaluation. The database developed for the project included a broad range of physical, ecological, cultural, and land use data from a number of sources.

A summary of the various sources and data collected is provided below.

Aerial Photography

Two sources of aerial photography were used extensively during the routing study:

- National Agricultural Imagery Program (NAIP) color imagery for New Mexico and Arizona, 2009, and
- Google Earth™ imagery accessed between May 2011 and December 2011.

Aerial imagery from these sources was used to identify and evaluate various resources within the study area. The NAIP imagery was also used in the production of map books and other visual displays employed during the public engagement process. The aerial photography was used to verify the location of various existing facilities, especially existing transmission lines, roads, and railroads.

Maps

A number of electronic and hardcopy maps were obtained for the routing study, including electronic U.S. Geological Survey (USGS) 7 ½-minute topographic quadrangle maps, transmission line information, maps of historic railroads, private ownership maps, and other mapped resources. A series of land development and zoning maps were obtained from county and city sources as well as Federal Aviation Administration (FAA) maps depicting the locations of airports and commercial and DoD flight paths. These maps showed the location of special use areas, zoning, and other land use categories. The FAA maps were used to evaluate the location of both commercial and DoD flight paths that could be impacted by the project. These maps were used throughout the overall data development process. Aviation flight paths were evaluated to determine if they would result in a significant constraint to any of the identified candidate corridors. While there are numerous commercial and military training routes in the general study area, all flight paths and training routes have a minimum elevation of 1,500 feet above ground level. This elevation is well above the transmission line structure height and, therefore, did not represent a constraint to the routing process. In addition to aviation flight paths, airports were also considered as a potential constraint and were mapped throughout the study area.

GIS Data Sources

An extensive electronic database was developed using the ESRI ArcInfo™ GIS platform. Electronic data were obtained from a number of sources including the BLM, commercial sources, USGS, and various State and county agencies. A list of data obtained and their sources is presented in table 2-2, Data Sources for Routing Opportunities, and table 2-3, Data Sources for Routing Constraints. The GIS database was the primary mapping and analysis tool used during the routing study. The GIS database was used to create overlays of various data layers, such as existing linear facilities with surface ownership and other resource-based data. The GIS database was used extensively to generate a series of maps depicting the various routing opportunities and constraints, and to conduct analyses of potential impacts associated with various route options. The GIS database was also effectively used at series of public open house meetings that were held to obtain input from local stakeholders. At the open house meetings, an interactive GIS station was used to demonstrate the study's overall routing process graphically, resulting in a clearer understanding of the overall process and its relevance to areas of local stakeholder concern.

TABLE 2-2. DATA SOURCES FOR ROUTING OPPORTUNITIES

Opportunities	Data Source and Needs
Existing Transmission Lines (69 kV and above)	Source: Platts data set Refine transmission line database
Designated Federal Corridors	Source: Designated Federal energy corridors
Railroads (active and abandoned)	Source: USGS and ESRI data
Federal Interstate Highway ROWs	Source: USGS and ESRI data
Pipeline ROWs	Source: Platts data set
Undivided Highways	Source: USGS and ESRI data
Existing Canals	Source: National Hydrography Dataset data
Other Existing Utility ROWs	Source: Lower-voltage distribution line coverages for mapping and analysis
Township Section and Range / Property Boundaries	Source: USGS data

TABLE 2-3. DATA SOURCES FOR ROUTING CONSTRAINTS

Constraints	Data Source
National Parks / Monuments / Recreation Areas / Landmarks	Source: BLM, National Park Service (NPS), Arizona and New Mexico State Park data, U.S. Department of Interior (DOI) NPS Federally designated Wild and Scenic Rivers data, Federal Highway Administration Scenic Roads data
State Parks / Recreation Areas	National Atlas, State sites
Wilderness Areas / Wilderness Study Areas	Source: BLM and National Atlas
ACECs	Source: BLM
Indian Lands	Source: National Atlas
Cultural and Historical Resources (limited for opportunity and constraints analysis)	Source: Cultural sources generally include BLM (historic trails and sites) and NPS (National Register of Historic Places [NRHP]); Arizona and New Mexico State inventories

TABLE 2-3. DATA SOURCES FOR ROUTING CONSTRAINTS

Constraints	Data Source
Nature Conservancy Preserves (distinguish between areas of interest and owned/managed properties)	Source: Nature Conservancy data, and Natural Resources Conservation Service (NRCS) data for conservation easements
State Scientific / Natural Areas	Source: Arizona or New Mexico separately designated scientific or natural areas;
Military Reservation / Installation (Include Fort Huachuca Electronics Testing Area)	Source: Onsite meetings and phone calls with key Installation employees; installation maps
Prime Farmlands	Source NRCS locations and acres of prime farmland and unique soils (will need hydric soils later); NRCS
Agricultural Areas (center-pivot irrigation systems)	Source: Research needed – U.S. Department of Agriculture (USDA), possibly Arizona or New Mexico, and USGS National Land Cover Dataset
Federal / State Wildlife Refuges	Source: U.S. Fish and Wildlife Service (USFWS), Arizona Game and Fish Department (AZGFD), and New Mexico Department of Game and Fish (NMDGF) data, Arizona and New Mexico State Natural Heritage Programs; USFWS
Threatened and Endangered Species Critical Habitat	Source: BLM and USFWS
Waterfowl Nesting or Rearing Areas	Source: Covered in above categories
Designated Unique Habitats	Source: Covered in above categories
County Parks / Recreational Areas	Source: County and city land use plans and comprehensive plans for designated parks and recreational areas near the transmission corridor
Municipal Areas (towns / cities)	Source: County and city land use plans and comprehensive plans for boundaries; individual municipalities
Federal, State, and Agency-Owned Land (not otherwise protected)	Source: Land ownership database; BLM surface ownership
Scenic Areas (including scenic travel routes)	Source: BLM, county, and city land use plans and comprehensive plans for scenic areas
Airports and Aviation Flight Paths	Source: FAA for FAA-registered airports and some non-registered airports; ESRI and FAA
VORTAC Tower Sites	Source: Federal Communications Commission
National Wild and Scenic Rivers	Source: Covered above in NPS data research
Geologically Unstable or Highly Erosive Areas	Source: State geological surveys; USGS and State Geological Surveys
National Historic Districts / National Register Sites	Source: Arizona and New Mexico State inventories; NPS NRHP
Visually Sensitive Areas (including VRM I classifications)	Source: VRM data from BLM
Historic and Scenic Trails	Source: County and city land use plans and comprehensive plans for historic and scenic trail data; BLM and local municipalities
Lands under the Management of Private Organizations	Counties and non-governmental organizations (NGOs); BLM surface ownership
Wetlands and Waters of the United States	EDR report information; USFWS National Wetlands Inventory
Sensitive Recreation areas	Source: City land use plans and comprehensive plans for sensitive recreation areas; BLM, USFS, and local municipalities
100-Year Floodplains	Source: Federal Emergency Management Agency
Existing Residential Areas	Source: USGS

Field Inspections

Members of the routing team conducted ground-level field inspections within the study area where accessible from public roads to ground truth and confirm electronic data used in the GIS database.

2.2 Development of Potential Routes

2.2.1 Identification of Route Options

The identification of potential route options for the project's New Build Section was based on opportunities to parallel existing linear facilities and avoid constrained areas to the maximum extent possible (see figure 2-1). For the New Build Section, the route option identification process focused on following a wide range of existing linear facilities, including transmission and distribution lines, highways, including I-10 and other roads, railroads, pipelines, and existing Energy Policy Act Section 368 Federal energy corridors on BLM lands. One of the advantages of following existing linear features is that they either provide access to the line route or include existing access roads. Use of the existing roads for project access greatly reduces new disturbance and overall project impacts.

The BLM is a multi-use agency that encourages energy development within existing utility corridors. The project is committed to using Section 368 energy corridors to minimize the use of new ROW. Section 368 of the Energy Policy Act requires the U.S. Department of the Interior (DOI), in conjunction with the U.S. Department of Agriculture (USDA), U.S. Department of Energy (DOE), U.S. Department of Commerce, and DoD, to designate pipeline and electric transmission corridors for the 11 contiguous western states and establish procedures to expedite the review of projects that would be located within established energy corridors. In response to Section 368, the BLM and DOE prepared the West-Wide Energy Corridor Programmatic Environmental Impact Statement (WWEC PEIS) with multiple cooperating agencies. The WWEC PEIS serves as an amendment to existing management plans and established multiple energy corridors on public lands that are compatible with local BLM land use plans. The Final WWEC PEIS, issued in November 2008, can be downloaded at http://corridoreis.anl.gov/documents/fpeis/index.cfm. The project route makes use of select segments of the available Section 368 energy corridors

In addition, the project team noted the location of Western Renewable Energy Zones (WREZs) in developing the project (see figure 2-2 for the location of the project in proximity to local WREZs). The Western Governors' Association and DOE released a joint WREZ Phase 1 report on June 15, 2009, that is an initial step to identifying areas in the Western interconnection that have both the potential for large-scale development of renewable resources and low environmental impacts. The project team also reviewed the results of the Arizona Renewable Resource and Transmission Identification Subcommittee, a stakeholder-informed process to identify renewable energy resource areas in Arizona and support the identification of transmission corridors required to serve those resource areas.

For the Upgrade Section, the route identification process evaluated two options: 1) upgrading the existing SWTC line, and 2) upgrading the existing Western line (see figure 2-3). These were the only two existing lines available to be upgraded to a capacity that would meet project objectives and, therefore, the only two lines considered for the Upgrade portion of the line.

The first step in the identification of route options was mapping existing linear facilities within the study area. In the case of the New Build Section, an analysis of all linear facilities was conducted to identify and eliminate those initial route segments that did not conform to the overall objectives of the project. These included route segments that were duplications of other options that had better overall routing potential as well as other segments that were unusable due to their alignment/direction. Once the initial

identification and screening of potential route options had been completed, the remaining route segments were then evaluated through the screening and alternatives analysis process described below.

An initial mapping and analysis of constraints was conducted within the study area, the results of which are presented in figures 2-4 and 2-5 for the New Build Section and Upgrade Section, respectively. By overlaying the areas of routing opportunity with the constraints, a series of viable routing opportunities were developed (see figures 2-6 and 2-7 for the New Build Section and Upgrade Section, respectively). The viable route segments represent the routing options that do not cross exclusionary constraint areas and that meet the project's overall needs to interconnect the various end points in a logical and efficient manner. The viable routing opportunities were used as the basis of analysis for subsequent phases of the routing study and were presented at the public open house and agency workshop meeting as described below.

2.2.2 Public Informational Meetings and Agency Workshops

Public engagement was an integral part of the study's overall routing process. It allowed the project team to understand initial concerns from a wide range of project stakeholders so these concerns could be integrated into the study's routing process from the outset. The overall goal of the public engagement process was to involve interested stakeholders and the general public in a transparent and credible process to 1) learn about the project and the project team's approach to siting transmission lines; 2) provide feedback on potential routing options; and 3) understand the different opportunities for continued participation throughout project development process, including participation in the comment periods provided as part of the National Environmental Policy Act (NEPA) review.

Public Process Tools

Project Phone Line and Email Address

The project team established a project phone line (1-888-752-2822) and email address (connect@southlinetransmissionproject.com) to enable members of the public to provide comments and ask questions about the project. The project team has tracked all incoming questions and comments, and responded to inquiries. All communications are logged in the stakeholder contact database so that the project team can review and consider the feedback during project development.

Stakeholder Contact and Communications Database

The project team established a database that currently includes more than 800 stakeholder names, organizations, and contact information, as well as outreach and correspondence with all stakeholders. Hosted online, the information included in the contact database is readily available to all project team members. The information in the database will be used to send periodic e-newsletters to project stakeholders; these contacts were also provided to BLM and Western for outreach purposes associated with the NEPA process.

Project Website

The project team launched a bilingual (English and Spanish) project website in the summer of 2011 to store information about the project, including maps, frequently asked questions (FAQs), timelines, and information about how the public can participate in project development. The website will continue to be expanded throughout project development and will serve as an archive of presentations, handouts, maps, and any additional information shared with the public. The project website is www.southlinetransmissionproject.com.

Project Informational Materials

To enable stakeholders to understand the project and provide informed feedback about the project and potential route options, the project team developed informational materials including a project fact sheet, FAQs, and project maps (high-level and detailed versions). These materials were provided at in-person meetings and subsequently made available on the project website.

Public Engagement Meetings

From June through December 2011, the project team worked with project stakeholders to iteratively refine the project study area and the selection of possible and optional routes submitted to the BLM and Western for the environmental review process.

In July and August, the project team contacted and met with numerous stakeholders representing local, county, and State governments, tribes, chambers of commerce, non-governmental organizations (NGOs), local landowners, military, energy interests, farm and ranch interests, and local, State, and Federal agencies to receive feedback on the overall routing approach and specific environmental, cultural, and other land uses that might impact the selection of potential routes.

In August and September, the project team compiled the information received from stakeholders (both general and site-specific data) and developed a number of potential route corridors. These broad swaths included all potentially viable options. These corridors were presented at a round of public information meetings, and stakeholders had an opportunity to provide feedback directly onto high-resolution maps regarding potential land use conflicts.

In October, November, and December, the project team received additional feedback from stakeholders, including feedback received from a public informational meeting in Benson, Arizona, and simultaneously winnowed the potential route corridors into a select group of potential and alternative routes for the BLM and Western to use in the environmental review process. This final set of potential and alternative routes reflects a significant amount of feedback from stakeholders, including information about military and flight operations, visual impacts, feasibility of crossing certain sections of land, potential impacts to sensitive species and habitats, and potential impacts to cultural resources. Some of the specific information obtained from stakeholders includes:

- Public input asking for power lines to follow major roads; however, there is a high visual impact for lines built in close proximity to highways because of their visibility to the public;
- Public desire to isolate lines from homes and important visual resources;
- Providing opportunities to interconnect future renewable energy projects is good for the local economy;
- BLM concern that a route going south out of Afton toward NM 9, heading west, and then extending north again to the I-10 corridor would create miles of additional transmission lines;
- The project should avoid Wilderness Study Areas;
- The Florida Mountains are visually sensitive and a portion has been designated as a BLM Visual Resource Management (VRM) Class I area;
- Landowner concerns about obstructed views in general;
- Pre-1955 claims in this area that could prohibit the BLM from issuing a ROW unless claimant concurrence is obtained;
- High likelihood for cultural sites around playas;

- High potential for sand hill cranes around Willcox Playa;
- DoD interest in routes near the Willcox Playa;
- Potential impacts from electronic interference with the Buffalo Soldier Electronic Testing Range;
- Avoidance of the Dos Cabezas Wilderness Area and BLM ACEC;
- Tumamoc Hill is a culturally, environmentally, and historically important site; and
- The new resource management plan for the Ironwood Forest National Monument (IFNM) may prohibit upgrading the existing SWTC line.

A summary of the stakeholder interviews, stakeholder outreach meetings, public information meetings, routing workshops, and agency webinars held as part of the routing study is presented in appendix A to this report.

2.2.3 Routing Refinement

Screening of the route options and selection of the proposed route was conducted in an iterative manner using the routing constraint criteria and the electronic database to identify those route options that best met the objectives of the project. Following the initial screening of the potential route options, an analysis was conducted by overlaying the various environmental and land use constraints with the potential route segments. Those route options that crossed or were in close proximity to exclusionary criteria, such as wilderness study areas, VRM Class I areas, and National and State parks, were eliminated from further consideration. During this timeframe, the project team contacted and met with numerous stakeholders representing local, county, and State governments, tribes, chambers of commerce, non-governmental organizations, local landowners, military, energy interests, farm and ranch interests, and local, State, and Federal agencies, to receive feedback on the overall routing approach and specific environmental, cultural, and other land uses that might impact the selection of potential routes.

Additional data refinement was then conducted for areas crossed by the remaining route options. The next step in the route options evaluation was to prepare a set of viable route options that served the objectives of the project based on their avoidance of exclusionary and high-sensitivity constraint areas, and the ability to support logical route development. These viable route options were then presented to members of the public and other stakeholders at a series of five open house meetings held in September 2011 and at a public meeting in Benson, Arizona, in November 2011 (see section 2.2.2.2, Public Engagement Meetings, for further details on the meetings). Using the results of these meetings and resource-specific comments from a series of routing study workshop teleconferences held with Western and the Las Cruces and Safford BLM field offices in November 2011, the viable route options were further assessed and a refined set of route alternatives was developed, focusing on corridors of a defined width linking the end points of the study area. The corridors for the New Build Section were given a width of 2 miles, or 1 mile on either side of a centerline/existing linear facility in most cases. The corridor width was reduced to a total of 1,000 feet in areas near residential and commercial developments, such as areas around Deming, Lordsburg, Willcox, and Columbus. The corridors for the Upgrade Section consisted of a total width of 500 feet, or 250 feet on either side of the existing transmission lines. A workshop was held by the project routing team to review the results of the routing study to that point and to define the proposed and alternative routes based on all available data.

Naming Conventions

The project team then developed naming conventions for the retained options. As noted above, at the highest level, the entire project is referred to as the Southline Transmission Project. The project is

broken down into two sections: the Upgrade Section and the New Build Section. For both sections, the project team identified some viable alternatives. The main alternative to the New Build is the Alternative Southern Route. Smaller variations on the Upgrade, the New Build, and the Alternative Southern Route are labeled as Alternative Route Segments A-H. An individual segment of a route is referred to as a "segment," with a unique identification number and letter combination (e.g., Segment B7)

Summary of Viable Route Options

Figures 2-8 and 2-9 present the individual viable route segments that were evaluated. A summary of the viable route segment refinement process, including the length and reasons all viable segments were retained or eliminated, is presented in table 2-4.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
			New Build Section Segments
A1	6.1	Dona Ana	Retained – Alternative Southern Route. Follows open land. Avoids existing telecommunications tower passed by A9 and A10, as well as ranching operations at A11.
A2	5.2	Dona Ana	Retained – Proposed Route. Essential component. Provides interconnect to existing 345-kV line. Follows existing 345-kV line.
A3	4.6	Dona Ana	Retained – Alternative Southern Route. Follows road instead of open land for reduced new ground disturbance.
A4	6.5	Dona Ana	Eliminated. Follows open land.
A5	2.8	Dona Ana	Retained – Alternative Southern Route. Follows county road. A5-and A8 together reduce land disturbance by offering a shorter total line length than the alternative segments that extend from Afton to NM 9.
A6	5.0	Dona Ana	Eliminated. Follows open land. Additional line length and ground disturbance.
A7	5.1	Dona Ana	Retained – Alternative Route Segment A.–Follows open land and rural road. Additional line length and ground disturbance.
A8	11.3	Dona Ana	Retained – Alternative Southern Route. Follows open land. A5-and A8 together reduce land disturbance by offering a shorter total line length than the alternative segments that extend from Afton to NM 9.
A9	3.0	Dona Ana	Eliminated. Follows rural road and passes near existing telecommunications tower.
A10	4.0	Dona Ana	Eliminated. Follows open land and passes near existing telecommunications tower.
A11	1.7	Dona Ana	Eliminated. Follows open land and passes near existing ranching operation.
A12	17.0	Dona Ana	Eliminated. Follows open land.
A13	4.8	Dona Ana	Alternative Route Segment A. Follows rural road. Additional line length and ground disturbance.
A14	19.5	Dona Ana	Eliminated. Follows county road and open land, and passes near visually sensitive areas including the Aden Lava Flow Wilderness Study Area and Kilbourne Hole, a geologic formation south of Afton.
B1	20.4	Luna	Retained – Proposed Route Cross Country. Passes through areas identified as having solar potential according to the WREZ map.
B2	21.5	Luna	Eliminated. Follows existing 69-kV line. Passes close to Florida Mountains Wilderness Study Area. Significant visual impact concerns. See note 2

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
B3	12.4	Luna	Eliminated. Follows NM 11. See note 2
B4	19.2	Luna	Eliminated. Follows rural roads and cross country. Would backtrack and add line length.
B5	10.4	Luna	Eliminated. Follows rural roads and open land. See note 2.
B6	4.6	Luna	Eliminated. Follows rural roads and open land. See note 2.
B7	8.6	Luna	Eliminated. Follows rural roads, existing 69-kV line, and open land. See note 2.
B8	15.0	Luna	Eliminated. Follows Route 11. Passes near a number of residences. See note 2.
B9	9.5	Luna	Eliminated. Follows rural roads. See note 2.
B10	11.6	Luna	Eliminated. Follows rural roads. Passes by some residences. See note 2.
B11	14.8	Luna	Eliminated. Follows rural roads. See note 2.
B12	8.1	Luna	Retained – Proposed Route. Follows property lines. Passes through areas identified as having solar potential according to the WREZ map.
C1	19.1	Grant	Eliminated. Follows State Road 146. Backtracks compared to proposed segment.
C2	12.0	Grant	Retained – Alternative Southern Route. Follows abandoned rail route.
C3	4.6	Hidalgo	Eliminated. Follows existing railroad and State road. See note 1.
C4	3.5	Hidalgo	Eliminated. Follows existing railroad. See note 1. Requires backtracking to use. Adds line length.
C5	10.0	Hidalgo	Eliminated. Follows existing 69-kV transmission line. See note 1.
C6	1.3	Grant	Retained – Alternative Southern Route. Essential connection from South route up to N24 and Hidalgo substation. Follows existing 115-kV transmission line.
C7	2.9	Hidalgo	Eliminated. Follows Muir Road. Passes near center-pivot irrigation. Redundant segment to proposed.
C8	13.2	Hidalgo	Retained – Alternative Route Segment D. Follows county road using C8, C17, N30, and N82 combination. Does not allow interconnection at Hidalgo substation.
C9	4.5	Grant	Eliminated. Follows existing 69-kV transmission line. See note 1.
C10	5.7	Hidalgo	Eliminated. Follows Existing 69-kV transmission Line. See note 1.
C11	1.5	Hidalgo	Eliminated. Follows existing railroad, 69-kV transmission line, and State road. See note 1.
C12	2.2	Grant	Eliminated. Follows existing railroad. See note 1.
C13	7.9	Grant	Eliminated. Follows existing railroad and backtracks compared to proposed segment.
C14	3.1	Grant	Eliminated. Follows existing 69-kV transmission line. See note 1.
C15	7.3	Hidalgo	Eliminated. Follows rural road. See note 1.
C16	2.1	Grant	Retained – Alternative Southern Route. Follows old rail route. Connector not needed for proposed route.
C17	1.7	Grant	Retained – Alternative Route Segment D. Follows abandoned rail line. Using C8, C17, N30, and N82 combination does not allow interconnection at Hidalgo substation.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
C18	3.1	Grant	Retained – Alternative Southern Route. Follows existing 115-kV line.
C19	3.0	Luna	Retained – Alternative Southern Route. Follows existing 115-kV line.
C20	3.1	Hidalgo	Eliminated. Follows county road. Redundant to proposed.
C21	1.0	Hidalgo	Eliminated. Follows existing 69-kV transmission line. Segment not needed.
C22	9.7	Hidalgo	Eliminated. Follows existing pipeline.
C23	5.9	Grant	Eliminated. Follows existing 69-kV transmission line. Backtracks compared to proposed segment.
C24	7.7	Grant	Eliminated. Follows existing 69-kV transmission line. Not needed once I-10 segments were eliminated.
C25	5.8	Grant	Retained – Alternative Southern Route. Follows rural road.
D1	4.0	Hidalgo	Eliminated. Follows county road. See note 1.
D2	18.5	Hidalgo	Eliminated. Follows county road east and north of Cotton City. See note 1.
D3	3.5	Hidalgo	Eliminated. Follows open land. See note 1.
D4	5.5	Hidalgo	Eliminated. Follows NM 9 and NM 338. Passes by some residential areas near Animas. Northern part of segment follows natural gas pipeline. See note 1.
D5	11.6	Hidalgo	Eliminated. Follows open land and some rural roads. Passes west of Cotton City. See note 1.
D6	4.1	Hidalgo	Eliminated. Follows State Roads 145 and 338. Passes north and west of Cotton City. See note 1.
D7	3.3	Hidalgo	Eliminated. Follows existing 69-kV transmission line. See note 1.
D8	3.9	Hidalgo	Eliminated. Follows existing 69-kV transmission line. See note 1.
D9	5.9	Hidalgo	Eliminated. Follows existing 69-kV transmission line and county road. See note 1.
D10	5.1	Hidalgo	Eliminated. Follows Route 338. See note 1.
D11	7.0	Hidalgo	Eliminated. Follows existing 69-kV transmission line a portion of the way and open land for the remainder. See note 1.
D12	2.1	Hidalgo	Eliminated. Follows existing 69-kV transmission line. See note 1.
D13	3.0	Hidalgo	Eliminated. Follows rural road. See note 1.
D14	1.0	Hidalgo	Eliminated. Follows existing 69-kV transmission line. See note 1.
D15	4.4	Hidalgo	Eliminated. Follows rural roads. See note 1.
E1	5.6	Cochise	Retained – Proposed Route. Follows 230-kV transmission line. Avoids downtown Willcox and reduces visual impacts.
E2	16.8	Cochise	Retained. Proposed Route. Follows existing 230-kV transmission line. Avoids downtown Willcox and reduces visual impacts.
E3	10.3	Cochise	Retained – Alternative Route Segment G. Follows existing pipeline followed by an existing 345-kV transmission line. Avoids downtown Willcox and reduces visual impacts. Alternative route west of Willcox increases line length over the proposed route.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
E4	3.9	Cochise	Retained – Alternative Route Segment G. Follows 345-kV transmission line and rural roads. Avoids downtown Willcox and reduces visual impacts. Alternative route west of Willcox increases line length over the proposed route.
E5	4.3	Cochise	Retained – Alternative Route Segment G. Follows rural road and open land. Avoids downtown Willcox and reduces visual impacts. Alternative route west of Willcox increases line length over the proposed route.
E6	5.3	Cochise	Retained – Alternative Route Segment G. Crosses open land. Avoids downtown Willcox and reduces visual impacts. Alternative route west of Willcox increases line length over the proposed route.
E7	10.2	Cochise	Retained – Alternative Route Segment G. Follows existing 69-kV transmission line. Avoids downtown Willcox and reduces visual impacts. Alternative route west of Willcox increases line length over the proposed route.
E8	1.2	Cochise	Eliminated. Follows county road. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E9	1.5	Cochise	Eliminated. Follows county road. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E10	0.5	Cochise	Eliminated. Follows existing 69-kV transmission line. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E11	3.0	Cochise	Eliminated. Follows existing 69-kV transmission line. Goes through downtown Willcox. Increased visual impacts. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E12	2.4	Cochise	Eliminated. Follows existing 69-kV transmission line. Near golf course, airport.
E13	4.8	Cochise	Eliminated. Follows I-10. Increased visual impacts along highway.
E14	8.0	Cochise	Eliminated. Follows 69-kV transmission line. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E15	6.4	Cochise	Eliminated. Follows existing natural gas pipeline.
E15	1.2	Cochise	Eliminated. Follows existing natural gas pipeline. Goes through downtown Willcox. Increased visual impacts.
E16	2.2	Cochise	Eliminated. Follows county road. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E17	2.0	Cochise	Eliminated. Follows county road. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.
E18	6.4	Cochise	Eliminated. Follows county road. Near golf course and airport.
E19	2.9	Cochise	Eliminated. Follows rural road. Closer to downtown Willcox than proposed or alternate route around Willcox, which could result in greater visual impacts.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
E21	0.6	Cochise	Eliminated. Follows existing 69-kV transmission line. Near golf course and airport.
E22	8.4	Cochise	Eliminated. Follows I-10. Goes through downtown Willcox. Increased visual impacts.
N1	19.2	Dona Ana	Retained – Proposed Route. Follows existing 345-kV line, Section 368 energy corridor, and existing gas pipeline. Passes just south of and avoids Aden Hills OHV Area.
N2	14.1	Dona Ana	Eliminated in favor of N4, which follows existing 345-kV line instead of I-10. Follows pipeline and short Section 368 segments.
N3	10.3	Luna	Eliminated in favor of following existing 345-kV line. Follows I-10. Follows open land. Segment not needed. Extended length of line without benefit. Originally identified to provide access to Mason Draw Solar Energy Zone (SEZ), which has subsequently been removed for BLM SEZ EIS.
N4	12.8	Dona Ana	Retained – Proposed Route. Follows existing 345-kV line and existing gas pipeline.
N5	2.5	Luna	Retained – Proposed Route, follows existing pipeline.
N6	10.4	Luna	Retained – Proposed Route. Follows existing 345-kV line and existing gas pipeline.
N7	6.1	Luna	Eliminated. Follows along I-10 and railroad in area of visual impact concern due to proximity of I-10 and residences.
N8	14.9	Luna	Eliminated. Follows natural gas pipeline. Connected to N2, which was eliminated in favor of N4, which follows existing 345-kV line instead of I-10. Follows pipeline and short Section 368 segments.
N9	12.2	Luna	Retained – Proposed Route. Follows existing 345-kV transmission line east and north of Deming.
N10	1.2	Luna	Retained – Proposed Route. Follows 345-kV transmission line north of Deming. Reduces visual impacts.
N11	11.0	Luna	Retained – Proposed Route. Follows existing 345-kV transmission line north of Deming. Reduces visual impacts.
N12	2.9	Luna	Eliminated. Follows I-10. Eliminated for concern about visual impacts in a highly trafficked area.
N13	12.1	Luna	Eliminated. Follows existing pipeline and passes by some residences.
N14	4.6	Luna	Eliminated. Follows existing pipeline and passes by a number of residences.
N15	3.6	Luna	Eliminated. Follows county road. Not needed as an interconnecting north-south segment.
N16	5.0	Luna	Eliminated. Follows natural gas pipeline. Not needed once I-10 segments were eliminated.
N17	17.8	Grant	Retained – Proposed Route. Follows 345-kV transmission line and natural gas pipeline. Includes some Section 368 energy corridor. Shortest segment to allow efficient interconnection at Hidalgo substation with proposed route.
N18	9.0	Luna	Eliminated. Follows I-10 in area of concern for visual impacts.
N19	7.0	Grant	Eliminated. Follows I-10 in area of concern for visual impacts.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
N20	3.3	Grant	Retained – Alternative Southern Route. Follows existing 115-kV transmission line. Shortest connection from South route up to N24 and Hidalgo substation.
N21	8.4	Grant	Eliminated. Follows pipeline. Heads into downtown Lordsburg, which would increase visual impacts. Also would add additional length to proposed route up to Hachita. Longer than proposed N23, N24 route.
N22	3.9	Grant	Retained – Alternative Southern Route. Follows existing 115-kV transmission line. Shortest connection from South route up to N24 and Hidalgo substation.
N23	9.6	Grant	Retained – Proposed Route. Follows 345-kV transmission line and natural gas pipeline. Shortest segment to allow efficient interconnection at Hidalgo substation with proposed route.
N24	5.4	Hidalgo	Retained – Proposed Route. Follows 345- and 115-kV transmission line and natural gas pipeline. Shortest segment to allow efficient interconnection at Hidalgo substation with proposed route.
N25	5.0	Hidalgo	Eliminated. Follows pipeline. Heads into downtown Lordsburg, which would increase visual impacts. Also would add additional length to proposed route up to Hachita. Longer than proposed N23, N24 route.
N26	6.7	Hidalgo	Eliminated. Follows I-10 in area of concern for visual impacts.
N27	6.2	Hidalgo	Eliminated. Follows existing 69-kV transmission line. Not needed once I-10 segments were eliminated.
N28	4.5	Hidalgo	Retained – Proposed Route. Follows 345- and 115-kV transmission line and natural gas pipeline. Follows some open land north of Lordsburg. Avoids visual impacts in Lordsburg.
N29	4.3	Hidalgo	Eliminated. Cross country segment. Not needed.
N30	6.7	Hidalgo	Retained – Alternative Route Segment D. Follows segments of Section 368 energy corridor. Provides alternative route south of Lordsburg for interconnection of the southern alternative route. Using C8, C17, N30, and N82 combination does not allow interconnection at Hidalgo substation.
N31	9.8	Hidalgo	Retained – Proposed Route. Follows existing natural gas pipeline.
N32	21.9	Cochise	Retained – Proposed Route. Follows existing natural gas pipeline.
N33	10.7	Hidalgo	Retained – Alternative Route Segment E. Does not follow existing linear feature.
N34	1.6	Hidalgo	Eliminated – North. Connector not needed for proposed.
N35	16.3	Cochise	Retained – Alternative Route Segment E. Does not follow existing linear feature.
N36	4.1	Hidalgo	Eliminated. Follows I-10 through area of concern for visual impacts.
N37	7.7	Hidalgo	Eliminated. Follows I-10 through area of concern for visual impacts.
N38	13.6	Cochise	Eliminated. Follows I-10 through area of concern for visual impacts and residential development.
N39	5.0	Cochise	Eliminated. Follows I-10 through area of concern for visual impacts.
N40	5.0	Cochise	Eliminated. Follows I-10 through area of concern for visual impacts and residential development.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
N41	13.2	Cochise	Eliminated. Follows existing pipeline. Passes by Dos Cabezas Wilderness Area and ACEC (VRM Class I).
N42	8.3	Cochise	Retained – Proposed Route. Follows natural gas pipeline.
N43	5.8	Cochise	Retained – Alternative Route Segment F. Follows existing 69-kV transmission line, railroad, and I-10. Alternative around the north of Bowie.
N44	3.8	Cochise	Retained – Alternative Route Segment F. Follows existing 69-kV transmission line. Alternative around the north of Bowie.
N45	3.6	Cochise	Eliminated. Goes through Bowie near residences and areas with potential for visual impacts. Closer to town than proposed.
N46	2.6	Cochise	Retained – Alternative Route Segment F. Follows I-10. North segment extends south of Bowie, but closer than proposed.
N47	16.2	Cochise	Eliminated. Follows natural gas pipeline. Closer to Dos Cabezas ACEC (VRM Class I) than proposed.
N48	15.0	Cochise	Retained – Proposed Route. Follows natural gas pipeline.
N49	14.7	Cochise	Retained – Alternative Route Segment F. Follows railroad, 69-kV transmission line, and I-10. Area with potential for visual impacts.
N50	1.2	Cochise	Alternative. Follows I-10. Area of visual concern.
N51	1.9	Cochise	Retained as alternative. Follows I-10 area of visual concern.
N52	5.9	Dona Ana	Eliminated. Follows open land. Segment not needed. Extended length of line without benefit. Originally identified to provide access to Mason Draw SEZ, which has subsequently been removed for BLM SEZ EIS.
N53	23.6	Luna	Eliminated in favor of N6, which is shorter and follows existing 345-kV line and natural gas pipeline instead of open land and 115-kV line. Follows rural roads.
N54	6.4	Luna	Eliminated due to residential and commercial development. Closer to the center of Deming than proposed.
N55	5.8	Luna	Eliminated. Follows I-10 through Deming. Concern for locating in close proximity to residences and commercial areas as well as visual impact concerns.
N56	2.4	Luna	Eliminated. Follows I-10 and through areas of visual impact concern. Segments through Deming were eliminated.
N57	2.2	Luna	Eliminated. Follows existing railroad. Segment not needed because other interconnecting segments that cross through Deming were eliminated.
N58	1.5	Luna	Eliminated Not needed to connect N9 and N10.
N59	5.2	Luna	Eliminated. Follows existing 69-kV transmission line and backtracks, adding additional line distance.
N60	4.1	Luna	Eliminated. Follows existing pipeline and passes by a number of residences.
N61	6.2	Luna	Eliminated. Follows existing 69-kV transmission line and natural gas pipeline. Adds unnecessary distance to the route.
N62	9.1	Luna	Eliminated. Follows existing transmission line. Adds unnecessary distance.
N63	7.6	Luna	Eliminated. Follows existing pipeline across previously undeveloped land.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
N64	4.4	Luna	Eliminated. Follows existing pipeline. Segment not needed and crosses previously undeveloped land.
N65	2.5	Luna	Eliminated. Follows existing pipeline. Not needed once I-10 segments were eliminated.
N66	4.1	Luna	Retained – Proposed Route. Follows 345-kV transmission line, away from I-10. Reduces visual impacts.
N67	12.4	Grant	Eliminated. Follows existing pipeline and rural road. Segment not needed and crossed areas with minimal existing development.
N68	6.7	Luna	Eliminated. Follows I-10 in area of concern for visual impacts.
N69	4.5	Grant	Eliminated. Follows I-10 in area of concern for visual impacts.
N70	2.9	Grant	Eliminated. Follows I-10 in area of concern for visual impacts.
N71	7.1	Grant	Eliminated. Follows I-10 in area of concern for visual impacts.
N72	1.9	Hidalgo	Retained – Proposed Route. Follows 345-kV transmission Line. Avoids visual impacts in Lordsburg.
N73	2.6	Hidalgo	Retained – North. Follows 345-kV transmission Line. Together, N73 and N75 add significantly more line length than proposed and, therefore, more ground disturbance.
N74	3.1	Hidalgo	Retained – Proposed Route. Follows open land north of Lordsburg. Avoids visual impacts in Lordsburg.
N75	29.9	Hidalgo	Eliminated. Follows existing 345-kV transmission line and open land. Together, N73 and N75 add significantly more line length than proposed and, therefore, more ground disturbance.
N76	8.4	Hidalgo	Retained – Proposed Route. Follows open land north and west of Lordsburg. Avoids visual impacts in Lordsburg.
N77	6.2	Hidalgo	Eliminated. Follows open land. Not needed once I-10 segments were eliminated.
N78	1.1	Cochise	Retained – Alternative Route Segment E. Follows I-10 natural gas pipeline through area of concern for visual impacts.
N79	1.5	Cochise	Eliminated. Follows rural road. Unneeded interconnection segment.
N80	2.5	Luna	Eliminated. Follows existing pipeline. Connector south and west of Deming not needed for proposed route.
N81	2.9	Cochise	Retained – Proposed Route. Follows natural gas pipeline south of Bowie.
N82	1.3	Hidalgo	Retained – Alternative Route Segment D. Follows Section 368 corridor. Connector not needed for proposed route. Using combination of Segments C8, C17, N30, and N82 does not allow interconnection at the Hidalgo substation.
N83	2.0	Luna	Retained – Proposed Route. Follows existing 345-kV transmission line. Essential for connecting N4 to N6.
N84	1.7	Cochise	Retained – Alternative Route Segment F. Follows I-10 south and west of Bowie.
N85	4.2	Cochise	Retained – Alternative Route Segment E. Follows existing 69-kV transmission line, railroad, and I-10.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
N86	1.7	Luna	Eliminated. Follows natural gas pipeline. Segment not needed once I-10 segments were eliminated for visual impact concerns.
N87	3.1	Luna	Eliminated. Follows I-10 in area of elevated concern for visual impacts.
N88	1.7	Hidalgo	Eliminated. Follows Route 90. Connector to N73 and N75 not needed with proposed route.
S1	1.3	Dona Ana	Retained – Alternative Route Segment A. Follows NM 9. Additional line length and ground disturbance.
S2	12.8	Dona Ana	Retained – Alternative Southern Route. Follows NM 9. Segment stays south of highway near West Potrillo Mountains Wilderness Study Area.
S3	10.3	Luna	Retained – Alternative Southern Route. Follows open land set back from West Potrillo Mountains Wilderness Study Area.
S4	11.2	Luna	Retained – Alternative Southern Route Follows NM 9.
S6	8.4	Luna	Retained – Alternative Southern Route Follows NM 9.
S7	8.7	Luna	Retained – Alternative Southern Route Follows open land. Shorter distance than alternative S18.
S8	20.3	Luna	Retained – Alternative Southern Route Follows NM 9.
S9	2.7	Grant	Eliminated. Follows NM 9. See note 1.
S10	3.2	Grant	Eliminated. Follows NM 9. See note 1.
S11	8.0	Grant	Eliminated. Follows NM 9. See note 1.
S12	10.5	Hidalgo	Eliminated. Follows NM 9. See note 1.
S13	12.5	Luna	Retained – Alternative Route Segment B. Follows NM 9, near West Potrillo Mountains Wilderness Study Area.
S18	10.4	Luna	Retained – Alternative – Route Segment C. Follows NM 9.
S19	5.2	Grant	Eliminated. Follows abandoned railroad. See note 1.
S20	**3.1**	Dona Ana	Retained – Alternative Route Segment A. Follows NM 9. Additional line length and ground disturbance.
S21	1.4	Dona Ana	Retained – Alternative Route Segment A. Follows NM 9. Additional line length and ground disturbance.
S22	2.4	Dona Ana	Retained – Alternative Route Segment A. Follows NM 9. Additional line length and ground disturbance.
S23	10.0	Luna	Retained – Alternative Southern Route Follows NM 9, rural roads, and open land. Passes south of Columbus through primarily open land.
S24	1.6	Grant	Eliminated. Follows NM 9. See note 1.
S25	2.9	Luna	Eliminated. Follows rural road around to the north of Columbus. Interconnects to S25.
S26	6.7	Luna	Eliminated. Follows rural roads and open land around to the north of Columbus. Passes close to residential areas and possible private landing strips immediately to the north.

TABLE 2-4. SUMMARY OF VIABLE ROUTE OPTIONS

Segment	Distance (Miles)	County	Segment Status (Retained or Eliminated)
			Upgrade Section Segments
R1	46.9	Cochise	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R2	15.5	Cochise	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R3	11.8	Cochise	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R4	3.8	Pima	SWTC Eliminated. See section 2.2.6.
R5	2.8	Pima	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R6	4.3	Pima	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R7	11.7	Pima	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R8	2.5	Pima	Retained – Proposed Route. Follows existing Western 115-kV transmission line.
R9	2.2	Pima	Retained – Proposed Route. Follows existing Western 115 kV transmission line.
R10	70.8	Cochise	SWTC Eliminated. See section 2.2.6. Follows existing SWTC 115-kV transmission line.
R11	15.0	Cochise	Retained – Alternative Route Segment H. Follows existing SWTC 115-kV transmission line.
R12	5.6	Pima	SWTC Eliminated. See section 2.2.6. Follows existing SWTC 115-kV transmission line.
R13	4.5	PIma	SWTC Eliminated. See section 2.2.6. Follows existing SWTC 115-kV transmission line.
R14	18.9	Pima	Retained – Proposed Route. Follows existing Western 115-kV transmission line.

Note 1 – Most route segments west of Hachita were eliminated in favor of shorter routes to the Lordsburg area. Route segments west of Hachita would require backtracking to reach this area, thus extending the overall length of the transmission line without any benefit as compared to the Alternative Southern Route.

Note 2 – Early in the process of defining potential routes, a number of potential interconnecting segments were identified between the I-10 corridor and the NM 9 corridor in southern New Mexico. These interconnecting routes were initially developed to provide options for changing the route from one corridor to the other in the event a significant constraint was identified. No significant constraints were identified and, thus, the north-south interconnecting segments between the northern and southern routes were not required to facilitate the logical routing of the New Build Section, and these segments were eliminated.

The alternatives that were retained for the New Build Section and Upgrade Section are shown in figures 2-10 and 2-11, respectively. The corridors shown represent the routes with the fewest environmental, land use, and engineering constraints between the end-point substations. The corridors for the New Build Section and Alternative Route Segments A-H have a total width of 2 miles, or 1 mile on either side of an existing linear facility. In areas of increased residential development, such as around

Deming, Lordsburg, Willcox, and Columbus, the corridor width was reduced to a total of 1,000 feet. The corridor width for the Upgrade Section was defined as 500 feet, with the exception of Alternative Route Segment H around the Town of Benson and the Vail substation interconnection, which has a 2-mile total width consistent with corridor widths of other new proposed lines.

2.2.4 Corridors Considered for the New Build Section

The full set of routing corridors considered for the New Build Section included a number of segments to the north and to the south, with several potential interconnections between the two. The northern route options primarily followed existing transmission lines, highways, roadways (including I-10), railroad lines, and pipelines. A few of the northern route options also followed Section 368 energy corridors across some areas of BLM land.

Northern Route Options

All of the northern routes evaluated out of the Afton substation follow an existing 345-kV transmission line in a northwesterly direction for approximately 19 miles. This option also follows a Section 368 Federal energy corridor across BLM lands and an existing railroad, and runs adjacent to the Afton Solar Energy Zone (SEZ). At this point, one of several options continues to follow the existing 345-kV transmission line for another approximately 91 miles to a point just north of Lordsburg. This option also runs north of Deming and crosses primarily open land under a mixture of BLM, State, and private land ownership. Other option evaluated in this area follow I-10, an existing 115-kV transmission line, and an existing pipeline, as well as several intermittent Section 368 Federal energy corridors. Of these additional options, one follows I-10 through Deming while another follows an existing natural gas pipeline and Section 368 Federal energy corridor to a point south of Deming. Between Deming and Lordsburg, there are three primary northern corridor options: a northern option following the existing 345-kV transmission line; a central option following I-10; and an option following an existing pipeline and 69-kV transmission line. These options provide opportunities to traverse either north or south of Lordsburg.

West of Lordsburg, one option continues to follow I-10 to the west and south to a point where the route turns and follows Highway 191 to the existing Afton substation. Other option between Lordsburg and Willcox follow existing pipelines and a portion of a Section 368 Federal energy corridor across Lordsburg Playa. These options avoid the Northern Peloncillo Mountains VRM Class I area to the north, as well as the Dos Cabezas Peak ACEC and VRM Class I areas. Near Willcox, there is an option that follows an existing 230-kV transmission line along the eastern boundary of Willcox Playa to the existing Apache substation. There are also a number of options that extend north and west of the City of Willcox, most of which follow either existing transmission lines or roads.

Southern Route Options

The southern route options follow existing rural roads south from the Afton substation to NM 9. All options in this area were selected to avoid the West Potrillo Mountains Wilderness Study Area. The southern route options then follow NM 9 through Columbus and Hachita to Animas, where a number of options extend north and intersect with one of the northern route options. The options connecting the northern and southern routes followed mostly existing highways and rural roads, a historic railroad line, and transmission and distribution lines. A north-south connection was identified west of the West Potrillo Mountains Wilderness Study Area that is intended to serve as a potential interconnection for a new substation that could be constructed in this general area. The north-south connections between the general areas of Columbus and Deming follow existing transmission lines and county roads. As can be seen in figure 2-10, the southern route options all interconnected with the northern route options

near the cities of Lordsburg or Deming. The westernmost interconnection between the southern and northern route options was located approximately 16 miles southwest of Lordsburg.

An additional southern route option was evaluated that involved potentially siting the transmission line either within or adjacent to the International Boundary and Water Commission's (IBWC) 60-foot-wide Roosevelt Easement, which exists along the southern extent of the project study area. This 60-foot exclusion area is maintained for public lands that exist along the international border with Mexico. Potentially accessing the Roosevelt easement was an attractive option because the easement contains a road maintained by the Border Patrol that could potentially be used as an access road for the project. However, through communication with the IBWC in Washington, D.C., it was determined that construction of the transmission line within and paralleling the Roosevelt Easement would not be allowed and that the development of new spur roads from the existing road located within the easement would also not be permitted. For these reasons, potential use of the Roosevelt Easement for project siting was eliminated from further consideration.

2.2.5 Corridors Considered for the Upgrade Section

The corridors considered for the Upgrade Section consisted of the existing Western 115-kV line and the SWTC 230-kV and 115-kV lines between the Apache and Saguaro substations in Arizona. Both transmission lines exit the Apache substation, with the Western line heading west and the SWTC line running south and then west. Both lines join approximately 4 miles west of the substation and continue west in adjoining ROWs for a distance of approximately 15 miles. Both lines cross approximately 0.5 miles of the Coronado National Forest in this area. The SWTC line then heads north and west of the City of Benson, while the Western line continues in a westerly direction. The two lines rejoin west of Benson for another 12 miles, where they again separate, with the SWTC line running south of the City of Vail and the Western line extending north of Vail. Both lines cross through the Fort Huachuca Buffalo Soldier Electronic Testing Range in this area. The Western and SWTC lines run along ROWs for the next 4.5 miles, at which point the lines diverge, with the Western line turning to the northwest and the SWTC line continuing due west. From the Apache substation to this point, both existing lines cross primarily open land, with the exception of the towns of Benson and Vail. From the point where the two lines diverge, the Western line runs to the northwest for about 12.5 miles and then turns north through the City of Tucson, crossing a mix of open commercial and residential areas, ending at the Tucson substation. The Western line in this area runs about 1.2 miles west of the Tucson Airport and crosses about 3 miles of the San Xavier Indian Reservation. From this point, the Western line heads north and west for a distance of approximately 35.5 miles to the Saguaro substation. Over this distance, the existing line crosses residential areas, open land, and agricultural land uses.

Starting at the point where the Western and SWTC lines diverge, the SWTC line heads due west for approximately 8.75 miles, where the line turns due south for a distance of about 8 miles. Over this area, the SWTC line crosses primarily open land and runs near the small community of East Sahuarita. The existing line then heads predominately west for about 11 miles and then turns northwest for a distance of about 17.5 miles, where it intersects with the existing Three Points substation. In this area, the line again crosses open land as well as about 2.25 miles of the San Xavier Indian Reservation. The line then runs due north for a distance of approximately 25.5 miles, where it intersects with the existing Western line immediately north of the Marana substation. In this area, the line crosses predominately open land, as well as approximately 3 miles of the Tohono Indian reservation and about 3 miles of the IFNM.

2.2.6 Elimination of the SWTC Option

As described in section 2.2.5, the SWTC Upgrade segment crosses approximately 3 miles of the IFNM (figure 2-12). The monument was established by Presidential Proclamation 7320 for the purpose of

protecting biological, cultural, geological, and other resource values. The BLM Tucson Field Office has the responsibility of planning for and managing the IFNM. In the September 2011, the BLM issued the IFNM Proposed Resource Management Plan (PRMP)/FEIS. In this planning document, several options are evaluated for managing existing and future utility corridors within the borders of the IFNM. Alternative B is very restrictive. The less-restrictive Alternative C is listed as the "preferred alternative" but the FEIS selectively gives preference to the more restrictive Alternative B option for utility corridors, which is a change from the DEIS, as noted below:

> *Under Alternative B, allocating the IFNM as an exclusion area without identifying any utility corridors would result in considering land use authorizations for rights-of-way only when required by law. This would exclude the potential for new rights-of-way for electric generating facilities (including renewables), transmission lines, pipelines, and other utilities, but would best protect the objects of the monument... Under Alternative C... Allocating the IFNM as an avoidance area (except for 241 acres that are identified as utility corridors) would limit opportunities for rights-of-way (including renewable energy projects) unless no other viable alternatives exist to avoiding placement of facilities within the IFNM. Corridors on 241 acres would provide limited opportunities for major utilities.*
>
> *The Proposed Plan would not provide for utility corridors, which is consistent with Alternative B; this differs from the preferred alternative in the Draft RMP/EIS, which included Alternative C for utility corridors.* (Source: PRMP/FEIS Executive Summary, Land Use Impacts, September 2011, http://www.blm.gov/az/st/en/prog/planning/ironwood/reports.html.)

The IFNM FEIS record of decision has not yet been signed and an implementation plan has not yet been delivered for this PRMP (as of February 27, 2012), However, the restrictive nature of these conclusions indicates that IFNM management staff would most likely not allow expansion of the existing SWTC ROW to upgrade the transmission line as part of the project.

Further, as indicated in figure 2-12, the project study area, as drawn, must cross IFNM property. The project team investigated expanding the study area to the east to cross lands outside of the IFNM boundary. However, as shown in figure 2-12, the neighboring land uses are also highly restrictive and unlikely to be readily compatible with new transmission line ROW. These land uses include wilderness areas, Sonoran Desert Conservation Plan - Biological Core Areas, State/local recreation areas, or parks (e.g., the Tucson Mountain County Park), the USBR-managed Tucson Mitigation Corridor, and the Saguaro National Park.

Regional transmission planning and technical studies also indicate that an upgrade of the Western 115-kV line would better meet the region's technical transmission needs. In addition, access to the existing substations along the Western line also provided additional opportunities to strengthen the existing regional and local transmission system.

Finally, upgrading the Western line better meets Western's need to facilitate the construction of transmission facilities, which will help ensure reliability of the electric transmission grid needed to carry out Western's core functions including the strategic goal of entering into public-private partnerships.

Due to these land use restrictions and technical and commercial requirements, the project team eliminated the SWTC option from further consideration.

2.3 Description of Project and Alternatives

A description of the project and alternatives for the project is presented below. The individual numbered segments are shown on figures 2-10 and 2-11 for the New Build Section and Upgrade Section, respectively.

2.3.1 Project Description

The project consists of the northern New Build Section and the Western Upgrade Section (see figures 2-13 and 2-14). Combined, the project has a total length of approximately 360 miles. In addition to the route for the double-circuit 345-kV New Build Section (approximately 205 miles) and the project's double-circuit 230-kV Upgrade Section from Apache to Saguaro (approximately 120 miles), the project also includes Segment R5, a 230-kV line that will be required to interconnect with the existing Vail substation (approximately 2.2 miles); Segment B1 between NM 9 and I-10 (approximately 30 miles); and Segment A2, a 230-kV line connecting the Afton substation and the existing Luna-Diablo 345-kV transmission line (approximately 5.2 miles). A detailed description of the proposed route is presented in the following two subsections.

Proposed New Build Section

The proposed New Build Section begins at the Afton substation and follows an existing 345-kV transmission line northwest to I-10 along Segments N1 and N4 past the Aden Hills OHV area. From there, the route would cross I-10 immediately beyond Doña, and continue north of I-10 along Segment N6 to Carne. Approaching Deming from the north, using Segment N9, the route would run north of Deming and then follow existing roads. Using Segments N10 and N11, the route heads west of Deming. The route would extend northwest along Segments N17, N23, and N24 to the Hidalgo substation at T22S, R17W, Section 9. From the Afton substation to the Hidalgo substation, the proposed route would follow an existing 345-kV transmission line. From the Hidalgo substation, the route would continue due west adjacent to the existing 345-kV transmission line, north around Lordsburg, and south along Segment N28. Using Segments N31 and N32, the route would follow an existing pipeline route. The proposed project route would then cross I-10 west of San Simon and follow an existing pipeline route south of the interstate and north of the Dos Cabezas Peaks ACEC along Segments N42 and N48. The route would then extend south along Segments E1 and E2 east of the Town of Willcox and Willcox Playa to the Apache substation. The proposed route would follow an existing 230-kV transmission line corridor along these segments around Willcox Playa. The termination point at the Apache substation would represent the western extent of the New Build portion of the project. The total length of the transmission line using the proposed northern route from the Afton substation to the Apache substation would be approximately 205 miles.

The proposed New Build portion of the project would also include Segment B1, which runs north-south between NM 9 and I-10. Segment B1 is east of Deming and the Florida Mountains, and west of the Potrillo Mountains. The total length of that segment would be approximately 30 miles and would serve as an interconnection to a possible new substation that could be constructed in the future. The project's proposed plan of service would also include a 5.2-mile in-and-out loop between the existing Afton substation and the existing Luna-Diablo 345-kV transmission line. The objective of this segment would be to interconnect the project to the existing Luna-to-Diablo 345-kV transmission line. The shortest distance to complete the loop is shown as Segment A2.

Proposed Upgrade Section

The proposed Upgrade Section of the transmission line would involve upgrading the existing Western transmission line between the Apache and Saguaro substations. This portion of the project, represented

by Segments R1, R2, R4, and R6, is an upgrade of a the existing Western 115-kV transmission line through Cochise, Pima, and Pinal counties, and the Applicant anticipates following the same path as the existing transmission line. A new, approximately 2-mile line, designated by Segment R5, will be required to interconnect with the Vail substation, located just north of the Western line at T15S, R15E, Section 4. The Upgrade Section is approximately 120 miles in length and could interconnect with more than 10 substations along the route.

2.3.2 Alternatives

The routing study identified both a northern route option and a southern route option for the New Build Section. The northern route was ultimately selected as the proposed route based on the overall shorter distance of that route, fewer impacts to previously undeveloped areas, and the ability to parallel multiple existing linear facilities. The southern route option provides an alternative to the proposed northern route between the Afton substation and the point where the proposed and alternative routes merge at a location approximately 10 miles east of Lordsburg. A description of the southern option is presented below as the Alternative Southern Route.

New Build Alternative – The Alternative Southern Route

The Alternative Southern Route would start at the Afton substation. This route would extend south to NM 9, continue west along NM 9 to Columbus, and then back north to the Hidalgo substation. From this point to the Apache substation, the Alternative Southern Route would be the same as the proposed project route.

The Alternative Southern Route from Afton to Lordsburg would originate at the Afton substation and follow, where possible, existing rural roads for 24 miles south to NM 9 along Segments A1, A3, A5, and A8. From there, the corridor would follow NM 9 and portions of an abandoned railroad track to Columbus along Segments S2 through S6, and then run northwest to Hachita along Segments S7 and S8. Portions of Segments S7 and S8 follow an abandoned railroad track. From Hachita, the alternative route would continue northwest along Segment C2 for 20 miles until intersecting an existing 69-kV transmission line, and then turn due north, following the existing transmission line along Segments C6, N20, and N22. In Segment N20, the alternative route would cross I-10. The route would then turn northwest along Segment N24, paralleling two existing 345-kV transmission lines. At Segment N24, the Alternative Southern Route would intersect the proposed project route into the Hidalgo substation. From the Hidalgo substation, the route would continue due west along Segment N28, north around Lordsburg, and south to an existing pipeline route that the proposed route follows using Segments N31 and N32. The route would then cross I-10 west of San Simon and follow an existing pipeline route south of the interstate and north of the Dos Cabezas Peaks ACEC along Segments N42 and N48. The route would then extend south along Segments E1 and E2, east of the Town of Willcox and Willcox Playa, to the Apache substation. The total length of the Alternative Southern Route from the Afton substation to the Apache substation would be approximately 240 miles. Using this Alternative Southern Route from Afton to Apache, the total project length would be approximately 395 miles, including the Upgrade portion of the project from Apache to Saguaro (approximately 120 miles); Segment B1 between NM 9 and I-10 (approximately 30 miles); and Segment A2, connecting the Afton substation and the existing Luna-Diablo 345-kV transmission line.

Alternative Route Segments

A number of additional alternative route segments were identified during the routing study that could be used instead of the proposed segments if found to be environmentally preferable:

- **Alternative Route Segment A:** includes individual Segments A7, A13, S1, S20, S21, and S22 south of Afton off the Alternative Southern Route.

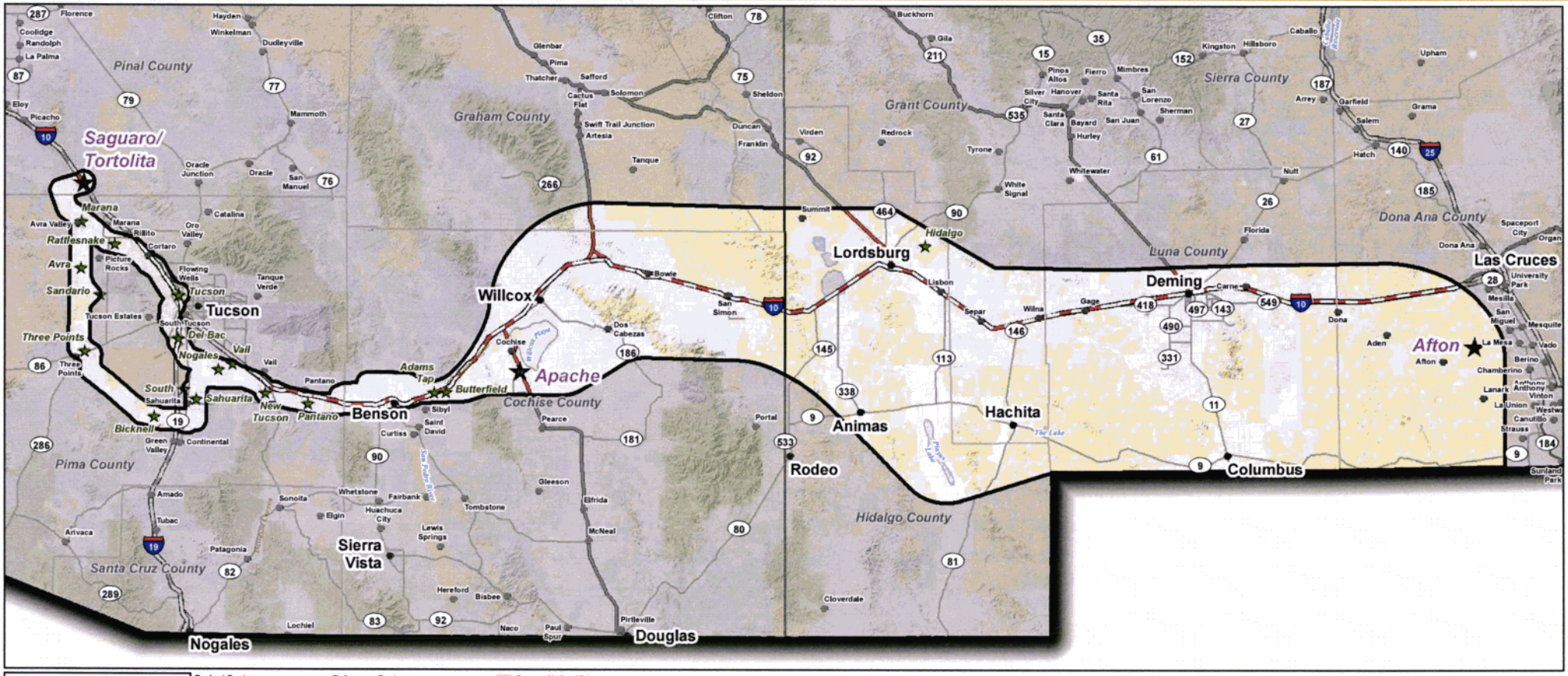
- **Alternative Route Segment B:** includes individual Segment S13 off the Alternative Southern Route.
- **Alternative Route Segment C:** includes individual Segment 18 off the Alternative Southern Route.
- **Alternative Route Segment D:** includes individual Segments C8, C17, and N30. This alternative provides a route to the south of Lordsburg.
- **Alternative Route Segment E:** includes individual Segments N33, N35, N78, N82, and N85. This alternative provides a route option north of I-10 and follows a Section 368 energy corridor.
- **Alternative Route Segment F:** includes individual Segments N43, N44, N45, N46, N49, and N84. This combination provides a route alternative along I-10 around Bowie.
- **Alternative Route Segment G:** includes individual Segments E3, E4, E5, E6, E7 and E13. This combination provides a north and western route option around Willcox. Segment E3 follows an existing gas pipeline and 345-kV transmission line, while Segments E4 through E7 follow an existing below-230-kV transmission line.
- **Alternative Route Segment H:** includes individual Segment R11 and provides an alternative off the Upgrade north of Benson.

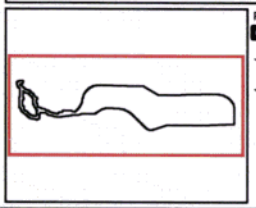
Upgrade Section Alternative

Because of the limited number of opportunities to upgrade an existing transmission line between the Apache and Saguaro substations, no viable alternatives to the proposed upgrade of the existing Western line were identified (see section 2.2.6, Elimination of the SWTC Option).

However, Alternative Route Segment H, listed above, could be used as an option to upgrade the Western line in its current location through the Town of Benson. If determined to be environmentally preferable, the Western line could be upgraded along a segment north of Benson, generally following the path of an existing transmission line owned by SWTC.

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural or City Street
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

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Miles

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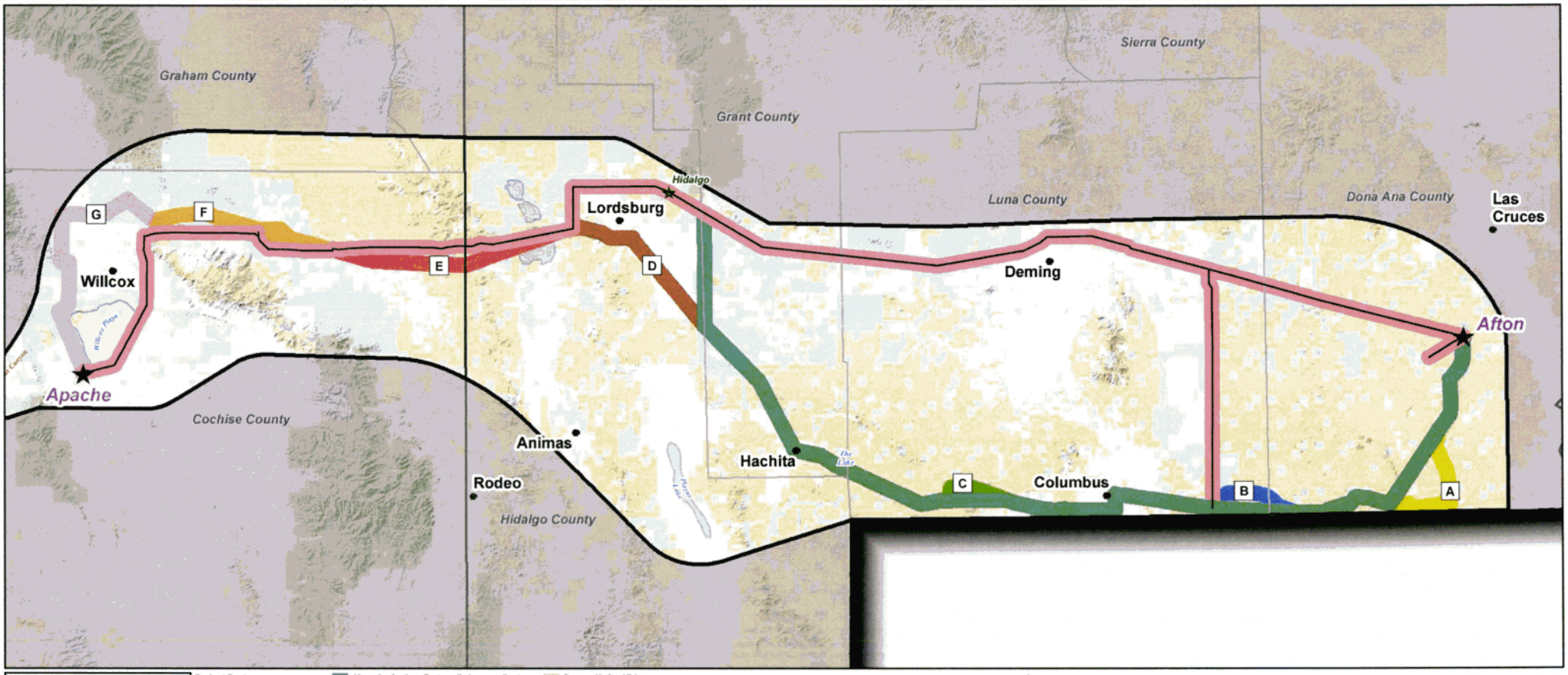
Figure 1-1
Study Area

Date: 4/11/2012

Southline Transmission Project

Figure 1-2
Proposed and Alternative Routes

SOUTHLINE TRANSMISSION PROJECT



Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Proposed Route
- Alternative Southern Route
- Alternative Route Segment A
- Alternative Route Segment B
- Alternative Route Segment C
- Alternative Route Segment D
- Alternative Route Segment E
- Alternative Route Segment F
- Alternative Route Segment G

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

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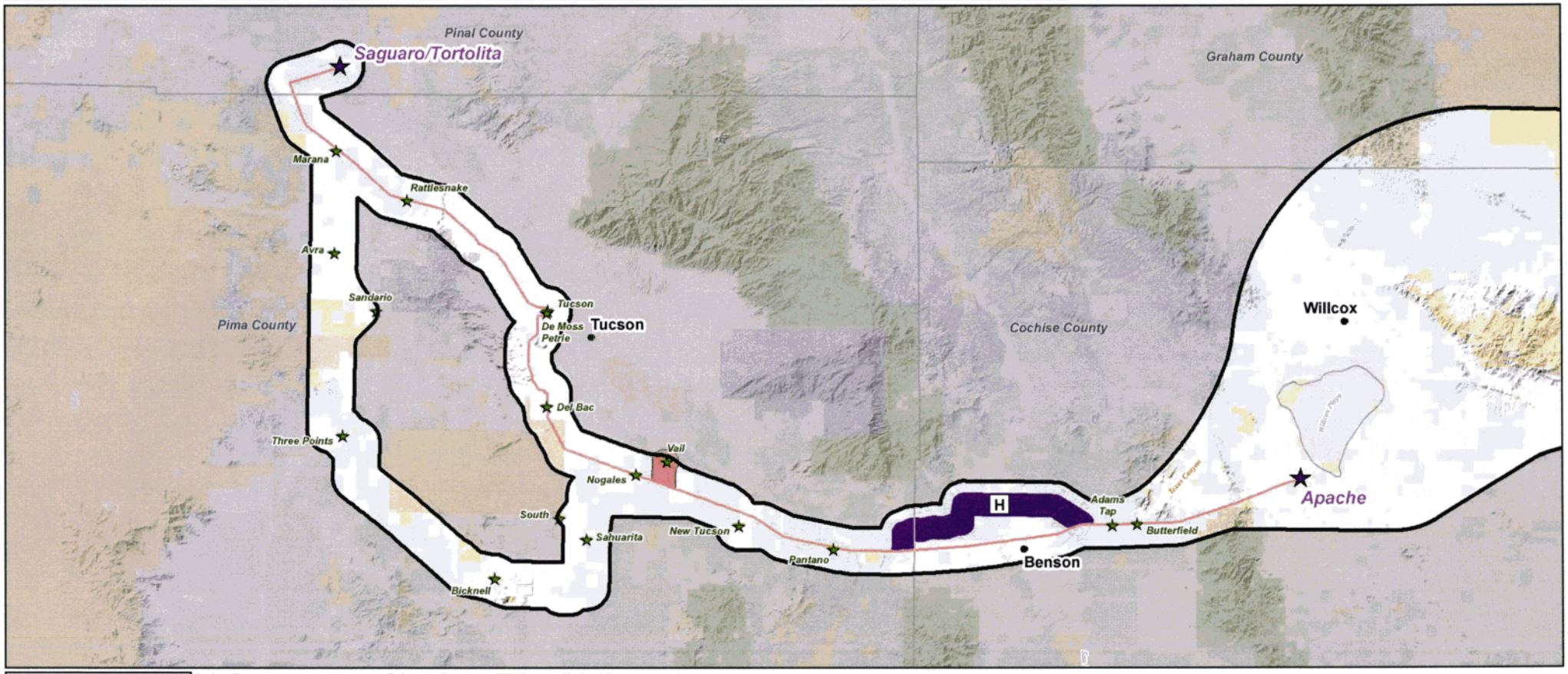
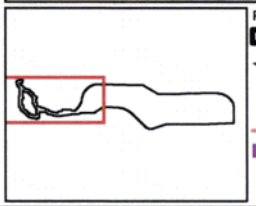
Figure 1-3
Proposed and Alternative Routes
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Proposed Upgrade Route (Western)
- Alternative Route Segment H

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

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Miles

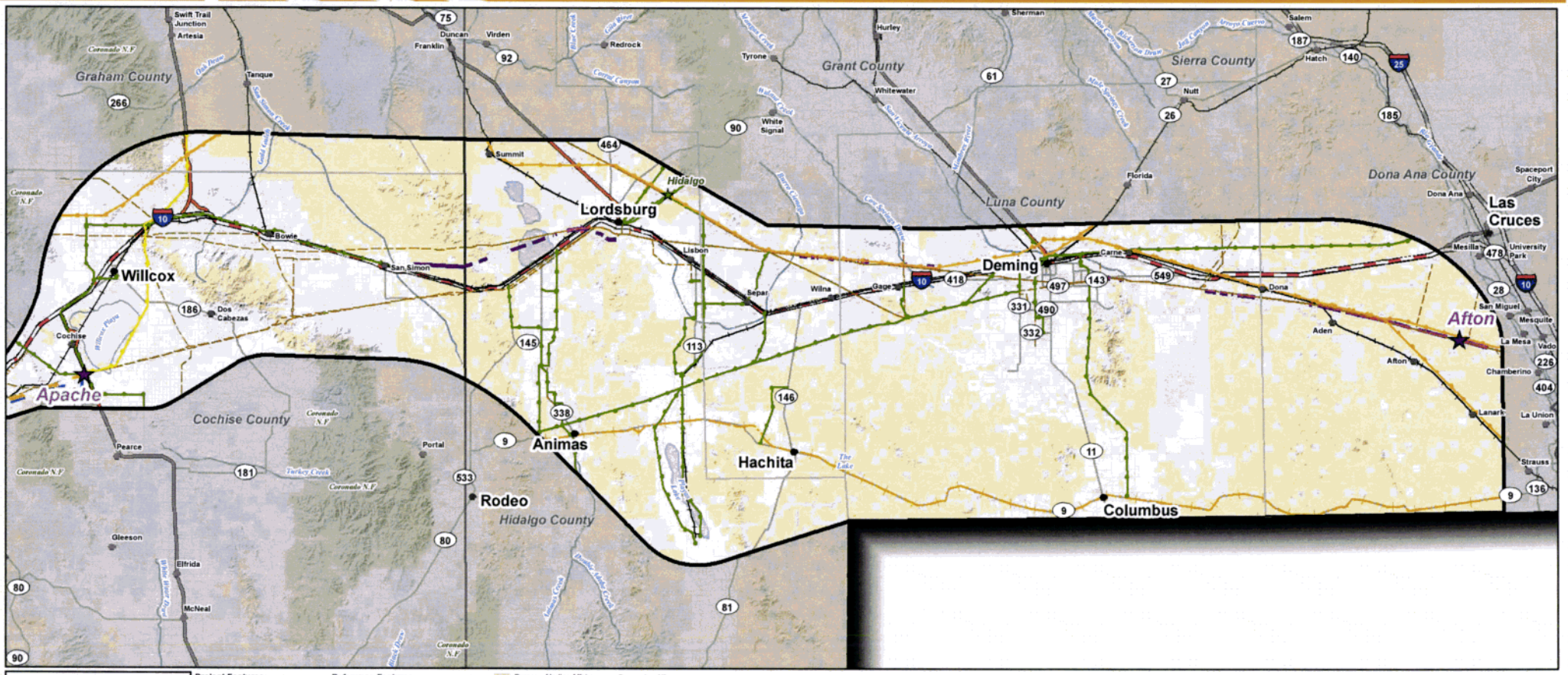
1:500,000

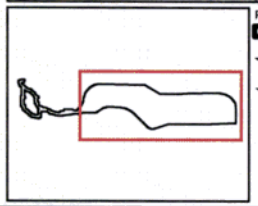
Upgrade Study Corridor: 500 feet
New Build Study Corridor: 2 miles

Figure 1-4
Final Proposed and Alternative Routes
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural or City Street
- Railroad
- Abandoned Railroad
- River/Stream
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

Opportunities
- Section 368 Energy Corridor
- Gas Pipeline

Existing Transmission Lines
- 345kV
- 230kV
- Below 230kV

N

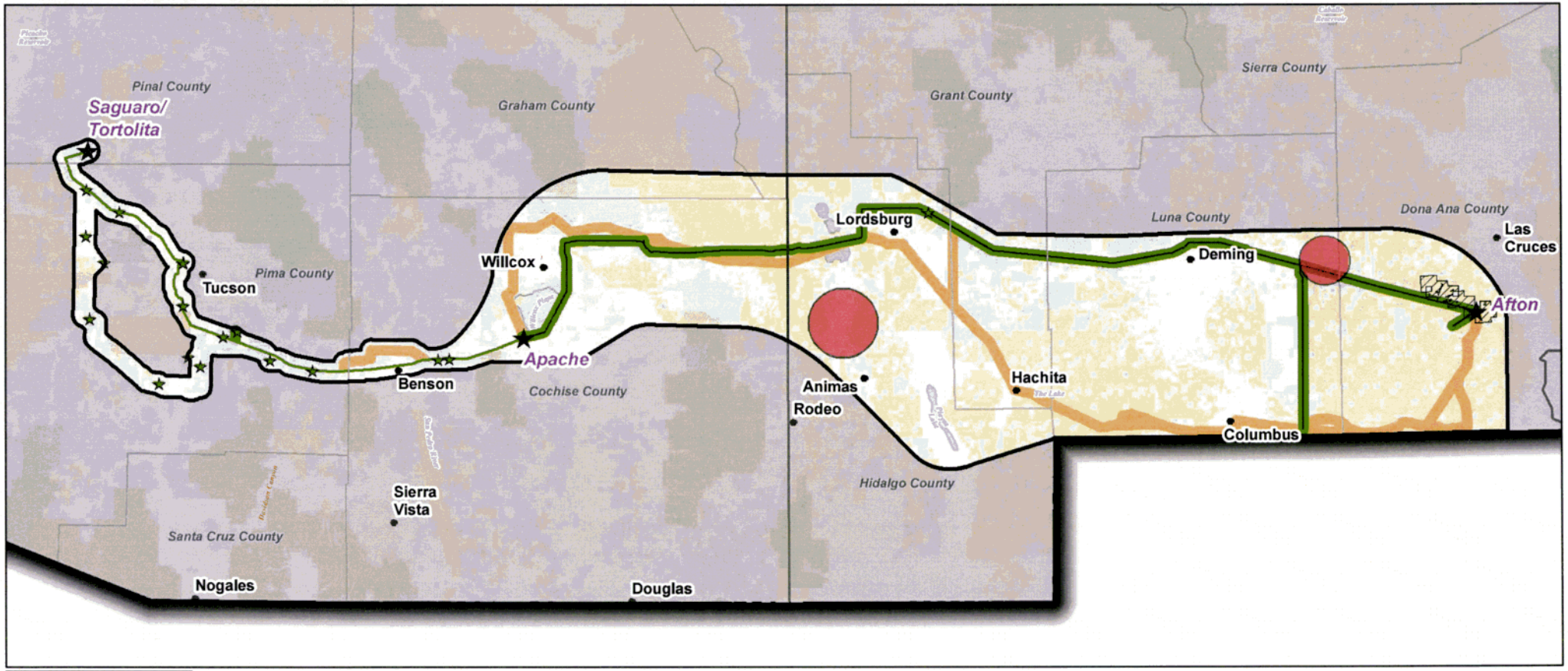
0 5 10
Miles

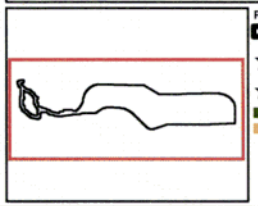
1:760,000

Figure 2-1
Opportunities
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

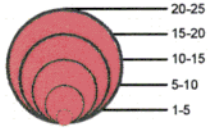




Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Proposed Route
- Alternative Routes

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State
- Solar Energy Zone (SEZ)

1,000s of GWh/yr



Notes:
Western Renewable Energy Zone (WREZ) seeks to identify those areas in the West with vast renewable resources to expedite the development and delivery of renewable energy to where it is needed (http://www.westgov.org/rtep/219).

Qualified Resource Area (QRA) represent areas of high-quality renewable energy resources for purposes of evaluating interstate transmission lines (http://www.westgov.org/rtep/219).

Solar Energy Zone (SEZ) is defined by the Bureau of Land Management Programmatic Environmental Impact Statement (BLM PEIS) as an area with few impediments to utility-scale production of solar energy where BLM would prioritize solar energy and associated transmission infrastructure development (http://solareis.anl.gov/sez/index.cfm).

N

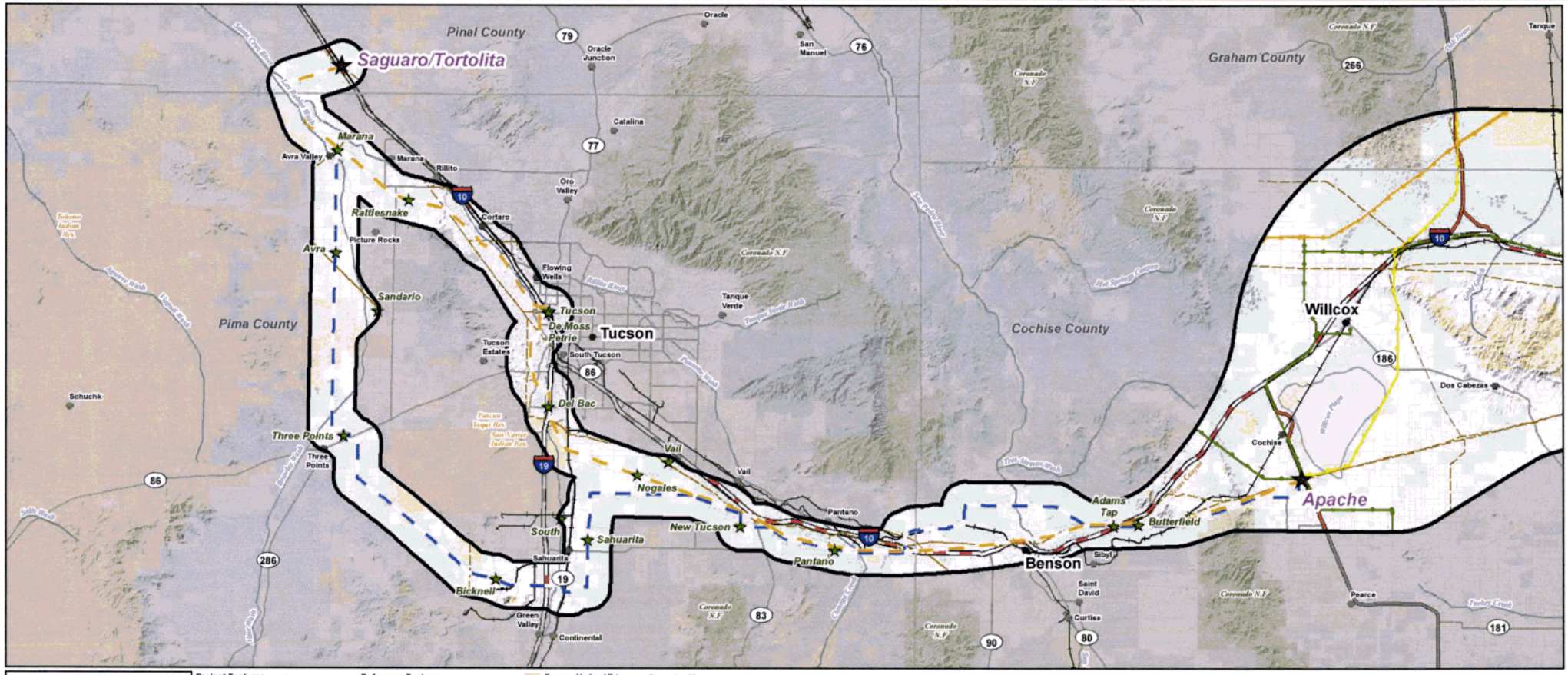
0 12.5 25
Miles

1:1,100,000

Figure 2-2
Renewable Energy Zones

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT



Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Southwest Transmission Cooperative line for potential improvement
- Western Area Power Administration line for potential improvement

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural or City Street
- Railroad
- Abandoned Railroad
- River/Stream
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

Opportunities
- Section 368 Energy Corridor
- Gas Pipeline

Existing Transmission Lines
- 345kV
- 230kV
- Below 230kV

N

0 5 10
Miles

1:500,000

Figure 2-3
Opportunities
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

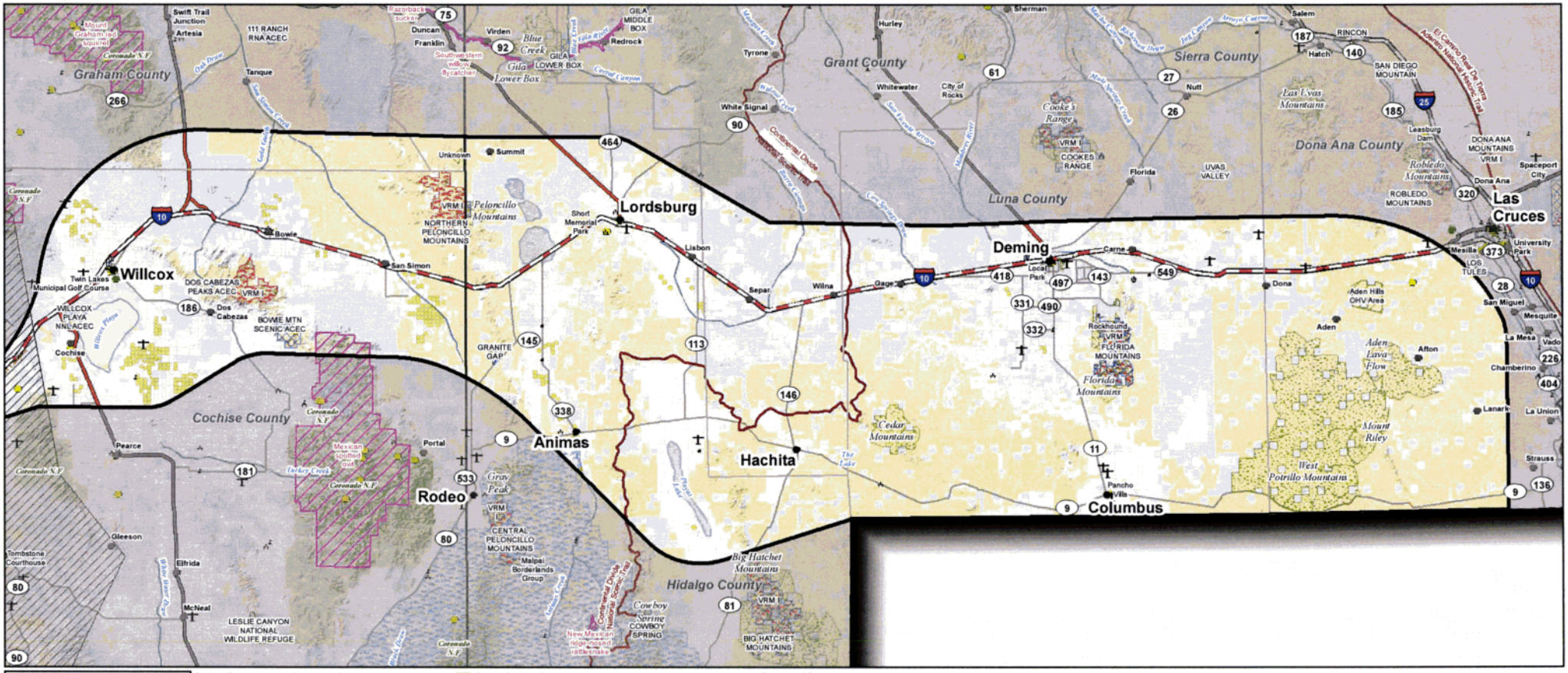


Figure 2-4
Constraints
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

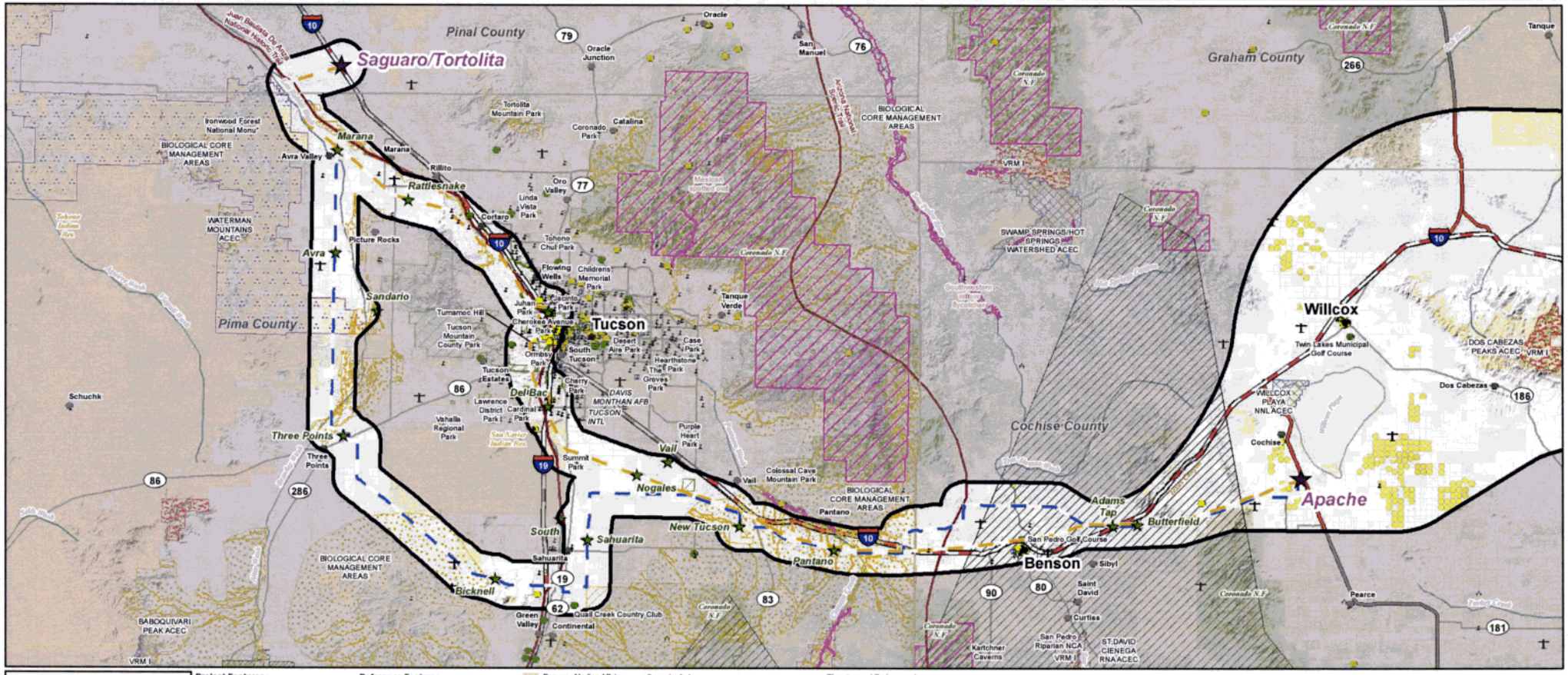


Figure 2-5
Constraints
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

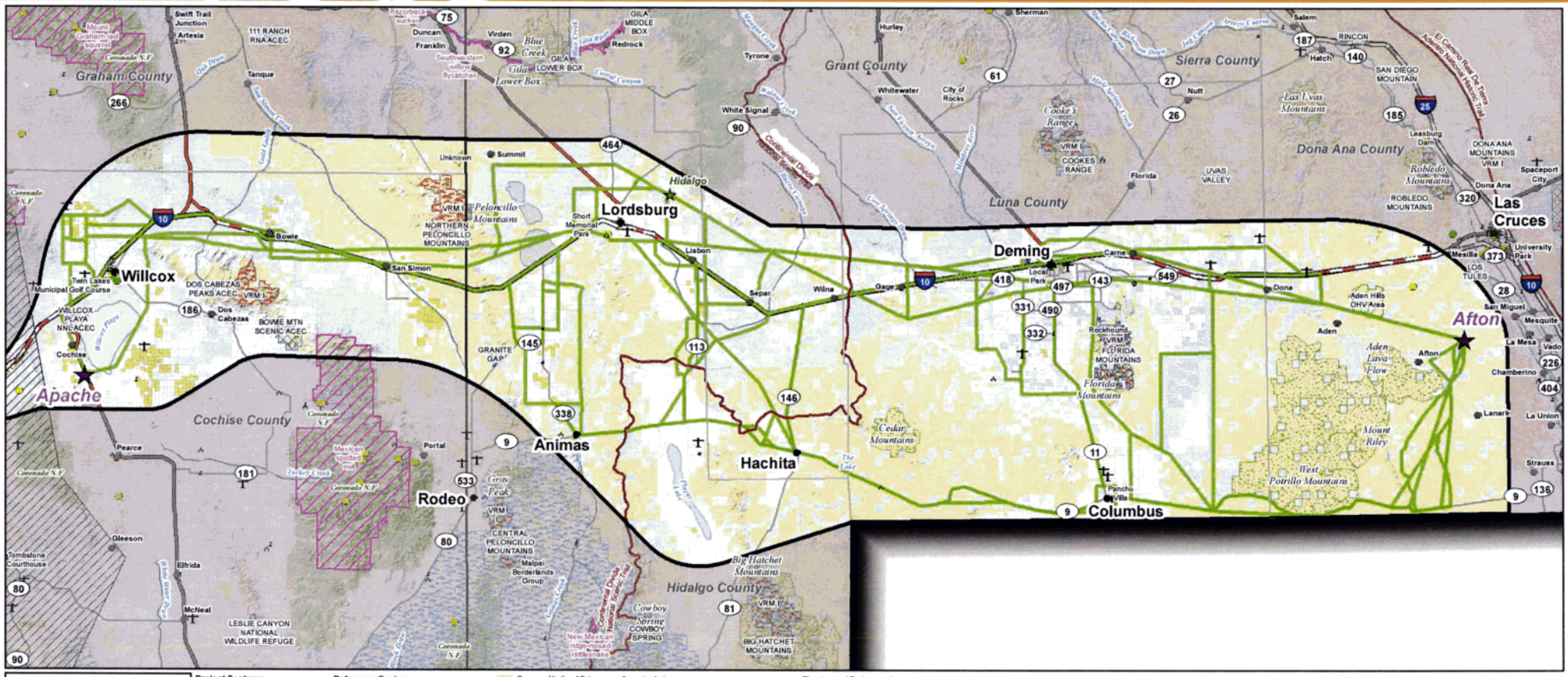


Figure 2-6
Viable Opportunities with Constraints
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

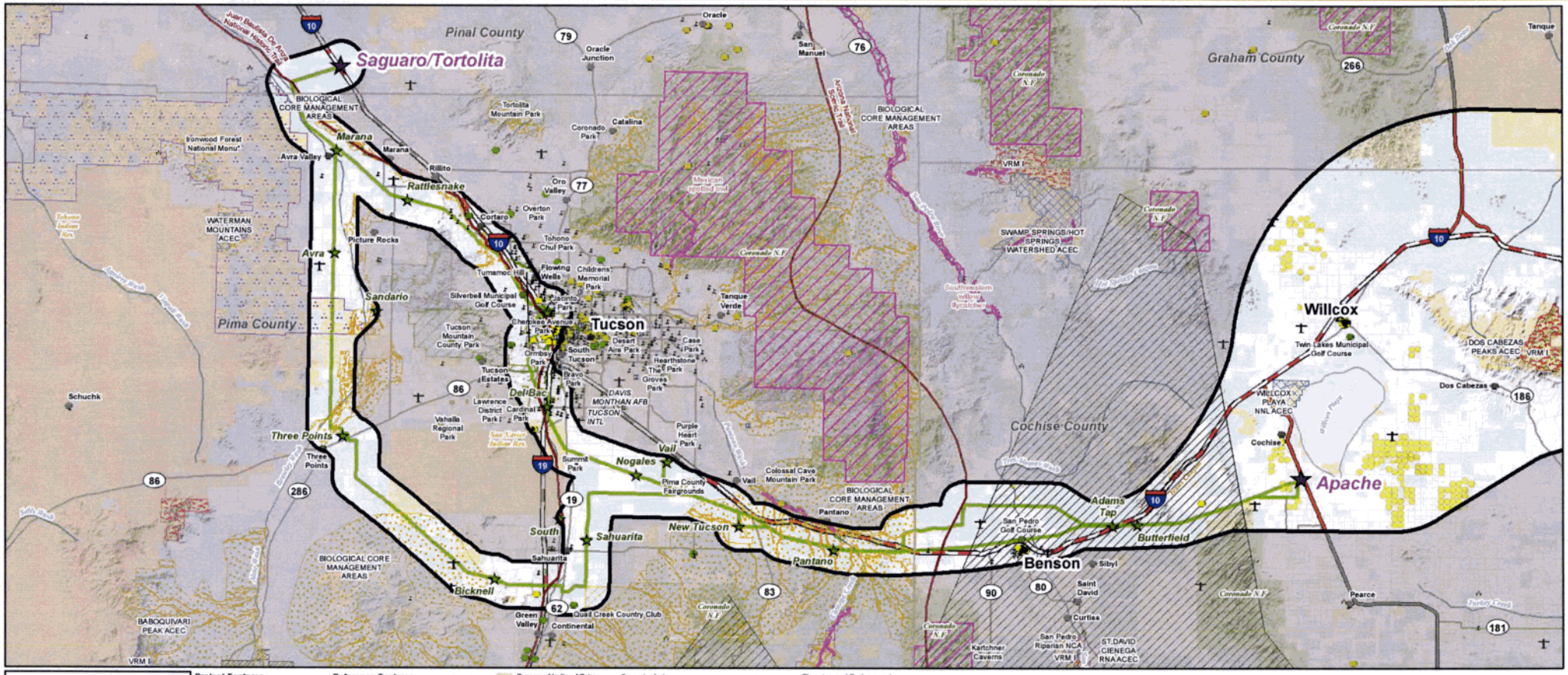
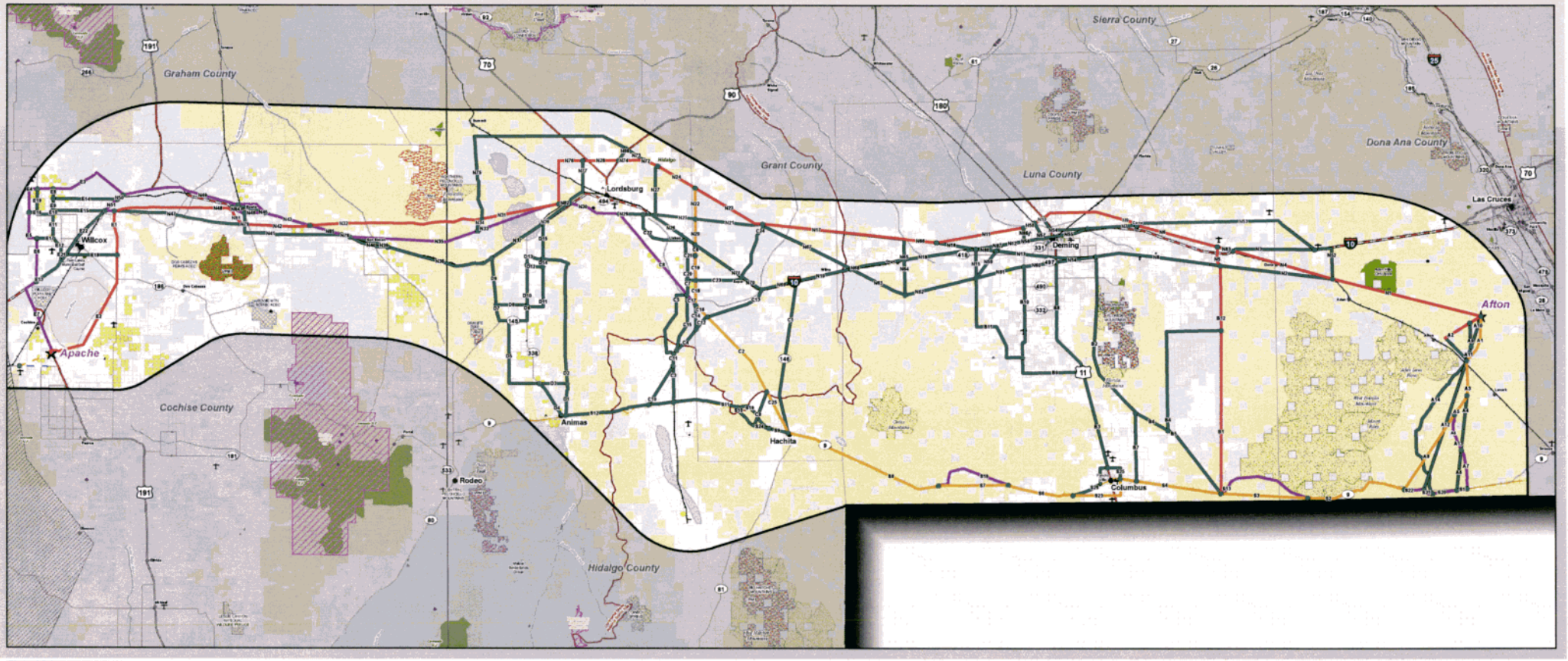


Figure 2-7
Viable Opportunities with Constraints
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT



Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Southwest Transmission Cooperative Line for Potential Improvement
- Western Area Power Administration Line for Potential Improvement
- Proposed Transmission Route
- Transmission Alternative Southern Route
- Transmission Alternative
- Viable Opportunity

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural, or City Street
- Railroad
- Abandoned Railroad
- County Boundary
- River/Stream
- Water Body
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

Constraints
- Airport
- School
- Hospital
- Church
- Cemetery
- National Register of Historic Places
- National Trail/Historic Trail
- Malpai Borderlands Group
- State/Local Recreation Area or Park
- Wilderness Area
- Wilderness Study Area
- National/Local Conservation Area
- National Wildlife Refuge
- Visual Resource Management Class I
- Ft. Huachuca Electronics Testing Area
- Area of Critical Environmental Concern
- State Scientific Area
- Center Pivot Irrigated Farmland
- Threatened and Endangered Species Habitat
- Sonoran Desert Conservation Plan - Biological Core Area

N

0 2.5 5 10
Miles
1:345,000

Figure 2-8
Viable Opportunities by Segment
New Build Section

Source:
POWERmap, www.powermap.platts.com 2011
Platts, A Division of The McGraw-Hill Companies

Additional Sources:
BLM, 2010; ESRI, 2009; National Atlas, 2009; DOE, 2009; FAA 2011; USFWS, 2011; RGIS, 2011; Malpai Borderlands Group, 2011; FEMA, 2010; Bing, 2010; NRCS, 2011; Pima County, 2011

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT

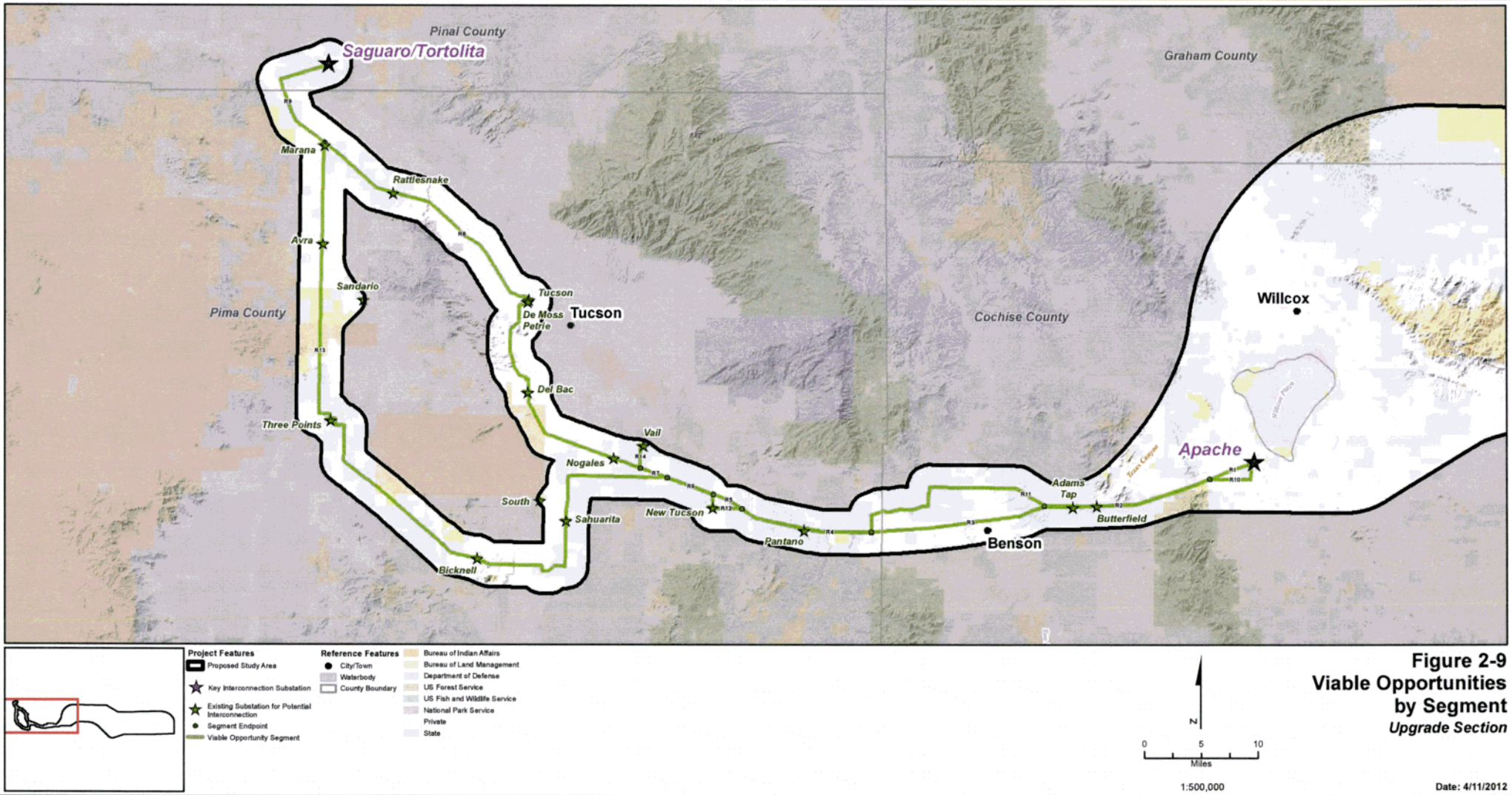
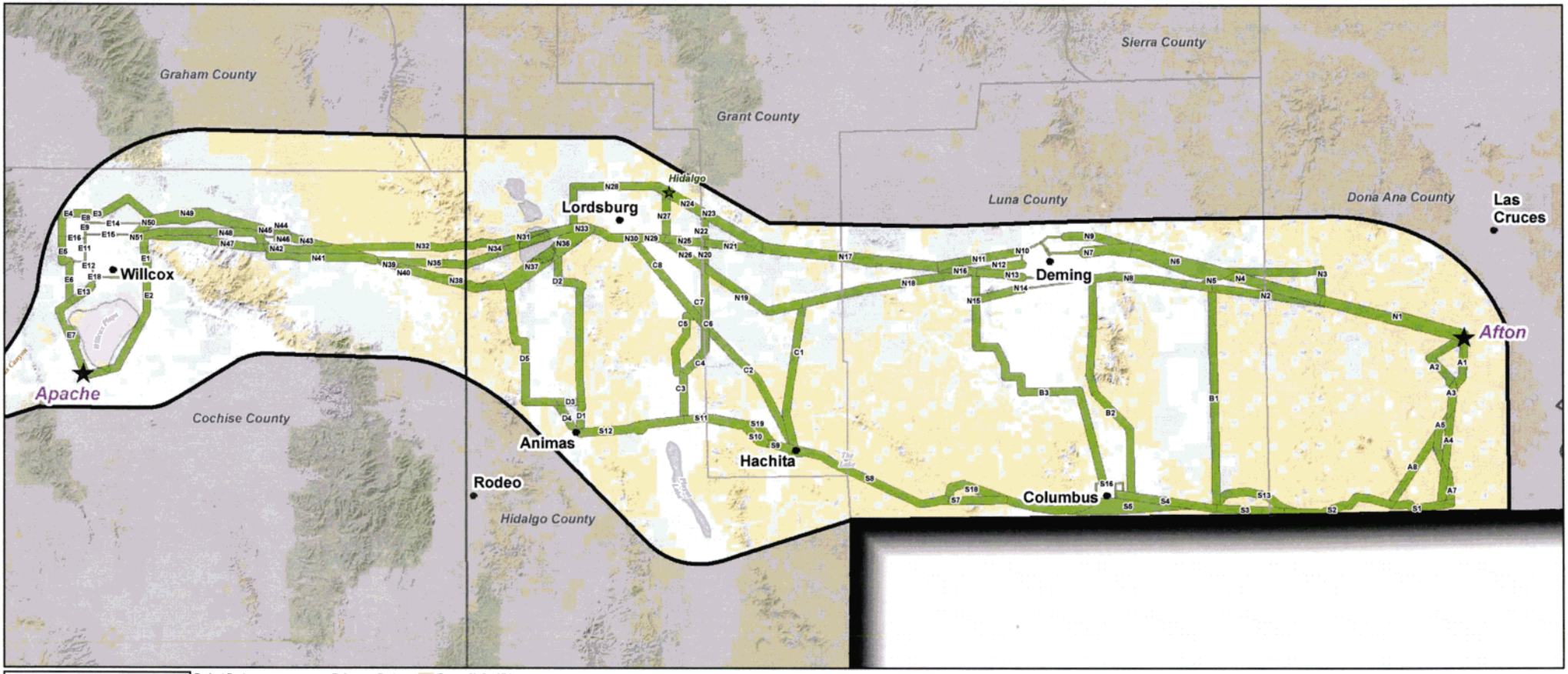
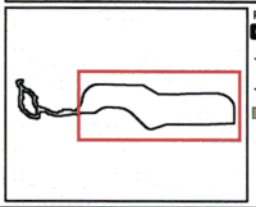


Figure 2-9
Viable Opportunities by Segment
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Corridor Segments

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

N

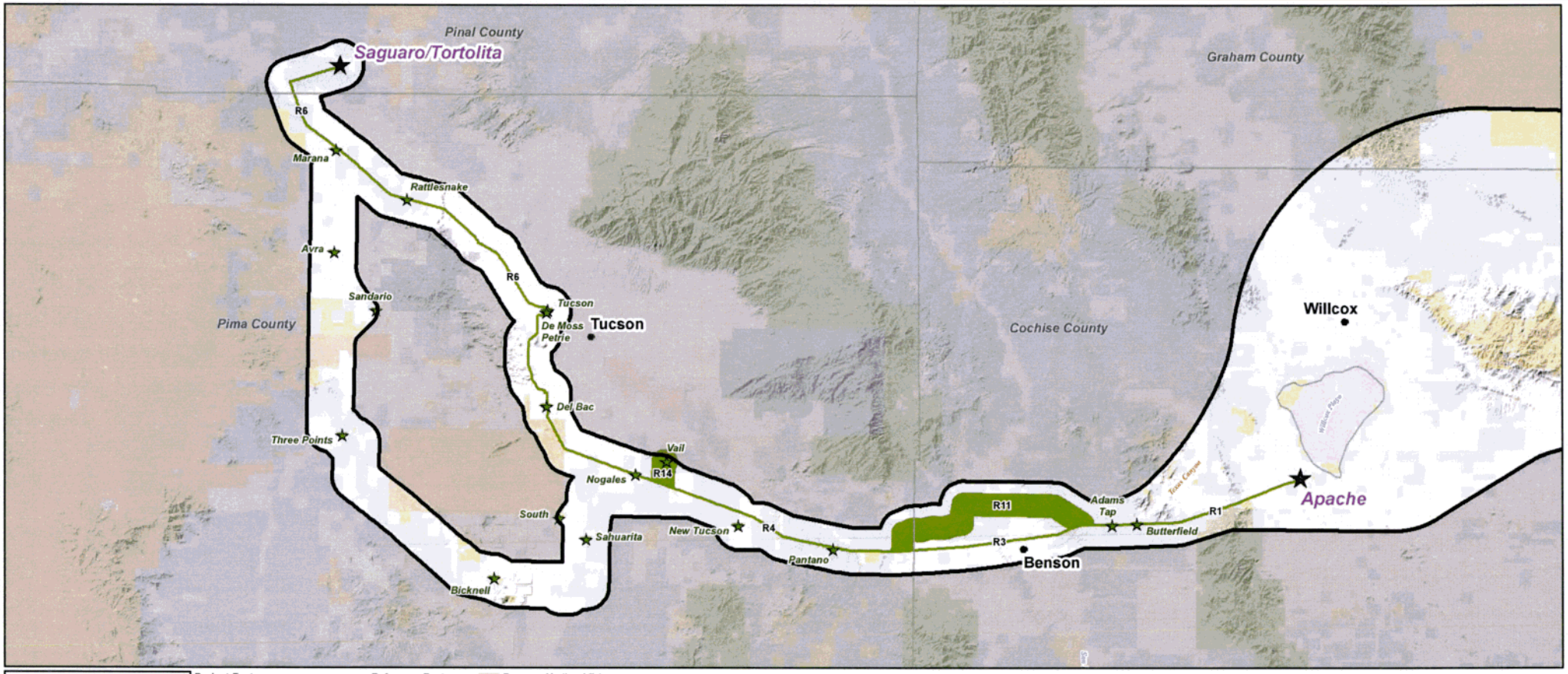
0 5 10
Miles

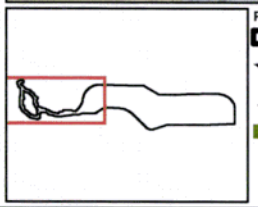
1:760,000

Figure 2-10
Corridors by Segment
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Corridor Segment

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

N

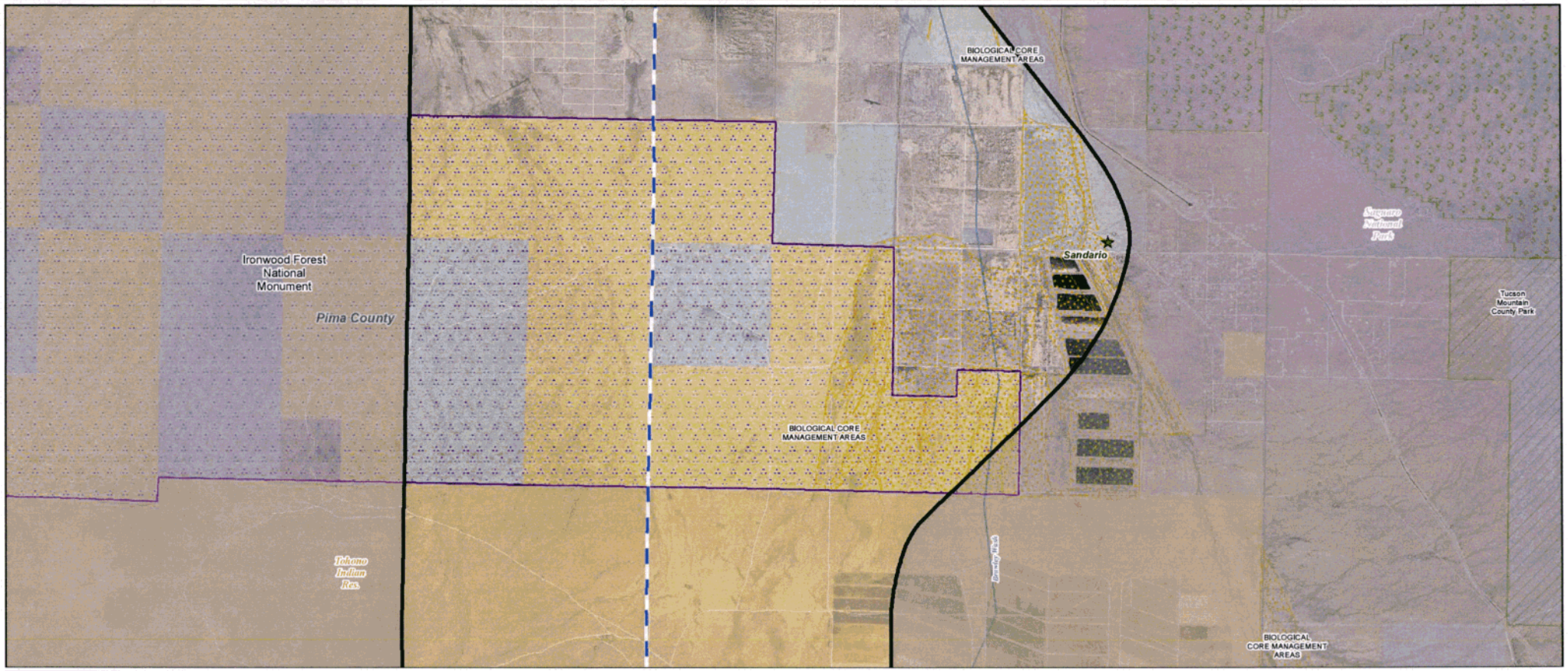
0 5 10
Miles

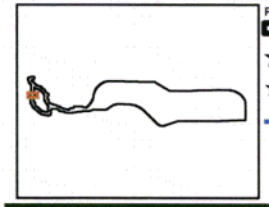
1:500,000

Figure 2-11
Corridors by Segment
Upgrade Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Southwest Transmission Cooperative Line for Potential Improvement

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural or City Street
- River/Stream
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State
- Wilderness Area
- Sonoran Desert Conservation Plan - Biological Core Area
- Ironwood Forest National Monument
- State/Local Recreation Area or Park
- BOR Tucson Mitigation Corridor

N

0 2,000 4,000
Feet

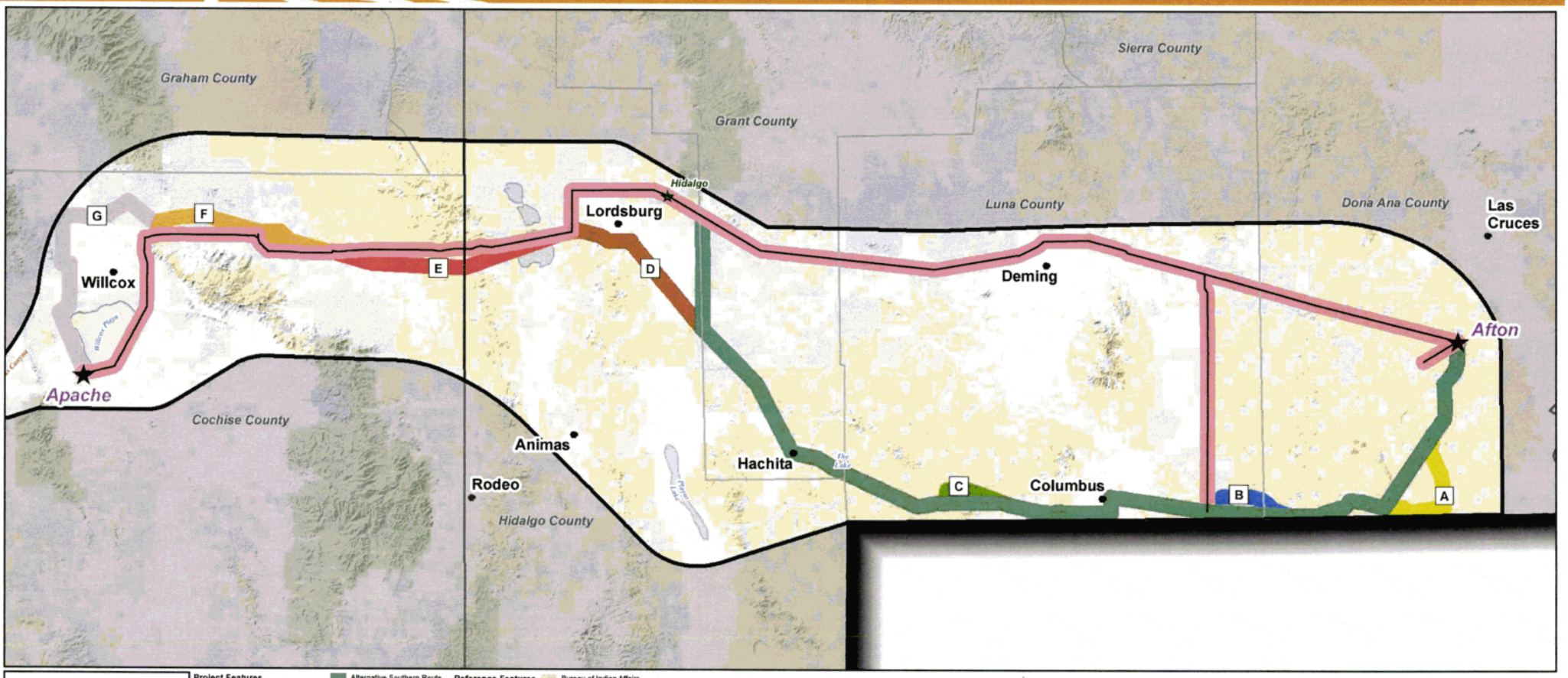
1:48,000

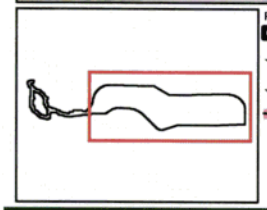
Figure 2-12
SWTC Route within the Ironwood Forest National Monument
Upgrade Section

Date: 4/11/2012

DEN \\COBRA\PROJ\SOUTHLINE_TRANSLINE_421181\GIS\MAPFILES\ROUTING_REPORT\SWTC_ROUTE_IFNM.MXD JQUAN 4/11/2012 3:15:02 PM

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Proposed Route
- Alternative Southern Route
- Alternative Route Segment A
- Alternative Route Segment B
- Alternative Route Segment C
- Alternative Route Segment D
- Alternative Route Segment E
- Alternative Route Segment F
- Alternative Route Segment G

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

N

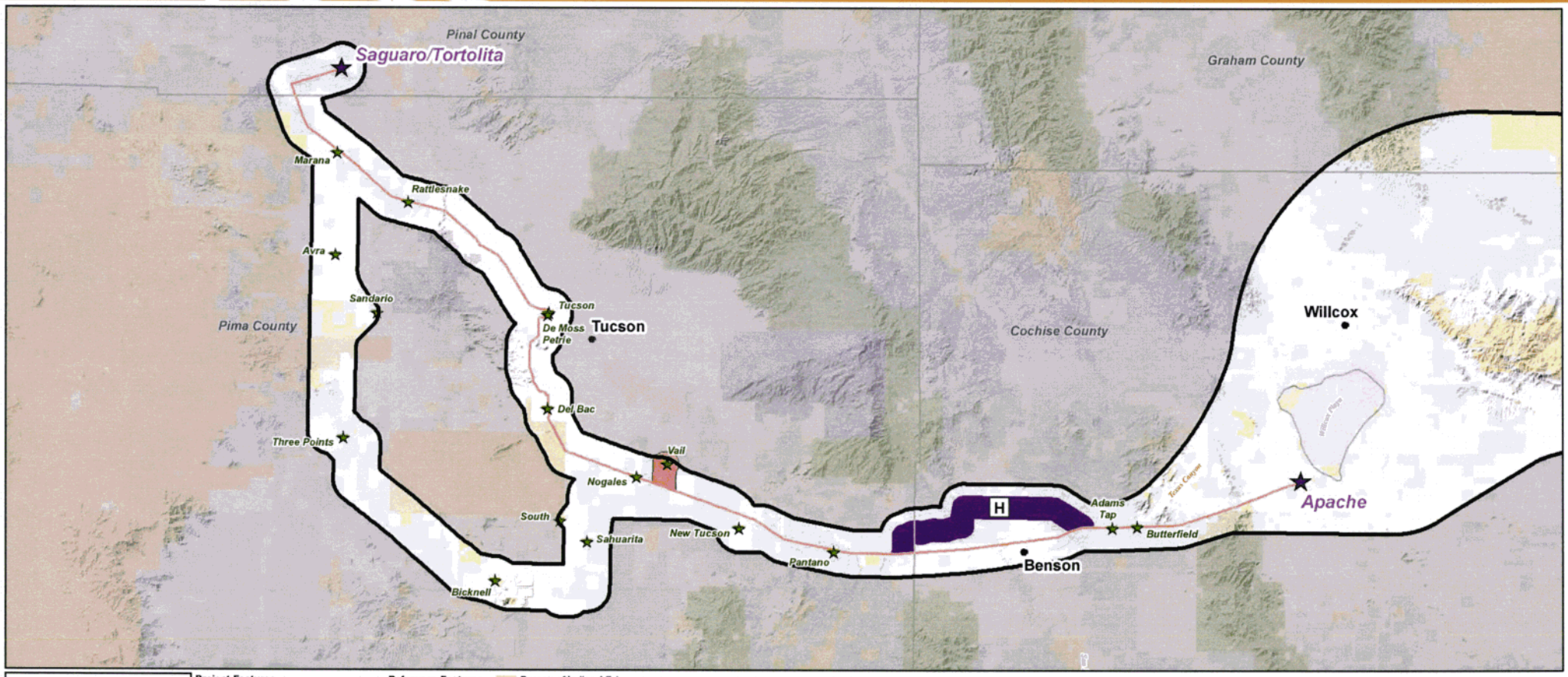
0 5 10
Miles

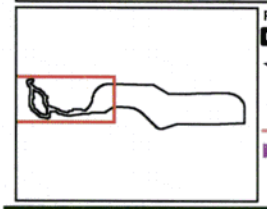
1:760,000

Figure 2-13
Proposed and Alternative Routes
New Build Section

Date: 4/11/2012

SOUTHLINE TRANSMISSION PROJECT





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Proposed Upgrade Route (Western)
- Alternative Route Segment H

Reference Features
- City/Town
- Waterbody
- County Boundary
- Bureau of Indian Affairs
- Bureau of Land Management
- Department of Defense
- US Forest Service
- US Fish and Wildlife Service
- National Park Service
- Private
- State

Upgrade Study Corridor: 500 feet
New Build Study Corridor: 2 miles

N

0 5 10
Miles

1:500,000

Figure 2-14
Proposed and Alternative Routes
Upgrade Section

Date: 4/11/2012

APPENDIX A

Stakeholder Interviews, Stakeholder Outreach Meetings, Public Information Meetings, Routing Workshops, and Agency Webinars

Appendix A: Stakeholder Interviews, Stakeholder Outreach Meetings, Public Information Meetings, Routing Workshops, and Agency Webinars

Stakeholder Interviews: June – August 2011

An independent third party, Kearns & West, conducted phone interviews with stakeholders identified by the project team and referred to the team by other stakeholders. Interviews were conducted from June 28 to August 19, 2011.

Approximately 100 stakeholders were contacted, 45 of which were interviewed. Members of the project team also met with more than 25 additional stakeholders, for a total of approximately 70 stakeholder interviews. These stakeholders represented the following interests:

- Chambers of Commerce
- City and County Government
- Energy Interests
- Farm/Ranch Interests
- Federal Agencies
- Interested Citizens/Residents
- Military
- NGOs
- State Agencies
- Tribes

The findings from these interviews were summarized in a stakeholder assessment report. Key findings included stakeholders' current awareness of the project, interests and concerns, lessons learned from other transmission projects, feedback on Hunt Consolidated and Black Forest Partners, and feedback on the proposed public engagement process and additional recommended stakeholders. The findings informed how the project team would engage stakeholders and the public most effectively.

Stakeholder Outreach Meetings: July – August 2011

The following outreach meetings were conducted prior to the public meetings and workshops. These outreach meetings were conducted to inform key stakeholders about the project early in the route study and selection process. Input from these meetings was used to refine potential route options, which were later shared at the public informational meetings, prior to the formal scoping process.

- City of Deming, NM, July 6, 2011;
- Luna County, NM, July 6, 2011;
- Las Cruces, NM, Chamber of Commerce, July 11, 2011;
- Southwest Transmission Cooperative, July 18, 2011;
- Fort Huachuca, AZ, July 18, 2011;

- Cascabel Working Group, Tucson Audubon, Community Watershed Alliance, Empire-Fagan Organization, July 19, 2011;
- City of Wilcox, AZ, July 20, 2011;
- New Mexico NGOs, July 26, 2011;
- New Mexico Public Regulation Commission, July 27, 2011;
- Arizona State Lands Department, August 2, 2011;
- Tucson Metropolitan Chamber of Commerce, August 2, 2011;
- Cochise County, AZ, August 3, 2011;
- Arizona NGOs, August 4, 2011;
- Arizona Department of Environmental Quality (ADEQ), August 5, 2011;
- City of Columbus, NM, August 17, 2011;
- Columbus, NM, City Council, August 17, 2011;
- Natural Resource Defense Council (NRDC), San Francisco, August 22, 2011;
- Pima County, AZ, September 12, 2011;
- Hidalgo County, NM, September 13, 2011; and
- Tucson City Council, Ward One, September 28, 2011

Public Informational Meetings: September 2011

The project team hosted five public informational meetings across the project study area in September 2011. These meetings were designed to share information about the project with potentially affected communities and gather public input early in the route study and selection process, prior to the formal Federal environmental review process. More than 125 attendees participated at the following locations:

Date & Time	Sept. 21, 2011 *5:00 PM – 8:00 PM*	Sept. 22, 2011 *5:00 PM – 8:00 PM*	Sept. 27, 2011 *5:00 PM – 8:00 PM*	Sept. 28, 2011 *5:00 PM – 8:00 PM*	Sept. 29, 2011 *5:00 PM – 8:00 PM*
Location	Lordsburg High School Cafeteria 501 West 4th St Lordsburg, NM	Mimbres Valley Special Events Center 2300 E. Pine St Deming, NM	Willcox Community Center 312 W. Stewart St Willcox, AZ	Four Points by Sheraton, University Plaza Ballroom 1900 E. Speedway Blvd. Tucson, AZ	Marana Health Center 13395 N. Marana Main St Marana, AZ

The project team used a wide variety of notification methods for these meetings including:

1. An email to all stakeholders on the project information list,
2. Direct calls and emails to more than 50 stakeholders,

3. Newspaper ads placed in 15 different publications,
4. Calls to cities and counties to encourage information-sharing on city/county websites,
5. Direct mailings to tribal leaders potentially affected by the project, and
6. Posting information on the project website

At the meetings, the project team provided an array of informational materials, including:

1. Project fact sheet,
2. Informational project posters,
3. Frequently asked questions,
4. Comment forms,
5. Large-scale hardcopy maps, and
6. An interactive GIS mapping database

All materials were made available in both English and Spanish to enable more inclusive public participation.

The comments received at these meetings were compiled by the project team and were used to refine the potential and alternative project route options.

Public Routing Workshops: September 2011

Two public routing workshops were held approximately the same time as the pre-NEPA public informational meetings, consisting of one each in Arizona (Tucson) and New Mexico (Deming). These workshops were intended to provide an opportunity for a variety of stakeholders representing agencies and broader constituencies to jointly conduct a detailed GIS map-based review of the potential route alternatives and provide feedback on the potential route alternatives and potential land and resource issues. Attendees at these workshops included local governments, tribes, non-profit organizations, Federal and State agencies, and other interested organizations.

Date & Time	September 28, 2011 *9:00 AM – 1:00 PM*	September 22, 2011 *9:00 AM – 1:00 PM*
Location	Four Points by Sheraton, University Plaza Ballroom 1900 East Speedway Blvd. Tucson, AZ	Mimbres Valley Special Events Center 2300 E. Pine St Deming, NM
Invitees	• Ak-Chin Indian Community • Arizona Corporation Commission • Arizona Department of Transportation • Arizona Game and Fish Department • Arizona Natural Resource Conservation Districts • Arizona Public Service • Arizona State Land Department • Arizona Wilderness Coalition • Bureau of Land Management • Cascabel Working Group	• Audubon New Mexico • Bureau of Land Management • City of Lordsburg • City of Deming • City of Las Cruces • Columbus Electric Cooperative • Comanche Nation • Defenders of Wildlife • Doña Ana County • Doña Ana County Farm Bureau • El Paso Electric

- City of Benson
- City of South Tucson
- City of Tucson
- Coalition for Sonoran Desert Protection
- Cochise County
- Cochise County Farm Bureau
- Davis Monthan Air Force Base
- Gila River Indian Community
- Graham County
- Greenlee County
- Navajo Nation
- Pascua Yaqui Tribe
- Pima County
- Pima County Farm Bureau
- Pinal County
- Salt River Pima-Maricopa Indian Community
- Salt River Project
- San Carlos Apache Tribe
- Sierra Club
- Sky Island Alliance
- Sonoran Institute
- Southern Arizona Buffelgrass Coordination Center
- Southwest Transmission Cooperative
- Sulphur Springs Valley Electric Cooperative
- The Hopi Tribe
- The Nature Conservancy
- The Wilderness Society
- Tohono O'odham Nation
- Tonto Apache
- Town of Marana
- Town of Willcox
- Trico Electric Coop
- Tucson Audubon
- Tucson Electric Power
- U.S. Army Fort Huachuca
- U.S. Fish and Wildlife Service
- Western Area Power Administration
- White Mountain Apache Tribe
- Yavapai-Apache Nation
- Fort Bliss
- Fort Sill Apache Tribe of Oklahoma
- Grant County
- Grant County Farm Bureau
- Hidalgo County
- Hidalgo County Farm Bureau
- Holloman Air Force Base
- International Boundary and Water Commission
- Luna County
- Luna County Farm Bureau
- Mescalero Apache Tribe
- Natural Resources Defense Council
- New Mexico Department of Transportation
- New Mexico Game and Fish Department
- New Mexico Public Regulation Commission
- New Mexico State Land Office
- New Mexico Wilderness Alliance
- PNM
- Pueblo of Acoma
- Pueblo of Isleta
- Pueblo of Laguna
- Pueblo of Zuni
- Sierra Club
- The Southwest Environmental Center
- The Wilderness Society
- Tri-State
- U.S. Army Corps of Engineers
- U.S. Border Patrol
- U.S. Fish and Wildlife Service
- Village of Columbus
- Western Area Power Administration
- White Sands Missile Range
- Ysleta del Sur Pueblo

Benson Community Meeting: November 2011

The project team held an additional community information meeting in Benson, Arizona, as requested by the Benson community. This meeting provided an additional opportunity for community members to learn about the project and weigh in on potential project route corridors. All the materials from the September public informational meetings were provided to the community members in Benson.

Date & Time	November 10, 2011 *6:30 PM – 8:30 PM*
Location	J6 Community Bible Church Community Room 714 South J Six Ranch Rd Benson, AZ

Agency Routing Webinars: November 2011

The project team held two routing webinars with BLM and Western field staff and supervisors in November 2011 to gather their local knowledge about potential resource issues in the project area. The feedback received from these two webinars contributed to the refinement of potential and alternative project route options.

Individual Stakeholder Contacts: 2011 and 2012

Beginning in spring 2011, members of the project team contacted and met with Federal, State, county, and local officials and relevant agency members to provide information about the project, answer questions, and understand preliminary interests and potential concerns.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
452	72	72.5	Mountain View Ranch		19-VIS	In connection with the foregoing, the California Public Utilities Commission ("CPUC") recently applied the concept of "overburdening" in a proceeding involving Southern California Edison Company "SCE"). In its Decision No. 13-07-018, issued July 16, 2013, the CPUC granted the Petition of the City of Chino Hills ("Chino Hills") for Modification of Decision No. 09-12-044. In the earlier decision, the CPUC had authorized SCE to construct a double-circuit 500 kV transmission line on towers 195-198 feet tall in a 150' right-of-way already occupied by SCE electric transmission facilities. In that regard, SCE's existing facilities 1 were to be removed from the aforesaid right-of-way; and, in fact, some of the removal of existing facilities and construction of new facilities had already occurred in the Chino Hills' area as of the time the CPUC reconsidered its earlier decision. On further consideration, the CPUC concurred with Chino Hills' argument that the previously authorized replacement facilities would have a "significant and unavoidable impact" on the residential viewscape in question, and particularly those who lived along the right-of-way. In addition, the CPUC proved to be sympathetic to Chino Hills' argument that the visual impact in question would unfairly impose on the affected residents of Chino Hills "too large a burden for the new transmission infrastructure that is being installed to benefit all Californians." Further, the CPUC concluded that the transmission supporting structure, which would "dwarf ' adjacent homes did not comport with the community values of Chino Hills and affected residents. Moreover, the CPUC recognized that the previously approved facilities could result in a diminution in property values and a reduction in local tax revenues to the detriment of affected residents and Chino Hills itself. footnote#1: The existing facilities were a 220 kV line, which had been erected in the 1940s on 75' lattice towers.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western would acquire additional land rights in accordance with Federal law for those easements determined to be insufficient. The potential visual impacts of the Upgrade Section of the proposed Project are analyzed in sections 3.10 and 4.10 of the Draft EIS.
456	72	72.8	Mountain View Ranch		19-VIS	As Currently Proposed, the "Upgrade" Portion of The Project Would Have a Substantial Adverse Impacts on Mountain View and Other Nearby Residential Subdivisions. I . Visual Impact. At page 890, lines I 3-14, the DEIS states as follows: "Visual contrast in the Upgrade Section would result from the introduction of taller transmission structures. Visual contrast to the Upgrade Section was determined to be low to moderate" [emphasis added]	The comment accurately reflects the analysis provided in sections 3.10 and 4.10 and appendix K of the Draft EIS. Section 4.10 of the Final EIS has been revised to acknowledge that while impacts are anticipated to be low to moderate and not significant at a landscape level, individual perspectives on the visual impact of the proposed Project may be different.
457	72	72.9	Mountain View Ranch		19-VIS	Further, at page 1096, lines 24-29, the DEIS states that "Other past and present actions in the CEAA have converted larger portions of the Upgrade Section analysis area to residential, commercial, and industrial development associated largely with the city of Tucson and surrounding lands. Because the proposed Upgrade Section would be located along existing transmission corridors, visual effects are likely to blend in with existing development and associated visual impacts and not substantially contribute to cumulative effects in concert with these other developments." [emphasis added] However, (i) the "comparison of typical existing and proposed structure types" depicted in Figure 2-12 to the DEIS indicates that the physical contrast between the existing 115 kV single circuit "H" frame structure and the proposed 230 kV double-circuit monopole structure is quite dramatic, with the latter physically and visually overwhelming or "dwarfing" the former.4 Further, the photographs set forth at Figure B-59 (KOP 43-04) of the DEIS effectively refute the above-quoted suggestions that (i) "visual effects are likely to blend in with existing development and associated visual impacts," and (ii) the visual contrast with existing residential development will be "low to moderate."5 With all due respect to the preparers of the DEIS, these observations and conclusions are simply incorrect with respect to that portion of Mountain View located south of Interstate 10 and the residential subdivisions located immediately to its west and south of Interstate 10. Physical Impact. In the Executive Summary portion of the DEIS, the following statements appear m connection with a discussion of the Project's right-of-way requirements: "The anticipated ROW width for the Upgrade Section 230-kV transmission line is 150 feet. . . In certain areas of the Upgrade Section, development and constraints may not allow for the expansion of the existing 100-foot ROW." [DEIS Executive Summary, page xvii, lines 5-1O] footnotes: 4 A copy of Figure 2-12 is attached hereto as Appendix "E." 5 A copy of Figure B-59 (KOP U3-04) is attached herto as Appendix "F." In that regard, the Sonoita Ranch housing development depicted in those photographs, is sim ilar to and near Mountain View.	The comment accurately reflects the analysis provided in sections 3.10 and 4.10 and appendix K of the Draft EIS. Section 4.10 of the Final EIS has been revised to acknowledge that while impacts are anticipated to be low to moderate and not significant at a landscape level, individual perspectives on the visual impact of the proposed Project may be different.
474	74	74.4	U.S. Forest Service	White	19-VIS	I will reiterate what I submitted earlier here, and some may benefit national historic trails as well as the Continental Divide Trail: Although the transmission line will cross the trail on existing utility corridors (under the preferred alternative), the difference in scale of the structures will be noticeable, and the length of time trail users are under transmission lines and exposed to the noise and foreground visual impacts will be longer. Therefore all possible mitigation measures should be implemented to minimize experiential and visual impacts, such as installing towers that oxidize to a natural patina, and spacing towers for maximum possible distance from the trail and/ or matching structure spans.	These are Project design features considered in table 2-7 in the Draft EIS (now table 2-8 in the Final EIS), and accurately reflect the analysis provided in section 4.10 of the Draft EIS.

EXHIBIT
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ADMITTED

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
346	68	68.23	Pima County	Bernal/Connolly	7-LAND	This route has 13 segments, U3b through U4, that stretch roughly 48.4 miles of which, 29.8 miles are on private land, 17.9 miles on State-owned land, and the remainder on County and Bureau of Reclamation lands (Draft EIS, Volume 2, Table 4.11-7, Page 919). Along the stretch of these segments, five "land types" have been identified (Draft EIS, Volume 2, Table 4.11-14, Page 933): (1) Total Representative ROW Acreage; (2) Farmland of Statewide Importance (FSI); (3) Farmland of Unique Importance (FUI); (4) Prime Farmland if Irrigated (PFI); and (5) Prime Farmland if Meeting Other Conditions (PFOC). It is not clear as to how these "land types" have attained their categorization, as a glossary of terms to define them does not exist as part of the draft EIS. The draft EIS determines 874.9 acres of land within "Total Representative ROW Acreage" (Draft EIS, Volume 2, Table 4.11-14, Page 933) with 25.1 acres of FUI, the latter amounting to approximately three percent of the former. It is not empirically conclusive that lands categorized under FSI, FUI, PFI, and PFOC are subsets of TRRA, as PFOC lands in Segment U3h, exceed TRRA lands by over 100 acres.	Sections 3.11.2 and 4.11.2 in the EIS have been revised based on this comment.
347	68	68.24	Pima County	Bernal/Connolly	7-LAND	The Draft EIS states that "[T]he construction of the transmission line would result in a minor direct effect by eliminating farmland from production, if it cannot be avoided" (Draft EIS, Volume 2, Page 932). An empirical explanation of this conclusion from BLM and other project proponents is essential for the County to review and either agree or disagree. Also, while it is good to know that "[A]dditional efforts to avoid farmlands would be available during completion of the final design," some mention of these stated efforts, earlier than the 'final design' stage is greatly desired in order for Pima County to assess their potential validity and effectiveness. Also, while stating that "[N]o direct or indirect effects of rangelands are expected to occur during the Project operation," such can be reassuring only with the provision of verifiable data.	Sections 3.11.2 and 4.11.2 in the EIS have been revised to clarify potential impacts to farmlands and range lands and the basis for the potential impacts.
348	68	68.25	Pima County	Bernal/Connolly	7-LAND	This route has 10 segments, MA1 through TH3b (Draft EIS, Volume 2, Table 4.11-7, Page 920), and raises very similar issues and concerns as those mentioned in "Proponent Preferred Route (Subroute 4.1)" above. Such as, the absence of empirical data when stating that "[O]nly three of the local alternatives – TH3a, TH3b, and TH3-Option C – would result in minor direct effects to Farmlands of Unique Importance." Also, inadequate explanation when stating that "[M]inimal acres of rangeland in the ROW would be directly affected by the construction of the transmission line under any of these local alternatives" is not convincing, especially, without a 'glossary of terms' to define 'minimal' or 'minor direct effects', among other terms.	Sections 3.11.2 and 4.11.2 in the EIS have been revised based on this comment.
376	68	68.53	Pima County	Bernal/Connolly	7-LAND	p. 441, Chapter 3, lines 8-22: a brief discussion of the Pima County Comprehensive Plan refers to a "supplement" regarding environmental planning, calling it the "2012 SDCP." The document is not further named, and only briefly described in terms of environmental planning. This refers to the 2012 issuance of the Multi-species Conservation Plan, an integral part of the Sonoran Desert Conservation Plan. The discussion should correctly recognize the documents it cites in the DEIS and correctly place the MSCP in the appropriate context of the SDCP.With reference to other local planning documents discussed in the DEIS, it is worth noting that both the City of Tucson and Pima County are developing new comprehensive plans that will be in effect most likely before the proposed Southline project goes to construction, if it is approved. The discussion should refer to the up-to-date planning documents and Southline should be certain that the transmission line plans meet the requirements and the intent of these new planning documents.	Sections 3.11.2 and 4.11.2 in the EIS have been revised based on this comment.
377	68	68.54	Pima County	Bernal/Connolly	7-LAND	p. 451, Chapter 3, Land Ownership, lines 4-20. This discussion incorrectly identifies the acreage in Pima County ownership that is intersected by Southline Transmission Line. The DEIS lists only the Cienega Creek Natural Preserve; does not list Empirita Ranch, Valencia Site, or Tumamoc Hill. Table 3.11-6 incorrectly reports the acreage. The discussion and table should be corrected.	Section 3.11.1 and table 3.11-6, as well as section 4.11.1, in the EIS have been revised based on this comment.
378	68	68.55	Pima County	Bernal/Connolly	7-LAND	p. 487, Chapter 3, lines 30-33 incorrectly list land management at Tumamoc Hill as, "Pima County and Arizona College of Science". The management listing needs to be corrected.	Section 3.12 in the EIS has been revised based on this comment.
449	72	72.1	Mountain View Ranch		7-LAND	The Plat for development of Mountain View was approved by the Board of Supervisors of Pima County, Arizona, on October 17, 2000; and, marketing and development of Mountain View has since been in progress. In that regard, Lots 1-132 of Mountain View are located directly adjacent to the south side of Interstate 10 and just east of State Highway 83; and, Lots 133-362 are located on the north side of Interstate 10. Mountain View is located in picturesque rolling Arizona-Sonora Desert terrain, with spectacular views of surrounding mountain ranges; as the name of the subdivision correctly suggests. In that regard, attached as Appendix "A" are copies of photographs taken by one of the principals of Developer/Investor on or about July 3, 2014 which illustrate (i) the view shed from various lots in Mountain View, and (ii) the viewshed from Sonoita Ranch, a single-family residential community immediately to the west of State Highway 83. Attached as Appendix "B" is a copy of the approved Plat map for Mountain View, which identifies the location of Lots 1- 132 in relation to Interstate 10 and State Highway 83.	As discussed in section 1.1 of the Draft EIS, the existing Western line was constructed in 1951; thus, the line and ROW predate the Mountain View Ranch Subdivision by more than 50 years. Planned residential development projects, such as the Mountain View Residential Development, are considered in section 4.21 in terms of the cumulative effects of the proposed Project.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
450	72	72.2	Mountain View Ranch		7-LAND	Based upon Developer/Investor's review of the March 2014 Draft Environmental Impact Statement/Draft Resource Management Plan Amendment (collectively "DEIS") for the Southline Transmission Line Project ("Project"), it appears that both the Project Proponents' Preferred Route and the Agency's Preferred Alternative Route contemplate use of the Western Area Power Administration's ("WAPA") existing transmission system easement which transects that portion of Mountain View located south of Interstate 10, a few miles west of the Pantano Substation. The easement in question is 100' feet width, and it transects portions of Lots 8, 9, 10, 11, 12, 27,28, 30, 33, 36, 39, 40, 41, 42, 43, 92, 95, 96, 104, 105, 106, 107 and 113 in the part of Mountain View located south of Interstate 10. Thus, and as discussed in Section II below, the Project would have direct and substantial adverse impacts upon current and future residents of Mountain View, prospective purchasers of homes in Mountain View and Developer/Investor.	The proposed Project and alternatives were described in chapter 2 of the Draft EIS. As described in chapter 2 of the Draft EIS, the proposed Project (Proponent Preferred, and Agency Preferred Alternative) includes use of Western's existing ROW. As discussed in section 1.1 of the Draft EIS, the existing Western line was constructed in 1951; thus, the line and ROW predate the Mountain View Ranch Subdivision by more than 50 years. Planned residential development projects, such as the Mountain View Residential Development, are considered in section 4.21 in the Draft EIS in terms of the cumulative effects of the proposed Project.
485	76	76.5	Arizona State Land Department	Ojeda	7-LAND	Generally speaking, it appears that the DEIS does not discuss remnant parcels as an issue of concern.	Sections 3.11.1 and 4.11.1 in the EIS have been revised to include information regarding remnant parcels
492	76	76.12	Arizona State Land Department	Ojeda	7-LAND	Generally speaking the construction/upgrade of new access roads may create opportunities for unauthorized OHV use, which could adversely affect State Trust Land. This indirect and cumulative effect should be addressed in detail.	Sections 3.11.1 and 4.11.1 in the EIS have been revised based on this comment.
493	76	76.13	Arizona State Land Department	Ojeda	7-LAND	Generally speaking it is unclear if the proposed alignment and ultimate location of associated roads, substations, and pole locations... take into consideration the creation of remnant parcels (location, size, shape or other characteristics of a parcel relative to its future economic value.	Sections 3.11.1 and 4.11.1 in the EIS have been revised to include information regarding remnant parcels
508	76	76.28	Arizona State Land Department	Ojeda	7-LAND	Please update this section to include impacts to (acreage) ASLD Agricultural and Range land uses.	Sections 3.11.1 and 4.11.1 in the EIS have been revised based on this comment.
510	76	76.30	Arizona State Land Department	Ojeda	7-LAND	Please provide information regarding ASLD's Marana, Rincon Posta Que Mada, Marana and Houghton Road Corridor Conceptual Plans (background to be emailed seperately) and reference ARS 37-331.03 (conceptual planning). Please contact Tim Bolton, in the Southern Arizona Office for further information.	Sections 3.11.1 and 4.11.1 in the EIS have been revised based on this comment
610	82	82.29	SunZia	Wray	7-LAND	Also, existing substations would be expanded along the path of the Upgrade Section and within the Tucson metropolitan area, apparently requiring significant, although undisclosed levels of impact to surrounding land uses. The Southline Draft EIS is not complete until these impacts are fully analyzed and fully disclosed to the public.	Sections 3.11.1 and 4.11.1 in the EIS have been revised to clarify how potential impacts to surrounding land uses have been considered, including the proposed expansion of existing substations. Additional detail on the location and type of expansions at the existing substations has been included in section 2.4.2 of the EIS. As discussed in the Draft EIS, impacts to land use are not considered significant.
611	82	82.30	SunZia	Wray	7-LAND	This is especially critical for the 30 single-family residences in the Drexel subdivision that are likely to be impacted by Southline's ROW requirements. We request the Draft EIS be supplemented to correct this deficiency by significantly expanding the disclosure of likely effects from these expansions.	Sections 3.11.1 and 4.11.1 in the EIS have been revised to clarify how potential impacts to surrounding land uses have been considered, including residential development along Western's existing ROW. Though portions of the EIS have been revised in response to public and agency comments on the Draft EIS, none of these revisions describe significant new circumstances or significant new information relevant to environmental concerns; therefore, no supplemental EIS has been prepared. Comments on the Draft EIS have been addressed in the EIS.
634	82	82.53	SunZia	Wray	7-LAND	Section 3.11 Land Use (Affected Environment) oversimplifies existing land uses by grouping development categories (e.g., Developed, low-intensity; Developed, medium- intensity; Developed, high-intensity) in terms of gross acreages for the New Build Section and the Upgrade Section without any further detailed descriptions.	Section 3.11.1 of the EIS has been revised to clarify how development categories were derived.
635	82	82.54	SunZia	Wray	7-LAND	This oversimplification is carried forward in Section 4.11 Land Use (Environmental Consequences) – Impacts Common to All Alternatives, which describes potential impacts to all development categories as being minor and temporary. The assignment of minor impacts does not appear substantiated, given that the Upgrade Section requires a new 150-foot wide ROW overlapping a distance of 25 feet of the existing ROW, and is routed through the historic Tumamoc Hill area, Tohono O'odham tribal lands, Tucson Mountain Park, and residential areas in Tucson where condemnation of multiple residential properties would be necessary, albeit such impacts are not disclosed in this Draft EIS.	As described in section 2.4.3 in the Draft EIS, only an additional 50 feet of ROW would be required, not an additional 150 feet. This section of the EIS has been revised for added clarity. As further clarified in chapter 2 of the Final EIS, no new ROW is anticipated between the Del Bac and Rattlesnake substations. Section 4.11.1 of the EIS has been revised to clarify how development categories were derived and how impacts were characterized.
707	82	82.126	SunZia	Wray	7-LAND	Land Use: Section 3.11 Land Use (Affected Environment) oversimplifies existing land uses by grouping development categories (e.g., Developed, low-intensity; Developed, medium-intensity; Developed, high-intensity) in terms of gross acreages for the New Build Section and the Upgrade	Section 3.11.1 of the EIS has been revised to clarify how development categories were derived.
708	82	82.127	SunZia	Wray	7-LAND	Section without any further detailed descriptions. This oversimplification is carried forward in Section 4.11 Land Use (Environmental Consequences) –Impacts Common to All Alternatives, which describes potential impacts to all development categories as being minor and temporary.	As described in section 2.4.3 in the Draft EIS, only an additional 50 feet of ROW would be required, not an additional 150 feet. This section of the EIS has been revised for added clarity. As further clarified in chapter 2 of the Final EIS, no new ROW is anticipated between the Del Bac and Rattlesnake substations. Section 4.11.1 of the EIS has been revised to clarify how development categories were derived and how impacts were characterized.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
343	68	68.20	Pima County	Bernal/Connolly	13-SOCI	The recognition of this area as an economic lynchpin was initiated with Pima County's investment of $6 million to purchase the undeveloped areas of Section 31 in order to protect Raytheon Plant operations from encroachment. Subsequently, this area has been targeted for expansion of Aerospace, Defense, and Technology employment and is a critical component for an industrial corridor from Nogales Highway to I-10. Section 31 is also an integral part of those lands south of Tucson International Airport that the Joint Planning Advisory Council which includes the Pima, Maricopa, and Central Arizona Associations of Governments has identified as the ideal location for the Import Distribution Center for the State of Arizona for goods coming into the United States from Mexico and Asia. The Arizona Commerce Authority has referred several potential tenants to the Business Park who would require between 500 to 1,000 acres for their operations. TESLA, one of the pending, potential tenants, is currently examining the feasibility of locating a $5B battery development and manufacturing facility to this site. Development of a significant employment center is an important socioeconomic factor for this region which currently suffers from high unemployment. Investments and partnerships supporting federal needs and interests of the FAA Tucson Airport Authority, US Air Force, National Guard Bureau, and Raytheon have led to the relocation of 4 miles of the Hughes Access Road at a cost approximating $12M, in addition to the development of the Aerospace, Defense, Technology Research and Business Park (see Exhibit B).	Section 4.15 in the EIS has been revised to include additional information on the economic importance of this area.
470	73	73.4	Sonoita Hills Community Association		13-SOCI	As was the situation in the Chino Hills case, the proposed Upgrade Section structures in the Mountain View Ranch Subdivision and surrounding single-family residential community area(s) would be "located right outside the residents' backdoors . . . [and would] transform the open space along the right-of-way to an eye sore." [See Decision No. 13-07-018 at pages 11-12] In addition, we believe that the proposed replacement facilities would destroy the property value of those who reside along the 100' right-of-way herein question.	As discussed in section 1.1 of the Draft EIS, the existing Western line was constructed in 1951; thus, the line and ROW predate the Mountain View Ranch Subdivision by more than 50 years. The potential impact of the proposed transmission line on property in terms of land use is described in section 4.11.1 and in terms of property value in section 4.15 of the Draft EIS.
710	82	82.129	SunZia	Wray	13-SOCI	Environmental Justice The impact analysis for the environmental justice population is deficient in two ways. First, the impact indicator and determination of significant impacts for environmental justice populations do not meet the context and intensity requirements for evaluation in a NEPA document. For example, as stated in the Draft EIS Section 4.15.2, the impact indicator for Environmental Justice Populations is "...anticipated high and disproportionate adverse socioeconomic or environmental effects on environmental justice communities relative to effects across the analysis area as a whole", whereas, the determination of significant impacts are stated in the Draft EIS as "(h)igh and disproportionate adverse effects on environmental justice communities." This does not explain the range or scale of impacts, for environmental justice populations, and therefore no meaningful comparison between alternatives can be made.	Sections 3.15 and 4.15 in the EIS have been revised to clarify indicators and determinations of significance for environmental justice; however, no high or disproportionate impacts to environmental justice communities are anticipated.
711	82	82.130	SunZia	Wray	13-SOCI	Second, the analysis area of environmental justice populations is too narrow in the Upgrade Section. To make a meaningful evaluation of disproportionately affected environmental justice populations, the reference-area comparison should contain a geographic boundary that is indicative of the overall population of the urbanized areas around Tucson. This will more accurately reflect the relative disproportionate effects on environmental justice populations.	The analysis area in the Draft EIS (sections 3.15 and 4.15) was identified based on the area most likely to bear environmental effects. As stated in section 4.15 of the Draft EIS, no high or disproportionate impacts to environmental justice communities are anticipated.
712	82	82.131	SunZia	Wray	13-SOCI	The determination in Section 4.15.2, pages 1020–1021 is that "In the Upgrade Section, 26 of the 38 Census tracts that could be crossed by any of the action alternatives can be defined as potential environmental justice communities..., few, if any, of these adverse effects would be "high" and, given the prevalence of low-income and minority residents throughout the area, disproportionate impacts on these groups are likely inevitable from any feasible transmission line alignment." Given that the majority of census tracts crossed by the Southline Project are defined as environmental justice populations, the land-use impacts that are related to condemnation and recreation that have not been disclosed in the Draft EIS (see Specific Resource Areas of Concern-Land Use, in this comment letter) would likely disproportionately affect environmental justice populations resulting in high impacts. The analysis needs to be corrected in order to fully disclose the level of impact on environmental justice populations. The Draft EIS should be supplemented to address the unclear nature of these impacts by actually disclosing impacts and the rationale for the conclusions. Then, the Draft EIS should be republished and an additional 30-day comment period be provided to allow public review and comment on the same.	Sections 3.11.1 and 4.11.1 (Land Use) and sections 3.15 and 4.15 (Socioeconomics and Environmental Justice) in the EIS have been revised to clarify the relationship between land use and environmental justice communities; however, no high or disproportionate impacts to environmental justice communities are anticipated.
728	82	82.147	SunZia	Wray	13-SOCI	Additionally, the non-disclosure of potentially significant environmental impacts to Land Use and Environmental Justice population through Tucson resulting from the construction and operation of the Upgrade Section should have instigated a search for alternatives that would have less impact on these important environmental resources.	The proposed Project and alternatives were described in chapter 2 of the Draft EIS. As noted in section 2.6 of the Draft EIS, alternatives were developed based on environmental concerns expressed during scoping, including the potential for major environmental impacts; consideration of the BLM and DOE NEPA guidelines, including recommendation to evaluate or dismiss; and review of all route alternatives and rationale by cooperating agencies and the ID team. Section 2.9 of the Draft EIS describes other alternatives that were dismissed from consideration. Further, no other alternatives were identified that would meet the goals of the Project (i.e., interconnections with existing substation) and were otherwise reasonable.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
438	69	69.2	Nature Conservancy	Marshall	9-NEPA	We submitted comments during the scoping phase of this project and appreciate the opportunity to provide brief follow-up comments. Overall, we appreciate the approach taken by BLM to upgrade existing transmission lines where possible, thereby reducing environmental conflicts and minimizing new impacts to areas that currently do not support infrastructure. Our comments are limited to a concern about the preferred alternative identified in Route Group 2 from the Hidalgo Substation to the Apache Substation in southeastern Arizona and on the role of mitigation for offsetting unavoidable and permanent impacts.	Noted.
439	69	69.3	Nature Conservancy	Marshall	9-NEPA	We are concerned about the alternatives that pass along the eastern and southern margins of Willcox Playa. As the DEIS describes, the Playa is a unique feature that maintains seasonal water and supports a large wintering population of Sandhill Cranes, as well as other migratory species dependent on surface water.	Route variations have been included in the EIS (P7a, P7b, P7c, P7d, and U3aPC) in response to public and agency comments and concerns about impacts to Willcox Playa. BLM and Western, in coordination with AGFD, developed mitigation measures to offset impacts to wildlife habitat and management goals and objectives in the Willcox Playa Wildlife Area. AGFD mitigation measures have been incorporated into the EIS as PCEMs in table 2-8.
441	69	69.5	Nature Conservancy	Marshall	9-NEPA	Generally, BLM did a thorough job of assessing impacts in the DEIS due to construction and we commend the identification of Best Management Practices and other measures in the DEIS draft Plan of Development as a means of minimizing impacts. However, no measures were identified to offset unavoidable, permanent habitat losses to wildlife throughout the route but especially in new sections proposed and those related to cumulative impacts. If unavoidable, permanent direct and indirect impacts to habitat and species as well as cumulative impacts are not offset, then it is inescapable that the environmental baseline for the region's natural resources will be adversely affected. A diminished environmental baseline raises the prospect of additional species' listings under the Endangered Species Act and the considerable costs, regulatory burdens, and uncertainty that follow.	Additional mitigation for vegetation and wildlife was provided by the FWS and AGFD and is considered in the EIS. Relevant sections (executive summary, as well as sections 2.4.6, 3.8, and 4.8) of the EIS have been updated to clarify proposed vs. committed mitigation.
442	69	69.6	Nature Conservancy	Marshall	9-NEPA	We believe this is an opportunity to apply regional mitigation strategies as described in Order No. 3330 issued by the Secretary of the Interior in 2013 cited in chapter 2 of the DEIS. While we recognize that this approach is still in development, we believe the Southline project fits the purpose and need under which the secretarial order was issued and note that similar strategies are being developed by BLM and partner agencies for Solar Energy Zones in Arizona	Additional mitigation for vegetation and wildlife was provided by the FWS and AGFD and is considered in the EIS. Relevant sections (executive summary, as well as sections 2.4.6, 3.8, and 4.8) of the EIS have been updated to clarify proposed vs. committed mitigation.
451	72	72.3	Mountain View Ranch		9-NEPA	The Proposed "Upgrade" Would Improperly and Impermissibly "Overburden" the Right-Of-Way Granted In the 100' Easement Used by WAPA. WAPA currently operates and maintains a 115 kV single-circuit system in the 100' easement which transects the south portion of Mountain View, with the electric conductors and insulators affixed to "H" shaped wooden supporting structures that are 75' feet in height. The "Upgrade" portion of the Project proposes to replace these facilities with a double-circuit 230 kV system using steel monopole structures 134' (average) in height. In essence, the Project would more than quadruple the electric transmission capacity within the 100' easement, using supporting structures which are at least 59' or 79% greater in height than the existing facilities. Developer/Investor submits that such proposed usage of the 100' easement here in question far exceeds that usage contemplated at the time the 100' easement was granted. As a consequence, the usage contemplated and proposed by the Project would "overburden" both the easement and real property transected by the easement, as well as property directly adjacent thereto or nearby. Such "overburdening" is particularly inappropriate and impermissible when the real properties in question are both currently being used and planned for single-family residential purposes. In that regard, attached as Appendix "C" are copies of two "Contract and Grant of Easement" documents, which together constitute the 100' electric easement used by WAPA for its existing 115 kV single-circuit system that transects Mountain View south of Interstate 10. In Section 1 of each document, the grant of right-of-way in question is for "an electric transmission line," not lines. This limitation is repeated thereafter in each document by references (i) in Section 1 to "said lin," and (ii) in Sections 2, 3, 4 and 5 to "said transmission line." [emphasis added] Clearly, the use of two (2) or more transmission lines with multiple circuits was not contemplated or intended by the grantors of the easement here in question. Nor, presumably was it contemplated by the grantee (United States Department of Interior, Bureau of Reclamation), a sophisticated power transmitting entity, which prepared the easement documents.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.
452	72	72.4	Mountain View Ranch		9-NEPA	The DEIS appears to give no consideration to the concept of "overburdening," and its application to circumstances such as those that would be presented by the presence of the proposed "Upgrade" facilities across single-family residential subdivisions such as Mountain View Ranch and other subdivisions to the west of Mountain View and south of Interstate 10.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
454	72	72.6	Mountain View Ranch		9-NEPA	Comment 6. Accordingly, against this background, the CPUC concluded that that portion of the new transmission system project there in question should be undergrounded, and the costs of such undergrounding spread among all ratepayers who would benefit from the new transmission facilities when completed.2 Succinctly stated, "Infrastructure necessary to fulfill the state's energy goals should not disproportionately burden one community for the benefit of the larger population. "3 When examined within the context of the concept of "overburdening," the similarities between the Chino Hills fact situation and the impact of the proposed Upgrade Facilities on Mountain View and the single-family residential subdivisions located to its west and south of Interstate 10 are quite striking. For example, the proposed Upgrade facilities are intended to serve an alleged "need" which far transcends the current and future requirements for service of Mountain View and other nearby residential communities. In addition, the proposed Upgrade facilities would more than quadruple the electric transmission capacity of WAPA's existing system, just as SCE's proposed double-circuit 500 kV system would more than quadruple the transmission capacity of its then existing 220 kV system. In this instance, the replacement 134' steel monopole towers would almost double the existing 75' supporting structures. In the SCE situation, the increase in tower height was more than doubled, but the 150' right-of-way there was 50% wider than the 100' right-of-way which transects Mountain View and other adjacent single-family residential communities. Thus, the "overburdening" concept is both applicable and appropriate for application in the present situation. Footnotes: 2 Decision No. 13-07-018 at page 21. SCE has since complied with Decision No. 13-07-018, a copy of which is attached as Appendix D. 3 Supra.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.
455	72	72.7	Mountain View Ranch		9-NEPA	In view of the foregoing, Developer/Investor submits that both the Proponent's Preferred Route and the Agency's Preferred Alternative Route should be realigned so as to pass south of Mountain View and the other single-family residential communities located to the west of Mountain View, south of Interstate 10 and west of State Highway 83. In that regard, it appears that at one point in time the Proponent was considering a "potential routing option" that would have crossed State Highway 83 (from east to west) several miles south of Interstate 10 and Mountain View. [See Figure 2-1b (Figure 2-7 Viable Opportunities with Constraints Upgrade Section), page 36 to DEIS]. That "potential routing option" should be reconsidered and adopted at this time.	This potential routing option was considered by BLM and Western (see discussion of TU1 in section 2.9 in the Draft EIS, Alternatives Considered but Eliminated from Further Analysis). As noted, the presence of existing power lines entering and exiting the substation on this alternative would require additional line crossovers that severely compromise future lines from entering and/or exiting the substation and potential future expansion of facility. Rather than resolve, minimize, or reduce resource conflicts, this route substantially complicates the power system in the area.
458	72	72.10	Mountain View Ranch		9-NEPA	As previously discussed in Sections I and II(A) above, WAPA's existing 115 kV single-circuit system is located in a 100' easement which transects that portion of Mountain View located south of Interstate 10. Thus, because of both existing and planned development, as well as the 100' width limitation in the easement itself, there are both developmental and legal constraints upon use of the easement for purposes of constructing, operating and maintaining the contemplated Upgrade Section facilities in this area.	Western will review all of its land rights before construction of upgrade facilities occurs Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.
459	72	72.11	Mountain View Ranch		9-NEPA	In that regard, the DEIS appears to state that in such circumstances the manner of construction contemplated would be the "tear-down and rebuild-in-place method."6 Assuming solely for discussion purposes that the Project should proceed with the Upgrade Section alignment in this area currently contemplated by both the Project Proponent's Preferred Route and the Agency's Preferred Alternative Route, use of this construction method would clearly have a physical impact on residents of Mountain View and the residential subdivisions to the west of it, in terms of dust, noise, increased transportation and unsightly visual impacts, to name a few. Footnote: 6 DEIS Executive Summary, page xvi, line 43 -page xvii, line I	The comment accurately reflects the description of alternatives in the Draft EIS. The potential impact of the proposed transmission line on air quality (dust), noise, transportation, and visual impacts was described in chapter 4 of the Draft EIS. As discussed in chapter 4 and summarized in tables 2-11, 2-12, 2-13, and 2-14 of the Draft EIS (now tables 2-15, 2-16, 2-17, and 2-18 in the EIS), with respect to impacts to air quality (dust), noise, and transportation, impacts would be temporary.
460	72	72.12	Mountain View Ranch		9-NEPA	In addition, to the extent that WAPA might find that it was in fact necessary to increase the existing right-of-way beyond 100', WAPA would be legally required to provide just and reasonable compensation to impacted landowners, including severance damages.	The ROW easement acquisition process is described in section 1.9 of the Draft EIS. If Western needs to expand the existing ROW, it would seek to negotiate a fair and reasonable settlement and provide just and reasonable compensation to impacted landowners, including severance damages.
461	72	72.13	Mountain View Ranch		9-NEPA	Realignment to Avoid Substantial Adverse Impact Thus, for the reasons discussed in Sections II(B)(I) and II(B)(2) above, as well as the "overburdening" discussion set forth in Section II(A), Developer/Investors submit that both the Project Proponent's Preferred Route and the Agency's Preferred Alternative Route should be realigned so as to pass south of Mountain View and the other single-family residential communities located to the west of Mountain View south of Interstate 10. In so doing, the aforementioned adverse impacts could be avoided.	The potential routing option was also considered by the BLM and Western; see a discussion of TU1 in section 2.9 in the Draft EIS (Alternatives Considered but Eliminated from Further Analysis). As noted in section 2.9 of the Draft EIS, the existing lines and substation would complicate the use of the reroute because of the need for additional line crossovers and would severely compromise future lines from entering or exiting this substation or any future expansion of it. This route does not resolve, minimize, or reduce resource conflicts, and it substantially complicates the power system in the area. Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.

Table 8-1. Comments on the Draft EIS and Agency Response (Continued)

Comment ID	Submittal No.	Comment No.	Organization	Commenter Last Name	Comment Subject	Comment on Draft EIS	Agency Response to Comments
462	72	72.14	Mountain View Ranch		9-NEPA	If the Project Is Ultimately Approved and Constructed, the Proponent (and Any Successor-In-Interest) Should Be Required to Utilize the Best Available Technology and Materials to Minimize the Visual Impact of the Electric Transmission Supporting Structures and Conductors. As indicated in the discussion set forth in the preceding sections of these Comments, Developer/Investor believes that the alignment for the Upgrade Section of the Project currently contemplated by both the Project Proponent's Preferred Route and the Agency's Preferred Alternative Route should be adjusted so as to pass south of Mountain View and those single family residential communities located on the south side of Interstate 10 and west of State Highway 83.	Table 2-7 in the Draft EIS (now table 2-8 in the EIS) included non-reflective paint as a Project design feature to minimize the potential visual impacts. The potential routing option was also considered by the BLM and Western; see a discussion of TU1 in section 2.9 in the Draft EIS (Alternatives Considered but Eliminated from Further Analysis). As noted in section 2.9 of the Draft EIS, the existing lines and substation would complicate the use of the reroute because of the need for additional line crossovers and would severely compromise future lines from entering or exiting this substation or any future expansion of it. This route does not resolve, minimize, or reduce resource conflicts, and it substantially complicates the power system in the area.
463	72	72.15	Mountain View Ranch		9-NEPA	However, in the event the project is ultimately approved and constructed, the Proponent (and any successor-in-interest) should be required to utilize the best available technology and materials to minimize the visual impact of the electric transmission supporting structures and conductors. In that regard, it is Developer/Investor's current understanding that there are three (3) types of finish currently available for steel monopole supporting structures similar to those contemplated for the Upgrade Section of the Project. These types of finish are (i) dull galvanized (light gray); (ii) weathering steel (dark brown/rust) and (iii) tainted (epoxy paint). With respect to the electrical conductors, the DEIS indicates that the Project Proponent proposes to ". . . incorporate nonspecular conductors into the Project design to decrease reflectivity and visibility of Project features." [DEIS at page 901, lines 33-34] [emphasis added] Developer/Investor submits that that same design objective should govern the selection and use of finishes for Project supporting structures; and, compliance with such design criteria should be an express condition in applicable approvals for the Project, including a Certificate of Environmental Compatibility ("CEC") from the Arizona Power Plant and Transmission Line Siting Committee ("Siting Committee") and the Arizona Corporation Commission ("ACC"). Footnote: 7 In making this suggestion, Developer/Investor does not intend to suggest that it believes that the Project otherwise qualifies for a CEC for the Project in any form or alignment. That determination is for the Siting Committee and the ACC to make following evidentiary hearings and consideration of various issues, including whether or not there is in fact a "need" for the Project	Southline Transmission, LLC, would be responsible for submittal of the application for a Certificate of Environmental Compatibility. BLM and Western are not responsible for ACC submissions.
464	72	72.16	Mountain View Ranch		9-NEPA	Developer/Investor appreciates the opportunity to submit the preceding Comments on the March 2014 DEIS for the Project. As discussed in Section II(A) above, Developer/Investor submits that use of the 100' electric easement which transects Mountain View south of Interstate 10 for purposes of constructing, operating and maintaining the contemplated Upgrade facilities would constitute an inappropriate and impermissible "overburdening" of both (i) the right-of way which is the subject of those easements and the usage of the same therein contemplated and (ii) residential property adjacent to and nearby the right-of-way.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.
465	72	72.17	Mountain View Ranch		9-NEPA	In addition, as discussed in Section II(B) above, construction, operation and maintenance of Upgrade facilities in the aforesaid 100' easement would have substantial adverse impacts on current and future residents in Mountain View, prospective homebuyers and Developer/Intervenor, as well as residents of other single-family residential communities located south of Interstate I 0 and west of State Highway 83. Accordingly, the alignment for the Upgrade Section of the Project should be adjusted so as to pass south of this area.	As discussed in section 1.1 of the Draft EIS, the existing Western line was constructed in 1951; thus, the line and ROW predate the Mountain View Ranch Subdivision by more than 50 years. The potential impact of the proposed transmission line on property in terms of land use was described in section 4.11.1 and in terms of property value in section 4.15 of the Draft EIS.
466	72	72.18	Mountain View Ranch		9-NEPA	Finally, any applicable approval of the Project should require the use of the best available technology and materials to mitigate and minimize the visual impact of supporting structures and electrical conductors for the Upgrade facilities.	Table 2-7 in the Draft EIS (now table 2-8 in the EIS) includes non-reflective paint as a Project design feature to minimize the potential visual impacts.
467	73	73.1	Sonoita Hills Community Association		9-NEPA	By means of this letter, Sonoita Hills adopts the Comments on the March 2014 Draft Environmental Impact Statement on the Southline Transmission Line Project, which Comments are contemporaneously being submitted by Mountain View Ranch Development Joint Venture, LLC and Mountain View Ranch Investment Joint Venture, LLC.	Thank you for your comments.
468	73	73.2	Sonoita Hills Community Association		9-NEPA	In the aforesaid Comments, there is a reference to and comparison with the circumstances surrounding the July 16, 2013 issuance of Decision No. 13-07-018 by the California Public Utilities Commission ("CPUC"), and the circumstances surrounding the proposed Upgrade Section of the Southline Transmission Line Project as it would impact the Mountain View Ranch Subdivision and other nearby single-family residential communities.	A decision of the California Public Utilities Commission (CPUC) regarding the proposed Upgrade Section of the Southline Transmission Line Project and possible impacts it may have on the Mountain View Ranch Subdivision or other residential communities in Arizona or New Mexico (the location of the project) has no bearing on the EIS process and is beyond the scope of this document.
469	73	73.3	Sonoita Hills Community Association		9-NEPA	In that regard , Sonoita Hills would additionally note the similarity in circumstances between residents of Chino Hills and Mountain View Ranch Subdivision homeowners and property owners who were aware of the existence of 75' tall electric transmission system supporting structures (constructed in the 1940s) at the time they purchased their respective properties, but had no reason to anticipate such structures would thereafter be proposed to be replaced by structures approaching or more than double the height of the pre-existing structures and with additional electrical conductors.	Western will review all of its land rights before construction of upgrade facilities occurs. Where necessary, Western will acquire additional land rights in accordance with Federal law for those easements determined to be insufficient.

FLPMA and the BLM's ROW regulations (43 Code of Federal Regulations (CFR) 2800) require that the BLM manage public land for multiple uses that take into account the long-term needs of future generations for renewable and non-renewable resources. The objectives for BLM in granting and managing ROWs is: (1) protect the natural resources associated with public lands and adjacent lands; (2) prevent unnecessary or undue degradation to public land; (3) promote the use of ROWs in common, taking in account engineering and technological compatibility, national security, and land use plans; and (4) coordinate, to the fullest extent possible, BLM actions with State and local government, and other interested parties (43 CFR 2801.2).

Decision to be Made

The decision to be made by BLM is:

1. In the New Build Section, whether or not to grant Southline a ROW to construct, operate, maintain, and decommission the Project on land administered by the BLM with terms and conditions as explained herein; and

2. In the Upgrade Section, whether or not to grant Western a new ROW to construct, operate, maintain, and decommission the Project on land administered by the BLM with terms and conditions as explained herein.

Selected Alternative

The BLM has decided to grant ROWs, subject to identified terms and conditions, to Southline and Western as described in the "Decision to be Made" section above, across the public land the BLM administers, to accommodate the Selected Alternative. The BLM decision includes multiple ROW grants in both the New Build and Upgrade sections of the Project. The Selected Alternative, which is the Agency Preferred Alternative as described in the 2015 Final EIS, will originate at the Afton Substation, south of Las Cruces, New Mexico, and terminate at the Saguaro Substation, north of Tucson, Arizona. The Project will be located in Doña Ana, Luna, Grant, and Hidalgo counties in New Mexico, and Cochise, Pima, and Pinal counties in Arizona. The Selected Alternative is 367 miles long, 100 miles of which is on public land administered by the BLM. No Resource Management Plan Amendment (RMPA) is necessary to support the Selected Alternative.

Public Involvement

Public involvement in the Project began before the initiation of the formal NEPA process, with a series of stakeholder meetings and workshops conducted by Southline in New Mexico and Arizona. These meetings and workshops were held in 2011, and were designed to give the public early notification and to solicit feedback.

The public was informed about the formal application for the Project and public scoping period by an NOI published in the Federal Register on April 4, 2012. During the NEPA process, public involvement was comprehensive. Three public scoping meetings were held in New Mexico, and three were held in Arizona; 133 comments were received. The public was informed about the availability of the Draft EIS/RMPA via publication of an NOA in the Federal Register on April 11, 2014, which initiated the 90-day comment period. Six public meetings were held during the Draft EIS comment period: three in New Mexico and three in Arizona.

EXHIBIT
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ADMITTED

In addition, BLM and Western sent letters in December 2014 to property owners in the area east of Willcox Playa in Cochise County, as well as south of Tucson International Airport along Old Vail Connection Road in Pima County, to notify them of new route variations in the areas.

A total of 1,029 substantive comments were received on the Draft EIS. The BLM and Western considered all substantive comments collected during the NEPA process in development and approval of the selected alternative. A total of 5 comments were received on the Final EIS published in the Federal Register on November 6, 2015, as described later in the "Comments Received on the Final EIS" section of this ROD.

Consultation with Other Agencies

BLM and Western invited 21 American Indian tribes and 33 agencies at the Federal, State, and local level to participate as a cooperating agency in preparation of the EIS. Seventeen[1] agencies accepted: U.S. Army Corps of Engineers (USACE); Reclamation; Department of Defense (DOD) Clearinghouse; U.S. Environmental Protection Agency (EPA); DOD Fort Huachuca; National Park Service (NPS); Forest Service (Coronado National Forest); U.S. Fish and Wildlife Service (FWS); Bureau of Indian Affairs (BIA) Western Regional Office; Arizona Game and Fish Department (AGFD); Arizona State Land Department (ASLD); New Mexico Department of Game and Fish; New Mexico State Land Office (NMSLO); Cochise County, Arizona; Greenlee County, Arizona; Graham County, Arizona; and City of Sierra Vista, Arizona.

Consultation and coordination with Federal and intergovernmental agencies, organizations, American Indian tribes, and interested groups of individuals are important to ensure that the most appropriate data have been gathered and employed for analyses, and that agency and public sentiment and values are considered and incorporated into decision making. Throughout the preparation of the EIS, formal and informal efforts were made by the BLM and Western to involve these groups in the scoping process and in subsequent public involvement activities, formal consultation, and review of the EIS.

The lead Federal agency, along with any other Federal agency that may be issuing permits or licenses for the Project, has a responsibility under Section 106 of the National Historic Preservation Act (NHPA) to consider the effects of its undertakings on "historic properties" (properties listed in or eligible for the National Register of Historic Places (NRHP)). The Section 106 consulting parties were the Tohono O'odham Nation, the Gila River Indian Community, the Salt River Pima-Maricopa Indian Community, the Ak-Chin Indian Community, the San Carlos Apache Tribe, the Mescalero Apache Tribe, the Fort Sill Apache Tribe, the White Mountain Apache Tribe, the Hopi Tribe, the Pueblo of Isleta, the Pueblo of Ysleta del Sur, the Pueblo of Zuni, State Historic Preservation Offices (SHPOs) in Arizona and New Mexico (NHPA 800.3(c)), Forest Service (Coronado National Forest), USACE, BIA, Western, ASLD, NMSLO, Arizona State Museum, NPS, Pima County, City of Tucson, Town of Marana, University of Arizona Desert Laboratory on Tumamoc Hill, National Trust, and Archaeology Southwest. To resolve the potential adverse effects of the undertaking on historic properties, a Project-specific Programmatic Agreement (PA) was developed among the Section 106 consulting parties and executed on March 14, 2016.

Section 7 of the Endangered Species Act (ESA) requires Federal agencies to ensure that their actions do not jeopardize the continued existence of threatened or endangered species or result in the destruction of their designated critical habitat and requires consultation with the FWS if the action agency determines that an action may affect listed species. FWS was solicited for comments and recommendations on specific species to evaluate for potential effects and was consulted on the development of species-specific

[1] Please note that in error, the Draft and Final EISs indicated 16 cooperating agencies rather than 17.

mitigation used in the EIS. Formal consultation under Section 7 of the ESA with the FWS was initiated on March 4, 2014. The FWS issued a Biological Opinion (BO) on December 30, 2014; an amended BO was issued on November 10, 2015.

DECISION

The BLM has decided to grant the following ROWs as described in Exhibit A, legal descriptions attached to the ROW grant, and as depicted in Figure 1.

In the New Build Section, BLM has decided to grant a ROW to Southline as follows:

1. Grant a ROW authorizing the construction, operation, maintenance, and decommissioning of a double-circuit 345-kV transmission line. The ROW would be 200 feet wide and 97.2 miles long, and would encompass 2,356 acres more or less. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the Authorized Officer (AO) deems necessary to protect the public interest.

2. Grant a ROW authorizing the construction, operation, maintenance, and expansion of a portion of the Afton Substation. The ROW would encompass an area of 7.8 acres more or less. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

3. Grant a ROW authorizing the upgrade, use, and maintenance of existing access roads outside the permanent ROW. The grant would be 16 feet wide on major access roads and 52.3 miles long, encompassing approximately 101.7 acres. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

4. Grant a ROW authorizing the upgrade, use, and maintenance of spur access roads outside the permanent ROW. The grant would be for roads measuring 12 feet wide and 18.8 miles long, encompassing 27.4 acres more or less. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

5. Grant a short-term ROW in association with the permanent ROW authorizing the use of workspace outside the permanent ROW during the construction of the Project. The short-term ROW would encompass an estimated 98.5 acres to accommodate three staging areas and expanded tensioning and pulling sites necessary at each line angle and substation. The term of the grant would be 3 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

6. Grant a short-term ROW in association with the permanent ROW authorizing the upgrade, use, and maintenance of access roads outside the permanent ROW. The short-term ROW would be for roads measuring 12 feet wide and approximately 3.77 miles long, encompassing 5.47 acres more or less. The term of the grant would be 3 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

In the Upgrade Section, BLM has decided to grant a ROW to Western as follows:

7. Grant a ROW authorizing the upgrade construction, operation, maintenance, and decommissioning of a 230-kV transmission line in previously authorized BLM ROW grant AZAR000438. The ROW would be 150 feet wide for a distance of 0.6 mile, encompassing 10 acres more or less. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

8. Grant a ROW authorizing the upgrade construction, operation, maintenance, and decommissioning of a 230-kV transmission line in previously authorized BLM ROW grant AZAR0438. The ROW would be 100 feet wide for a distance of 0.5 mile, encompassing 6.2 acres more or less.[2] The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

9. Grant a ROW authorizing the construction for operation, and expansion of the existing Nogales Substation. The ROW for the substation would be a total of 10.2 acres more or less. The grant would be issued for a term of 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

10. Grant a ROW authorizing the upgrade, use, and maintenance of existing access roads outside the permanent ROW. The grant would be 16 feet wide and 0.1 mile long, encompassing approximately 0.2 acre. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

11. Grant a ROW authorizing the upgrade, use, and maintenance of spur access roads outside the permanent ROW. The grant would be 12 feet wide and 0.12 mile long, encompassing 0.2 acre more or less. The term of the grant would be 30 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

12. Grant a short-term ROW in association with the permanent ROW authorizing the use of workspace outside the permanent ROW during the construction of the Project. The short-term ROW would encompass an estimated 0.4 acre for tensioning and pulling sites. The term of the grant would be 3 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

13. Grant a short-term ROW in association with the permanent ROW authorizing the upgrade, use, and maintenance of access roads outside the permanent ROW. The short-term ROW would be 12 feet wide and approximately 0.03 mile long, encompassing 0.03 acre more or less. The term of the grant would be 3 years with the right of renewal. The ROW shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the AO deems necessary to protect the public interest.

[2] This applies to the portion of previously authorized BLM ROW that falls within State land in the north half (N ½) northeast quarter (NE ¼) of section 7, township 17 south, range 20 east, Gila and Salt River Meridian, Arizona. This parcel was transferred to the State but excepting and reserving the 100-foot-wide ROW AZAR000438, which cannot be relinquished or amended.

Agency Standards

The ROW grants must comply with agency (BLM and Western) stipulations described and referenced in the attachments to this ROD.

Bonding

Southline will post a performance bond to ensure adequate adherence to all terms and conditions on Federal lands. The amount of the bond will be determined at a later date. The bond must be accepted by the BLM AO prior to commencement of surface-disturbing activities authorized under the ROW grant. The bond will apply to the following:

1. Accommodation of all cultural resources post-fieldwork costs associated with implementing the approved treatment plans in New Mexico and Arizona or other cultural resources mitigation measures. Such costs may include, but are not limited to, the following: treatment; fieldwork; post-field analyses, research, and final report preparation; interim and summary report preparation; and the processing and curation of project documentation and cultural material collected during data recovery field work in a Department of the Interior-approved curation facility, and as specified in the Southline PA and post-construction administrative costs associated with reporting as specified by the PA (Stipulation X).

2. Restoration and reclamation of disturbed areas and other requirements relative to the construction phase of the project. Upon completion, or partial completion, of construction-related reclamation requirements, the AO may reduce or terminate the amount of the bond.

3. Liability for damages or injuries resulting from releases or discharges of hazardous materials.

The bond may be released as specific tasks are completed and accepted by the BLM. This bond must be maintained in effect until temporary improvements used during construction are removed and restoration and reclamation of the ROW has been accepted by the AO.

State and Federal Legal Requirements

This ROD also requires Southline and Western to meet the requirements of the other major authorizing agencies for this Project concerning any necessary Federal and State permits, licenses, and/or approval and consultation requirements on Federal lands as identified in Table 1-5 found on pages 20 through 23 of the Final EIS for the Southline Transmission Line Project.

Compliance and Monitoring

Southline will provide compliance environmental inspectors/monitors for transmission line construction and access road upgrades, and substation construction. These monitors will report directly to the BLM. Their role and responsibility is to ensure compliance with all terms, conditions, and stipulations of the ROW grant and short-term ROW, and other permits, approvals, and regulatory requirements as described in Sections 2.4.1, 2.4.5, and 2.4.6 of the Final EIS. The environmental inspectors/monitors shall follow the Environmental Compliance Management Plan included as Appendix A6 of the NEPA Plan of Development (POD), dated March 14, 2016 (Attachment A). Southline will also be responsible for monitoring the reclamation and stabilization of the ROW over the long-term. Included in this requirement, among other things, is the yearly monitoring of the ROW for invasive plants and, if

necessary, spraying as outlined in the Noxious Weed Management Plan included in Appendix B11 of the NEPA POD (see Attachment A).

Terms, Conditions, and Stipulations

This decision is contingent upon Southline's and Western's meeting all terms, conditions, and stipulations for Federal lands listed below:

1. Southline and Western shall follow the construction procedures and mitigation measures described in its application and supplements as identified in the Final EIS as modified. These mitigation measures are included with this ROD as the NEPA POD and Framework Plans in Attachment A.

2. Southline and Western shall comply with the standard stipulations of the ROW grant and short-term ROW.

3. Prior to any construction or other surface disturbance associated with the ROW grant and short-term ROW, Southline and Western shall receive written Notices to Proceed (NTPs) from the AO or delegated agency representative. Any NTP shall authorize construction or use only as therein expressly stated and only for the particular location, segment, area, and use described.

4. In accordance with Title 43 CFR Part 2800, Southline has provided the BLM with a NEPA POD dated March 2016 (see Attachment A) detailing how the transmission line and associated facilities will be constructed in compliance with the ROW and short-term ROW terms, conditions, and stipulations. Southline and Western shall comply with all required environmental protection measures and Proponent Committed Environmental Measures (PCEMs) outlined in the NEPA POD and Framework Plans to the satisfaction of the BLM. These measures include, but are not limited to, the standard stipulations of the ROW grant and short-term ROW.

5. Southline and Western shall construct, operate and maintain the facilities, improvements, and structures within the ROW and areas authorized by the short-term ROW in conformity with the NEPA POD dated March 2016 (see Attachment A), which is part of the grant. Any relocation, additional construction, or use that is not in accordance with the approved NEPA POD shall not be initiated without the prior written approval of the AO.

6. Southline and Western shall implement all activities described in the "Description of the Proposed Action" and the terms and conditions of the BO written by the FWS found in Attachment B of this ROD.

7. Southline and Western shall comply with the terms and conditions of the PA developed between the Section 106 consulting parties and signed by the BLM, the State Historic Preservation Officers in Arizona and New Mexico, the Tohono O'odham Nation and the Advisory Council on Historic Preservation (ACHP). The PA is provided in Attachment C. Pursuant to the PA, a Historic Properties Treatment Plan (HPTP) will be developed for the treatment of affected historic properties.

8. Southline shall comply with all the agreed upon plans, deliverables, activities, and funding set forth in the Memorandum of Agreement between the Arizona Game and Fish Commission and Southline.

As noted in the "Decision to be Made" section above, the terms, conditions, and stipulations for Federal lands listed above apply to Southline in the New Build Section, and to Western for the 0.5-mile segment of BLM land in the Upgrade Section.

Notice to Proceed

This decision does not authorize Southline and Western to commence construction of any Project facilities for the Southline Transmission Line Project or proceed with other ground-disturbing activities in connection with the Southline on public land. Southline and Western shall not commence construction of Project facilities or proceed with any ground-disturbing activities related to the Southline Project on Federal lands until Southline and Western in accordance with 43 CFR 2807.10, receive a written notice to proceed from the BLM's AO authorizing Southline to commence construction of Project facilities or proceed with other ground-disturbing activities in connection with the Southline Transmission Line Project.

Bonding and outstanding plans and deliverables are needed from Southline before BLM can issue an NTP. Outstanding plans and deliverables required prior to the NTP include signed acceptance of the ROW grant, a complete and authorized POD, and the associated framework plans not yet completed. These outstanding data needed for the POD and needed framework plans include Geotechnical Investigation, Project Construction Plan, Special Construction Techniques, Construction Workforce Plan, Access Road Plan, HPTP, Soil Management Plan, Health and Safety Plan, Avian Protection Plan, Waste Management Plan, Helicopter Flight Plan/Flight and Safety Plan, Decommissioning Plan, Project and Environmental Features map set, Key Mitigation Measures and Reclamation Practice map set, and an Access Roads map set.

Appeal of this Decision

Any appeal of this decision must follow the procedures set forth in 43 CFR Part 4. Within 30 days of the decision, a written notice of appeal must be filed in the office of the AO at U.S. Department of the Interior, Bureau of Land Management, Las Cruces District Office, 1800 Marquess Street, Las Cruces, New Mexico 88005. If a statement of reasons for the appeal is not included with the notice, it must be filed with the Interior Board of Land Appeals (IBLA), Office of Hearings and Appeals, U.S. Department of the Interior, 801 North Quincy St. Suite 300, Arlington, Virginia 22203 within 30 days after the notice of appeal is filed with the AO.

If you wish to file a petition for stay pursuant to 43 CFR Part 4.21(b), the petition for stay should accompany your notice of appeal and shall show sufficient justification based on the following standards:

1. The relative harm to the parties if the stay is granted or denied,
2. The likelihood of the appellant's success on the merits,
3. The likelihood of irreparable harm to the appellant or resources if the stay is not granted, and
4. Whether the public interest favors granting the stay.

If a petition for stay is submitted with the notice of appeal, a copy of the notice of appeal and petition for stay must be served on each party named in the decision from which the appeal is taken, and with the IBLA at the same time it is filed with the AO.

Table 8. Environmental Protection Measures by Resource

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Standard Mitigation						
	X	The boundaries of construction activities will be predetermined and staked or flagged prior to any construction activity. No permanent markings will be applied to rocks or vegetation.	X			
	X	Prior to construction, all construction personnel will be instructed on the protection of cultural and ecological resources.	X			
	X	All vehicle movement will be restricted to designated access, contracted acquired access, or public roads.	X	X	X	X
	X	To limit disturbance, existing access roads will be used to the extent practicable, provided that doing so does not additionally impact resource values. Widening and grading of roads will be kept to the minimum required for access by Project construction equipment.	X	X	X	X
	X	Structures and/or ground wire will be marked with high-visibility devices such as aerial marker balls, where required by government agencies such as the FAA.	X	X	X	
	X	Transmission line materials will be designed and tested to minimize audible noise, radio interference, electromagnetic interference (EMI), and television interference due to corona.	X	X	X	
	X	No widening or upgrading of existing roads will be undertaken in the area of construction and operations, except for repairs or modifications to make roads safely passable, where soils and vegetation are sensitive to disturbance, in areas of critical habitat for vegetation or wildlife, in areas of habitat for BLM special status species, or where such activities could harm historic properties.		X	X	
	X	During operation of the transmission lines, the ROW will be maintained free of non-biodegradable debris. Desert vegetation will be crushed in place to promote seeding and revegetation, and reduce erosion potential.			X	
	X	BLM and Western road construction specifications will be followed where unimproved spur roads cannot be employed.		X	X	
	X	Unimproved spur roads will be used to the extent practicable in areas where no grading will be warranted to access work areas, within the approved ROW. Unimproved spur roads will be used to access a site without specifically blading a road or significantly modifying the landscape. All vehicle movement will be restricted to designated access, even if that is unimproved access. Vegetation will be crushed where feasible, not cut. For all access types, soil will be compacted, but not removed, except when grading requires displacement of surface soil.		X	X	X
	X	Where new roads will be required, water bars and/or rolling dip cross-drains will be utilized to minimize erosion. Details of their use will be documented in the SWPPP.	X	X	X	
	X	Structures will be placed to avoid, and/or to allow conductors to span, sensitive features such as riparian areas, waterways, roads, trails, and cultural sites within limits of standard transmission line structure design. This will minimize the amount of sensitive features disturbed and/or reduce visual contrast.	X	X	X	
	X	Clearing of trees in and adjacent to the ROW will be minimized to the extent practicable to satisfy conductor-clearance requirements (NESC and up to 10 years' timber growth). Trees and other vegetation will be selectively removed to blend the edge of the ROW into adjacent vegetation patterns, as appropriate.		X	X	
	X	Separation between transmission lines and existing utilities, roads, and railroads will be minimized to the extent practicable. Opportunities to share portions of adjacent ROWs will also be explored.	X			
	X	All construction vehicle movement will be restricted to predesignated access, contractor-acquired access, and public roads.		X		
	X	The width of construction and new temporary access roads will be sited to keep to the minimum needed to avoid sensitive areas and to limit ground disturbance.		X		
	X	Surface elevations will be returned to approximate pre-Project conditions, as practicable.		X		X
WILD-1		A Worker Environmental Awarness Program (WEAP) will be prepared. All construction crews and field contractors will be required to participate in WEAP training prior to starting work on the Project. The WEAP training will include instructions for crews to report any issues, a review of the special status species; WUS; riparian habitat; cultural, paleontological, and other sensitive resources that could be impacted by the proposed Project; the locations of sensitive biological resources and their legal status and protections; and measures to be implemented for avoidance of these sensitive resources. A record of all trained personnel will be maintained during the construction period.	X	X		
	X	The process by which the BLM, Western, and Southline and its construction contractor will conduct environmental monitoring, compliance, and reporting activities during construction will be described in a Project compliance plan that will be prepared by the CIC after theCIC has been selected and reviewed by BLM. After issuance of the notice to proceed, a CIC, designated by the BLM and Western, will provide environmental oversight and compliance monitoring on BLM-managed lands during Project construction to ensure compliance with all design features and mitigation measures.	X	X		

EXHIBIT
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STL-30
ADMITTED

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Reclamation						
	X	A Reclamation, Vegetation, and Monitoring Plan will be developed and implemented.		X	X	X
	X	Reclamation will be accomplished with native species unless otherwise approved.		X	X	X
	X	Seeding will occur between November and March to ensure a greater chance of success. This will be tied to replacement of conserved topsoil with its natural seed stock.		X	X	X
Air Quality and Climate Change						
	X	Project activities will be in compliance with all applicable Federal, State, and local laws and regulations concerning prevention and control of air pollution during construction and operation.		X	X	
	X	An Erosion, Dust Control, and Air Quality Plan will be prepared as part of the final POD. The plan will be developed and implemented to minimize and mitigate potential air quality and climate change impacts. The Erosion, Dust Control, and Air Quality Plan will include a section detailing the Construction Emissions Mitigation Plan (CEMP). See appendix A6 of this POD for an outline of the information in the Erosion, Dust Control, and Air Quality Plan, including the CEMP.	X	X	X	X
	X	All necessary air quality permits will be obtained prior to construction or operating equipment that will result in regulated atmospheric or fugitive dust emissions.	X			
	X	Trackout control devices such as grizzly bars, wheel washers, gravel pads, etc. will be located at all entrances and exits.		X		
	X	Where implementation of these measures will have a meaningful impact on air quality, haul-truck cargo beds will be covered with tarps and travel speeds will be limited to no more than 15 miles per hour (mph) on unpaved roads.		X		
	X	Combustion emissions from mobile sources will be minimized by proper maintenance of equipment.		X	X	
AIR-1		Dust control measures consistent with all applicable State or local standards, as outlined in the Erosion, Dust Control, and Air Quality Plan, will be implemented; these include the following reasonable precautions: (1) frequent watering (no new water sources developed), stabilization, or covering (as appropriate) of excavations, spoils, access roads, storage piles, and other sources of fugitive dust (parking areas, staging areas, other) if construction activity causes visible emissions of fugitive dust beyond the work area; (2) reduction in the amount of disturbed area where possible; (3) planting of vegetative ground cover, as appropriate, in disturbed areas after construction activities have ended; and/or (4) treatment of actively disturbed areas with BLM-approved dust palliatives.		X		
AIR-2		To reduce the potential for greenhouse gas emissions, only properly trained Project personnel will handle sulfur hexafluoride, and a sulfur hexafluoride recovery and recycling program will be implemented.	X		X	X
Cultural Resources						
	X	Cultural resources will continue to be considered during post-EIS phases of work. Specific cultural resource inventory, protection, and mitigation measures to be employed will be outlined in the Project-specific PA, in accordance with Section 106 of the NHPA. The final POD will include the signed PA and the HPTP.	X	X	X	X
	X	A Native American Graves Protection and Repatriation Act (NAGPRA) Plan of Action will be developed to outline the procedures to be followed in the event that human remains are encountered during ground disturbance. The NAGPRA Plan of Action will be applicable to discoveries of human remains on Federal and Tribal land, and compatible with State laws from Arizona and New Mexico, which protect human remains on State or private lands. For State and private lands in Arizona, "burial agreements" are developed through the Arizona State Museum with each tribe that may claim cultural affiliation to possible human remains discoveries.	X	X	X	
CR-1	X	The area of potential effects will be defined in the PA and will consist of the approved alternative corridor and appropriate buffers; all areas and ancillary features that will sustain ground disturbance (access roads, construction yards, etc.) will be subjected to a Class III, 100 percent–coverage pedestrian inventory to identify all historic properties that may be affected by the proposed Project. Survey and reporting requirements will follow BLM Handbook 8110 requirements for a Class III Intensive Field Survey (BLM 2004).	X			
CR-2		Before construction, and as described in the WEAP, Southline and its construction contractor will provide cultural resources sensitivity training to all construction personnel so that Project personnel understand the procedures in the monitoring and discovery portion of the HPTP.	X	X		
CR-3		An HPTP will be developed and implemented to avoid, minimize, and mitigate the adverse effects of the Project on historic properties. Mitigation measures may range from avoidance and preservation in place to data recovery excavations conducted before the destruction of a site if avoidance is not feasible. The HPTP will include a Monitoring and Discovery Plan detailing procedures to be followed in the inadvertent discovery of a potentially significant archaeological site or human remains.	X	X	X	
CR-4		Ground-disturbing activities and other proposed Project components will be sited to avoid or minimize direct impacts on cultural resources listed as, or potentially eligible for listing as, unique archaeological sites, historical resources, or historic properties.	X	X	X	
CR-5		Establish and maintain a protective buffer zone around each recorded archaeological site within or immediately adjacent to the ROW that will be treated as an "environmentally sensitive area" within which construction activities and personnel are not permitted.	X	X		

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
CR-6		Evaluate the significance of archaeological resources, buildings, and structures in the area of potential effects in terms of their eligibility for inclusion in the NRHP.	X			
CR-7		Activities will minimize ground surface disturbance within the bounds of significant archaeological sites, historical resources, or historic properties.	X	X		
CR-8		During construction, it is possible that previously unknown archaeological or other cultural resources or human remains could be discovered. Prior to construction, the Proponent will prepare a Construction Monitoring and unanticipated cultural resources Discovery Plan to be implemented if an unanticipated discovery is made.		X		
Hazardous Materials and Waste						
	X	Framework Plans prepared as part of the final POD will be developed and implemented to minimize and mitigate potential hazardous materials and waste; plans include SWPPP; SPCC Plan; Soil Management Plan; and HMMP. These plans will include requirements by the EPA, OSHA, Arizona Department of Environmental Quality, and the New Mexico and Arizona Departments of Transportation.	X	X	X	X
	X	The SWPPP will include BMPs to address the storage and handling of hazardous materials and sediment runoff during construction activities to minimize the risk of an accidental release. The SWPPP is required by, and enforced by, the EPA in New Mexico, and the Arizona Department of Environmental Quality in Arizona.	X	X	X	
	X	Construction, operation, and maintenance crew members who handle oil or other hazardous substances described in the SPCC Plan will be properly trained to deal with a spill, and appropriate spill response or containment material will be available for use at applicable work sites. Careful handling and designation of specific equipment repair and fuel storage areas, as outlined in the SPCC Plan, will reduce the potential for oil and fuel spills. In the event that there is an oil or fuel spill, immediate measures will be taken to control the spill, and the BLM, National Response Center, and/or Arizona Department of Environmental Quality or New Mexico Environment Department will be notified as defined in the SPCC Plan.	X	X	X	X
	X	Personnel, contractors, and transporters involved with hazardous materials management will be required to comply with Federal and State regulations established for the transportation, storage, handling, and disposal of hazardous substances, materials, and wastes. "Hazardous substances" means any substance, pollutant, or contaminant that is listed as hazardous under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.		X	X	X
HAZ-1		The Project-specific HMMP and program will outline proper hazardous materials use, storage, and transport requirements and applicable handling procedures. EPA procedures for handling and storage of hazardous materials, OSHA requirements for proper storage and labeling on the job site, and New Mexico and Arizona Department of Transportation requirements for transportation of hazardous materials will be followed.	X	X	X	X
HAZ-2		If backfill material to be used is derived from a site that could possibly have contamination, it will be sampled and determined to be free of regulated contaminants before it is used to fill excavations. The results of any tested soils should be shared with the appropriate surface managing agency. No contaminated soils will be used as fill material for the Project.		X		
HAZ-3		New or expanded substation locations that involve the purchase or long-term leasing of land, purchased transmission line ROWs, and any other property to be acquired will be screened for environmental liabilities. The degree and level of screening will be based on knowledge or information available on the property to determine the probability of contaminants of concern or other environmental impairment. A Phase I Environmental Site Assessment will be conducted if preliminary screening indicates a reasonable risk that such environmental conditions may exist on the property and the property continues to be targeted for acquisition by the Project, consistent with American Society for Testing and Materials Standard E1527-13.	X			
HAZ-4		The Soil Management Plan will provide guidance for the proper handling, onsite management, and disposal of contaminated soil, if encountered during construction, operation, and maintenance activities. Appropriately trained personnel will be onsite during preparation, grading, and related earthwork activities to monitor the soil conditions encountered.	X	X	X	X
HAZ-5		In the event of a spill, workers in the immediate area will cease work, begin spill cleanup operations, and notify appropriate agencies as required by law and specified in the SPCC Plan. Southline and its construction contractor(s) are responsible for cleanup and assume liability for any and all releases of hazardous substances disposed on public land, in accordance with State, Federal, and local laws and regulations. Southline will immediately notify the BLM authorized officer of any and all releases of hazardous substances on public land.		X	X	X
HAZ-6		All construction and demolition waste, including trash and litter, garbage, and other solid waste, will be removed and transported to an appropriately permitted recycling or disposal facility. Southline and its construction contractor will prepare a Construction Waste Disposal Plan for all nonhazardous wastes generated during construction of the Project. The plan will contain a description of all nonhazardous solid and liquid construction wastes, recycling plans, and waste management methods to be used for each type of waste.		X		X
HAZ-7		Southline or the applicable contractors will maintain all vehicles in good working order. Equipment will be properly tuned and maintained to avoid leaks of fluids.		X	X	X
HAZ-8		Service and refueling procedures will not be conducted within 500 feet of a seep, wash, or other water body. Routine service of any vehicles or equipment will not be done within the ROW.		X	X	X

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Health and Human Safety						
HEA-1 HEA-3		The HASP and Fire Protection Plan prepared as part of the Final POD will be developed and implemented to minimize and mitigate potential health and human safety impacts. Southline and its contractors will work with the appropriate surface-managing agencies to incorporate any fire restrictions that are put into effect during construction, operation, and decommissioning of the Project.	X	X	X	X
HEA-2		Southline and its construction contractor will locate overhead and underground utilities that may reasonably be expected to be encountered during construction. If a utility service interruption is known to be unavoidable, Southline and its construction contractor will coordinate with the service provider to notify members of the public, the jurisdiction, and the service providers affected by the interruption via letters and newspapers notices published no later than 7 days prior to the first interruption. Copies of the notices will be provided to the BLM and Western following notification.	X	X		
HEA-4		All permanent metallic objects within the Project's transmission line ROWs will be grounded in accordance with industry standards.	X	X	X	
		Southline and its construction contractor will provide a safety representative at all times with the construction crews, first aid kits stored in each construction vehicle, a worker trained in first aid included in each work group during construction, and the development and implementation of a HASP.		X		
	X	The HASP will address potential situations that workers could encounter during construction and maintenance. The purpose and goal of the worker safety and environmental training will be to communicate Project-related environmental and safety concerns and appropriate work practices to all field and construction personnel prior to the start of construction, including spill prevention, emergency response measures, accident prevention, use of protective equipment, medical care of injured employees, safety education, and fire protection. Training will encompass environmental training related to road designations and speed limits, promote "good neighbor" policies, and institute BMPs for construction. The training will emphasize site-specific physical conditions to improve hazard prevention in accordance with OSHA requirements (29 CFR 1910 and/or 1926, as applicable).	X	X	X	
Land Use						
		Although disturbance to Pima County Conservation Lands will primarily occur within the existing Western ROW for the existing line, every effort will be made to minimize and avoid impacts to these lands (such as Bar V Ranch, Tumamoc Hill, etc.), to the extent practicable.		X	X	
Farmlands and Rangeland						
FARM-1	X	Fences and gates will be repaired or replaced to their original, predisturbed condition (or better), as required by the landowner, BLM Authorized Officer, or other land managing entity if they are damaged or destroyed by construction activities. New temporary and/or permanent gates will be installed only with the permission of the landowner or the BLM. Temporary gates not required for post-construction access control will be removed following construction completion and in accordance with the POD.	X		X	
	X	Water facilities (e.g., tanks, developed springs, water lines, wells, etc.) will be repaired or replaced to their predisturbed condition if they are damaged or destroyed by construction, operation, or maintenance activities, as required by the landowner of land management agency. Temporary watering facilities will be provided for wildlife and livestock until permanent repair or replacement is complete.		X	X	X
	X	Laydown areas and substation development will be located on previously disturbed land, where possible, to reduce the impact to farm operations and production in active farmlands. If laydown areas cannot avoid farmlands, Southline will receive approval from the landowner of the farmland to lease the land required for the laydown area.	X	X		
	X	Temporary gates will be installed to prevent livestock from escaping rangelands and accessing roadways. Fences and gates will be repaired or replaced to their original, predisturbed condition, as required by the landowner or the BLM Authorized Officer if they are damaged or destroyed by construction activities. Cattle guards will be installed at access points to prevent livestock from exiting unsecured gates onto roadways.	X	X		
	X	On agricultural land, ROWs will be aligned, in so far as practicable, to reduce the impact to farm operations and agricultural production. This will typically be done in conjunction with negotiating ROW agreements with landowners.	X	X		
Geology and Minerals						
GEO-1		Southline will prepare a geotechnical engineering study prior to the final project design to identify site-specific geological conditions and potential geological hazards. The data collected from the study will be used to guide sound engineering practices and mitigate potential geological hazards.	X			

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Military Operations						
DoD-1	X	The transmission line operator will work with Buffalo Soldier Electronic Testing Range (BSETR) to coordinate, and possibly limit, interconnections to the upgraded Tucson-Apache 230-kV transmission line to the extent allowed by Western's Open Access Transmission Service Tariff and Federal Energy Regulatory Commission (FERC) Orders. The transmission line operator will work with interconnection applicants to locate any future interconnection points on Western's upgraded Tucson-Apache 230-kV transmission line outside the BSETR and within 1 mile of its boundaries. New transmission facilities are defined to include substations, switchyards, and converter stations. Western's Open Access Transmission Service Tariff and the Federal Power Act, as amended, provide the framework, in accordance with Federal law, to consider interconnection requests. Western's Tariff substantively conforms with FERC Orders 888, 889, 890, 2003, and 2006, and ensures open access to Western's transmission system on an equal footing with regulated utilities.	X			
DoD-2	X	Southline and Western will work with BSETR to identify micro-siting opportunities during Project design.	X			
DoD-3	X	The transmission line operator will coordinate with BSETR during the design phase of the proposed Project to limit EMI. The proposed Project will be constructed using the best available construction techniques and technology (i.e., use of grounding, selective conductor type and arrangement, and conductor surface gradients), to the extent feasible and reasonably economical, in order to minimize EMI.	X			
DoD-4	X	The transmission line operator will coordinate with BSETR to allow for an updated measure of the "floor value" of the proposed Project over the first 6 months of operation once the proposed line is energized. Such cooperation could include provision of real-time operating and load information to BSETR to help calibrate the floor value of EMI.	X	X	X	
DoD-5	X	The transmission line operator will coordinate with BSETR to develop reporting standards, for potential inclusion in the transmission line maintenance and inspection program, to the extent allowable by FERC and NERC reliability standards. While normal inspection maintenance will take care of typical EMI issues, specific incidents such as storm damage or vandalism will need to be responded to outside of the normal maintenance cycle. If not detectable through transmission line monitoring, the operator will need to hear from someone experiencing interference in order to respond.	X	X	X	
DoD-6	X	The transmission line operator will coordinate planned outages (curtailment of power line operations for BSETR to implement testing) with BSETR to the extent feasible in order to meet necessary contractual commitments, utility mandates, laws and regulations, and power system requirements. The operator is very limited in the timing and duration of potential outages, outages stress the rest of the system, which can cause system failures.	X		X	
X		Use the optional structure height of 90 feet in areas intersecting the military training route (MTR) VR-263, which has a 100 feet above ground level flight altitude. Additionally, do not erect any structures exceeding 200 feet in height in areas intersecting MTRs VR-260 and VR-1233. Towers crossing the MTRs should also have anti-collision lighting to the maximum extent possible in order to make the hazard of transmission lines more apparent to pilots flying low altitude at night. These measures will mitigate impacts to military training and airspace usage, as well as contribute to the safe conduct of missions.	X	X		
X		Chart the transmission lines before they are erected.	X			
X		Identify transmission structures with high-visibility markers in areas where they intersect or parallel MTRs.	X	X		
MIL-1		The appropriate military scheduler(s) and U.S. Border Patrol representative(s) will be contacted to schedule airspace usage for any construction or maintenance activity on lands that could be used by the military and/or U.S. Border Patrol for training activities or other flights. Coordination will occur with the applicable scheduling office to schedule necessary airspace usage prior to maintenance activities.	X	X		
MIL-2		The proposed Project will comply with FAA regulations, including lighting regulations, to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.	X	X	X	
Noise						
	X	Schedule construction activities and route construction traffic to minimize disruption to nearby residents and existing operations surrounding the Project.		X		
	X	Noisy construction activities (including blasting) should be limited to the least noise-sensitive times of day (daytime only between 7 a.m. and 10 p.m.) and to weekdays. In sensitive wildlife areas, they should be limited to between 1.5 hours after sunrise and 1.5 hours before sunset.		X		
	X	If warranted, in extreme circumstances, erect temporary wooden noise barriers around areas where construction equipment will disturb sensitive receptors[1] near substations. Barriers may reduce noise by 3 to 10 dBA (EPA 1971).		X		
	X	To the extent possible, locate noisy equipment away from sensitive receptors.		X		
	X	Whenever feasible, schedule noise-generating activities to occur at the same time, since additional sources of noise generally do not add noise. That is, less-frequent noise activities will be less annoying than frequent less-noisy activities.		X		
	X	If blasting or other activities that cause loud bursts of noise are required during the construction period, nearby residents will be notified in advance.		X		

[1] As identified in the EIS, noise sensitive receptors include residential areas, schools and day care facilities, hospitals, long-term care facilities, places of worship, libraries, parks, and recreational areas specifically known for their solitude and tranquility (such as wilderness areas).

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
	X	If possible, minimize trips for surveillance and monitoring of Project transmission lines.			X	
NOI-1		Construction will comply with local noise ordinances. There may be a need to work outside the local ordinances to perform work during available line outage windows in order to take advantage of low electrical draw periods during nighttime hours. The construction contractor will comply with variance procedures required by local authorities.		X		
NOI-2		Construction equipment will be maintained in good working order in accordance with manufacturer's recommendations.		X		X
NOI-3		Idling of construction equipment and vehicles will be minimized during construction.		X		
NOI-4		Workers will be provided with appropriate hearing protection, if necessary, as described in the HASP.		X	X	X
Paleontology						
	X	The Project will avoid Potential Fossil Yield Classification (PFYC) 3 and 4 geological units where possible by spanning resource areas.	X			
PAL-1	X	In consultation with the appropriate land management agencies, Southline and its contractor will develop a Paleontological Monitoring Plan to address paleontological resources within the project area. This plan will address personnel education, predisturbance surveys, monitoring of ground disturbance, and the deposition and curation of fossils in a qualified repository.	X	X		
PAL-2		If scientifically significant fossils are encountered during construction, construction activities will be temporarily diverted away from the discovery and the authorized officer of the BLM will be notified. BLM will then implement the appropriate measures to avoid, protect, and/or recover the fossil remains.		X		
Recreation						
REC-1		Southline will not site additional workspace areas, such as contractor yards, in recreation areas in order to minimize impacts on recreational users during construction.	X	X		
REC-2		Southline and its contractor will coordinate with the BLM to display appropriate "closed" signage at the entrance to new spur roads to structure locations and access roads located on BLM-managed lands. This includes temporary signs during the construction phase of the Project and permanent signs and/or vehicle barriers that will close the spur routes to public travel during the operational phase. Signs will be removed as appropriate upon decommissioning.	X	X	X	X
REC-3		If temporary short-term closures to recreational areas are necessary for construction activities, Southline and its contractor will coordinate those closures with recreational facility owners. To the extent practicable, Southline and its construction contractor will schedule construction activities to avoid heavy recreational use periods (e.g., holidays or tournaments). Southline and its construction contractor will coordinate with the facility owner to post notice of the planned closure onsite 14 calendar days prior to the closure.	X	X	X	X
	X	Construction will be limited to certain areas of the ROW during specified hunting seasons (e.g., big-game hunting seasons) by sequencing construction activities along the ROW, in coordination with New Mexico Department of Game and Fish (NMDGF) and AGFD, in accordance with each agency's hunting regulations. Such coordination will allow the agencies to notify hunters of potential for T-line construction activities to affect their hunt. Where construction cannot avoid hunting seasons (e.g., mountain lion, "varmint," and other species with year-round hunting seasons) hunters will be required to avoid discharging firearms adjacent to the construction areas, in accordance with NMDGF and AGFD hunting regulations.	X	X		
	X	If the Arizona National Scenic Trail must be temporarily closed during construction, an alternate trail route (detour) will be provided during the closure. If it is necessary for trail users to leave the trail during the temporary closure, trail users will need to obtain permission from the Arizona State Land Department.	X	X		X
Wilderness						
	X	Notify Wilderness Inventory Unit users by publication of the construction schedule in local media, posting the schedule at administering agency offices, posting the schedule at trailheads or other recreation access points to Wilderness Inventory Units, or other means of reaching visitors. This notification process will alert wilderness users to the potential temporary impacts of presence and sound of construction on opportunities for experiences of solitude and primitive recreation settings, and allow visitors to decide whether they want to reschedule their visit.	X	X		X
	X	Feather the edges of the shrubs and trees adjacent to the ROW when recontouring and revegetating the construction ROW in vegetation communities with a large shrub or tree component, to reduce the line or edge that will be apparent between the shrubs and trees and the grass of the reclaimed ROW.	X	X		X
Trails						
	X	In accordance with the "Design Features and Best Management Practices for National Trails and Associated Resources" (see Appendix 1 in Manual 6280 (BLM 2012d)), proposed projects within a National Trail Management Corridor will be designed and located in a manner that is compatible with trail purposes.	X	X		
	X	Minimize visual contrast of Project through use of Project design such as using low profile buildings; siting using the natural topography to hide or screen development, reducing the aerial extent of impact by clustering developments, using vegetative screening; mimicking the line, form, and texture of the surrounding landscape; painting infrastructure, using colors that camouflage the development and prevent glare; and other techniques developed to address the site-specific conditions (BLM 2012d).	X	X		
	X	Avoid the use of dye, restrict administrative vehicle travel off of designated routes to minimize spread of exotic and invasive species with the National Trail Management Corridor, and consider alternative treatment methods such as use of backpacker sprayer (BLM 2012d).	X	X		

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Soils						
SOIL-1		As appropriate and feasible, Southline and its construction contractor will implement topsoil segregation and conservation practices at substation sites and as directed by the BLM and Western.		X		
	X	In construction areas (i.e., temporary use areas, structure sites, access roads, etc.) where grading is required, surface restoration will be implemented as required by the landowner or BLM authorized officer. The method of restoration will normally consist of returning disturbed areas back to approximate their normal contour, replacing topsoil, reseeding (where required), installing cross drains for erosion control, placing water bars in the road, and/or filling ditches. The Reclamation, Vegetation, and Monitoring Plan will include final details on the details of restoration.		X		
Socioeconomics						
	X	Southline should maximize local hiring, to the extent feasible, during construction. Local hiring could both maximize local economic benefits from the proposed Project, and help reduce potential housing issues and new public service demands.	X	X		
	X	Southline will develop plans for housing the temporary construction workforce during the periods of time when construction will focus on the western portions of the New Build Section (e.g., Hidalgo County) and the eastern portion of the Upgrade Section (e.g., northeastern Cochise County). If the Proponent Alternative is selected, housing planning should also include southern Luna County. The plan should be developed with input and review from local authorities in those areas to both minimize potential impacts on housing and public services and inform the communities of potential challenges associated with construction.	X	X		
Transportation						
TRA-1		Prior to the start of construction, Southline and its construction contractor will prepare a Traffic and Transportation Management Plan for the Project to address the timing and routing of Project trips in an effort to minimize Project impacts on local streets, highways, and railroad operations.	X			
TRA-2		At least 90 days prior to any construction-related helicopter use on the Project, Southline and its construction contractor will coordinate with the FAA for review and approval of plans for any helicopter flights that will take place during construction and operation. Southline and its construction contractor will then provide information to the BLM and Western regarding the intended need and use of helicopters during construction and operation of the Project, including the Flight and Safety Plan; the estimated number of days and hours that the helicopter will operate; the type and number of helicopters that will be used; the location, size, and number of staging areas for helicopter takeoffs and landings; and written approval from property owners for use of helicopter staging areas.	X	X	X	
	X	If any existing roads were to be damaged by Southline or its construction contractor during construction activities and/or truck traffic, the road will be repaired.		X		
	X	In order to mitigate traffic impacts on primary roads in metropolitan areas, shift changes for construction crews will not occur during the peak hours for the road during construction. Oversize or overweight vehicle movements will be planned for nighttime hours, where practical and not detrimental to safety or evening residential noise levels, or those specified in permitting regulations in order to minimize traffic disruptions.	X	X		
	X	In order to reduce public access to BLM roads and adjacent lands that are not currently accessible by the public, the Proponent will fence off or place restricted access signage at new access roads, where appropriate.	X	X	X	
	X	Throughout the permitting and design phase, the Proponent will correspond with Federal, State, and local transportation agencies in order to avoid Project inconsistencies with current and future transportation plans.	X			
	X	Throughout the permitting and design phase, the Proponent will correspond with Federal, State, and local airports in order to ensure that the FAA criteria for structures near airports are met, and to avoid Project inconsistencies with identified airport plans.	X			
	X	Identify transmission-structures with high-visibility markers in areas where they intersect or parallel MTRs.			X	
	X	Provide gates and fencing in areas where OHV use will be restricted due to military operations, or to protect sensitive resources.		X	X	X
Vegetation						
VEG-1	X	Efforts will be made to minimize vegetation removal and permanent loss at construction sites to the extent practicable. Access will not be graded unless necessary for erosion control or other engineering reason. Final structure and spur road locations will be selected to avoid special status vegetation to the greatest extent feasible.		X		
VEG-2	X	Southline and its construction contractor have developed a Reclamation, Vegetation, and Monitoring Plan (Appendix B15) that will guide restoration and revegetation activities for all disturbed lands associated with construction of the Project and its eventual termination and decommissioning. The plan addresses all land disturbances, regardless of ownership. It has been developed in consultation with appropriate agencies and landowners and will be provided to these entities for review and input. The plan provides details on topsoil segregation and conservation, vegetation treatment and removal, salvage of appropriate species, and revegetation methods, including use of native seed mixes, application rates, transplants, and criteria to monitor and evaluate revegetation success.	X	X	X	X
VEG-3	X	Special-status plants, including the Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), will be avoided. Where avoidance is not possible, special status plants will be conserved by relocating plants and/or reseeding, replacing topsoil with existing topsoil that was removed, and regrading in compliance with local ordinances (Pima County, Tohono O'odham Nation). Measures to conserve special status plants will be implemented through the Reclamation, Vegetation, and Monitoring Plan.	X	X		X

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
VEG-4	X	Removal of riparian scrubland vegetation will be avoided where possible. Natural regeneration of native plants will be supported by selectively cutting vegetation with hand tools, mowing, trimming, or using other removal methods that allow root systems to remain intact.		X	X	X
VEG-5	X	In consultation with local BLM field offices and local resource agencies, Southline and its construction contractor will develop and implement a Noxious Weed Management Plan.	X	X	X	X
VEG-6	(see also PPC-3 and 4)	As required, equipment will be cleaned before ingress to minimize the potential for the spread of invasive species. These details will be described in the Noxious Weed Management Plan. Buffelgrass (*Pennisetum ciliare*) will be specifically addressed in the plan, which will outline efforts to control it within areas disturbed by the proposed Project to ensure that it does not spread to adjoining lands.	X	X	X	X
	X	Preconstruction native plant inventories, including Chihuahua scurfpea, and surveys for noxious weed species as stipulated by the appropriate land management agency will be conducted once transmission line center line, access road, and transmission line structure sites have been located.	X			
	X	Although the 150-foot ROW across the San Xavier District of the Tohono O'odham Nation was surveyed for Pima pineapple cactus in summer 2014, additional preconstruction species-specific surveys for the Pima pineapple cactus will be conducted once transmission line center line, access road, and transmission line structure sites have been located, as needed.	X			
	X	Preconstruction coordination with Pima County, the University of Arizona, and other appropriate groups will be conducted to minimize impacts to Tumamoc globeberry (*Tumamoca macdougalii*) monitoring plots and plants on Tumamoc Hill. Measures to conserve this plant, as well as other special status plants, will be implemented through the Reclamation, Vegetation, and Monitoring Plan.	X	X		X
	X	In construction areas where grading is not required, vegetation will be left in place wherever feasible, and original contours will be maintained to avoid excessive root damage and allow for regrowth. All existing roads will be left in a condition that is equal to or better than their condition before the construction of the transmission lines, as determined by the appropriate land management agency.		X		
		Field presence/absence surveys will be conducted for special status species in locations where such species are likely to occur within the Project ROW, and specifically locations where vegetation will be impacted, prior to any actual impacts. Surveys will be conducted following established protocols by qualified biologists approved by BLM.	X			
	X	Southline and its construction contractor will provide training to all appropriate field personnel working on the Project to identify noxious weeds and prevent spread. Training will discuss known invasive and noxious weed species, known locations, identification methods, and treatment protocols. Training materials and a list of Project personnel completing the course will be provided to the BLM and Western.		X		
	X	Invasive and noxious weed populations will be mapped and reported to BLM/Western. BLM and Western will determine which areas will necessitate vehicle washing, based on the results of the invasive/noxious weed surveys.	X	X		
	X	Noxious weeds and other exotic, invasive plant species will be inventoried by a qualified biologist in the immediate proximity to any sensitive plant communities and any special status species populations. This noxious weed inventory will then provide information to supplement mitigation plans for sensitive plant communities and/or special status species habitats, to prevent the expansion of any noxious weeds or other exotic invasive plant species into those locations. Mitigation planning shall be included as part of the Plant and Wildlife Species Conservation Measures Plan.	X			
	X	Southwest Regional Gap Analysis Project plant associations (communities) that are considered to be environmentally sensitive will be included in ground-truthing field surveys, such as wetlands, riparian areas, drainages, and special status species habitats, to confirm the presence and extent of such communities. If any such sensitive plant communities are identified and documented, the first response will be a determination regarding whether the sensitive community can be avoided. If avoidance is not possible, a mitigation plan (included as part of the Plant and Wildlife Species Conservation Measures Plan) will be developed as needed for those vegetation communities, including options to reduce impacts to those communities. Exclusion zones (at least 10 feet around the perimeter of the plant community) will be delineated around any such plant communities and marked with flagging. Construction monitoring shall be employed around any such sensitive plant communities, and the biological monitor shall have the authority to halt any construction activity deemed intrusive and causing impacts beyond those stated in the mitigation plan. Any changes in construction plans that occur after the Project approval will require additional field presence/absence surveys for such sensitive plant communities and will require a variance request from the BLM if such communities are found, and the above mitigation measures will apply.	X			
	X	A compensation plan will be developed as part of the Plant and Wildlife Species Conservation Measures Plan, to meet BLM requirements and approval. The compensation plan will include calculations of compensation ratios and mitigation acreages for special status plant species requiring additional mitigation. Compensatory mitigation could include payment of an in-lieu fee, acquiring mitigation land or conservation easements, or a combination of the two.	X			
	PPC-1	For Pima pineapple cactus that cannot be avoided, Southline will purchase credits in a U. S. Fish and Wildlife Service (FWS)-approved conservation bank for Pima pineapple cactus, corresponding to the area of permanent disturbance to occupied Pima pineapple cactus habitat. Alternatively, Southline may purchase suitable mitigation lands within Pima County's Pima pineapple cactus Priority Conservation Areas.	X			
	PPC-2	In compliance with Executive Order 13112 regarding invasive species, all disturbed soils that will not be landscaped or otherwise permanently stabilized by construction shall be seeded using species native to the project vicinity.		X		
	PPC-3	Also in compliance with Executive Order 13112 regarding invasive species, all earthmoving and hauling equipment shall be washed at the contractor's storage facility prior to arriving onsite to prevent the introduction of invasive species.		X		

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
	PPC-4	To prevent invasive species propagules from leaving the site, the contractor shall inspect all construction equipment and remove all attached plant/vegetation and soil/mud debris identified prior to leaving the construction site.		X		
	PPC-5	Any Pima pineapple cactus that are not within the area of permanent disturbance, but are present within the Project vicinity, shall be flagged by a qualified biologist prior to the commencement of work to avoid accidental damage during construction. Flagging will be removed following construction. Flagging will consist of flagging the area around the Pima pineapple cactus, not flagging the plant itself, and signage will label it as an "Environmentally Sensitive Area". Flagging will be removed following construction.	X	X		
	PPC-6	Any Pima pineapple cactus that cannot be avoided will be conserved by relocating plants within the existing ROW, but outside of the area of any ongoing disturbance.	X	X		
	BO-CM (Biological Opinion-Conservation Measures)	BLM and Western will coordinate with the Arizona-Sonoran Desert Museum in salvaging for the museum's collection if individual Pima pineapple cactus cannot be relocated for some reason.	X	X		
		Pre-construction surveys for Chihuahua scurfpea and other special status plant species will occur in suitable habitat and ground disturbance in occupied habitat will be avoided to the extent practicable. FWS shall be contacted prior to disturbance if an Chihuahua scurfpea are located.	X	X		
	X	Prickly Russian thistle (*Salsola tragus*), Sahara mustard (*Brassica tournefortii*), and fountain grass (*Pennisetum setaceum*) are not identified as noxious weeds in Arizona. However, if these species are present in the ROW and not present in adjacent areas, thus indicating that project activities caused the introduction and spread of these species, then measures will be taken to treat these invasive species in the ROW.				
	X	If noxious weed species on the 2006 list, which currently have small and limited distributions in the state and/or are identified as "alert" species in AZ-WPIG are identified in and/or adjacent to the ROW, the BLM/Southline will attempt to coordinate with the adjacent landowner to treat and eradicate, if possible, these uncommon noxious weeds.				
	X	The responsible Project operator will comply with agency requirements regarding management of noxious weeds within the ROW, along access roads, and at temporary use areas (e.g., cleaning equipment to prevent spread of noxious weeds). Chemical treatment within or adjacent to the ROW generally would be limited only to areas with noxious weeds, and only if absolutely necessary.				
Visual Resources						
VIS-1		In order to restore disturbed areas to an appearance that will blend back into the overall landscape, seeding and/or planting will be conducted in any area that has been cleared or disturbed during construction. Seed mix will be tailored to an area's soil type, existing vegetation, and native species.		X		X
VIS-2	X	The alignment of any new access roads (including unimproved spur roads) will stay within the designated access ROW and will follow the designated area's landform contours and avoid steep areas as much as feasible, provided that such alignment does not additionally impact resource values. This will minimize ground disturbance and/or reduce scarring (visual contrast).	X	X		
VIS-3		During the construction period, dust suppression measures will be used to minimize the creation of dust clouds potentially associated with the use of access roads.		X		
VIS-4	X	The Project will incorporate nonspecular conductors into the Project design to decrease reflectivity and visibility of Project features.	X	X		
	X	Non-transmission line structures such as operations and maintenance buildings, microwave equipment buildings, regeneration structures, emergency generators, and other associated structures will be treated or painted with non-reflective, flat-toned surface treatment. The color of the structures will be painted BLM Environmental Color Chart "Shadow Gray", unless otherwise directed by the authorized officer based on a field evaluation of color choices that will demonstrate better measurable performance over Shadow Gray. BLM Visual Resource Management staff shall be consulted and shall approve color selection relative to site-specific structures to be painted.		X	X	
	X	All lattice towers shall be "dulled" non-specular metal and monopoles properly color treated (BLM Environmental Color Chart "Shadow Gray").	X	X		
	X	Aerial markers or warning lights will be installed on conductors or structures if required by FAA, U. S. Customs and Border Protection, and DOD regulations for structures over 130 feet. The use of red strobe lighting will reduce potential impacts from artificial night lighting and will reduce impacts from night brightness and viewing of night skies. The minimum number and intensity of lights will be used, given that the tallest structures are under the 200-foot FAA requirement (FAA Advisory Circular 70/7460-1K (FAA 2007)). Exterior lights installed on conductors or other facilities will be aviation warning lights, or FAA L-864 aviation red-colored flashing lights with 20 to 40 flashes per minute standard flashing range.		X	X	
	X	The alignment of new access roads or cross-country routes will follow the landform contours where practicable to minimize ground disturbance and reduce visual scarring of the landscape, provided that the alignment does not affect other resource values.	X	X	X	
	X	Clearing of trees in and adjacent to the ROW will be minimized to reduce visual contrast to the extent practicable to satisfy conductor-clearance requirements. Trees and other vegetation will be removed selectively to blend the edge of the ROW into adjacent vegetation patterns, as practicable and appropriate.	X	X	X	
	X	All new or improved access that will not be required for maintenance will be closed or rehabilitated to make it less visually apparent.	X	X	X	
		Tower design may be modified, or an alternative tower type may be selected, to minimize visual contrast as appropriate (BLM 2013o).	X	X	X	
	X	Standard tower design will be modified to correspond to spacing of existing transmission structures, where feasible and within the limits of standard tower design, to reduce visual contrast (BLM 2013).	X	X		
	X	At highway, canyon, and trail crossings, towers will be placed at the maximum feasible distance from the crossing within the limits of standard tower design to reduce visual impacts.	X	X		

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
Water Resources						
WAT-1		A Project-specific construction SWPPP will be prepared prior to the start of construction of the transmission line and substations in compliance with Clean Water Act (CWA) Section 402, if required. The SWPPP will use BMPs to address the storage and handling of hazardous materials and sediment runoff during construction activities to minimize the risk of an accidental release. As part of the SWPPP, soil disturbance at structure construction sites and access roads will be the minimum necessary for construction and will be designed to prevent long-term erosion, through activities such as restoration of disturbed soil, revegetation, and/or construction of permanent erosion control structures. A U.S. Army Corps of Engineers permit will be obtained prior to the start of construction of the transmission line and substations for the discharge of dredged or fill material in compliance with CWA Section 404, if required. Activities in and around streams and wetlands will be designed to avoid, minimize, and mitigate impacts to WUS.	X	X		
WAT-2		Construction equipment will be kept out of flowing stream channels, unless feasible alternatives are not available. Structures will be located to avoid active drainage channels, especially downstream of steep slope areas, to minimize the potential for damage by flash flooding and mud and debris flows.	X	X		X
WAT-3		Flood-control devices will be located where required to protect structures from flooding or erosion. Appropriate design of structure foundations will be used to prevent scour or inundation by a 100-year flood and to avoid disturbed areas. The locations of transmission structures will be designed to avoid steep, disturbed, or otherwise unstable slopes. If drainages cannot be avoided by structure placement, Southline and its construction contractor will design drainage crossings to accommodate estimated peak flows and ensure that natural volume capacity can be maintained throughout construction and upon post-construction restoration.	X	X		
	X	Roads will be built as close as possible to right angles to the streams and washes. Culverts or temporary bridges will be installed where conditions warrant. All construction and operations activities shall be conducted in a manner that will minimize disturbance to vegetation, drainage channels, and intermittent or perennial stream banks.		X		
	X	If a route is approved near the internal border, construction activities should be accomplished in a manner that does not change historic surface runoff characteristics at the international border. Copies of any hydrologic or hydraulic studies and site-specific drawings for work proposed in the vicinity of the international boundary will be submitted to the U.S. International Boundary and Water Commission.	X	X	X	X
	X	To the extent practicable, structures will be sited with a minimum distance of 200 feet from streams.	X			
Wildlife						
WILD-2		In consultation with the BLM and Western, Southline and its construction contractor will prepare and implement a Construction Biological Monitoring Plan prior to issuance of a notice to proceed and prior to construction that will specify the level of biological monitoring to be provided throughout construction activities in all construction zones with the potential for presence of sensitive biological resources. The number of monitors and monitoring frequency will be specified for each work zone.	X	X		
WILD-3		Preconstruction surveys will be required in areas where Sonoran desert tortoise (now a separate species: Morafka's desert tortoise (*Gopherus morafkai*)), and Gila monster (*Heloderma suspectum*) are expected to occur. In consultation with the BLM and Western, Southline and its construction contractor will hire qualified biologists to conduct preconstruction surveys in ground disturbance areas within suitable habitat for appropriate special status species.	X			
WILD-4		To reduce impacts on the Sonoran (Morafka's) desert tortoise, known to exist in the western portion of the project area, only authorized biologists with a valid AGFD permit will handle desert tortoises if encountered within the Project area, following the most current desert tortoise handling guidelines published by the AGFD.		X		X
WILD-5		To reduce impacts on all species protected by the Migratory Bird Treaty Act (MBTA), (1) Southline and its construction contractor will conduct preconstruction surveys for active nests, and consult with the appropriate agencies (BLM, FWS, or AGFD) on a case-by-case basis when active nests are found in Project areas, unless directed to do otherwise by these same agencies; (2) a buffer will be placed around active bird nests, and nests will not be moved during breeding season, in compliance with the MBTA, unless the Project is expressly permitted to do so by the FWS or BLM, depending on the location of the nest; (3) all active nests and disturbance or harm to active nests will be reported to the FWS or BLM, upon detection; and (4) work will halt if it is determined that active nests will be disturbed by construction activities, until further direction or approval to work is obtained from the appropriate agencies.	X	X		
WILD-6		To reduce impacts on golden eagles and other raptors, Southline and its construction contractor will develop and implement an APP, in coordination with AGFD and the BLM and Western for approval. The plan will be prepared in accordance with guidance provided by the FWS and in consultation with best practices such as the "Reducing Avian Collisions with Power Lines" (APLIC 2012).	X	X	X	X
WILD-7		Southline and its construction contractor will follow Pima County guidelines for surveys prior to disturbance located in Pima County for western burrowing owls (*Athene cunicularia*). Surveys for western burrowing owl will also be conducted in Cochise County near agricultural fields surrounding the Willcox Playa, and anywhere else throughout the Project where suitable habitat occurs. Surveys for western burrowing owls in Arizona will follow the "Burrowing Owl Project Clearance Guidance for Landowners" (AGFD 2009).	X	X		
		Surveys for western burrowing owl in New Mexico will follow the NMDGF "Guidelines and Recommendations for Burrowing Owl Surveys and Mitigation" (NMDGF 2007).	X	X		
WILD-8		Final structure and spur road locations will be adjusted to avoid sensitive wildlife resources to the greatest extent feasible.	X	X	X	

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
AGFD-1	X	Preconstruction surveys for non-game sensitive species such as ornate box turtle (*Terrapene ornata*), western burrowing owl (*Athene cunicularia*), Texas horned lizard (*Phrynosoma cornutum*), kit fox (*Vulpes macrotis*), etc. Timing of the surveys will be determined through consultation with AGFD and NMDGF	X			
		Preconstruction surveys for species listed under the Endangered Species Act or specified by the appropriate land management agency as sensitive or of concern will be conducted in areas of known occurrences or suitable habitat. Timing of the surveys will be determined by FWS-approved, species-specific survey protocol.	X			
	X	Monitoring of construction activities will be required in some areas to ensure that effects on these species are avoided during construction. If bald eagle (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*) nests are identified during preconstruction surveys, seasonal restrictions on construction within a specified buffer will be implemented where applicable, according to FWS protocols, to comply with the Bald and Golden Eagle Protection Act. Preconstruction nesting-season surveys for migratory birds and surveys for burrowing owls in suitable habitat will be conducted as needed to comply with the MBTA.		X		
	X	Surveys for bat roosts will be conducted within 0.25 mile of the Project ROW in areas that potentially contain caves, karst features, or mines. Occupied bat roosts will be avoided.	X			
	X	Clearing, grubbing, blading, and access road improvements occurring within identified sensitive areas will be conducted outside the breeding season for most desert-nesting migratory birds.	X	X		
	X	Construction holes left open overnight will be appropriately fenced or covered to prevent damage to wildlife or livestock. They will be inspected daily until filled to ensure no wildlife has become entrapped.		X		
	X	Except where otherwise posted or allowed, a Project speed limit of 25 mph will be designated for all construction areas, spur roads, and new access roads to minimize the potential for construction equipment collisions with wildlife. In areas with mountainous terrain and/or poor site distances, the Project speed limit will be 15 mph.		X		
	X	In construction areas where recontouring is not required, vegetation will be left in place wherever possible, to avoid excessive root damage and allow for resprouting.		X		
	X	If designated suitable bighorn sheep (*Ovis canadensis*) habitat along subroute 1.2 in segment S2 were to become occupied by bighorn sheep, then no Project facilities except transmission lines will be built in that area, if that route is selected.		X		
	X	To avoid impacting roosting bats at the Ina Road bridge, blasting activities will be restricted to less than 130 decibels (dB) if possible, and if that is not possible, then blasting activities will occur at night after most bats have left their roost. No blasting will occur in April or May when the maternity colony is present.		X		
AGFD-2	X	Southline will fund the relocation of Crane Lake, including acquisition of land if necessary, construction of the lake and associated infrastructure, revegetation, and visitor facilities. This will include operation and maintenance costs of the lake and infrastructure for the life of the Project, with the renewal of commitment upon future renewal of the Project permit.	X	X	X	
AGFD-3	X	Southline will provide funding to improve riparian emergent wetlands on three historic ponds near Kansas Settlement Road. Wetlands will be constructed to AGFD specifications and adequately equipped with pumps, liners, and drains to ensure that wildlife values are maintained.	X	X	X	
AGFD-4	X	Southline will fund the removal of non-native flora and revegetation with native flora on the Willcox Playa Wildlife Area.	X	X	X	
	LNB-1	All paniculate agaves (*Agave palmeri*, *A. parryi*, and *A. chrysantha*) and saguaros (*Carnegiea gigantea*) will be inventoried within the proposed ROW, and the potential to avoid or salvage each plant will be assessed. The priority will be avoidance when feasible.	X	X		
	LNB-2	All suitable (e.g., healthy, undamaged, not flowering) paniculate agaves that cannot be avoided will be salvaged using methods approved by the BLM/Western and FWS, but mature agaves will be given preference for avoidance when feasible. Plants salvaged from areas of permanent disturbance will be used to reclaim areas of temporary disturbance, or replanted outside disturbed areas if necessary.	X	X		
	LNB-3	Other species of agaves such as *A. schottii* that are not primary food plants for nectar-feeding bats will be salvaged and used for reclamation in accordance with to the Reclamation, Vegetation, and Monitoring Plan.	X	X		
	LNB-4	Saguaros less than 15 feet in height will be salvaged, unless prevented by site-specific conditions or poor plant health. Plants salvaged from areas of permanent disturbance will be used to reclaim areas of temporary disturbance, or replanted outside of disturbed areas if necessary. Larger saguaros will be avoided whenever feasible, but will be topped or removed if necessary.	X	X		
	LNB-5	Agave and saguaro salvage will be augmented, as necessary within 3 years after completion of initial restoration activities. Augmentation will occur within the ROW in areas of higher value to bats (e.g., in the vicinity of active roosts, within areas of high concentration of agaves) to achieve a goal of no net loss of forage plants. Plant stocks from local sources or approved nursery-grown plants will be used.	X	X		
	LNB-6	Salvaged plants will be monitored following reclamation for a period of 3 years, as described in the POD. Supplementary water will be provided, if monitoring indicates that rainfall is insufficient to achieve the goal of no net loss of forage plants. Plant survival through the monitoring period will be reported annually to the BLM/Western and FWS.	X	X		
	WF-1	All non-emergency construction and maintenance in riparian woodlands at the San Pedro River, Cienega Creek, and the Santa Cruz River will take place between September 15 and March 1, to avoid disturbance of breeding or nesting southwestern willow flycatchers (*Empidonax traillii extimus*).		X		

Table 8. Environmental Protection Measures by Resource (Continued)

PCEM	Agency	Feature by Resource	Preconstruction	Construction	Operation and Maintenance	Decommissioning
	WF-2 YBC-2	Line marking devices will be placed at the proposed crossings of the San Pedro River, Cienega Creek, Santa Cruz River, and the Willcox Playa Wildlife Area, to minimize the potential for avian collisions with transmission lines.		X		
	YBC-1	All non-emergency construction and maintenance in riparian woodlands at the San Pedro River, Cienega Creek, and Santa Cruz River will take place between September 15 and March 1, to avoid disturbance of breeding or nesting yellow-billed cuckoos (*Coccyzus americanus*).		X		
	BAT-1	Construction activities that create sudden and sporadic loud noise (e.g., blasting) within 0.5 mile of the Volcano Mine complex will be restricted in the Spring (April 1 to May 31), depending on the presence of bats to protect maternity roosts and potential hibernacula.		X		
	BO-CM	BLM and Western will work with FWS, AGFD, and NMDGF to implement recovery actions for lesser long-nosed bat (*Leptonycteris yerbabuenae*), Mexican long-nosed bat (*Leptonycteris curasoae*), southwestern willow flycatcher, and yellow-billed cuckoo.	X			
	BO-CM	BLM and Western will work with FWS, AGFD, and NMDGF to participate in recovery planning and implementation of conservation actions for northern Mexican gartersnake (*Thamnophis eques megalops*), particularly on efforts to remove harmful nonnative species from occupied northern Mexican gartersnake habitat.	X			
	BO-CM	BLM, Western, and Southline will use the smallest mesh size possible (<0.5 inch) for erosion-control products, or products that do not contain any mesh- or net-like attributes near occupied northern Mexican gartersnake habitat. BLM, Western, and Southline will refrain from using erosion-control products (such as wattles), that contain a mesh size of 0.5 inch (or 1.27 cm) within proposed critical habitat for the northern Mexican gartersnake.		X		
	BO-CM (appendix B)	Preconstruction surveys will take place in habitat classified as moderate or high suitability for the northern aplomado falcon (*Falco femoralis septentrionalis*) within the proposed ROW and a 1-mile buffer. Surveys should be conducted several times from January 15 to June 30 in order to detect breeding activity.	X			
	BO-CM (appendix B)	All existing raptor nests or other large nests found during preconstruction surveys will be preserved in place, if possible, or relocated if necessary. No relocation of active nests will occur, and no nests will be relocated until after consultation with the Federal action agencies, State agencies, and FWS.	X	X		
	BO-CM (appendix B)	Construction will not take place within 1 mile of occupied northern aplomado falcon nests between January 15 and September 1. Aplomado falcons are frequently observed on their breeding territories in southern New Mexico in January. Therefore, January 15 is the start date for seasonal restrictions.		X		
	BO-CM (appendix C)	Preconstruction desert tortoise surveys will be conducted in suitable habitat. A WEAP that includes information on desert tortoises will be implemented. Any desert tortoises encountered during preconstruction surveys or during construction activities will be handled in accordance with the AGFD "Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects" (AGFD 2007).	X			

plans will be adjacent to the proposed Project: Rincon Posta Quemada (ASLD 2007), and Houghton Road Corridor Conceptual Plans (ASLD 2004).

III. FEDERAL GOVERNMENT PLANS

The CEC Proposed Route study area includes lands managed by the Bureau of Land Management ("BLM"), Department of Defense ("DOD"), and Bureau of Reclamation ("BR") (*see* Table H-1 and Exhibit A-2, Land Ownership and Jurisdiction). The analysis in this exhibit focuses on state, local, and private existing uses and land use plans; however, an extensive discussion of the federal land use regulations, policies, and plans in the study area can be found in Exhibit B-1, Final EIS Section 3.11.

IV. PRIVATE ENTITY PLANS

No private entity plans were identified on private lands in or in the vicinity of the CEC Proposed Route. ~~and CEC Substation study area.~~ Although the CEC Upgrade Route and CEC Substation expansions at Vail and DeMoss Petrie are located within the city limits of Tucson, they are located in non-residential areas. No new planned residential subdivisions are identified in or in the vicinity of the CEC Proposed Route. ~~study area.~~

V. FARM AND RANGELANDS PLANS

Farm and rangeland plans are implemented at the federal and state levels. Relevant management plans were reviewed to identify potential conflicts between the existing resource management objectives and the CEC Proposed Route. A summary of federal farm and rangeland laws, programs, and policies is located in Exhibit B-1, Final EIS Section 3.11.

The ASLD administers grazing on state lands. The ASLD issues grazing leases to ranchers following protocol issued in the "Arizona Standards for Rangeland Health and Guidelines for Grazing Administration" (University of Arizona 2012). The intent is to provide standards to ensure healthy rangelands, with management coordinated between the state and federal agencies.

VI. MILITARY

The CEC Proposed Route is located on, or in the vicinity of DOD Lands, Military Training Routes ("MTR"), and Military Operations Areas ("MOA"). Federal policies

EXHIBIT
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ADMITTED

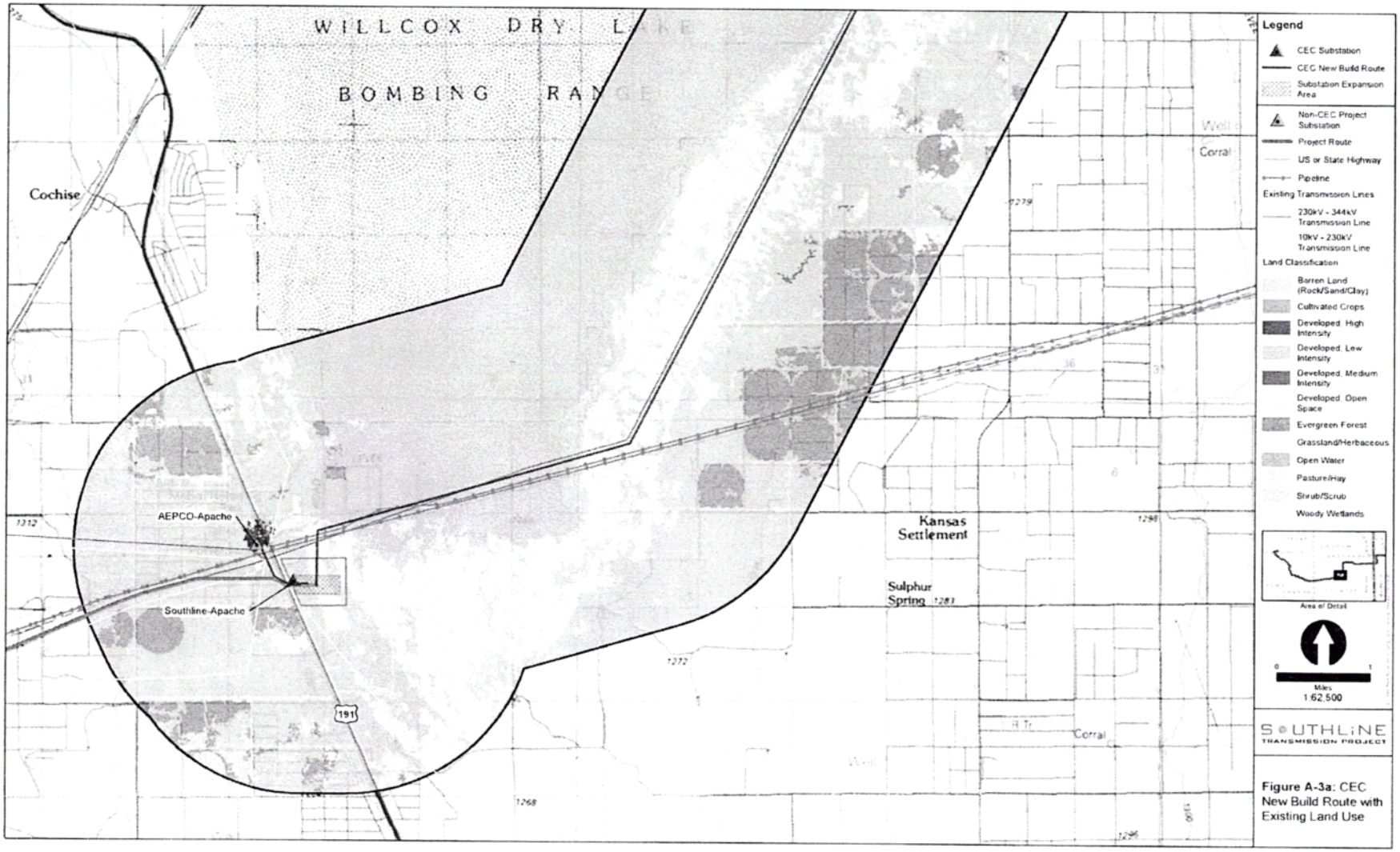

Figure A-3a: CEC New Build Route with Existing Land Use

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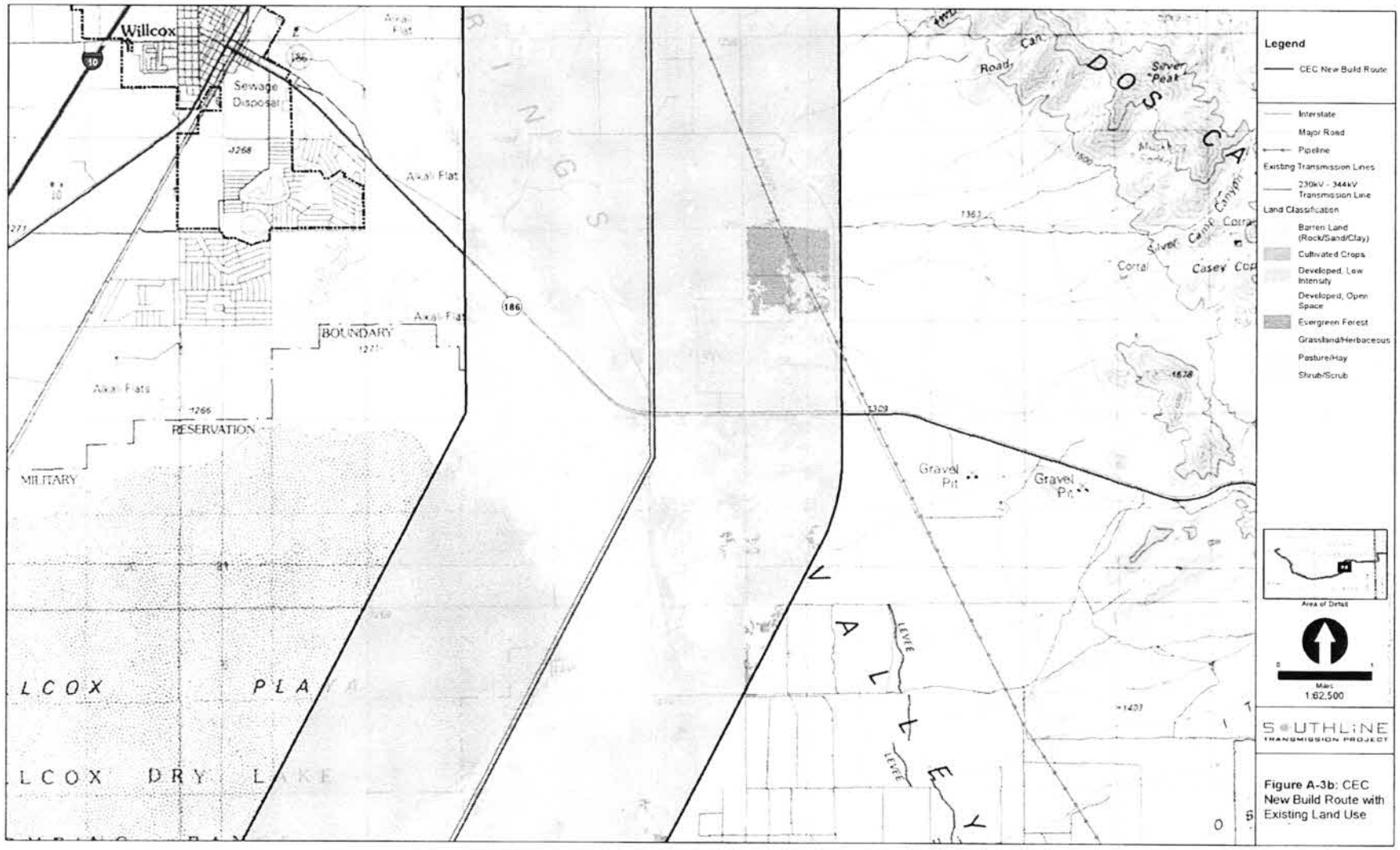


Figure A-3b: CEC New Build Route with Existing Land Use

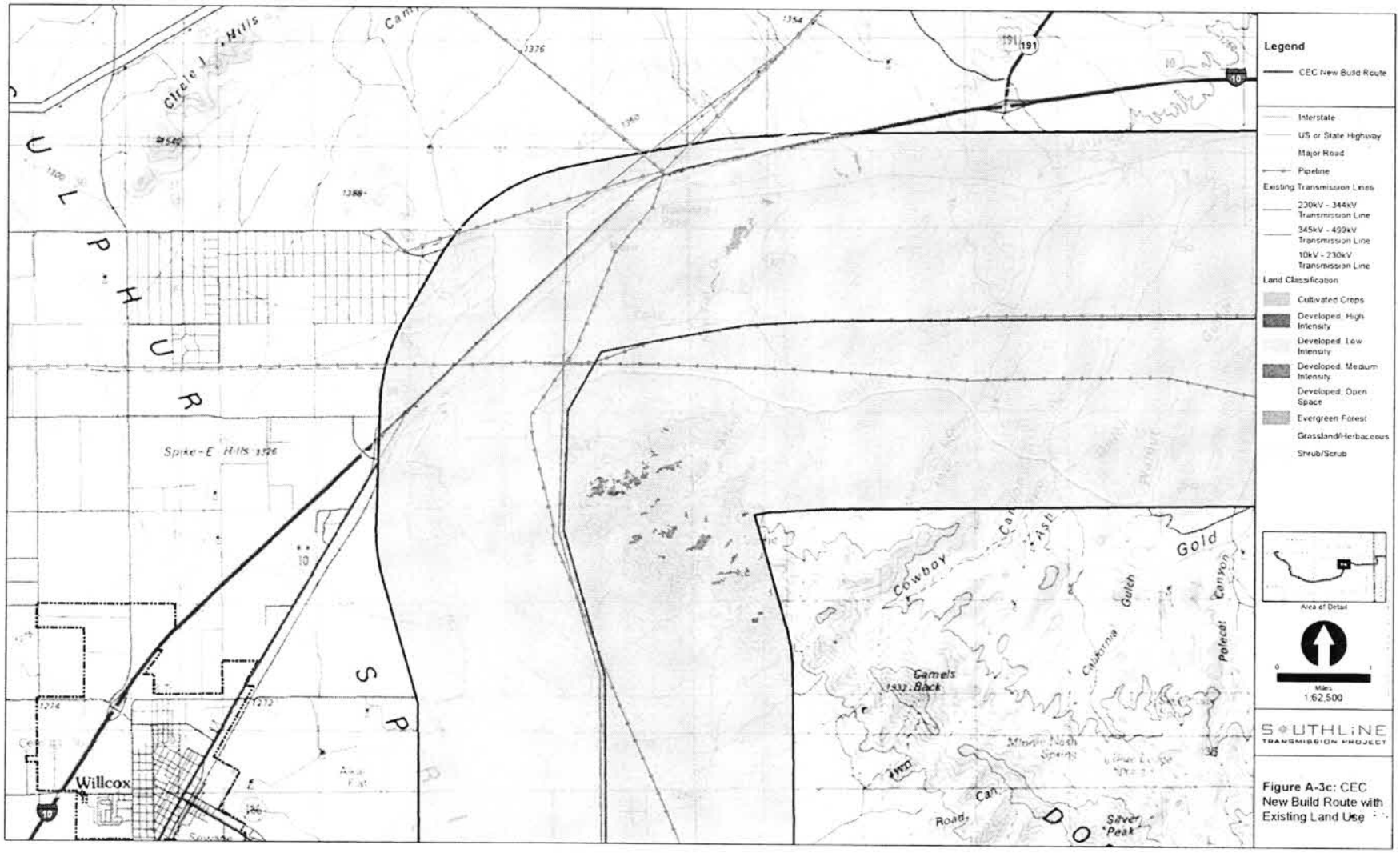


Figure A-3c: CEC New Build Route with Existing Land Use

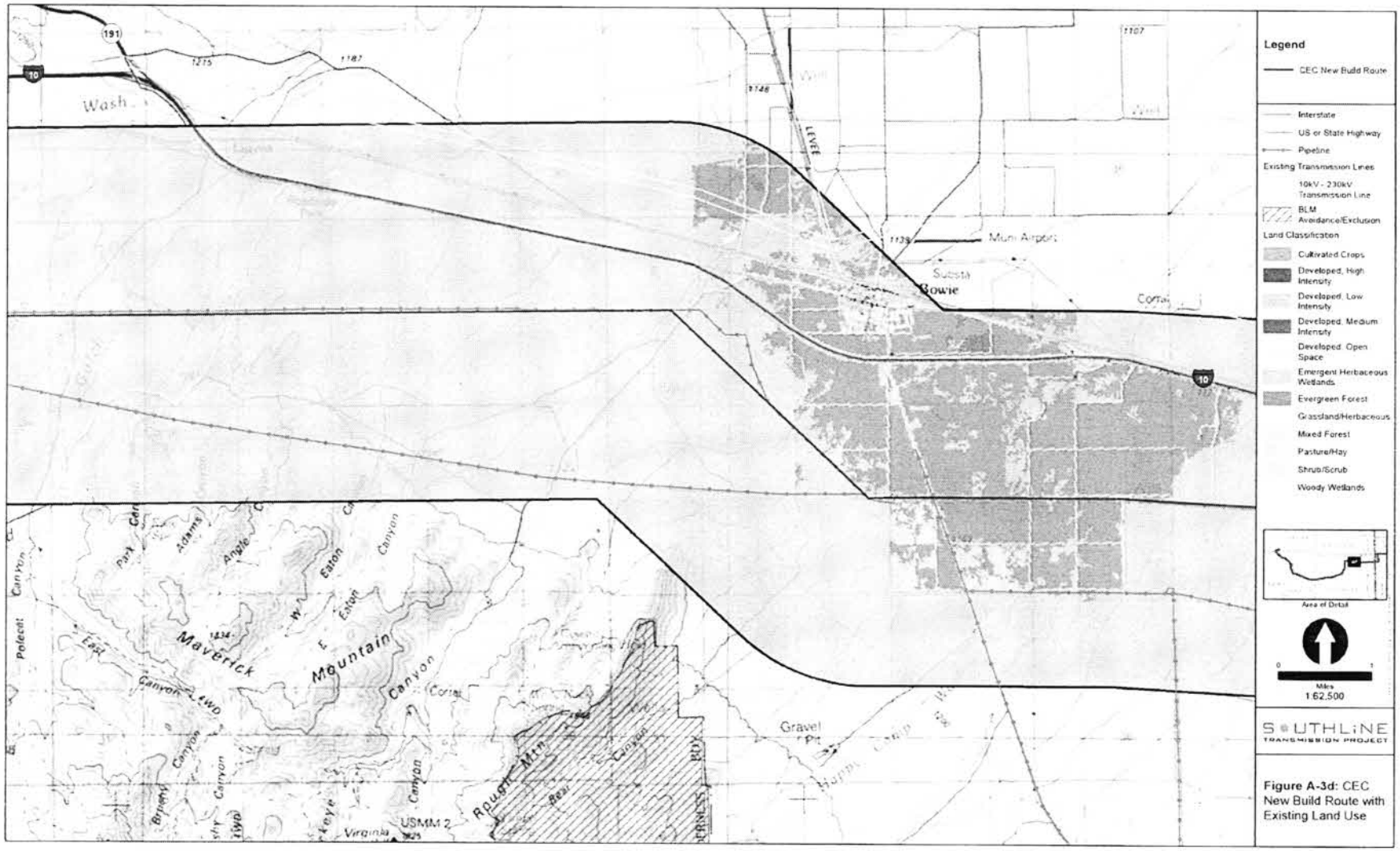


Figure A-3d: CEC New Build Route with Existing Land Use

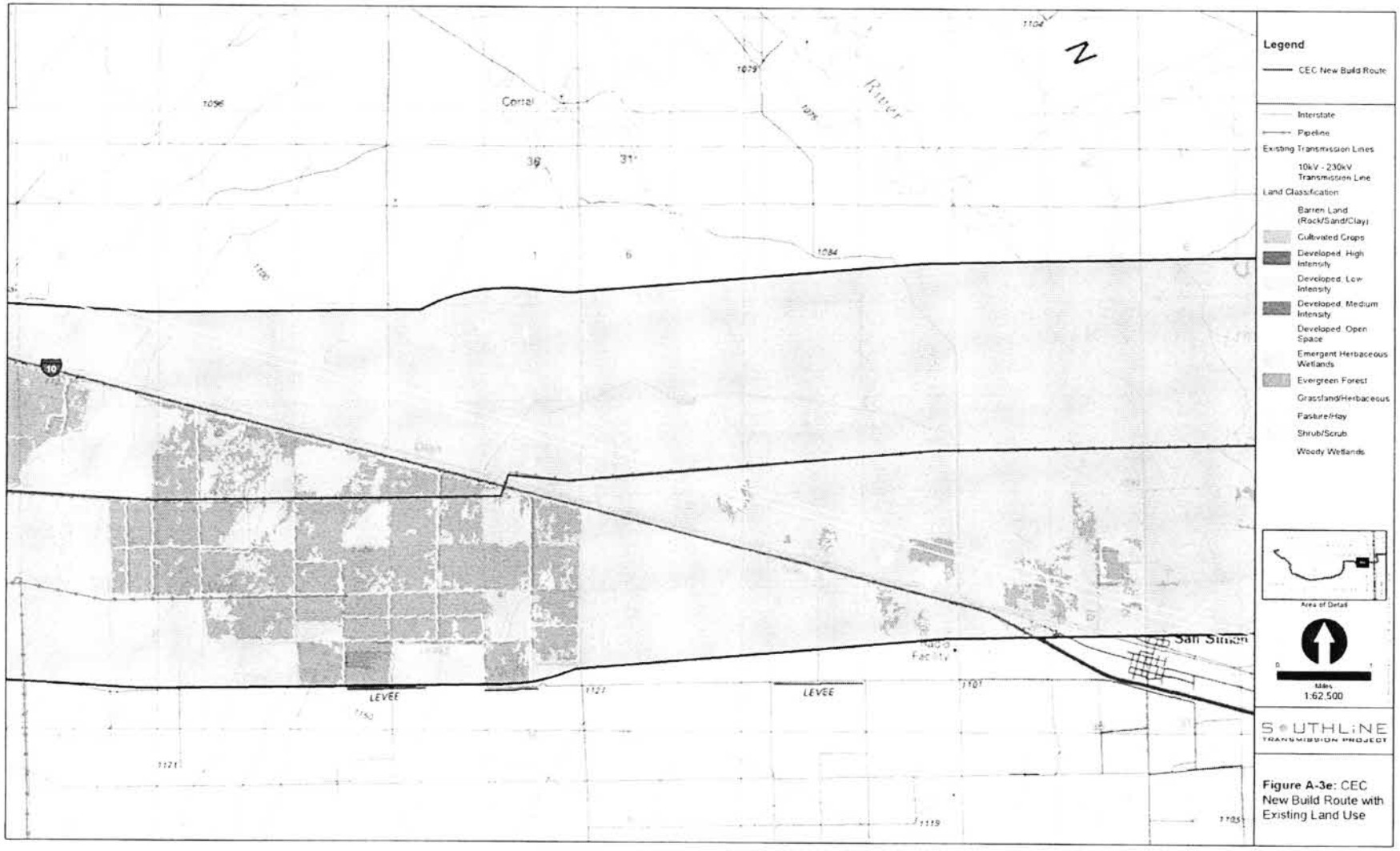


Figure A-3e: CEC New Build Route with Existing Land Use

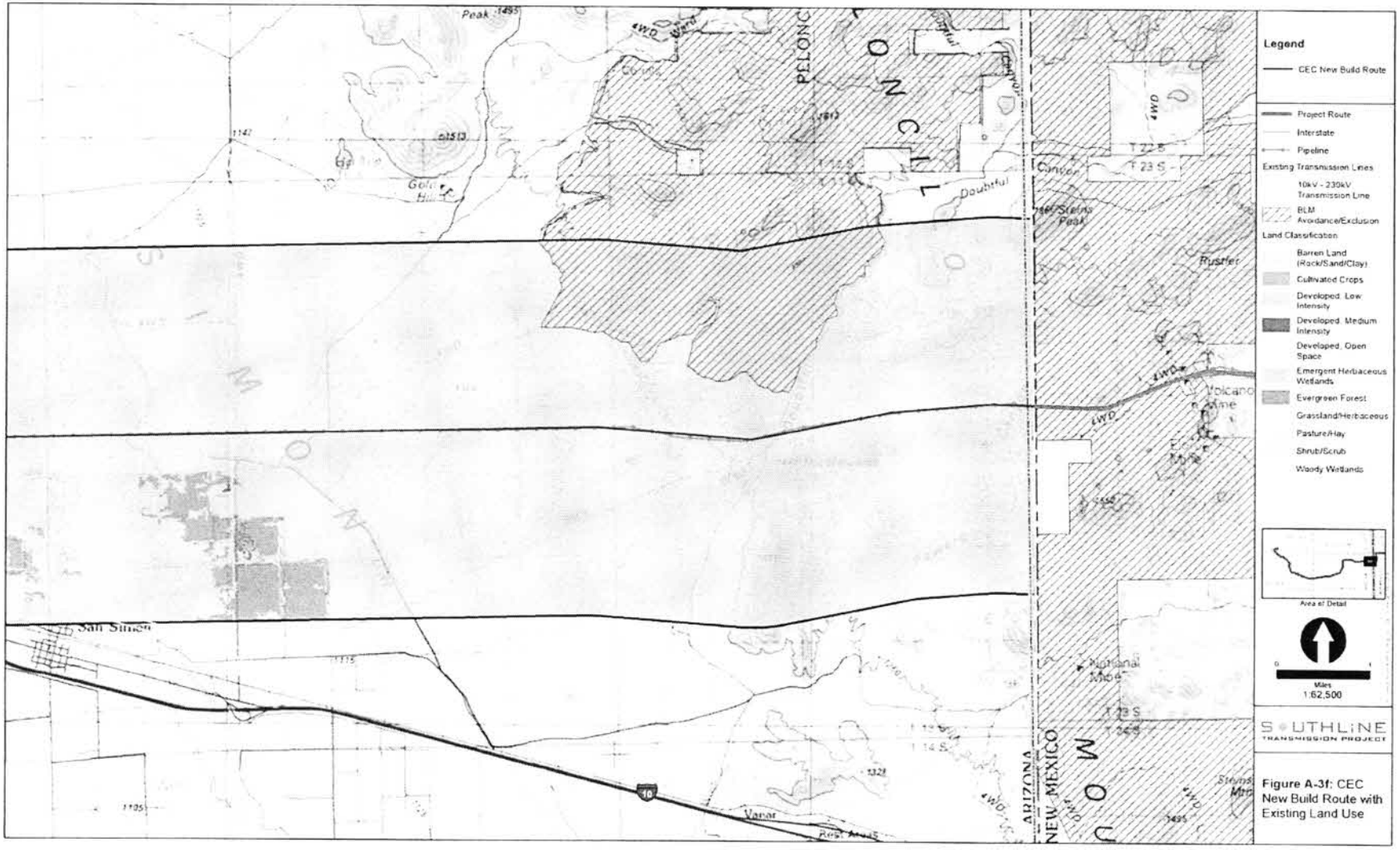


Figure A-3f: CEC New Build Route with Existing Land Use

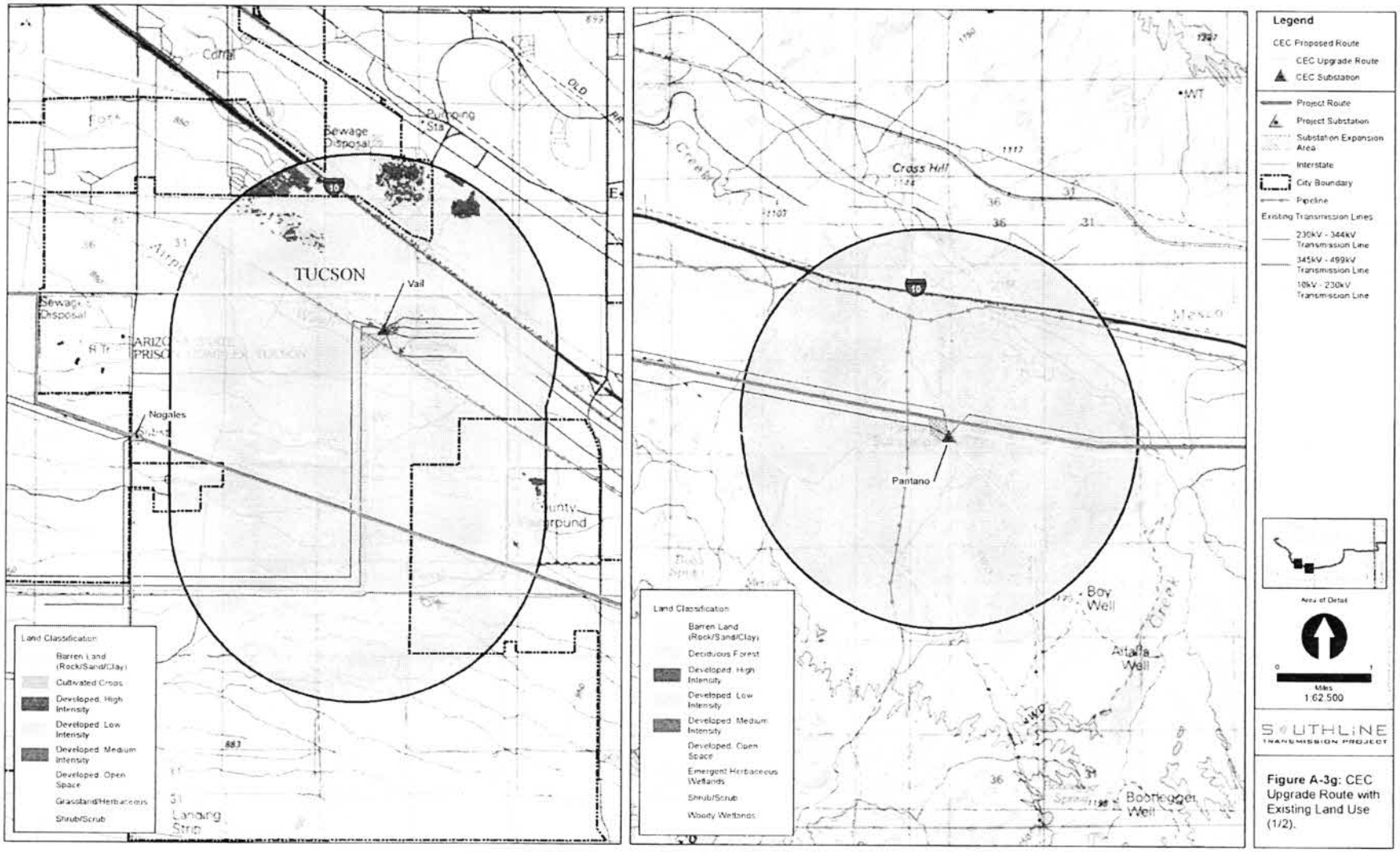


Figure A-3g: CEC Upgrade Route with Existing Land Use (1/2).

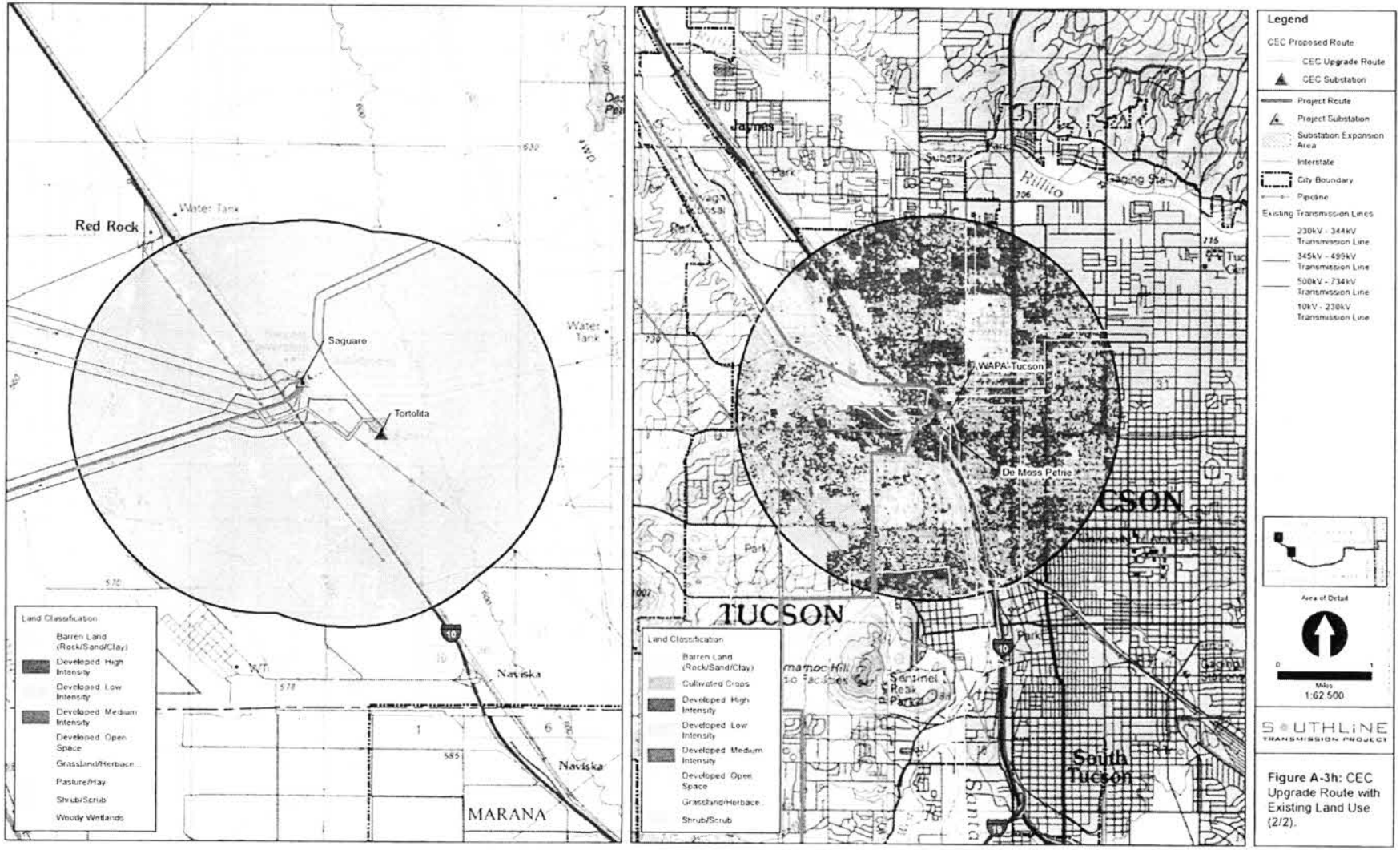
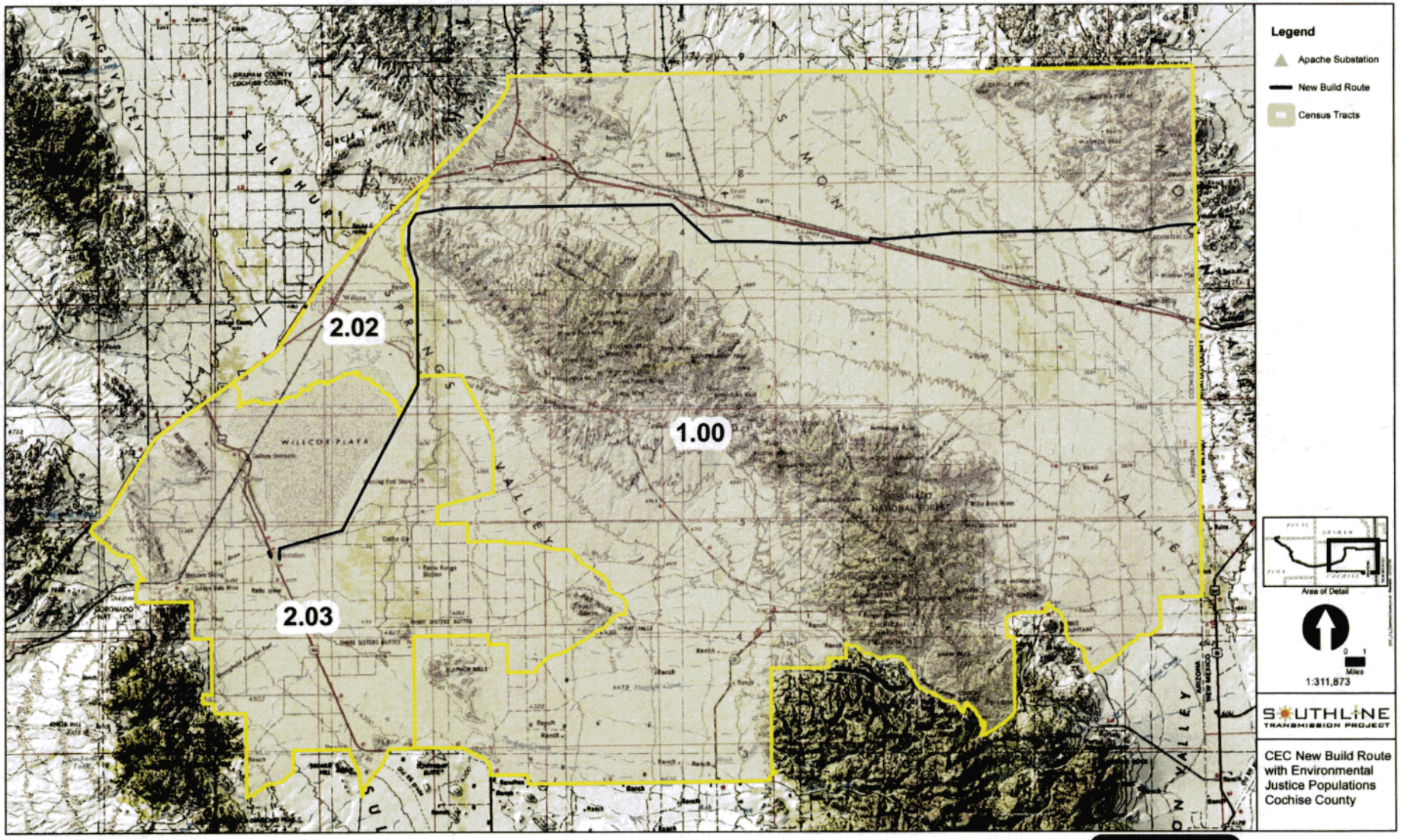


Figure A-3h: CEC Upgrade Route with Existing Land Use (2/2).



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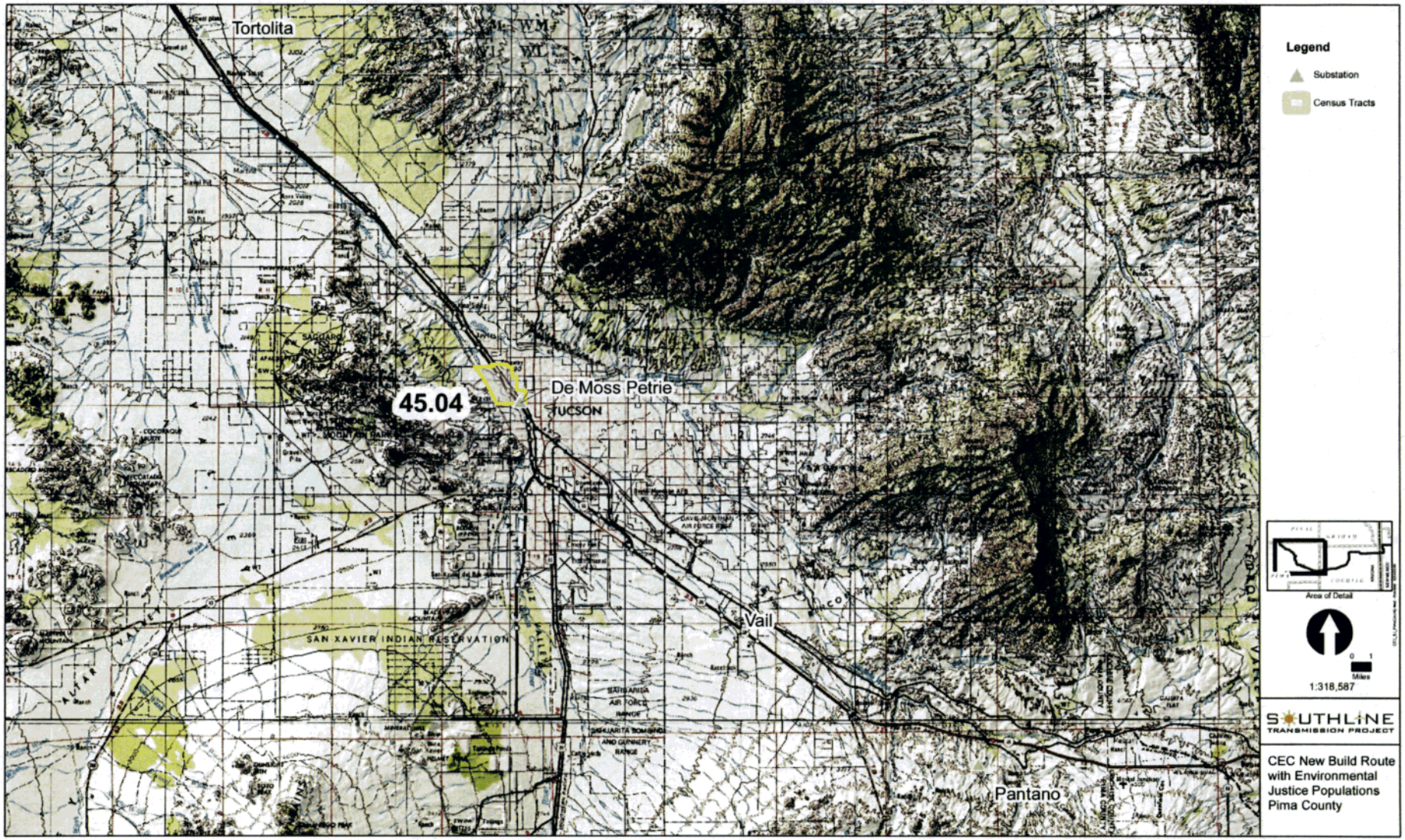
ADMITTED

STL 33


Tortolita
45.04
De Moss Petrie
TUCSON
Vail
SAN XAVIER INDIAN RESERVATION
Pantano
Legend
Substation
Census Tracts
Area of Detail
0 1
Miles
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SOUTHLINE
TRANSMISSION PROJECT
CEC New Build Route
with Environmental
Justice Populations
Pima County

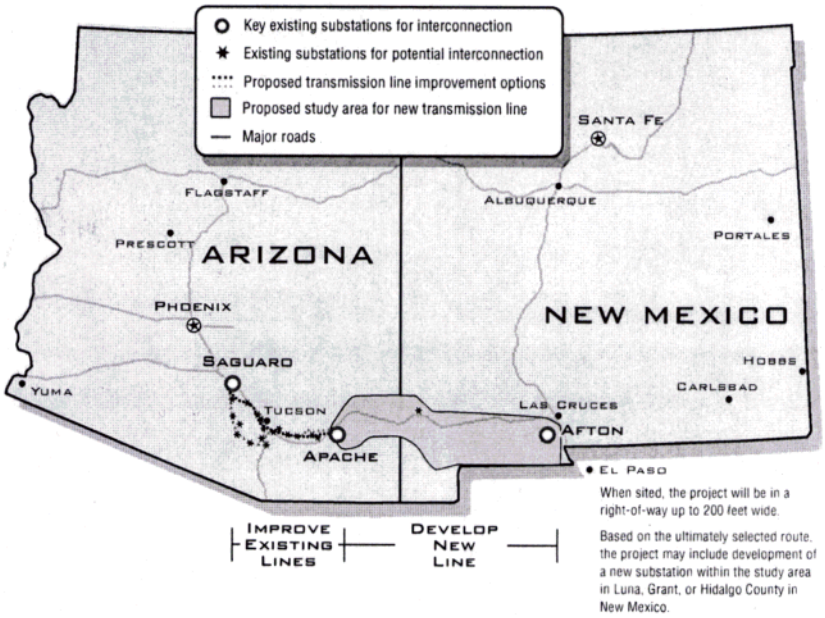
EXHIBIT
STL-34
ADMITTED

SOUTHLINE
TRANSMISSION PROJECT

What is the Southline Transmission Project?

The Southline Transmission Project is a proposed transmission line designed to collect and transmit electricity across southern New Mexico and southern Arizona, bringing electric system benefits to the Desert Southwest, one of America's fastest-growing regions. The Southline Transmission Project is being designed to minimize land and resource impacts by selecting a route along existing corridors such as abandoned rail lines, and by improving existing transmission lines where feasible – an innovative approach that respects the region's communities and natural and cultural resources. The project will consist of two segments:

- A **new 225-mile, 345 kilovolt (kV) double-circuit transmission line** between the existing substations at Afton (NM) and Apache (AZ)
- A series of improvements **to approximately 130 miles of existing transmission lines** between the Apache (AZ) and Saguaro (AZ) substations.



When sited, the project will be in a right-of-way up to 200 feet wide.

Based on the ultimately selected route, the project may include development of a new substation within the study area in Luna, Grant, or Hidalgo County in New Mexico.

Why is the Southline Transmission Project Needed?

- ***To sustain growth*** – The Desert Southwest is expected to experience substantial long-term growth, creating increased demand for energy.
- ***To ensure reliability*** – There are limited existing electrical connections in the area and many older lines that are approaching the end of their useful lives, raising reliability risks.
- ***To relieve congestion*** – Additional transmission capacity in the region is needed to help local utilities increase access to the most cost-efficient energy sources.
- ***To provide renewable energy*** – Satisfying the renewable energy requirements of western states requires access to and economic transmission of renewable resources; a major challenge facing renewable energy development is insufficient transmission access.

What Benefits Does the Southline Transmission Project Bring?

- ***Cost-effective, reliable electricity*** – By interconnecting with more than 10 substations along its route, the Southline Transmission Project will enable local utilities to meet energy demands.
- ***Local economic development*** – The Southline Transmission Project will facilitate local economic development through project construction, enhanced power reliability, and by enabling additional local renewable energy development.
- ***Resource conservation*** – Working from federal and state energy and land use planning efforts, using existing infrastructure, and developing a route along existing infrastructure corridors will minimize land use conflicts.
- ***Renewable energy*** – The Southline Transmission Project will enable renewable energy projects to connect to the electric system, helping states in the Desert Southwest meet renewable energy requirements.
- ***Smart, coordinated approach*** – The Southline Transmission Project team has worked closely with local utilities and other transmission providers since 2009 to ensure the Southline Transmission Project meets local needs and improves the region's electric system.

Summer - Fall 2011	2011 – 2012	2013 – 2014	2015
Public engagement and outreach, including public workshops to develop routing alternatives	Federal, state, and local permitting processes	Right-of-way acquisition, procurement, and construction	Targeted in-service date

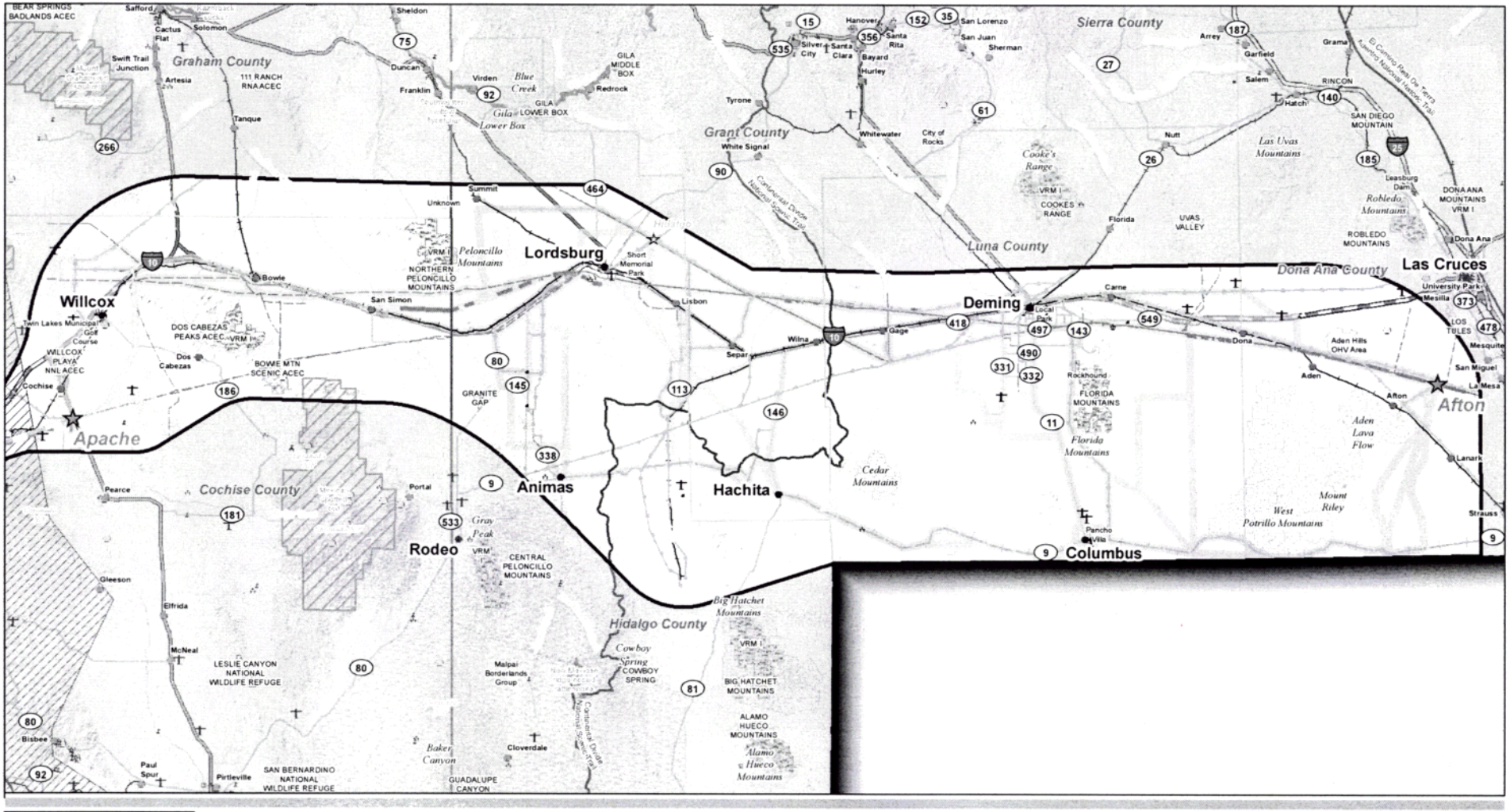
We look forward to working with you

As part of our planning process, we will be holding public workshops on routing alternatives.
We strive to respond rapidly to all inquiries, including requests for meetings and presentations.
Please visit our website to sign up for updates and to access the latest information.

Website: **www.southlinetransmissionproject.com** / Phone: **(888) 752-2822**
Email: **connect@southlinetransmissionproject.com**

July 2011

STL 34



Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Southwest Transmission Cooperative line for potential improvement
- Western Area Power Administration line for potential improvement

Reference Features
- City/Town
- Interstate
- US Highway
- State or County Highway
- Local, Neighborhood, Rural or City Street
- Railroad
- Abandoned Railroad
- River/Stream
- Waterbody
- County Boundary

Bureau of Indian Affairs
Bureau of Land Management
Department of Defense
US Forest Service
US Fish and Wildlife Service
National Park Service
Private
State

Constraints
- Airport
- School
- Hospital
- Church
- Cemetery
- National Register of Historic Place
- National Trail/Historic Trail
- Areas of Critical Environmental Concern
- Ft. Huachuca Electronics Testing Area
- Threaten and Endangered Species Habitat
- Wilderness Area
- Wilderness Study Area
- National/Local Conservation Area
- National Wildlife Refuge
- Visual Resource Management Class I
- State/Local Recreation Area or Park
- Malpai Borderlands Group
- Center Pivot Irrigated Farmland
- State Scientific Area

Opportunities
- Viable Routing Opportunity
- Section 368 Energy Corridor
- Gas Pipeline

Existing Transmission Lines
- 345kV
- 230kV
- Below 230kV

N

0 5 10
Miles

1:790,000

Opportunities and Constraints
New Build Section

Date: 9/16/2011

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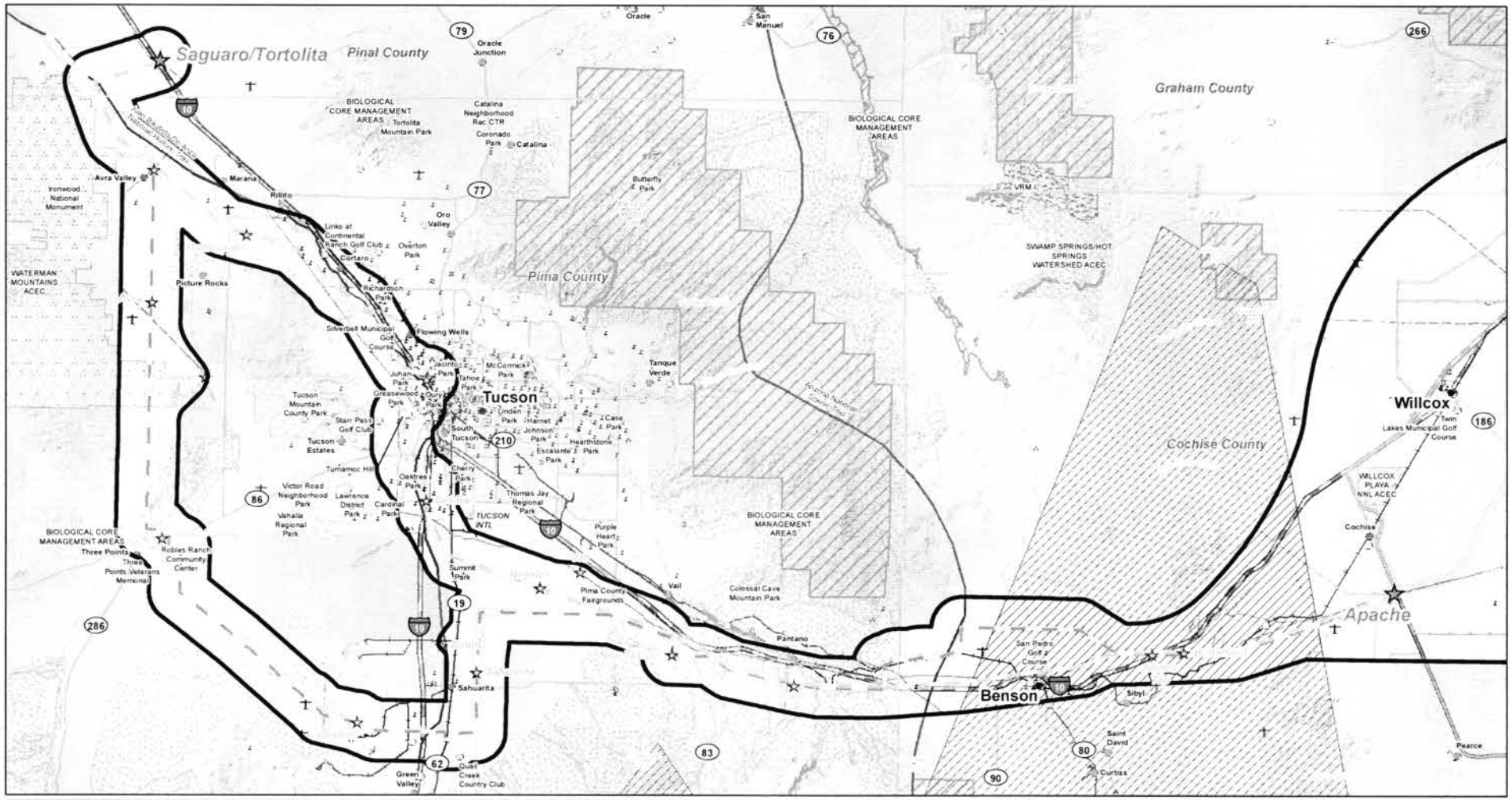
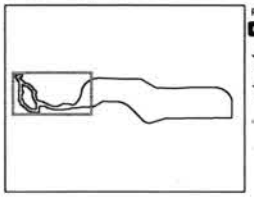
ADMITTED





Project Features
- Proposed Study Area
- Key Interconnection Substation
- Existing Substation for Potential Interconnection
- Southwest Transmission Cooperative line for potential improvement
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Reference Features
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Bureau of Indian Affairs
Bureau of Land Management
Department of Defense
US Forest Service
US Fish and Wildlife Service
National Park Service
Private
State

Constraints
- Airport
- School
- Hospital
- Church
- Cemetery
- National Register of Historic Place
- National Trail/Historic Trail
- Areas of Critical Environmental Concern
- Ft. Huachuca Electronics Testing Area
- Threaten and Endangered Species Habitat
- Wilderness Area
- Wilderness Study Area
- Sonoran Desert Conservation Plan - Biological Core Area
- National/Local Conservation Area
- National Wildlife Refuge
- Visual Resource Management Class I
- State/Local Recreation Area or Park
- Malpai Borderlands Group
- Center Pivot Irrigated Farmland
- State Scientific Area

Opportunities
- Viable Routing Opportunity
- Section 368 Energy Corridor
- Gas Pipeline

Existing Transmission Lines
- 345kV
- 230kV
- Below 230kV

N

0 4 8
Miles

1:400,000

Opportunities and Constraints
Rebuild Section

Date: 9/16/2011

SOUTHLINE
TRANSMISSION PROJECT

Welcome to the Southline Transmission Project

Public Informational Meeting

Please Sign In

SOUTHLINE
TRANSMISSION PROJECT

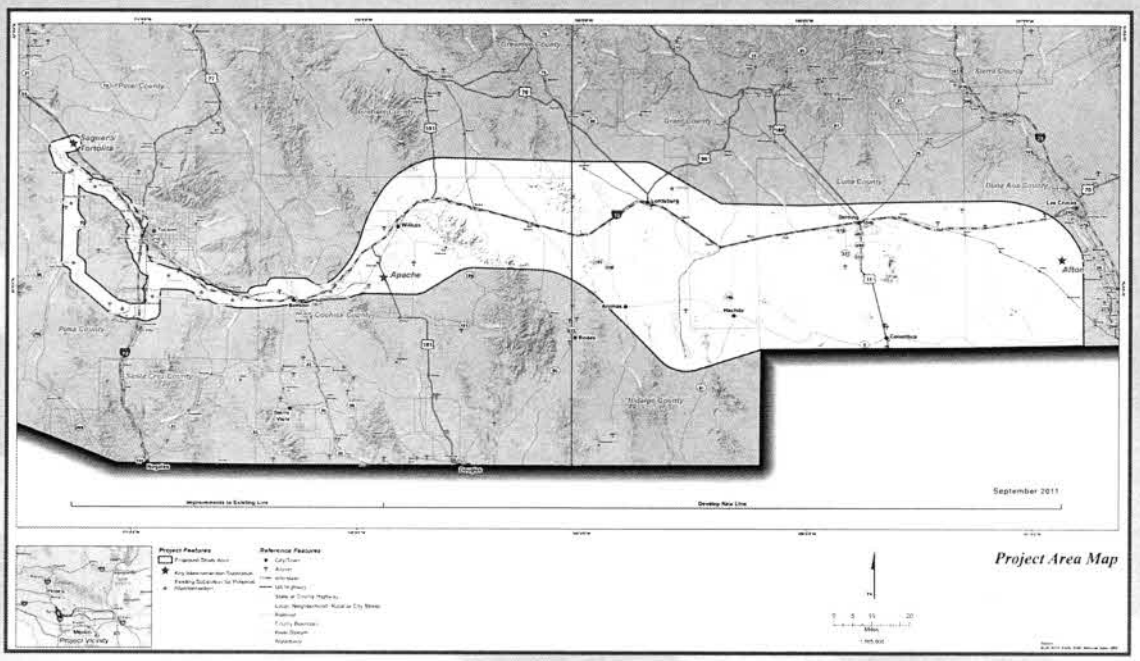
Project Overview

The Southline Transmission Project is a proposed transmission line designed to collect and transmit electricity across southern New Mexico and southern Arizona, bringing electric system benefits to the Desert Southwest, one of America's fastest-growing regions.

The Southline Transmission Project is being designed to minimize land and resource impacts by selecting a route along existing corridors such as abandoned rail lines, and by improving existing transmission lines where feasible – an innovative approach that respects the region's communities and natural and cultural resources.

The project will consist of two segments:

- A **new 225-mile, 345 kilovolt (kV) double-circuit transmission line** between the existing substations at Afton (NM) and Apache (AZ)
- A series of improvements **to approximately 130 miles of existing transmission lines** between the Apache (AZ) and Saguaro (AZ) substations



The Southline Transmission Project will interconnect with more than 10 existing substations along its route, enabling local utilities to meet energy demands. Based on the ultimately selected route, the project may include development of a new substation within the study area in Luna, Grant, or Hidalgo County in New Mexico.

About the Team

Black Forest Partners, L.P.

- Project manager for Southline Transmission Project
- Led by Southwest natives Bill Kipp and Doug Patterson
- Originally focused on investment opportunities in renewable energy generation projects in southern New Mexico and southern Arizona
- Soon discovered the regional transmission system was insufficient and in need of more capacity to relieve congestion and improve reliability
- Created concept for Southline Transmission Project in 2008 as a transmission solution to minimize land use challenges and strengthen the existing system, while enabling the development of renewable energy projects

Southline Transmission, L.L.C.

- Project sponsor since 2010
- Subsidiary of Hunt Power, L.P., based in Dallas, Texas
- Hunt Power develops and invests in entrepreneurial electric and gas utility opportunities
- Part of a larger privately-owned group of companies managed by the Ray L. Hunt family that engages in oil and gas exploration, refining, power, real estate, ranching, and private equity investments

Additional Consultants

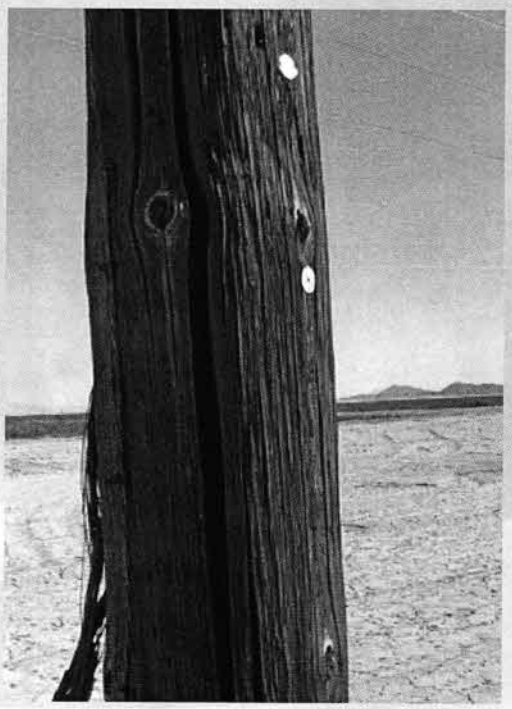
- Black & Veatch and USE Consulting, engineering
- CH2M HILL, environmental team lead
- ENValue, siting
- Fontana Energy Associates, permitting
- Kearns & West, public engagement and outreach
- Tierra Right of Way Services, environmental resources and permitting
- WestLand Resources, cultural and environmental resources

SOUTHLINE
TRANSMISSION PROJECT

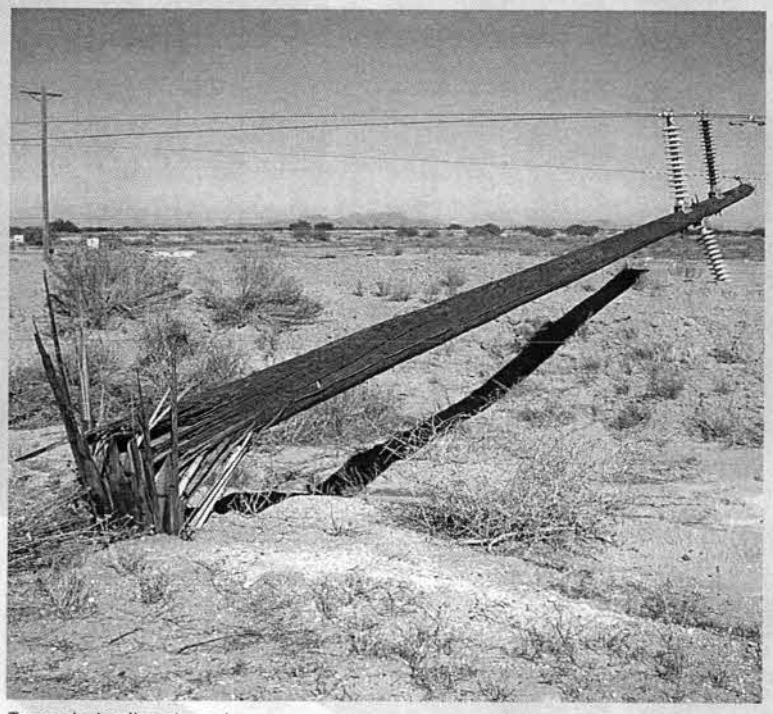
Project Need and Benefits

Improve Reliability

Recent wildfires and winter storm-related outages have highlighted the **vulnerability of the electric transmission system** in the Desert Southwest. There are limited transmission connections between the southern New Mexico and El Paso, Texas area and the rest of the western United States transmission grid, creating reliability risks in the event of wildfires, storms, or other events. Additionally, the local infrastructure is aging.



Cracked 115-kV wood pole South of Phoenix
Credit: Western Area Power Administration FY2011 Ten Year Capital Program Meeting PowerPoint



Transmission line storm damage
Credit: Western Area Power Administration FY2011 Ten Year Capital Program PowerPoint

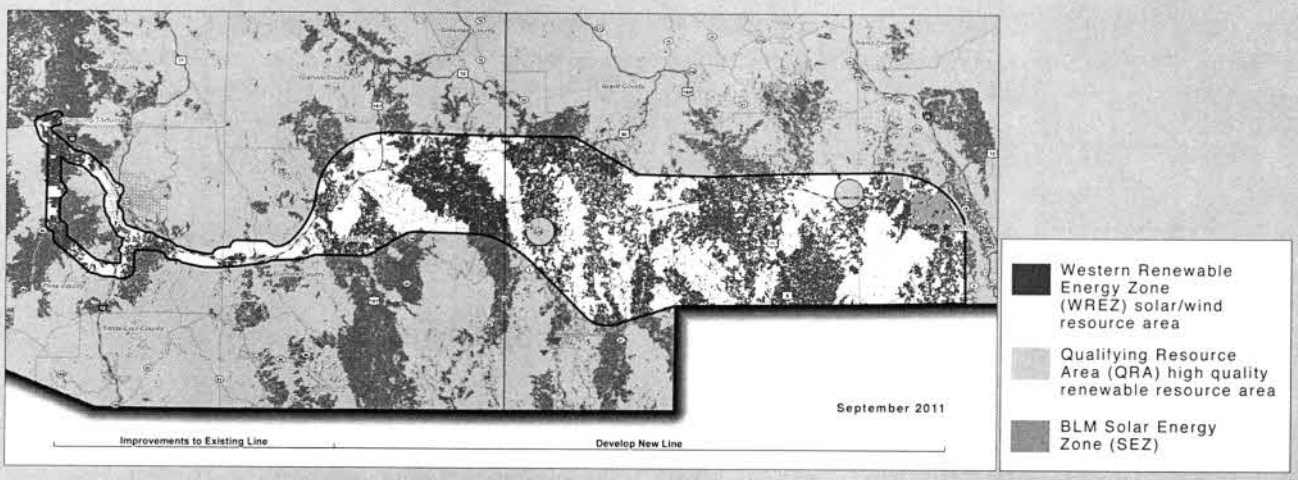
The lines in Arizona that the Southline Transmission Project would improve are decades-old wood pole H-frame systems whose deterioration poses reliability and maintenance concerns. If there are any disruptions in the existing regional transmission system, local utilities may not be able to meet energy demands. The Southline project would strengthen the existing electrical system by replacing outdated structures.

SOUTHLINE
TRANSMISSION PROJECT

Project Need and Benefits

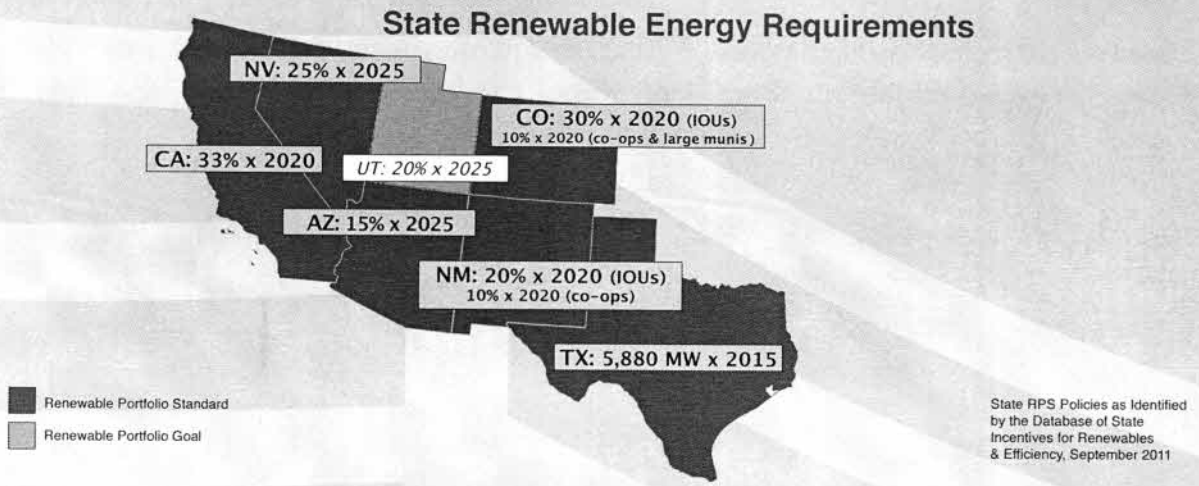
Enable Renewable Energy

The U.S. Department of Energy's National Renewable Energy Laboratory and the Western Governors' Association Western Renewable Energy Zones process have identified **great potential for solar and other renewable energy development** in the Southwest. The proposed Southline Transmission Project lies within some of the region's most promising renewable resource areas.



Renewable energy development has been hindered in the area largely because of a lack of transmission capacity. The Southline Transmission Project will enable renewable energy projects to connect to the electric system, helping states in the Desert Southwest **meet renewable energy requirements**.

State Renewable Energy Requirements



While the Southline Transmission Project is not linked to the development of any particular energy generation projects, the study area includes multiple high-quality renewable resource areas where generation project development is likely.

SOUTHLINE
TRANSMISSION PROJECT

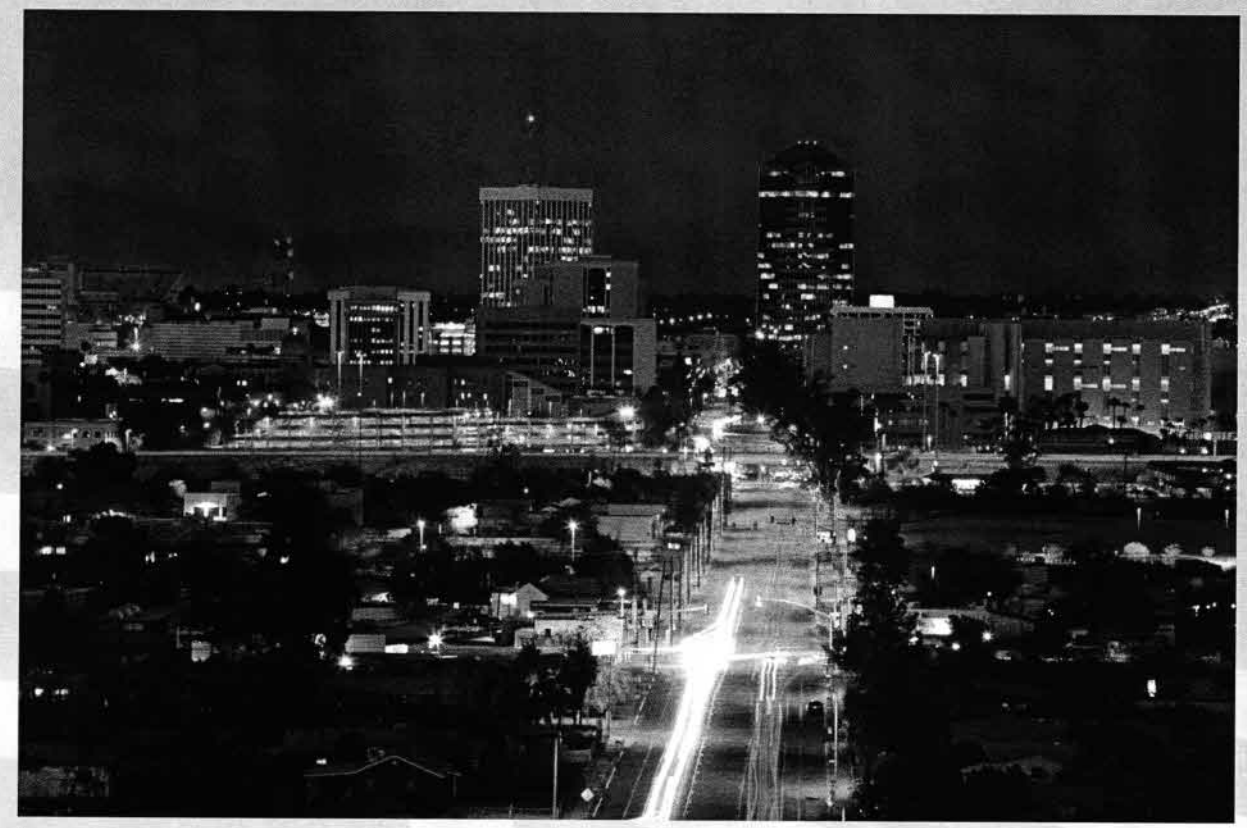
Project Need and Benefits

Relieve Congestion

Due to **a lack of sufficient transmission capacity** in the Desert Southwest, local electric utilities are constrained in their ability to consistently access the most cost-efficient energy resources. The Southline Transmission Project team has worked closely with local utilities and other regional transmission providers since 2009 to ensure the Southline Transmission Project can meet local needs and improve the region's electric system. By enabling bidirectional use of power, the Southline Transmission Project will **relieve congestion**.

Sustain and Support Growth

The Desert Southwest is expected to experience **substantial long-term growth**. Local utilities have identified a need for additional transmission access to support the expected **increased demand for energy**.

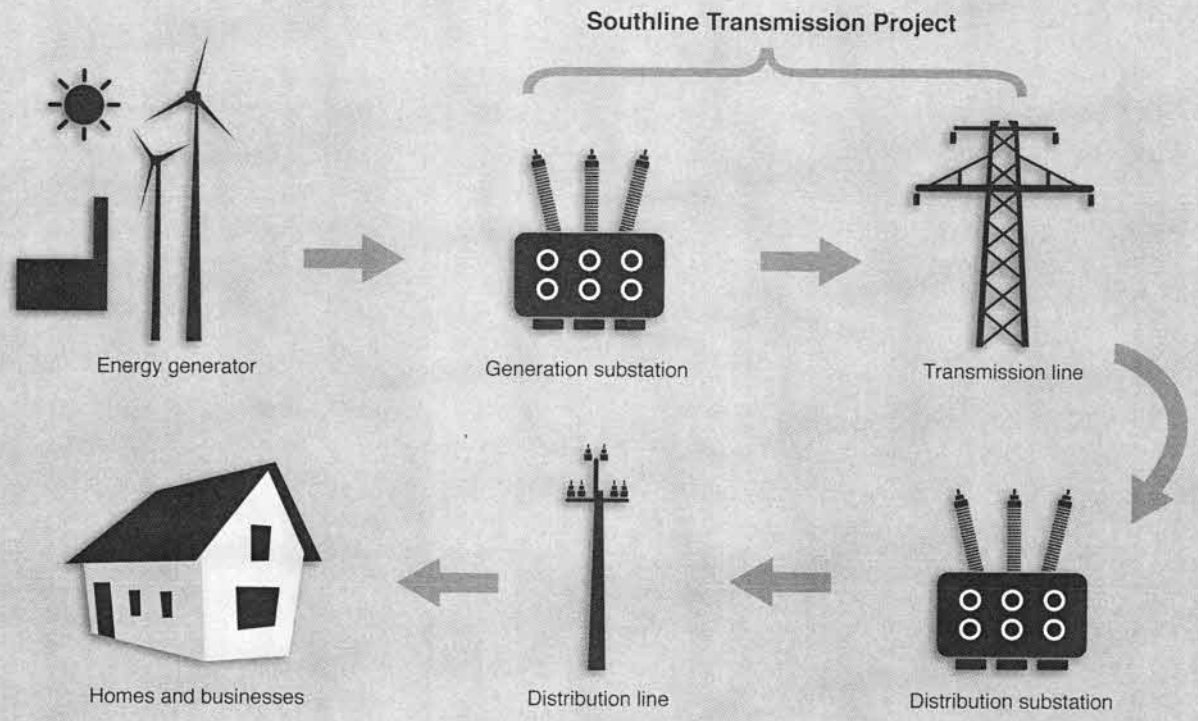


Tucson, Arizona at night

SOUTHLINE
TRANSMISSION PROJECT

The Electrical Grid

How Electricity is Transmitted:



- Energy is generated from both renewable and conventional energy sources.
- A substation at the site of electricity generation increases the voltage for transfer to transmission lines, enabling electricity to travel longer distances.
- Transmission lines carry the electricity from the generation substation to a distribution substation, located closer to electricity users.
- A distribution station then lowers the voltage and transfers the electricity to local distribution lines.
- Local distribution lines carry electricity to business and household consumers.

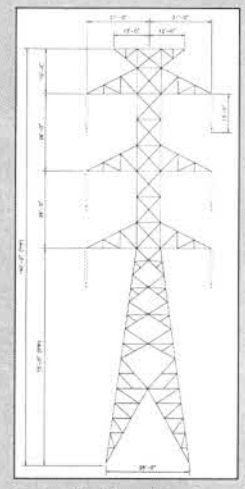
SOUTHLINE
TRANSMISSION PROJECT

Southline Transmission Project Design

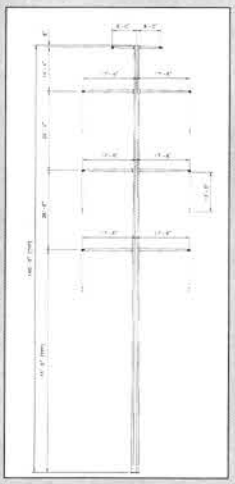
The Southline Transmission Project consists of two proposed segments:

Afton-Apache Segment (New Transmission Line)

The Afton-Apache segment will be a new transmission line, connecting existing substations at Afton (located south of Las Cruces, New Mexico) and Apache (located south of Willcox, Arizona).



Potential Afton-Apache transmission structure

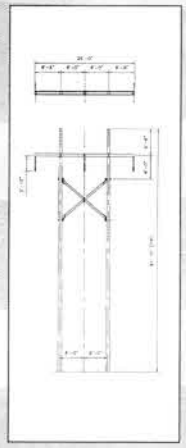


Potential Afton-Apache transmission structure

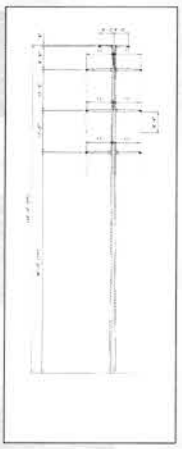
Afton-Apache Segment: Double-circuit 345kV	
Anticipated Line Length	225 miles
Type of Structure	Self-supporting lattice towers or tubular steel poles
Approximate Structure Height	110-170 feet
Approximate Structure Spacing	1000-1400 feet
Anticipated Number of Structures Per Mile	4-8 (depending on structure type, terrain, and other factors)
Anticipated Right-of-Way Width	200 feet (larger ROW may be required in some site-specific locations to accommodate rough terrain or long spans)

Apache-Saguaro Segment (Improvements to Existing Transmission Lines)

The Apache-Saguaro segment will be an upgrade and rebuild of existing transmission lines connecting existing substations at Apache and Saguaro (located northwest of Tucson, Arizona).



Existing Apache-Saguaro transmission structure

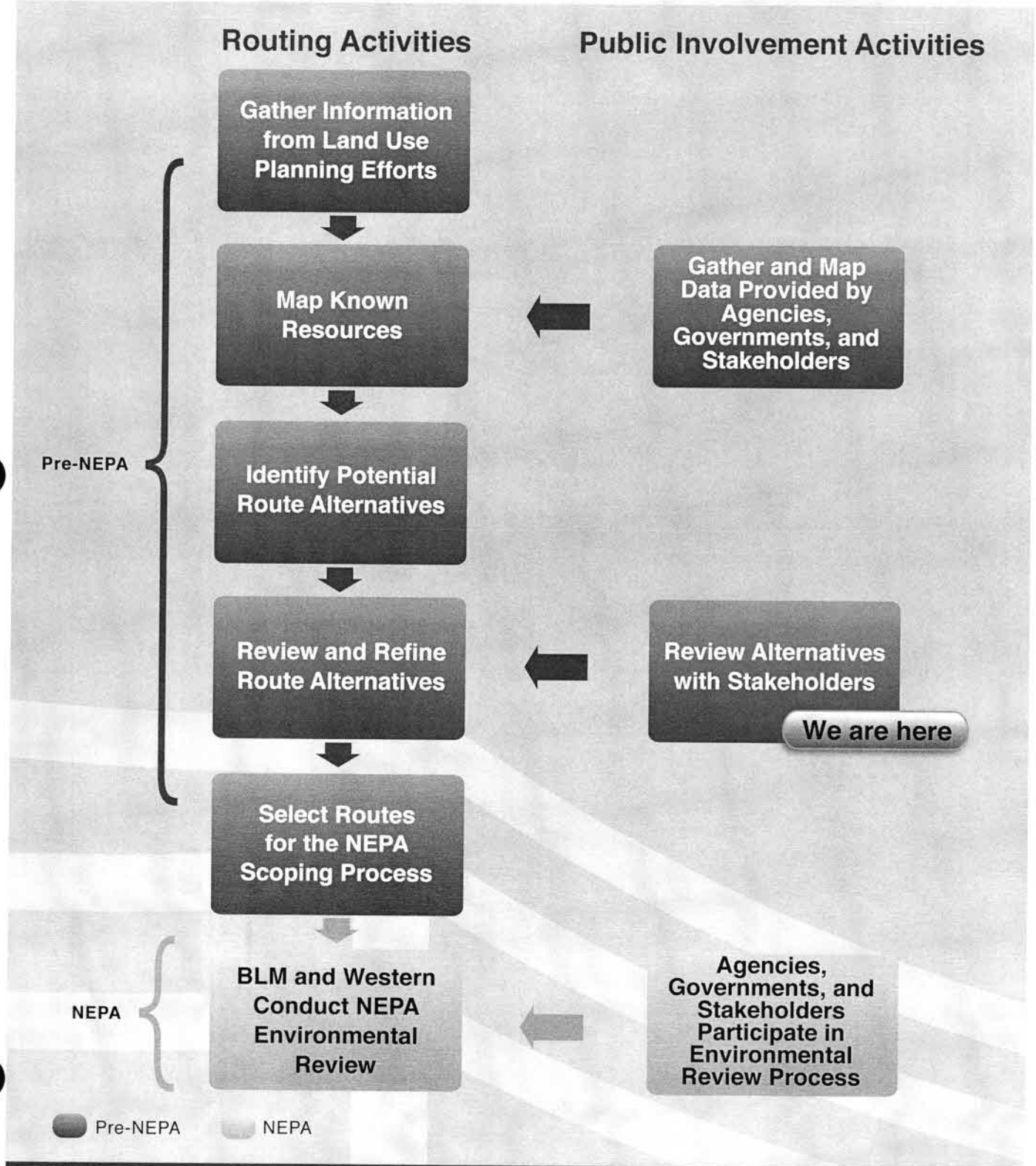


Potential Apache-Saguaro transmission structure

Apache-Saguaro Segment: Double-circuit 230kV	
Anticipated Line Length	130 miles
Type of Structure	Tubular steel poles
Approximate Structure Height	100-140 feet
Approximate Structure Spacing	700-1100 feet
Anticipated Number of Structures Per Mile	5-8 (depending on structure type, terrain, and other factors)
Anticipated Right-of-Way Width	150 feet

SOUTHLINE
TRANSMISSION PROJECT

The Routing Process



SOUTHLINE
TRANSMISSION PROJECT

Siting Philosophy & Planning

The selection of the Southline Transmission Project's route is guided by an approach to minimize impacts by following existing corridors wherever possible. This approach includes:

- Working within or next to existing corridors (such as abondoned rail lines, transmission lines, and roads)
- Avoiding sensitive environmental/cultural areas (e.g., wilderness areas, sensitive riparian zones, and other areas of environmental or cultural concern) during site selection
- Incorporating information from existing federal and state energy and land use planning efforts
- Working closely with interested stakeholders and land managers to understand and, where possible, avoid or minimize impacts to sensitive areas
- Considering sensitive resources during engineering design, construction, and future operations and maintenance

Photo credit: ***Ken Lund***

Photo credit: ***Wesley Fryer***

Project Siting

Siting Opportunities and Constraints

The Southline Transmission Project team is committed to minimizing conflicts with existing environmental, cultural, and land resources. As part of this commitment, the team is identifying siting constraints and opportunities early on to develop responsible routes and route alternatives.

Examples of Siting Opportunities

Abandoned railroad
Photo credit: Fabien Fivaz

Transmission line adjacent to road

Transmission line

Siting opportunities include existing linear facilities (such as transmission lines, highways, and rail corridors). Siting a project parallel to these features helps to minimize associated impacts to the land and is generally consistent with land use planning direction of federal, state, and local land management agencies and siting authorities.

Examples of Siting Constraints

Air Force airplane
Photo credit: Jerry Gunner

Sensitive historic resources

Saguaro National Park
Photo credit: Ken Lund

For new transmission lines, siting constraints include areas where siting the transmission line would not be possible or would be extremely difficult, such as National Parks, airports, and wilderness areas.

Above are some examples of siting constraints and opportunities that will guide the development of route alternatives for the Southline Transmission Project. We welcome your feedback on additional siting constraints or opportunities within the project area.

SOUTHLINE
TRANSMISSION PROJECT

Anticipated Project Timeline

2011

Early engagement/outreach (summer-fall)

- Public engagement to inform route development
- Early public meetings to share information and receive input on potential route alternatives

We are here

Initiation of NEPA[1] process (fall-winter)

- BLM[2] and Western[3] initiate the NEPA process
- Public scoping meetings for NEPA
- Ongoing public outreach and involvement
- Ongoing permitting with federal/state/local governments/agencies, as appropriate

2012

Preparation of Draft Environmental Impact Statement (through early 2013)

- Conduct biological, cultural, and other resource studies
- Ongoing public outreach and involvement
- BLM and Western release Draft Environmental Impact Statement (DEIS)
- 45-day public comment period begins upon release of DEIS

2013

Final permitting decisions and documents (2013)

- BLM and Western release Final Environmental Impact Statement (FEIS) and Record of Decision (ROD)
- State and local governments and agencies issue permits, as required

2014

Right-of-way acquisition and construction (2014-2015)

- Right-of-way acquisition and engineering
- Construction begins

2015

Project completion (2015)

- Construction is completed
- Project in-service date

(1) NEPA: National Environmental Policy Act
(2) BLM: Bureau of Land Management
(3) Western: Western Area Power Administration

SOUTHLINE
TRANSMISSION PROJECT

Project Permitting

The Southline Transmission Project will undergo multiple comprehensive permitting and approval processes.

Federal Level

The Bureau of Land Management (BLM) and the Western Area Power Administration (Western) are the lead federal agencies charged with ensuring that the project complies with National Environmental Policy Act (NEPA) requirements.

BLM and Western will coordinate with these and potentially other federal agencies:

- Federal Aviation Administration
- National Park Service
- U.S. Army Corps of Engineers
- U.S. Bureau of Indian Affairs
- U.S. Department of Defense
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Border Patrol

Photo credit: ***Ken Lund***

State Level

The Southline Transmission Project team anticipates coordinating with many, if not all, of the following state-level permitting and regulatory agencies:

- Arizona Corporation Commission
- Arizona Department of Environmental Quality
- Arizona Department of Transportation
- Arizona Game and Fish Department
- Arizona State Land Department
- New Mexico Department of Transportation
- New Mexico Game and Fish Department
- New Mexico Public Regulation Commission
- New Mexico State Land Department

Local Level

The Southline Transmission Project team will comply with all applicable local permitting requirements, including coordination with the appropriate entities in the following counties:

- Cochise County, Arizona
- Graham County, Arizona
- Greenlee County, Arizona
- Pima County, Arizona
- Pinal County, Arizona
- Doña Ana County, New Mexico
- Luna County, New Mexico
- Grant County, New Mexico
- Hidalgo County, New Mexico

Photo credit: ***Flickr member Dyanna***

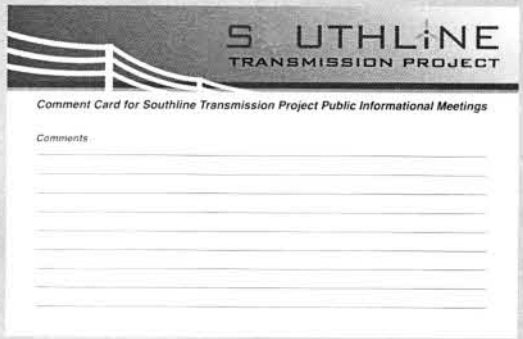
Photo credit: ***Jeff Strearns***

SOUTHLINE
TRANSMISSION PROJECT

Your Participation

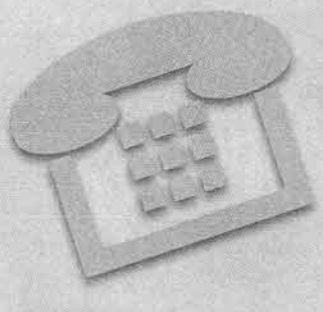
Today:

- Speak with a project team member
- Provide direct input on project maps or at the GIS mapping stations
- Fill out a comment card


SOUTHLINE
TRANSMISSION PROJECT

Comment Card for Southline Transmission Project Public Informational Meetings

Comments



Anytime:

- Email us: connect@southlinetransmissionproject.com
- Call us: (888)752-2822

For More Information:

- Visit us at www.southlinetransmissionproject.com
- Sign up for email updates
  - Access the sign-up form on our website
  - Fill out a comment card with a request to sign up

SOUTHLINE
TRANSMISSION PROJECT

Help Guide the Process.
Attend a public meeting in September

The Southline Transmission Project is being designed to minimize land and resource impacts by selecting a route along existing corridors such as abandoned rail lines, and by improving existing transmission lines where feasible – an innovative approach that respects the region's communities and natural and cultural resources.

Welcome

About the Southline Transmission Project

The formal NEPA public scoping period will occur later this fall. Meeting information will be posted by the Bureau of Land Management and Western Area Power Administration. We hope you will attend these meetings and provide comments as part of the formal environmental review process.

SOUTHLINE
TRANSMISSION PROJECT

Comment Station

Please submit written comments here.
Thank you for providing feedback today.

The Bureau of Land Management and the Western Area Power Administration will host scoping meetings as part of the National Environmental Policy Act (NEPA) environmental review process later this fall.

Information about these meetings will be posted to our project website as it becomes available.

SOUTHLINE TRANSMISSION PROJECT

Southline Transmission Project Routing Workshop

Tucson, Arizona
September 28, 2011

Workshop Objectives

- Provide an overview of the proposed project
- Discuss the approach to siting the new-build segment
- Discuss the rebuild segment
- Identify and discuss potential land and resource issues that should be considered
- Review and obtain feedback on potential options for new and rebuild segments

Agenda

- Introductions
- Project Overview
- Routing Process Overview (new-build segment)
- Discussion of Rebuild Segment
- Issues Identification and Route Review

Introductions

- Name
- Organization
- Location

About the Project Team

- Sponsor / Applicant
  - Southline Transmission, L.L.C.
  - A subsidiary of Hunt Power, L.P. Hunt Power, L.P. develops and invests in entrepreneurial electric and gas utility opportunities, and is part of a larger privately-owned group of entities managed by the Ray L. Hunt family that engages in oil and gas exploration and production, refining, power, real estate, ranching, and private equity investments.

- Project Managers
  - Black Forest Partners, L.P.
  - Led by Southwest natives Bill Kipp and Doug Patterson. Black Forest Partners created the concept for the Southline Transmission Project in 2008 as a transmission solution to minimize land use challenges and strengthen the existing system, while enabling the development of renewable energy projects.

Project History

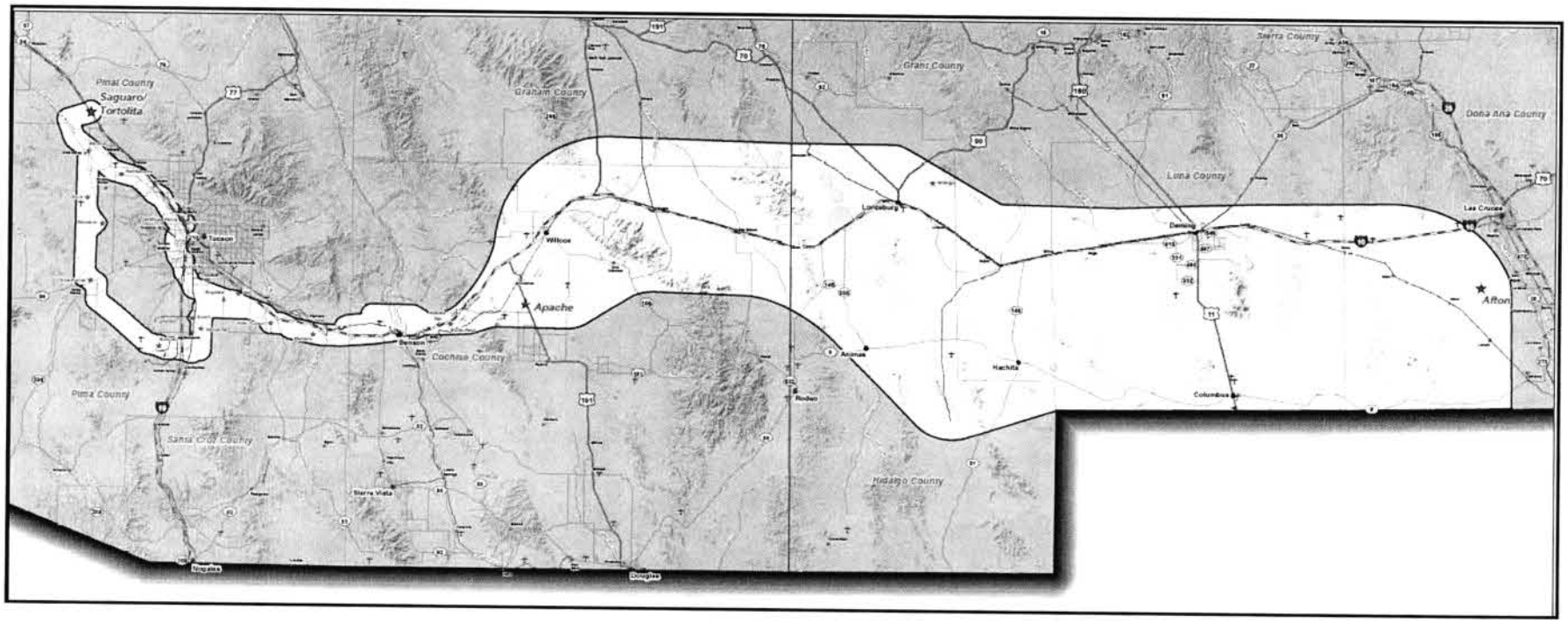
- Initial concept
- Participation in utility planning forums
- Further development of project definition
- Public engagement

Project Overview

- Proposed transmission line in southern NM and AZ consisting of two segments:
  - New ~225 mile, 345 kV double-circuit between the existing Afton (NM) and Apache (AZ) substations
  - Improvements to ~130 miles of existing lines between the existing Apache (AZ) and Saguaro (AZ) substations
- Interconnection with 10+ existing substations along the Project route
  - One (1) new substation may be developed in New Mexico

SOUTHLINE TRANSMISSION PROJECT

Project Overview



ARIZONA

NEW MEXICO

APACHE-SAGUARO
REBUILD PORTION

AFTON-APACHE
NEW-BUILD PORTION

Why is the Project Needed?

- Improve reliability
- Relieve congestion
- Enable renewable energy
- Sustain and support growth

Questions?

Routing Philosophy

- Route Afton-Apache new-build portion within or next to existing corridors where possible
- Upgrade existing lines in Apache-Saguaro rebuild portion
- Avoid impacts to sensitive environmental and land use areas
- Incorporate existing federal, state, and local land use information into our planning
- Work closely with stakeholders and land managers to avoid and minimize impacts

Anticipated Project Timeline

- **Early Engagement/Outreach and Routing**
- **Initiation of NEPA**
- **Draft EIS Preparation**
- **Final Permitting Documents, Decisions**
- **Right-of-Way Acquisition, Construction**
- **Project Completion**

Project Permitting

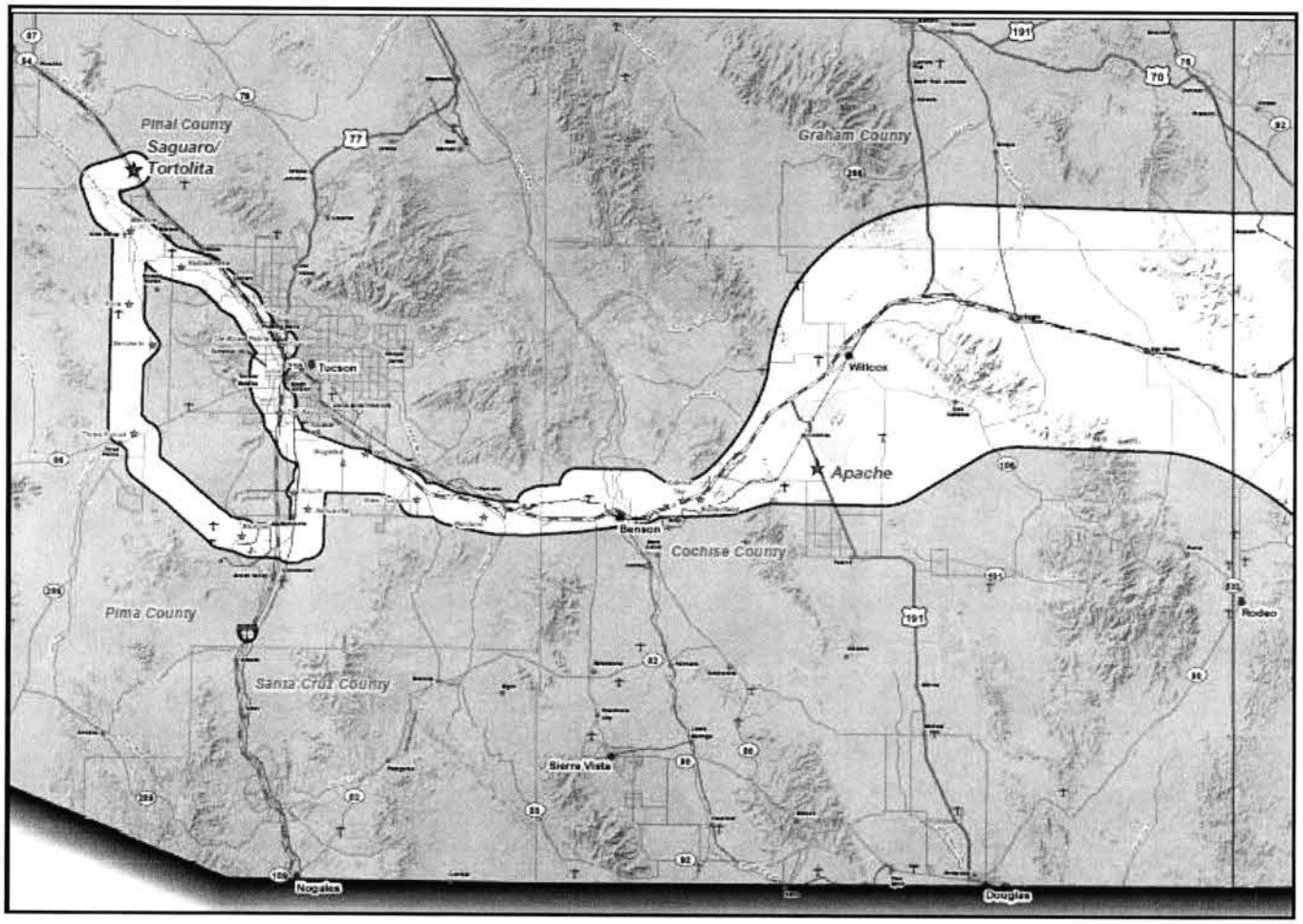
- Federal process
  - BLM and Western will serve as co-lead agencies for NEPA (EIS)
  - Project will coordinate with other federal, state, local agencies and entities
- State and local processes
  - Project will coordination with appropriate state and local governments and agencies in NM and AZ

Overview of Project's Routing / Planning Process

- Project need defines project endpoints
- Project endpoints define the project study area
- Existing corridors and linear features within the study area identify routing opportunities for Afton-Apache new-build portion
  - Identified constraints and sensitive areas within the study area help determine viability of identified opportunities
  - Evaluation of opportunities and constraints identifies most viable route options
- Location of existing lines defines Apache-Saguaro rebuild opportunities

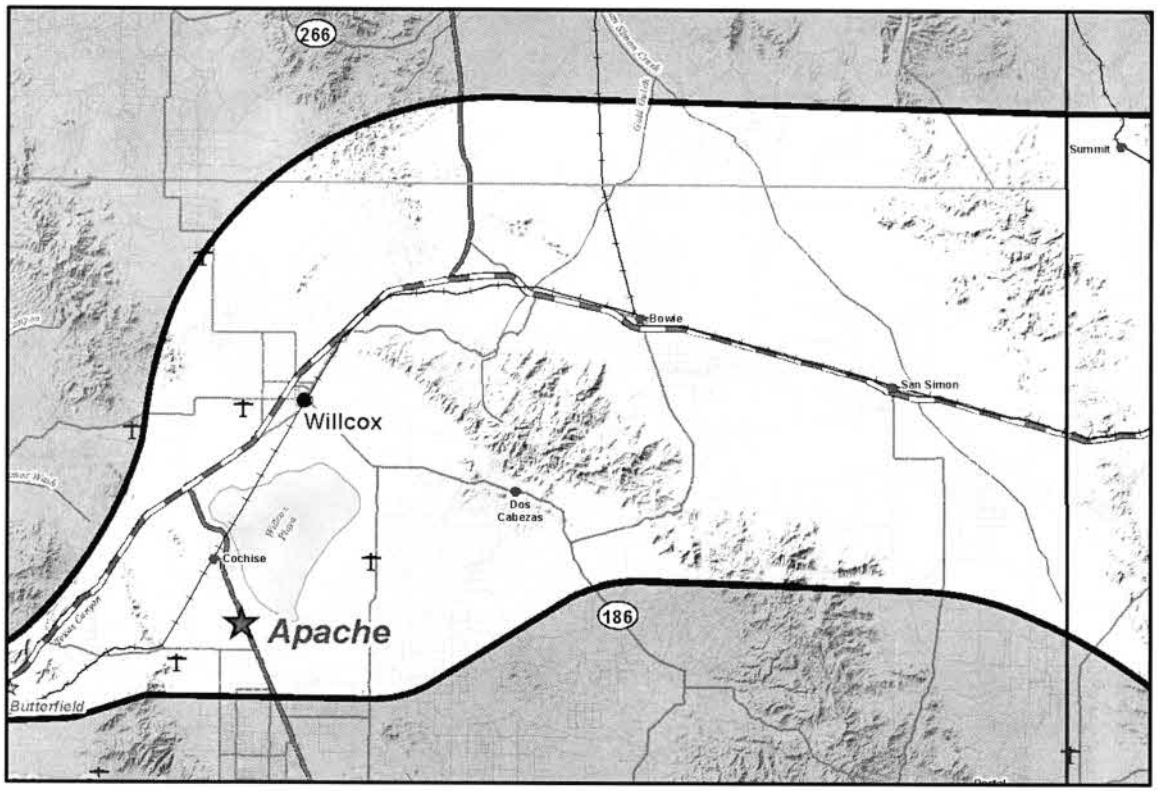
SOUTHLINE TRANSMISSION PROJECT

Project Study Area - Arizona



Project Study Area

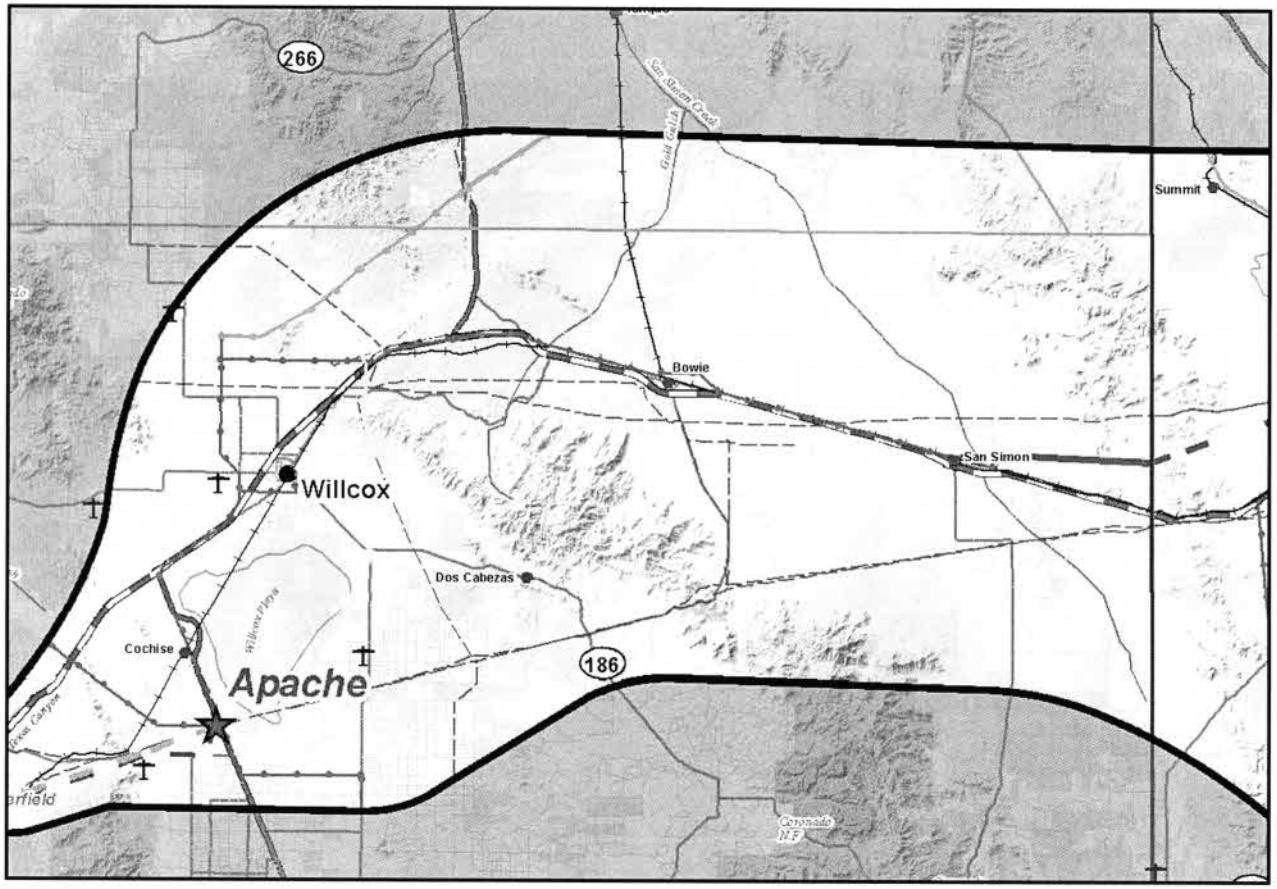
New-Build Transmission Line Portion of the Project - Arizona



Routing Opportunities for New Lines

- Designated Utility Corridors
- Existing Linear Utilities
  - Transmission lines, pipelines, distribution lines
- Highways and Roads
- Railroads
- Section Lines
- Property Lines

Identified Routing Opportunities



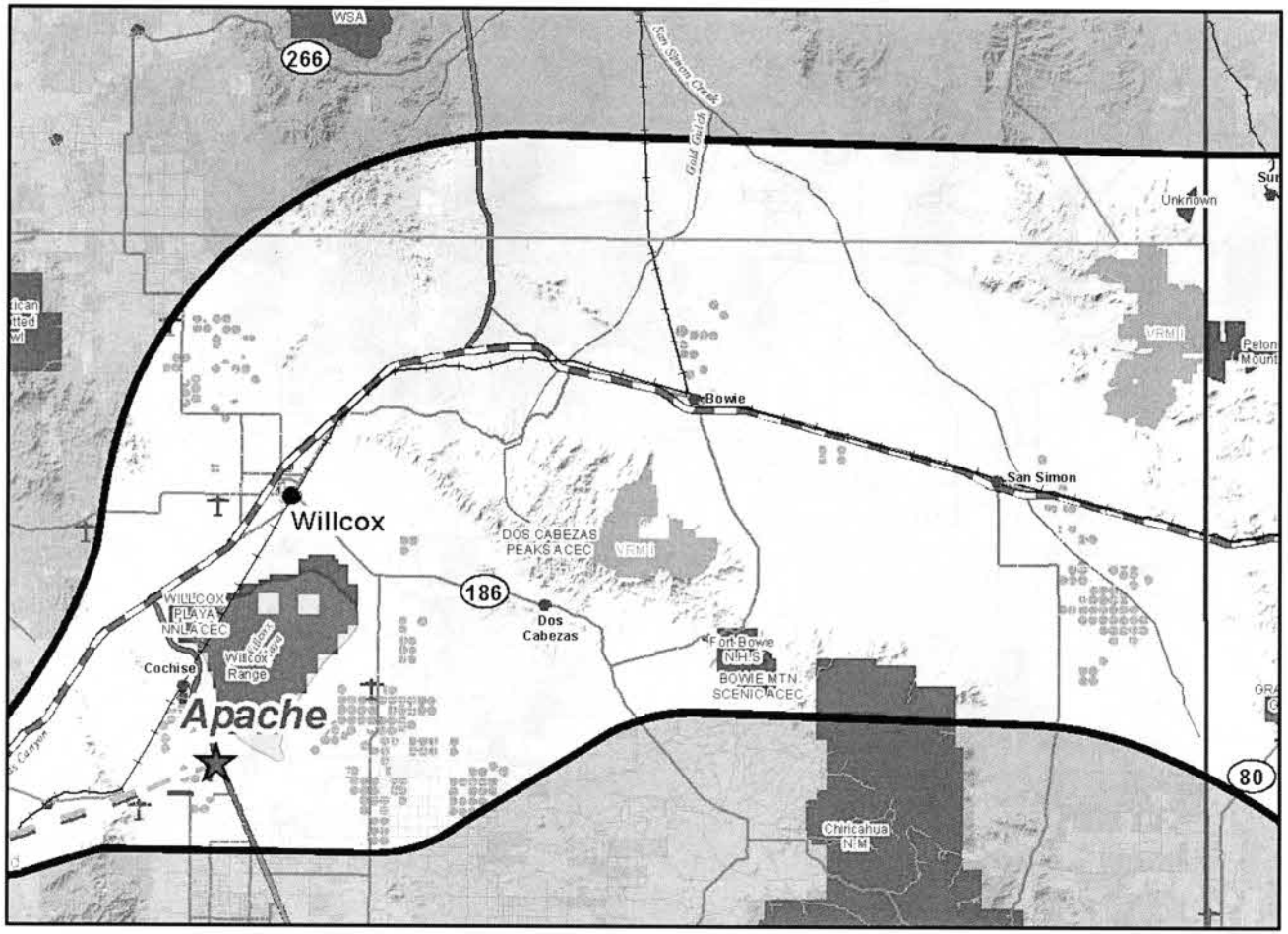
Routing Constraints for New Lines

- Constraints are areas that could affect the siting a transmission line
- Constraints are considered in two basic categories
  - Avoidance areas are where a transmission line would typically not be sited unless there is no other option.
  - Sensitive areas require the consideration of additional routing and/or specific construction methods or additional permitting / mitigation procedures.

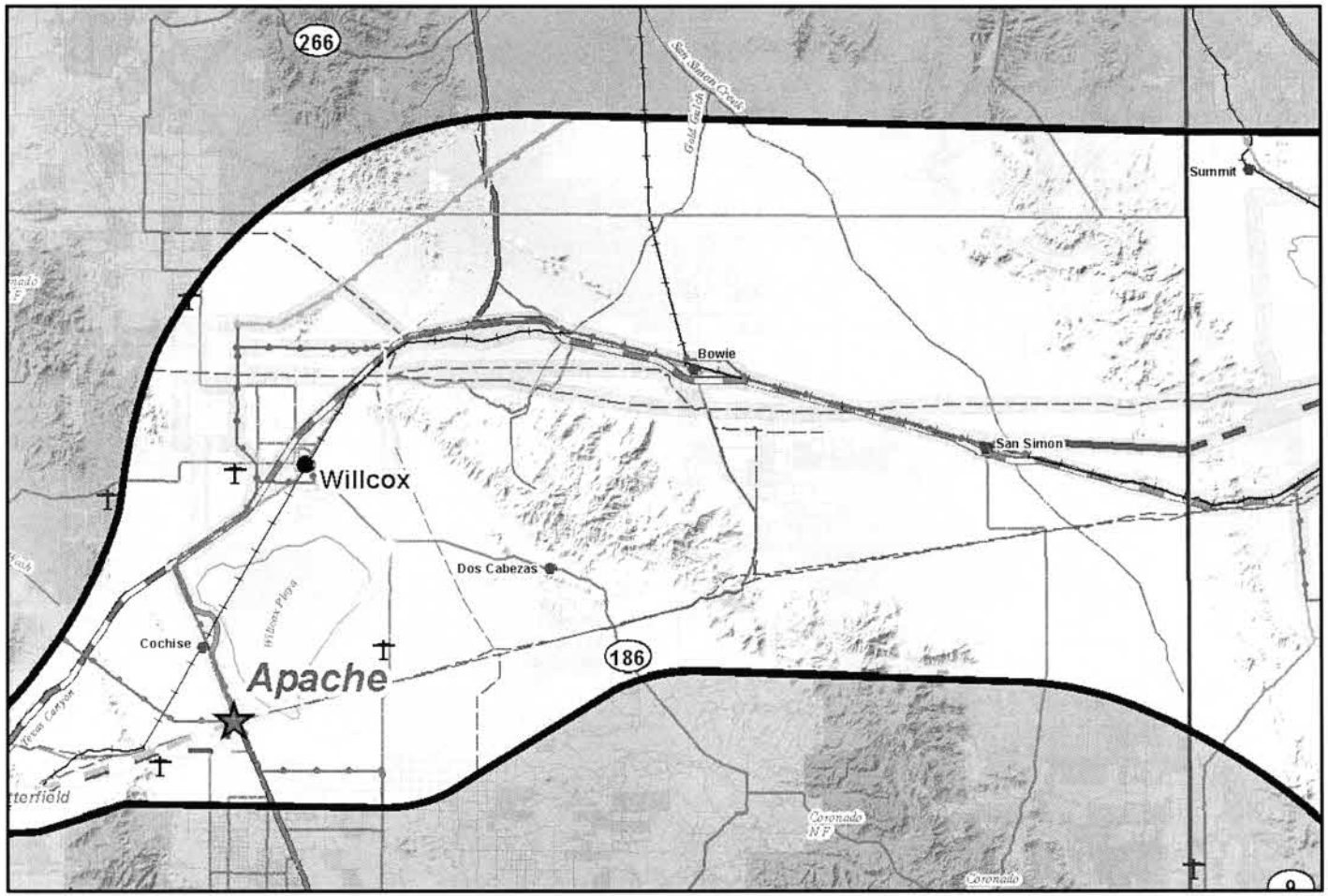
Routing Constraint Examples

- Land Uses
  - Residential Areas
  - Airports
  - Mechanically Irrigated Areas
  - Mining Areas
- Ecological Areas
  - T&E Species Habitat
  - Wetlands / Riparian Areas
- Land Management
  - Wilderness Areas
  - Parks / Recreation Areas
  - Scenic Areas
  - Designated Historic Sites
  - National Parks
- Engineering
  - Unstable areas
  - Floodplains

Identified Routing Constraints

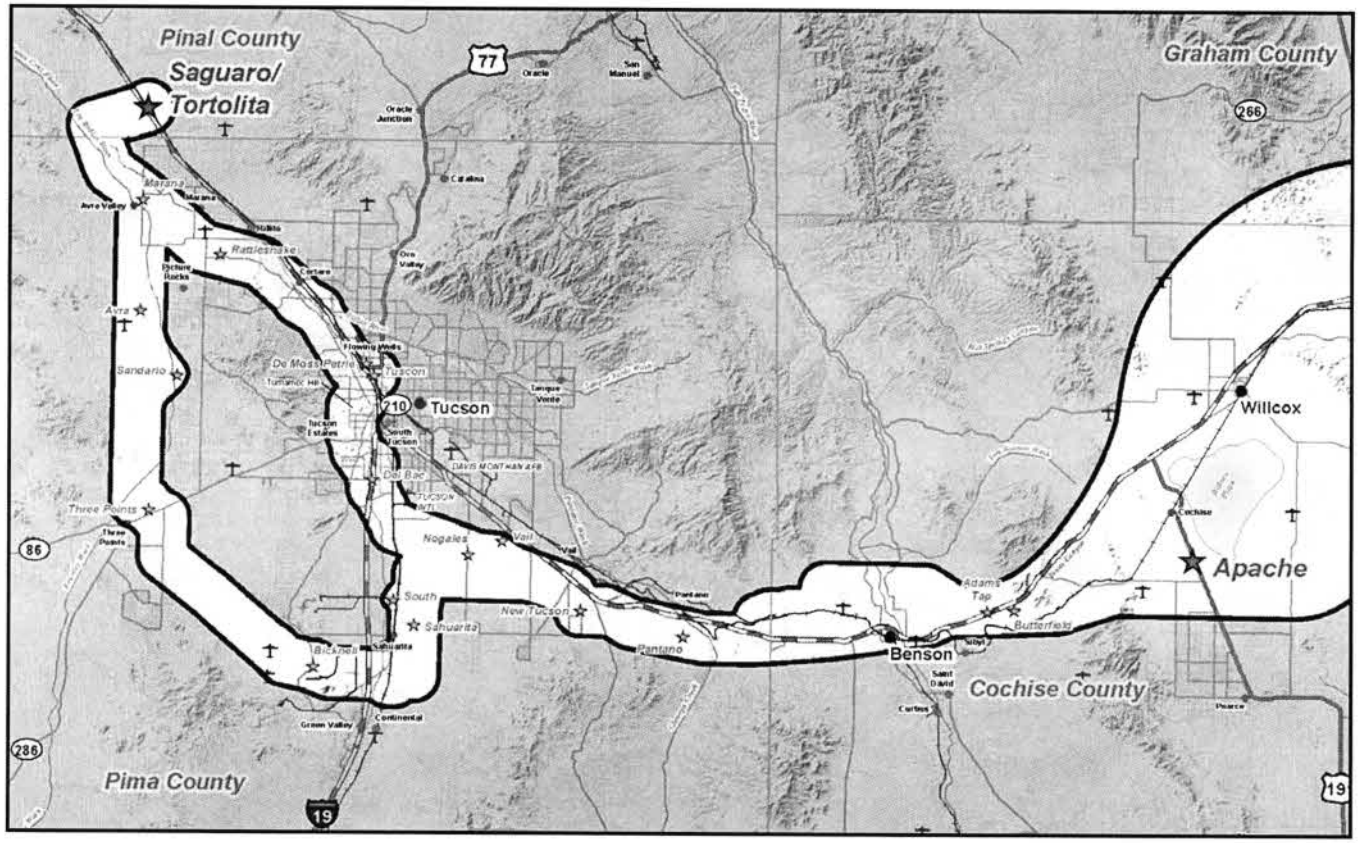


Potentially Viable Routes Identified

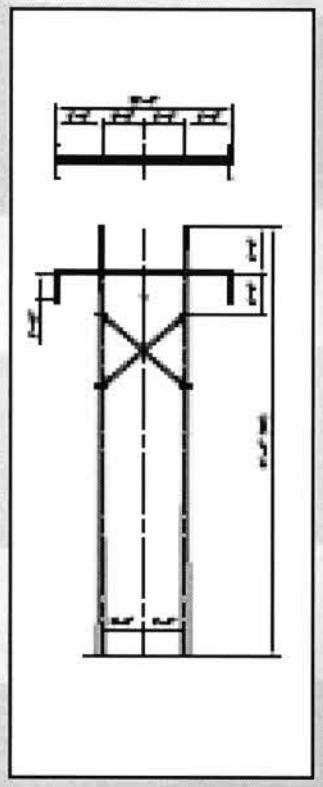


Project Study Area

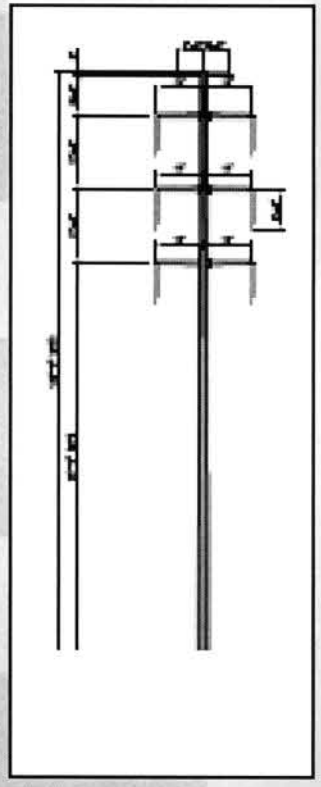
Rebuild Portion of the Project - Arizona



Proposed Rebuild Design



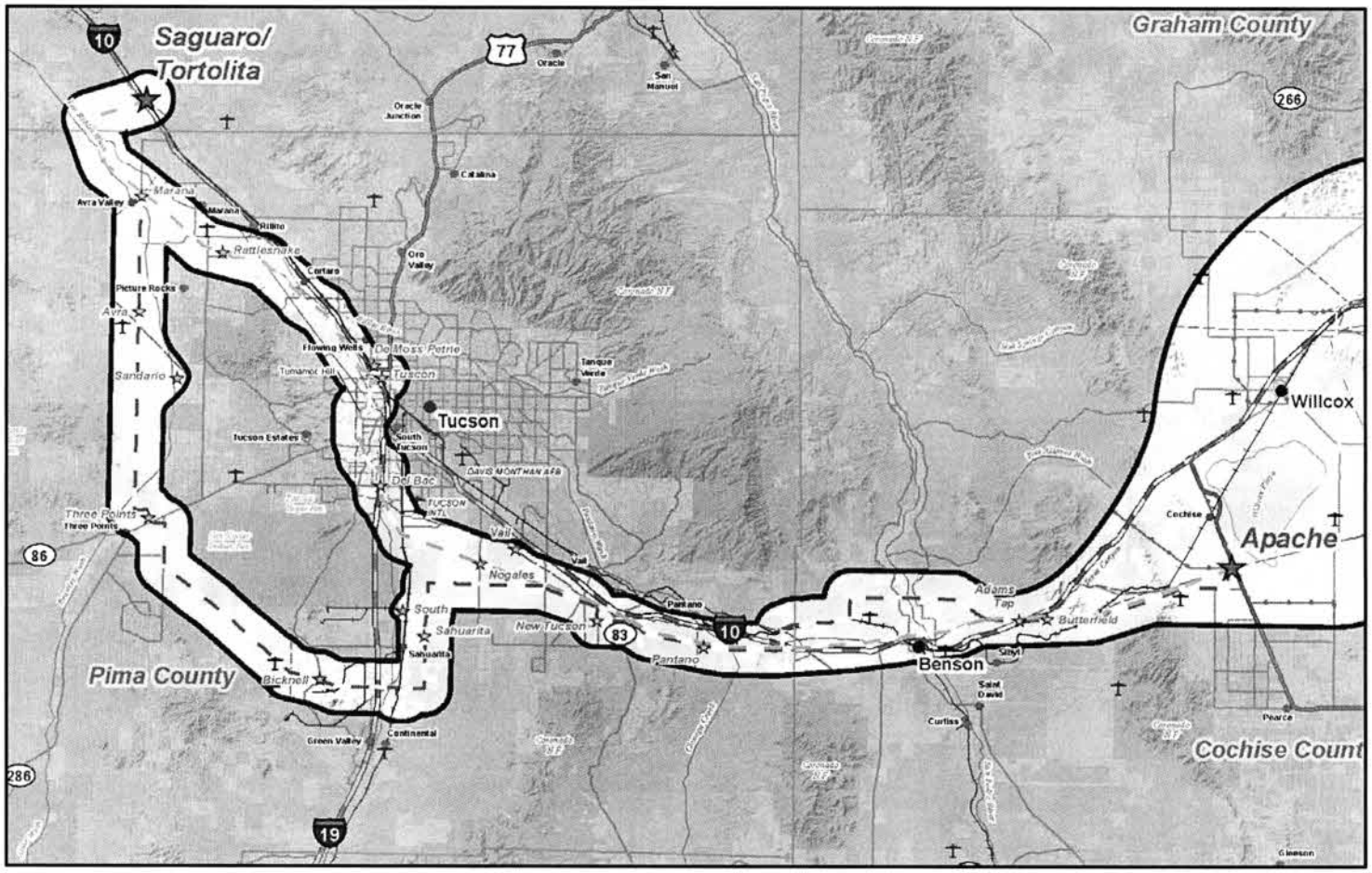
Existing Apache-Saguaro transmission structure



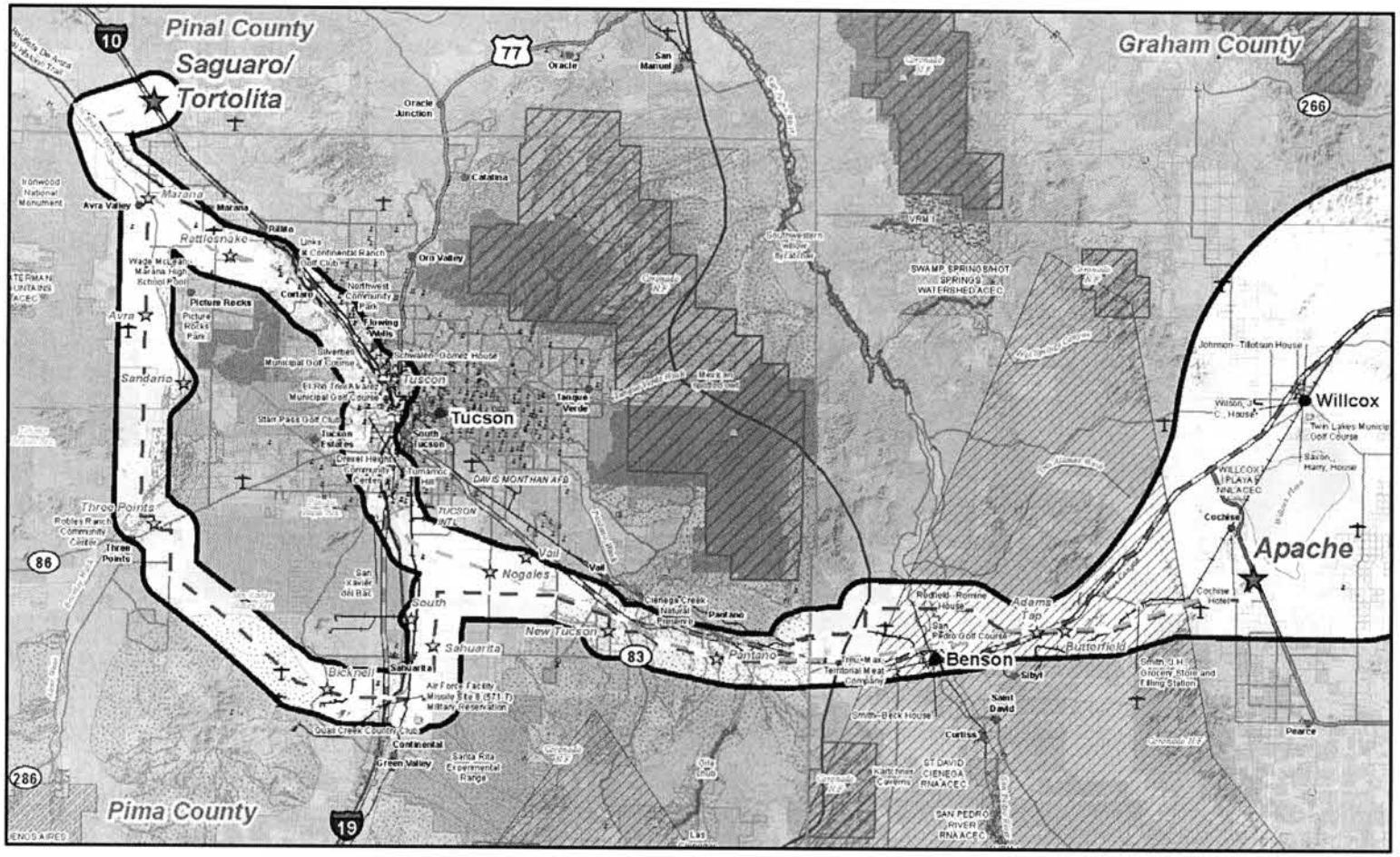
Potential Apache-Saguaro transmission structure

Example of Steel Replacement of Wooden H-Frame: (taken from Silverbell Road)

Potential Rebuild Options



Sensitive Areas in Rebuild Area



SOUTHLINE TRANSMISSION PROJECT

Questions, Comments?

Process For Reviewing Routes at Workshop

- Several Large-Scale Maps Around the Room for Review / Markup
- Interactive GIS Station for "Zooming-In" to Areas of Interest

Please Provide Input

- Identify Areas of Interest or Concern
- Provide Comments on Identified Route Segments
- Correct Any Discrepancies in the Data We Have Collected

All guard structures would be located within the Project ROW. The temporary disturbance associated with installation of guard structures would consist of an approximately 100 x 100–foot work area at the base of each guard structure and two holes approximately 3 feet in diameter. The installation method of the guard structures would be direct embedding with crushed rock and excavated material. All excavated material for the guard structures would be used to backfill these guard structures. As such, no excavated material would require offsite removal. All topsoil would be salvaged, stockpiled, and replaced on removal of the guard structures and initiation of reclamation activities.

UPGRADE OF THE EXISTING WESTERN TRANSMISSION LINE

One of two methods of construction for the Upgrade Section of the Project would be used, depending on ROW constraints: the tear-down and rebuild in place method; or construction of the new facilities adjacent to the existing facilities. In locations where possible, the new 230-kV line would be built 50 feet away from the edge of the existing 100-foot ROW, parallel to the existing line. A total of 50 feet of new ROW would be obtained where possible in order to accommodate this construction method. This would allow the existing line to remain in service until the new line is energized, at which point the existing line would be decommissioned and removed. Seventy-five feet of the existing 100-foot ROW would then be abandoned, and the remaining 25 feet adjacent to the new transmission line would be incorporated to form the new 150-foot permanent ROW. This is the preferred method of construction, as it would minimize the outage time on the existing line, and the risk of outages for local consumers during the upgrade process. Most of the disturbance in the old ROW would occur within 50 to 75 feet of the existing ROW centerline to remove old structures or old conductors. Western would work with private landowners during the micro-siting process to minimize potential impacts to landowners.

In places, such as across Bar V Ranch in Pima County, and the congested urban areas from the Del Bac Substation through Tucson to the Rattlesnake Substation, it may not be physically possible or prudent to construct the upgrade line in this manner. In these cases, a tear down and rebuild in place method would need to be used, centered on the existing 100-foot ROW. The old line would need to be taken out of service and torn out and the new line constructed in the original 100-foot, or somewhat expanded, ROW. This work would likely be subject to seasonal restrictions to minimize the outage impacts on system reliability.

Figures 2-15a and 2-15b are examples of typical ROW configuration for the New Build and Upgrade sections of the Project.

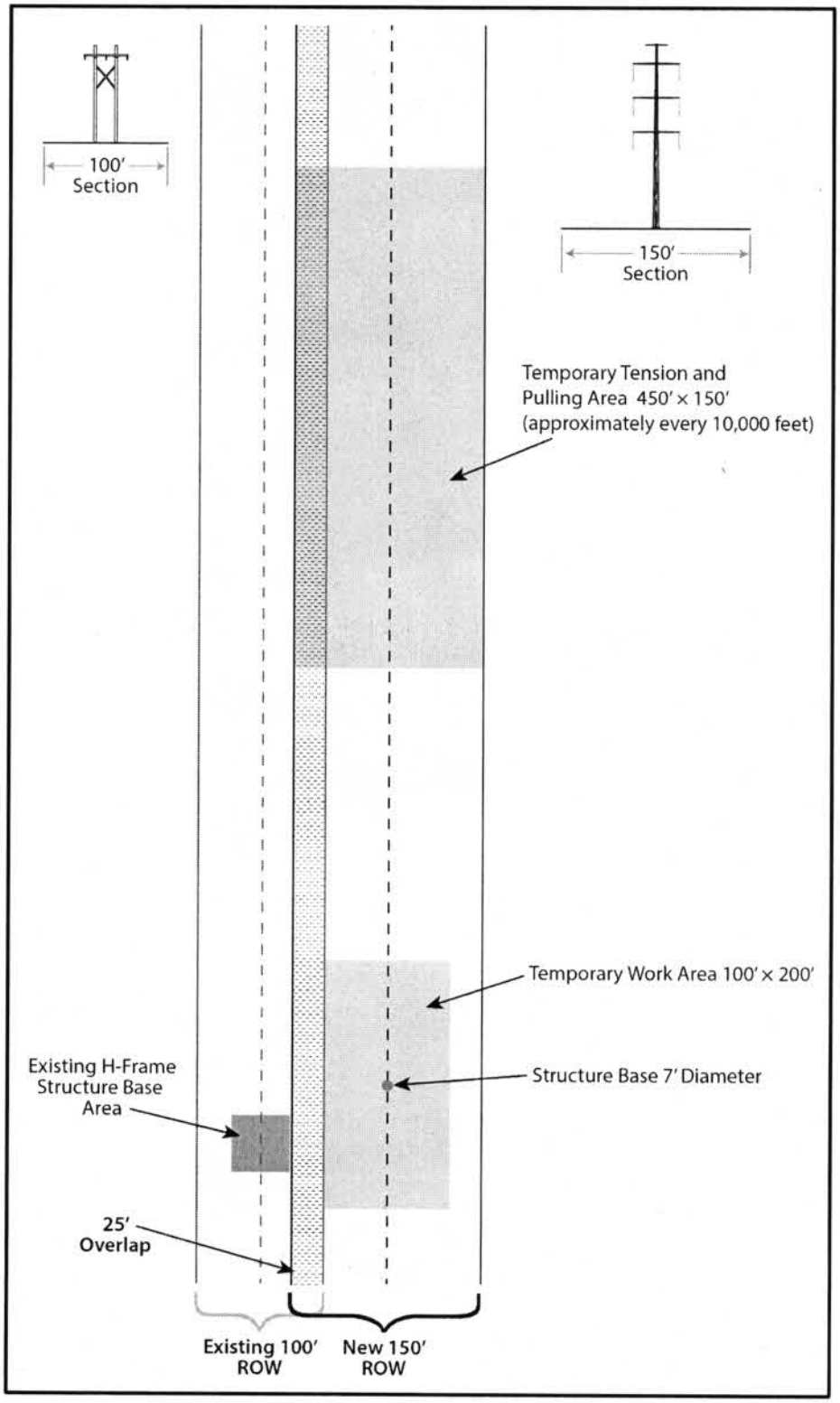
Disturbance Estimates

Table 2-7 (above) presents estimated temporary and permanent disturbance by Project segment. Following is a discussion of the basic assumptions used to develop these disturbance estimates. These disturbance estimates are also the foundation of the impact analysis presented in chapter 4. Both potential temporary and permanent disturbance estimates take into account existing infrastructure and access points where appropriate. Potential temporary disturbance would result primarily from the following construction activities (also included in table 2-7):

- Upgrade of existing roads or improvement of new roads for access;
- Construction of new, or expansion of existing, substations;
- Preparation of structure work areas (temporary work areas, tensioning and pulling sites, equipment staging and construction yards, etc.), and concrete batch plants;

EXHIBIT
STL-36
ADMITTED
STL 36

Figure 2-15b. Typical ROW configuration (150-foot), Upgrade Section.



SOUTHLINE OUTREACH AND NOTICE EFFORTS

2009 – 2011 (PROJECT ORIGINATION & PRE-NEPA)

Transmission Planning

- Southline began initial transmission planning with regional utilities in 2009 and continued through 2011
- Southline began WECC Project Coordination and Path Rating process in 2009 and continued through 2011
- Southline gave quarterly presentations to WestConnect's open transmission planning process began in 2009 and continued through 2011
  - Regular interaction with and updates to ACC Staff at WestConnect meetings, including Prem Bahl, Toby Little, Ed Stoneberg, Jeff Francis, Zach Branum
- Southline participated in ACC Biennial Transmission Assessment process in 2010

Political/Legislative Outreach

- Southline began initial outreach regarding Project in June 2011 through consultant, David Kimball, with Gallagher & Kennedy in Phoenix

Date	Contact
June 27, 2011	Commissioner Bob Stump and his policy advisor, Amanda Ho
June 27, 2011	Commissioner Gary Pierce and his policy advisor, John Le Sueur
June 27, 2011	Commissioner Brenda Burns and her policy advisor, Tom Galvin
June 27, 2011	State Land Commissioner Maria Baier
June 27, 2011	Kevin Kinsall and Leisa Brug with AZ Governor's Office

  - Followed up these conversations with Project fact sheet

- Afterward, Southline asked David Kimball to keep officials apprised of the Project and its progress, as well as the local state legislative delegations

Date	Contact
July 11-13, 2011	Kimball and his staff made introductory phone calls and emails to the following legislators: Steve Smith, David Stevens, Gail Griffin, Peggy Judd, Terri Proud, Vic Williams, Macario Saldate IV, Olivia Cajero Bedford, Sally Ann Gonzales, Bruce Wheeler, Paula Aboud, Daniel Patterson, Frank Pratt, Linda Lopez, Matt Heinz,

EXHIBIT
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STL-37
ADMITTED
STL 37

	John Fillmore, David Gowan Sr., Ted Vogt, Frank Antenori, Sylvia Allen, Andy Biggs, Al Melvin, Brenda Barton, Chester Chandell, Ed Farnsworth, and Steve Urie.
August 12, 2011	Visit with Leisa Brug with Governor's Office
September 15 & 19, 2011	Calls with legislator Matt Heinz
November 10, 2011	Email update to legislators Daniel Patterson & Matt Heinz

Pre-NEPA Scoping Conducted by Southline

- Southline held pre-NEPA stakeholder meetings in 2011

Date	Meeting Attendee
July 18, 2011	Southwest Transmission Cooperative
July 18, 2011	Fort Huachuca
July 19, 2011	Cascabel Working Group Tucson Audubon Community Watershed Alliance Empire-Fagan Organization
July 20, 2011	City of Willcox
August 2, 2011	Arizona State Land Department
August 2, 2011	Tucson Metropolitan Chamber of Commerce
August 3, 2011	Cochise County
August 4, 2011	Arizona Non-governmental Organizations
August 5, 2011	Arizona Department of Environmental Quality
August 22, 2011	Natural Resource Defense Council
September 12, 2011	Pima County

- Southline held a pre-NEPA routing workshop in 2011

Date	Meeting Location
September 28, 2011	Tucson

  - Attendees included local counties and jurisdictions, federal agencies, and environmental NGOs (~25 attendees)

- Southline held pre-NEPA public meetings in 2011

Date	Meeting Location
September 27, 2011	Willcox
September 28, 2011	Tucson
September 29, 2011	Marana
November 10, 2011	Benson

  - Attendees included local landowners, environmental NGOs, business groups, and local, state, and federal agencies and jurisdictions
  - Notice of Pre-NEPA public meetings provided via
    - Published on Project website
    - Published in newspapers

Publication Date	Publication	Area
September 11, 2011 September 21, 2011	Casa Grande Dispatch	Casa Grande (Saguaro area)
September 7, 2011 September 14, 2011	Navajo-Hopi Observer	Navajo and Hopi Tribes, Winslow area
September 11, 2011 in EA Courier September 14, 2011 in Copper Era	Eastern Arizona Courier (Graham county)/ Copper Era (Greenlee County)	Safford (Graham and Greenlee Counties)
September 8, 2011	Sierra Vista Herald/Bisbee Daily Review	Sierra Vista
September 13, 2011 September 19, 2011	Arizona Daily Star	Tucson
September 16, 2011 September 22, 2011	La Estrella de Tucson	Tucson
September 14, 2011	Explorer Newspapers, Inc.	Tucson
September 15, 2011 September 22, 2011	Tucson Weekly	Tucson
September 14, 2011 September 21, 2011	Willcox Range News	Willcox
September 15, 2011 September 22, 2011	Navajo Times	Navajo Nation

    - Email distribution (624 recipients)
      - List developed by Kearns & West (collaboration and strategic communications firm) through research of local stakeholder groups, tribal groups, and local, state, and federal agencies to create direct email list

- Then conducted a stakeholder assessment, which included stakeholder interviews to determine whether there were additional groups that should be contacted/included

2012 (NEPA SCOPING)

Transmission Planning

- Southline participated in WECC Path Rating process
- Southline continued quarterly presentations to WestConnect's open transmission planning process
  - Regular interaction with and updates to ACC Staff at WestConnect meetings, including Prem Bahl, Toby Little, Ed Stoneberg, Jeff Francis, Zach Branum
- Southline participated in ACC Biennial Transmission Assessment process in 2012

Formal BLM/WAPA Outreach

- BLM/WAPA scoping email distribution

Date	Description	Recipients
April 27, 2012	Notification of scoping comment period	653
June 4, 2012	Notification of extended comment period	790
June 28, 2012	Notification of scoping comment period end date	788

  - BLM & WAPA created email distribution list from
    - Southline pre-NEPA efforts
    - Agencies, government representatives, and special interest groups from previous projects / contractor research
    - Permittees list from BLM
    - DOE NEPA Stakeholders Directory
    - County assessor data for Tucson and Willcox property owners and residents

- BLM/WAPA scoping postcard distribution

Date	Description	Recipients
April 23, 2012	Agency and public postcard notice of scoping period	626
April 25, 2012	Agency and public postcard notice of	64

	scoping period	
May 1, 2012	Permittees postcard notice of scoping period	206

Southline Team Outreach

- Sent email with information about the initiation of the NEPA process and the scoping period to Southline contact database developed in 2011 and updated with stakeholders who reached out through email, phone, and personal contact (4/4/12)
- Sent email with information about scoping meetings to Southline contact database developed in 2011 and updated with stakeholders who reached out through email, phone, and personal contact (5/3/12)

Political/Legislative Outreach

- David Kimball continued his outreach efforts on behalf of Southline

Date	Contact
May 14, 2012	An email containing a Southline update was sent to the following officials: Gary Pierce, Bob Stump, Brenda Burns, Maria Baier, Kevin Kinsall, Leisa Brug, Steve Smith, David Stevens, Gail Griffin, Peggy Judd, Vic Williams, Macario Saldate IV, Olivia Cajero-Bedford, Sally Gonzales, Bruce Wheeler, Steve Farley, Frank Pratt, Linda Lopez, Matt Heinz, John Fillmore, David Gowan Sr., Ted Vogt, Frank Antenori, Sylvia Allen, Andy Biggs, Al Melvin, Brenda Barton, Chester Chandell, Ed Farnsworth, and Page Gonzales.

2014 (DRAFT EIS COMMENT PERIOD)

Transmission Planning

- Southline participated in WECC Path Rating process
- Southline continued quarterly presentations to WestConnect's open transmission planning process
    - Regular interaction with and updates to ACC Staff at WestConnect meetings, including Prem Bahl, Toby Little, Ed Stoneberg, Jeff Francis, Zach Branum
- Southline participated in ACC Biennial Transmission Assessment process in 2014

Formal BLM/WAPA Outreach

- BLM/WAPA draft EIS email distribution

Date	Description	Recipients
April 14, 2014	Agency and public notification of draft EIS comment period	998
May 2, 2014	Agency and public hearing reminder for NM	998
May 15, 2014	Agency and public hearing reminder for AZ	997
June 26, 2014	Reminder comment deadline ends in 2 weeks	1,049
July 3, 2014	Reminder comment deadline ends in 1 week	1061
July 9, 2014	Reminder comment deadline ends tomorrow	1,059

- BLM/WAPA draft EIS mailing distribution

Date	Description	Recipients
April 16, 2014	Agency and public postcard notice of draft EIS comment period	998
April 16, 2014	Permittees postcard notice	268
April 25, 2014	Tucson property owners and residents along route	2,056
December 16, 2014	Tucson and Willcox property owners and residents in vicinity of route variations	Approximately 1,100

Southline Team Outreach

- Sent email with information about the DEIS and related meetings to Southline contact database developed in 2011 and updated with stakeholders who reached out through email, phone, and personal contact (4/23/14 with 952 recipients and 5/1/14 with 827 recipients)

Political/Legislative Outreach

- David Kimball continued his outreach efforts on behalf of Southline

Date	Contact
May 13, 2014	An email containing a Southline update was sent to the following officials: Gary Pierce, Brenda Burns, Bob Stump, Susan Bitter-Smith, Bob Burns, Leisa Brug, Kevin Kinsall, Scott Smith, Michael Hunter, Vanessa Hickman, Andy Tobin, Lynne Pancrazi, Juan Carlos Escamilla, Lisa Otondo, Andrea Dalessandro, Rosanna Gabaldon, Demion Clinco, Olivia Cajero Bedford, Sally Ann Gonzales, Maracio Saldate IV, Frank Pratt, Steve Farley, Ethan Orr, Victoria Steele, Al Melvin, Adam Kwasman, Steve Smith, Andy Biggs, Gail Griffin, David Gowan Sr., David Stevens, and Bob Worsley.

2015 (FINAL EIS)

Transmission Planning

- Southline participated in WECC Path Rating process
- Southline continued quarterly presentations to WestConnect's open transmission planning process
    - Regular interaction with and updates to ACC Staff at WestConnect meetings, including Prem Bahl, Toby Little, Ed Stoneberg, Jeff Francis, Zach Branum

Formal BLM/WAPA Outreach

- BLM/WAPA postcard inquiry regarding final EIS distribution

Date	Description	Recipients
February 19, 2015	Agency and public inquiry regarding distribution of Final EIS	1,387
February 19, 2015	Tucson property owners and residents along route as provided by Regina Romero (City of Tucson Ward 1) inquiry regarding distribution of Final EIS	1,060

- Final EIS distribution

Date	Description	Recipients
November 6, 2015	Agency and public	CD - 229 Hard copy - 54
November 6, 2015	Tribal	CD – 37

		Hard copy - 17

Southline Team Outreach

- Sent email with information about the FEIS to Southline contact database developed in 2011 and updated with stakeholders who reached out through email, phone, and personal contact (11/10/15, 891 recipients)

Political/Legislative Outreach

- February 2015, initial contact with ACC Staff (Toby Little) regarding Ten Year Plan and CEC Application
- December 2015, reached out to Chairman of ACC Line Siting Committee regarding CEC Application
    - Lisa Romeo & Chairman Chenal

2016 (RECORD OF DECISIONS & CEC)

Transmission Planning

- Southline participated in WECC Path Rating process
- Southline continued quarterly presentations to WestConnect's open transmission planning process
    - Regular interaction with and updates to ACC Staff at WestConnect meetings, including Prem Bahl, Toby Little, Ed Stoneberg, Jeff Francis, Zach Branum

Formal BLM/WAPA Outreach

- BLM/WAPA BLM Record of Decision distribution

Date	Description	Recipients
May 9, 2016	Agency and public	273
May 9, 2016	Tribal	37

Southline Team Outreach

- Sent email with information about the RODs to Southline contact database developed in 2011 and updated with stakeholders who reached out through email, phone, and personal contact (5/27/16, 878 recipients)

Political/Legislative Outreach

- Formal CEC Application Prefiling Meeting with Chairman Chenal

Date	Meeting Attendees
October 3,2016	WAPA; Grand Canyon State Electric Cooperative Association, Inc.; Arizona Game & Fish Department; Sunzia; Arizona Corporation Commission, Commission Staff; Arizona State Land Department; Bureau of Land Management; Pinal County; Galileo Project, Bureau of Land Management; Fort Huachuca

  - Invited 33 affected jurisdictions, cooperating agencies, and potential intervenors

- Meeting with ACC Staff in advance of filing CEC Application

Date	Meeting Attendees
October 3,2016	Member Woodall; Elijah Abinah – Deputy Director of the Utilities Division; Charles Hains – Staff attorney; Zachary Branum - Utilities Division; Del Smith - Utilities Division

- Meetings with ACC Commissioners and Governor's Office in preparation for expected CEC Application filing

Date	Contact
October 12, 2016	Commissioner Andy Tobin and his policy advisor, Matt Gress
October 12, 2016	Commissioner Bob Burns and his policy advisor, Angela Paton
October 12, 2016	Matthew Rowell, policy advisor to Commissioner Doug Little
October 12, 2016	Brandon Nelson, policy advisor to Commissioner Tom Forese
October 12, 2016	Hunter Moore with Governor's Office

- David Kimball continued his outreach efforts on behalf of Southline

Date	Contact
November 23, 2016	An email containing a Southline update and notice of the upcoming ACC Line Siting Committee hearing was sent to the following officials: Gail Griffin, Steve Smith, Mark Finchem, Vince Leach, Steve Farley, Randall Friese, Olivia Cajero Bedford, Maracio Saldate IV, Sally Ann Gonzales, Andrea Dalessandro, Rosanna Gabaldon, and J. Christopher Ackerley.

Formal CEC Notice of Hearing

- Southline published Notice of Hearing, CEC Application, Prefiling and Prehearing Transcripts on its website

- Southline published Notice of Hearing in the following newspapers

Publication Date	Publication	Area
October 23, 2016 October 24, 2016	Arizona Republic	Statewide
October 23, 2016 October 24, 2016	Arizona Daily Star	Statewide
October 26, 2016	San Pedro Valley News	Benson area
October 26, 2016	Willcox Range News	Willcox area
October 26, 2016	The Explore Newspaper	Marana area

- Southline provided Notice of Hearing via CMRRR to the following jurisdictions

Date	Jurisdiction
November , 2016	Cochise County
November , 2016	Pima County
November , 2016	Pinal County
November , 2016	City of Tucson
November , 2016	City of Willcox
November , 2016	AGFD
November , 2016	ASLD

- Southline posted Notice of Hearing signs along the CEC Proposed Route

Date	Location
November 9, 2016	Near Tortolita Substation
November 9, 2016	Near DeMoss Petrie Substation
November 9, 2016	Near Vail Substation
November 9, 2016	Near Apache Substation
November 9, 2016	Near Willcox Playa Wildlife Area
November 9, 2016	Between Bowie and San Simon

- Southline provided a hard copy of the CEC Application

Date	Jurisdiction
November , 2016	ACC, Phoenix
November , 2016	Power Plant and Transmission Line Siting Committee
November , 2016	ACC Legal Division
November , 2016	ACC Utilities Division
November , 2016	ACC, Tucson
November , 2016	Cochise County
November , 2016	Pima County
November , 2016	Pinal County
November , 2016	City of Tucson
November , 2016	AGFD
November , 2016	ASLD

- Southline also arranged to have a hard copy of the CEC Application and Prefiling and Prehearing Transcripts available at the following libraries

Date	Location
November , 2016	Elsie S. Hogan Community Library (Willcox)
November , 2016	Benson Public Library (Benson)

constructing and operating the energy project, which would be enabled by Western's execution of the interconnection agreement and upgrades to their existing transmission system (the Federal actions).

2.6 ACTION ALTERNATIVES

The alternatives development process began with the initial routing efforts completed by Southline to identify the Project used for the BLM ROW grant application, followed by public and agency scoping. Issues noted during public and agency scoping were used to develop agency alternatives. The agency alternatives do not constitute wholesale route alternatives, but rather are local alternatives that provide additional route options addressing specific identified resource issues or issue areas. These processes are described below (see section 2.6.1).

Route variations not included in the Draft EIS are included in the Final EIS for alternatives in route group 2 and route group 4. These route variations include P7a, P7b, P7c, and P7d near Willcox Playa (route group 2) and U3aPC near the Tucson International Airport (route group 4).These variations of routes analyzed in the Draft EIS are included in this Final EIS based on requests from the public and cooperating agencies (see chapter 8).

Names for the various routing alternatives used throughout this EIS are defined as:

- Proponent Preferred – Southline's preferred route as proposed in their ROW grant application (considered a subroute, composed of segments);
- Proponent Alternative – Southline's alternative route as proposed in their ROW grant application (considered a subroute, composed of segments);
- Local alternative – Localized route options proposed by Southline or developed by BLM and Western in coordination with cooperating agencies to address specific resource issues; and
- Route variation – Minor variations in routes developed by BLM and Western in response to comments on the Draft EIS.

2.6.1 Process

Alternatives Developed by Southline

As described in Section 2.2, "Route Selection Process," Southline prepared a routing study to identify viable routes, evaluate potential environmental and land use constraints associated with those routes, and identify the optimal route alternatives for the proposed Project. Through this process, Southline submitted "proponent preferred routes" to BLM for the ROW grant application. The process of preparing the routing study and selecting Southline's preferred routes was needed to develop a Project proposal for review by the agencies and to initiate the NEPA process.

Southline's siting process was iterative, wherein a number of reasonable routes or segments were identified as possible alternatives and then studied using a geographic information system (GIS)-based evaluation process. For the siting process, Southline collected data, identified major on-the-ground features, and coordinated with land management agencies and landowners. Southline also adjusted possible alternative routes in response to input from its stakeholder outreach, and from early outreach with the BLM and Western.

The primary focus of the routing process for the New Build Section was to analyze existing linear facilities to identify and eliminate those initial route segments that did not conform to the overall

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objectives of the Project. These included route segments that were duplications of other options that had better overall routing potential, as well as other segments that were unusable because of their alignment/direction.

The screening process was augmented by a public engagement program that was designed to identify stakeholders and to work closely with these stakeholders to discuss the Project and obtain their input to the routing study process through direct interaction with the Project team. This approach was used for both the New Build and Upgrade sections of the line. Through this siting process, Southline ultimately selected a set of preferred alternatives ("Proponent Preferred" and "Proponent Alternative") and eliminated a number of routes, some due to public input and others as a result of constraints or because they did not meet the technical needs of the Project.

Southline's routing process is described in detail in the "Southline Transmission Project Routing Report" (Southline 2012a); the report is available online.[6]

Alternatives Developed by the Bureau of Land Management and Western Area Power Administration

The BLM and Western, in coordination with the interdisciplinary (ID) team and cooperators, developed alternatives to the proposed route in order to address issues raised by Federal land management, State and local agencies, and the public. WWEC data were considered (figures 2-16a and 2-16b), and Southline provided input on the reasonableness and suitability of the BLM- and Western-developed alternatives.

Because Southline's routing process was so interactive and included extensive stakeholder outreach and early screening with Western and BLM, agency alternatives developed through the NEPA process resulted in only small route variations around local resource conflicts. Through the Federal scoping process, routes identified by Southline were considered, and, in some cases, new local alternatives were added, based on the public and agency comments, ID team, and cooperating agency input. The alternatives development process included the evaluation of the following:

- Environmental concerns expressed during scoping, including the potential for major environmental impacts;
- Consideration of the BLM and DOE NEPA guidelines, including recommendation to evaluate or dismiss; and
- Review of all route alternatives and rationale by cooperating agencies and the ID team.

2.7 TRANSMISSION LINE ROUTE ALTERNATIVES

Southline's Proponent Preferred and Proponent Alternative routes were divided into four route groups and then into subroutes within each route group. Route groups were established based on geography, common resource issues, and interconnection points (substations), as shown in figures 2-16a and 2-16b. These four geographic route groups allow for localized comparisons among subroutes and local alternatives.

Transmission line route alternatives developed by the agencies are "local alternative" options that attempt to avoid or minimize negative impacts to specific environmental or socioeconomic conditions. The naming convention and labeling style for each local alternative is based on nearby geographic landmarks (e.g., north of Deming (DN); local alternative No. 1 (DN1)).

[6] Available at: http://www.southlinetransmissionproject.com/files/Routing_Report_AppA_and_Figures_042412_final.pdf.

The four route groups are:

1. Route group 1: Afton Substation to Hidalgo Substation (New Build Section);
2. Route group 2: Hidalgo Substation to Apache Substation (New Build Section);
3. Route group 3: Apache Substation to Pantano Substation (Upgrade Section); and
4. Route group 4: Pantano Substation to Saguaro Substation (Upgrade Section).

Local alternatives were developed consistent with NEPA (40 CFR 1502.14), which requires Federal agencies to "rigorously explore and objectively evaluate" a range of alternatives to the proposed Federal action. In addition, the route alternative alignments were sited to address issues raised by land management agencies, local government, individuals, and organizations. Agency cooperators and the ID team provided input on the reasonableness and suitability of these BLM- and Western-developed local alternatives.

The following considerations were used to further evaluate alternatives:

1. Did the alternative meet the underlying Project stated objectives for the proposed Project?
2. Is the route alternative consistent with the policy objectives for the management of the area (e.g., in conformance with land use plans)?
3. Is it substantially similar in design or does it have substantially similar effects as an alternative that is already being analyzed?
4. Did the route alternative address and resolve resources conflicts and/or identified issues?
5. Did the route alternative cause fewer adverse environmental effects (fewer detrimental effects, less severe effects, or shorter-term effects) than the proposed route for at least some resources?

Some local alternatives were considered but eliminated from detailed study because they do not meet the criteria for a reasonable alternative (listed above). A discussion of alternatives considered but eliminated can be found in section 2.9.

Route groups, subroutes, local routes and route variations are listed in table 2-9, followed by a description of each alternative subroute and local alternative presented by route group. An overview of the route groups and segments is depicted in figures 2-17a through 2-17d; details of the route groups and segments are depicted in figures 2-18a through 2-18j.

Table 2-9. Summary of Route Groups, Subroutes, Route Variations, and Local Alternatives

Subroutes	Total Miles	Segments
Route Group 1: Afton Substation to Hidalgo Substation		
Subroute 1.1, Proponent Preferred	147.1	P1, P2, P3, P4a
Subroute 1.2, Proponent Alternative	141.1	S1, S2, S3, S4, S5, S6, S7, S8
Route Group 1 Local Alternatives	–	DN1, , B, C, D
Route Group 2: Hidalgo Substation to Apache Substation		
Subroute 2.1, Proponent Preferred	95.5	P4b, P4c, P5a, P5b, P6a, P6b, P6c, P7, P8
Subroute 2.2, Proponent Alternative	96.0	E, F, Ga, Gb, Gc, I, J
Route Group 2 Route Variations	–	P7a, P7b, P7c, P7d
Route Group 2 Local Alternatives	–	LD1, LD2, LD3a, LD3b, LD4, LD4-Option 4, LD4-Option 5, WC1

Table 2-9. Summary of Route Groups, Subroutes, Route Variations, and Local Alternatives (Continued)

Subroutes	Total Miles	Segments
Route Group 3: Apache Substation to Pantano Substation		
Subroute 3.1, Proponent Preferred	70.3	U1a, U1b, U2, U3a
Route Group 3 Local Alternatives	–	H
Route Group 4: Pantano Substation to Saguaro Substation		
Subroute 4.1, Proponent Preferred	48.3	U3b, U3c, U3d, U3e, U3f, U3g, U3h, U3i, U3j, U3k, U3l, U3m, U4
Route Group 4 Route Variation	–	U3aPC
Route Group 4 Local Alternatives	–	MA1, TH1a, TH1b, TH1c, TH1-Option, TH3-Option A, TH3-Option B, TH3-Option C, TH3a, TH3b

2.7.1 Route Group 1: Afton Substation to Hidalgo Substation

General Description and Issues

This route group falls within the New Build Section. The critical public concerns expressed for the proposed Project in this route group include north-south-trending wildlife linkage and migratory bird pathways, potential habitat fragmentation, potential conflict with national scenic and historic trails, and potential conflict with land uses. Specifically, there are known migration pathways for sandhill crane (*Grus canadensis*) that bisect this area in two general northeast-southwesterly flight paths. In addition, several agency and public comments indicated that the Proponent Alternative (subroute 1.2) traverses largely untouched open space, agricultural areas, and important wildlife habitat.

In addition, this route group crosses near several visually and environmentally important mountain ranges and natural topographic features, such as the Florida Mountains, Potrillo Mountains, Cedar Mountains, Lewis Flats, and Playas Valley, which support important wildlife connections and include the West Potrillo Mountains, Aden Lava Flow, Mount Riley, and Florida Mountains Wilderness Study Areas. Finally, within this route group, the proposed Project and alternative route each cross the Continental Divide National Scenic Trail (CDNST) and the Butterfield Overland Mail and Stage Route/Butterfield Overland Trail National Historic Trail (Butterfield Trail) in three places.

Subroute 1.1, Proponent Preferred

Subroute 1.1 (Proponent Preferred, New Build Section) extends approximately 147 miles between Las Cruces and Lordsburg and generally heads west along I-10 and north around Deming, "ending" just east of Lordsburg at the existing Hidalgo Substation. This route also includes a 31-mile-long, north-south alignment west of the Potrillo Mountains. Subroute 1.1 includes segments P1, P2, P3, and P4a (see figure 2-17a). More than 75 percent of subroute 1.1 is adjacent to, and routed along, linear features such as existing transmission and gas lines (table 2-10).

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation

Route Group 4			Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
				MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
Subroute Length (miles)			48.3	1.1	1.4	1.6	0.3	1.0	0.8	0.8	1.8	2.7	4.5	6.2	55.5
Land Ownership (miles crossed)	BLM		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	BIA		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	DOD		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Forest Service		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Reclamation		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
	State		18.0	1.1	0.2	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	18.9
	County		0.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
	Private		29.6	0.0	1.2	1.4	0.3	0.3	0.8	0.8	1.8	2.7	4.5	6.2	36.0
Ground Disturbance	Temporary	Acres	322.2	5.6	7.2	8.0	1.3	5.0	4.2	4.2	9.2	13.9	23.0	31.6	359.1
		Acres/Mile	6.7	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.1	6.5
	Permanent	Acres	89.7	0.3	0.3	1.1	0.1	0.1	0.9	0.6	2.5	2.7	3.3	3.2	92.2
		Acres/Mile	1.9	0.3	0.2	0.7	0.6	0.1	1.1	0.8	1.4	1.0	0.7	0.5	1.7
BLM RMP Conformance	VRM	Acres crossing Class II Lands	None	None	None	None	None	None	None	None	None	None	None	None	None
	ROW Avoidance Areas		No impact	None	None	None	None	None	None	None	None	None	None	No impact	No impact
	Plan Conformance		No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict	No conflict
Air Quality			Fugitive dust and equipment emissions would occur under all subroutes and alternatives; emissions would be relative to the length of the subroute and alternative(s) chosen. The subroute and all the alternatives would traverse the Tucson carbon monoxide maintenance area and the Rillito particulate matter 10 non-attainment area. **Impact Intensity: Minor**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 3.1	Same as subroute 4.1

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Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

		Local Alternative Segments										Route Variation	
Route Group 4	**Subroute 4.1 - Proponent Preferred (Upgrade)**	**MA1**	**TH1a**	**TH1b**	**TH1c**	**TH1-Option**	**TH3-Option A**	**TH3-Option B**	**TH3-Option C**	**TH3a**	**TH3b**	**U3aPC**	**Agency Preferred Alternative**
Noise and Vibration	More than 100 noise sensitive receptors (NSRs) exist along this subroute, particularly around Tucson. The nearest NSRs are within 50 feet of the ROW. The local alternatives still occur within the city of Tucson; therefore, they have little net impact on the quantity or proximity of NSRs to the ROW. **Impact Intensity: Major but Temporary**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	This variation avoids traversing portions of Summit, Arizona and associated potential NSRs. The variation is within 50 feet of potential NSRs. However, the amount of NSRs impacted would be less than the subroute it is substituting for. **Impact Intensity: Major but temporary**	Same as subroute 4.1
Geology and Mineral Resources	Geology: No impact. Mineral Resources: No impact. **Impact Intensity: No impact**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 3.1	Same as subroute 4.1
Soil Resources	No key issues with soil resources in route group 4. **Impact Intensity: No impact**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Has moderately erodible soils (~1 acre). same as subroute 4.1	Same as subroute 4.1
Paleontological Resources	No key issues for paleontological resources. **Impact Intensity: No impact**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	No key issues for paleontological resources **Impact Intensity: No impact**	Same as subroute 4.1 **Impact Intensity: No impact**
Groundwater, Surface Water, and Wetlands	6 WUS 4 wetlands 266 acres of floodplains **Impact Intensity: No impact**	0 WUS 0 wetlands 19 acres of floodplains **Impact Intensity: No impact**	0 WUS 0 wetlands 2 acres of floodplains **Impact Intensity: No impact**	0 WUS 0 wetlands 0 acres of floodplains **Impact Intensity: No impact**	0 WUS 0 wetlands 0acres of floodplains **Impact Intensity: No impact**	0 WUS 0 wetlands 3 acres of floodplains **Impact Intensity: No impact**	1 WUS 1 wetland 2 acres of floodplains **Impact Intensity: No impact**	1 WUS 0 wetlands 10 acres of floodplains **Impact Intensity: No impact**	2 WUS 2 wetland 7 acres of floodplains **Impact Intensity: No impact**	1 WUS 0 wetland 3 acres of floodplains **Impact Intensity: No impact**	1 WUS 5 wetlands 31 acres of floodplains **Impact Intensity: Minor to moderate**	0 WUS 0 wetlands 4 acres of floodplains **Impact Intensity: No impact**	6 WUS 4 wetlands 269 acres of floodplains **Impact Intensity: No impact**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

		Local Alternative Segments										Route Variation	
Route Group 4	**Subroute 4.1 - Proponent Preferred (Upgrade)**	**MA1**	**TH1a**	**TH1b**	**TH1c**	**TH1-Option**	**TH3-Option A**	**TH3-Option B**	**TH3-Option C**	**TH3a**	**TH3b**	**U3aPC**	**Agency Preferred Alternative**
Biological Resources (Vegetation)	The Pima pineapple cactus, listed as endangered under the ESA, has potential to be present on the southern parts of segments U3 and U4. Sensitive species— button cactus, desert barrel cactus (*Ferocactus cylindraceus*), Engelmann prickly pear (*Opuntia engelmannii* var. *flavispina*), giant sedge, littleleaf false tamarind (*Lysiloma watsonii*), magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow (*Abutilon parishii*), San Carlos wild-buckwheat, staghorn cholla (*Cylindropuntia versicolor*), Thornber's fishhook cactus (*Mammillaria thornberi*), Tumamoc globeberry (*Tumamoca macdougalii*), and hybrid Kelvin cholla (*Opuntia kelvinensis*)— have potential to occur. Buffelgrass *Pennisetum ciliare)* is known to be present in segment U3, and likely to occur in segment U4 **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— desert barrel cactus, magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. Field bindweed (*Convolvulus arvensis*) and hydrilla (*Hydrilla verticillata*) could be present in TH3a **Impact Intensity: Minor**	No ESA-listed species occur in this segment. Sensitive species— magenta-flowered hedgehog cactus, night-blooming cereus, Pima Indian mallow, staghorn cholla, Tumamoc globeberry, and hybrid Kelvin cholla—have potential to occur. Buffelgrass is known to occur in this segment. **Impact Intensity: Minor**	The Pima pineapple cactus, listed as endangered under the ESA, has some potential to be present on route variation U3aPC. Sensitive species- magenta-flowered hedgehog cactus, kelvin cholla, staghorn cholla, Tumamoc globeberry, and varied fishhook cactus have some potential to occur in route variation U3aPc. **Impact Intensity: Minor**	The Pima pineapple cactus, listed as endangered under the ESA, has potential to be present on the southern parts of segments U3, U3a PC and U4. Sensitive species-button cactus, desert barrel cactus, Engelmann prickly pear, giant sedge, littleleaf false tamarind, Pima Indian mallow, slender-needle corycactus, Thornber fishhook cactus, Tumamoc globeberry, magenta-flowered hedgehog cactus, kelvin cholla, and staghorn cholla—have potential to occur. Buffelgrass is known to occur in segment U3 and likely to occur in segment U4. **Impact Intensity: Minor**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

Route Group 4		Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
			MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
Biological Resources (Wildlife)	General Wildlife	Disturbance to wildlife habitat on 323 acres.	Disturbance to wildlife habitat on 6 acres.	Disturbance to wildlife habitat on 7 acres.	Disturbance to wildlife habitat on 8 acres.	Disturbance to wildlife habitat on 1 acre.	Disturbance to wildlife habitat on 5 acres.	Disturbance to wildlife habitat on 4 acres.	Disturbance to wildlife habitat on 4 acres.	Disturbance to wildlife habitat on 9 acres.	Disturbance to wildlife habitat on 14 acres.	Disturbance to wildlife habitat on 23 acres.	Disturbance to wildlife habitat on 32 acres.	Disturbance to wildlife habitat on 359 acres.
	Federally Listed Species	Disturbance to 237 acres of lesser long-nosed bat habitat. Disturbance to 143 acres of Sonoran desert tortoise habitat. No habitat 12 acres of southwestern willow flycatcher and western yellow-billed cuckoo foraging habitat.	This local alternative occurs in an agricultural area. No impacts on Federally Listed Species.	Disturbance to 5 acres of lesser long-nosed bat habitat and 4 acres of Sonoran desert tortoise habitat.	Disturbance to 7 acres of lesser long-nosed bat habitat and Sonoran desert tortoise habitat.	This local alternative occurs in a developed area. Disturbance to 1 acre of lesser long-nosed bat habitat.	Disturbance to 7 acres of lesser long-nosed bat habitat and Sonoran desert tortoise habitat.	Disturbance to 4 acres of lesser long-nosed bat habitat and Sonoran desert tortoise habitat.	Disturbance to 4 acres of lesser long-nosed bat habitat and 2 acres of Sonoran desert tortoise habitat.	Disturbance to 5 acres of lesser long-nosed bat habitat and 2 acres of Sonoran desert tortoise habitat.	Disturbance to 17 acres of lesser long-nosed bat habitat and 10 acres of Sonoran desert tortoise habitat.	Disturbance to 23 acres of lesser long-nosed bat habitat and 2 acres of Sonoran desert tortoise habitat.	Disturbance to 32 acres of lesser long-nosed bat habitat and 25 acres of Sonoran desert tortoise habitat.	Disturbance to 273 acres of lesser long-nosed bat habitat. Disturbance to 167 acres of Sonoran desert tortoise habitat. Disturbance to 10 acres of riparian vegetation along the Santa Cruz River for southwestern willow flycatcher and western yellow-billed cuckoo foraging habitat.
	BLM Sensitive Species	Disturbance to habitat for 22 BLM Sensitive Species.	Disturbance to habitat for 1 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	This local alternative occurs in a developed area. No impacts on BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 17 BLM Sensitive Species.	Disturbance to habitat for 11 BLM Sensitive Species.	Disturbance to habitat for 23 BLM Sensitive Species.
	Arizona Wildlife Species of Concern	Disturbance to habitat for 26 Arizona Wildlife Species of Concern.	Disturbance to habitat for 1 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 2 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 19 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 18 Arizona Wildlife Species of Concern.	Disturbance to habitat for 11 Arizona Wildlife Species of Concern.	Disturbance to habitat for 16 Arizona Wildlife Species of Concern.	Disturbance to habitat for 26 Arizona Wildlife Species of Concern.
	Arizona Species of Greatest Conservation Need	Disturbance to habitat for 16 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 1 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	This local alternative occurs in a developed area. No impacts on Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 11 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 1 Arizona Species of Greatest Conservation Need.	Disturbance to habitat for 16 Arizona Species of Greatest Conservation Need.
	Pima County Species	Disturbance to habitat for 15 Pima County Species.	Disturbance to habitat for 1 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	This local alternative occurs in a developed area. No impacts on Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 12 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 10 Pima County Species.	Disturbance to habitat for 2 Pima County Species.	Disturbance to habitat for 15 Pima County Species.

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

Route Group 4		Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
			MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
	Migratory Birds	Disturbance to migratory bird habitat on 323 acres. Near an unnamed ridge near Ajo Way and Rattlesnake Pass in the Tucson Mountains.	Disturbance to migratory bird habitat on 6 acres.	Disturbance to migratory bird habitat on 7 acres.	Disturbance to migratory bird habitat on 8 acres.	Disturbance to migratory bird habitat on 1 acre.	Disturbance to migratory bird habitat on 5 acres.	Disturbance to migratory bird habitat on 4 acres.	Disturbance to migratory bird habitat on 4 acres.	Disturbance to migratory bird habitat on 9 acres.	Disturbance to migratory bird habitat on 14 acres.	Disturbance to migratory bird habitat on 23 acres.	Disturbance to migratory bird habitat on 32 acres.	Disturbance to migratory bird habitat on 359 acres. Near an unnamed ridge near Ajo Way and Rattlesnake Pass in the Tucson Mountains.
	Wildlife Special Designation Areas	Disturbance to Pima County Biological Core Management Areas (5 acres), Important Riparian Areas (25 acres), Multiple Use Management Areas (67 acres), and Agricultural Inholdings (17 acres). Disturbance to Pima County Priority Conservation Areas for groundsnake (75 acres), western burrowing owl (*Athene cunicularia hypugaea*) (134 acres), cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) (91 acres), and Pima pineapple cactus (9.8 acres). Disturbance to Santa Cruz River Park om less than 1 acre, Tumamoc Hill on 4 acres and Tucson Mountain Park on 2 acres.	Disturbance to 5 acres of Pima County Priority Conservation Area for western burrowing owl.	Disturbance to Pima County Multiple Use Management Areas on 7 acres. Disturbance to Tumamoc Hill on 6 acres.	No Wildlife Special Designation Areas would be crossed by this local alternative.	No Wildlife Special Designation Areas would be crossed by this local alternative.	No Wildlife Special Designation Areas would be crossed by this local alternative.	Disturbance to Pima County Important Riparian Areas (2 acres) and Multiple Use Management Areas (1 acre). Disturbance to the Santa Cruz River Park on 1 acre. Disturbance to Pima County western burrowing owl priority conservation areas on 3 acres.	Disturbance to less than 1 acre of Pima County Important Riparian Areas, Multiple Use Management Areas, and the Santa Cruz River Park. Disturbance to Pima County western burrowing owl priority conservation areas on 3 acres.	Disturbance to Pima County Important Riparian Areas (3 acres) and Multiple Use Management Areas (4 acres). Disturbance to the Santa Cruz River Park on 3 acres. Disturbance to Pima County western burrowing owl priority conservation areas on 6 acres.	Disturbance to Pima County Important Riparian Areas (2 acres) and Multiple Use Management Areas (less than 1 acre). Disturbance to Pima County western burrowing owl priority conservation areas on 9 acres.	Disturbance to Pima County Important Riparian Areas (20 acres) and Multiple Use Management Areas (2 acres). Disturbance to the Santa Cruz River Park on 10 acres. Disturbance to Pima County western burrowing owl priority conservation areas on 15 acres.	Disturbance to 7 acres of Pima County Priority Conservation Area for western burrowing owl and 31.6 acres of the Pima pineapple cactus PCA.	Disturbance to Pima County Biological Core Management Areas (5 acres), Important Riparian Areas (26 acres), and Agricultural Inholdings (9 acres). Disturbance to Pima County Priority Conservation Areas for cactus ferruginous pygmy owl (91 acres), groundsnake (75 acres), western burrowing owl (134 acres), cactus ferruginous pygmy owl (96 acres), and Pima pineapple cactus (41.4 acres).
	All Wildlife	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**	**Impact Intensity: Minor**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

		Local Alternative Segments										Route Variation	
Route Group 4	**Subroute 4.1 - Proponent Preferred (Upgrade)**	**MA1**	**TH1a**	**TH1b**	**TH1c**	**TH1-Option**	**TH3-Option A**	**TH3-Option B**	**TH3-Option C**	**TH3a**	**TH3b**	**U3aPC**	**Agency Preferred Alternative**
Cultural Resources	Potential direct/visual impact to Tumamoc Hill Archaeological District and Desert Laboratory NHL, the Butterfield Trail , and the Mormon Battalion Trail. Potential direct impacts to the Los Robles Archaeological District, AZ BB:13:315(ASM), and the Valencia Site (NRHP-listed), 16 NRHP-eligible resources, and 66 forecast NRHP-eligible resources (Forecast Resources). However, route is an existing transmission line, meaning reduced ground disturbance; however, the Valencia Site is located in the expansion footprint of the Del Bac Substation. **Impact Intensity: Moderate**	No key issues for cultural resources. **Impact Intensity: No impact**	Potential direct/visual impact to Tumamoc Hill Archaeological District and Desert Laboratory NHL. Potential direct impact to 2 forecast NRHP-eligible resources (Forecast Resources). **Impact Intensity: Moderate**	Potential direct/visual impact to Tumamoc Hill Archaeological District and Desert Laboratory NHL. Potential direct impact to 10 NRHP-eligible resources (Forecast Resources). **Impact Intensity: Moderate**	Potential direct/visual impact to the Mormon Battalion Trail. **Impact Intensity: Minor**	Potential direct/visual impact to Tumamoc Hill Archaeological District and Desert Laboratory NHL. Potential direct impact to 4 NRHP-eligible resources (Forecast Resources). **Impact Intensity: Moderate**	Potential direct impact to 1 NRHP-eligible resource and 3 forecast NRHP-eligible resources (Forecast Resources). **Impact Intensity: Minor**	No key issues for cultural resources. **Impact Intensity: No impact**	Potential direct/visual impact to the Zuñiga Route. Potential direct impact to 1 NRHP-eligible resource and 17 forecast NRHP-eligible resources (Forecast Resources). **Impact Intensity: Minor**	Potential direct/visual impact to the Zuñiga Route. Potential direct impact to 1 NRHP-eligible resource and 7 forecast NRHP-eligible resources (Forecast Resources). **Impact Intensity: Minor**	Potential direct/visual impacts to the Butterfield Trail. Potential direct impact to 3 eligible resources and 16 forecast eligible resources (Forecast Resources). **Impact Intensity: Moderate**	Potential to impact the Mormon Battalion Trail and the Gila Trail. **Impact Intensity: Minor**	Potential direct/visual impact to Tumamoc Hill Archaeological District and Desert Laboratory NHL, and the Butterfield Trail. Potential direct impacts to the Los Robles Archaeological District, AZ BB:13:315(ASM), and the Valencia Site, (NRHP-listed), 15 NRHP-eligible resources, and 58 forecast NRHP-eligible resources. The route is an existing transmission line meaning reduced ground disturbance; however, the Valencia Site is located in the expansion footprint of the Del Bac Substation. **Impact Intensity: Moderate**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

		Local Alternative Segments										Route Variation	
Route Group 4	**Subroute 4.1 - Proponent Preferred (Upgrade)**	**MA1**	**TH1a**	**TH1b**	**TH1c**	**TH1-Option**	**TH3-Option A**	**TH3-Option B**	**TH3-Option C**	**TH3a**	**TH3b**	**U3aPC**	**Agency Preferred Alternative**
Visual Resources	Crosses primarily Class C scenery. There are sensitive viewers located at Sentinel Peak, along the Anza NHT, the Butterfield Trail, the Arizona NST, at Saguaro National Park, and within pockets of urban recreational places, linear biking, and pedestrian trails. There would low to moderate impacts; the replacement structures and line would similar in form to the existing line, but would be taller. Although the structures would be taller, the increased height would barely be distinguishable viewed against the backdrop of the valley floor, surrounding development, and surrounding hills. **Impact Intensity: Moderate**	Crosses Class C landscape and has a sensitivity level of low to moderate, given the proximity to existing development and existing transmission line. Visual impact would be low. **Impact Intensity: Minor**	Visual impact is considered moderate to high in this area because of the increased scenic quality and visual sensitivity associated with Tumamoc Hill. **Impact Intensity: Moderate to major**	Same as segment TH1a	Same as segment TH1a	Visual impact is considered moderate to high in this area because of the increased scenic quality and visual sensitivity associated with Tumamoc Hill. **Impact Intensity: Moderate to major**	Crosses Class C scenery with low sensitivity because of its proximity to human-made development as well as being located within a corridor with existing lattice transmission line structure transmission lines. **Impact Intensity: Minor**	Same as segment TH3-Option A	Same as segment TH3-Option A	Crosses Class C scenery with low sensitivity given the location parallel to a major transportation corridor. **Impact Intensity: Minor**	Same as segment TH3a	Crosses primarily Class B scenery. Avoids Summit, Arizona. Requires construction of a new transmission line paralleling existing transmission ROW. Impacts to viewers would be low because of the distance from sensitive viewers and that the replacement structures would be similar to those in the existing landscape. There are no BLM lands for variation U3aPC. **Impact Intensity: Minor**	TH1-TH1a: Visual impact is considered moderate to high in this area because of the increased scenic quality and visual sensitivity associated with Tumamoc Hill. Alternative is located outside BLM-administered land. **Impact Intensity: Moderate to major** MA1: Crosses Class C landscape and has a sensitivity level of low to moderate, given the proximity to existing development and existing transmission line. Visual impact would be low. **Impact Intensity: Minor**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

		Local Alternative Segments										Route Variation	
Route Group 4	**Subroute 4.1 - Proponent Preferred (Upgrade)**	**MA1**	**TH1a**	**TH1b**	**TH1c**	**TH1-Option**	**TH3-Option A**	**TH3-Option B**	**TH3-Option C**	**TH3a**	**TH3b**	**U3aPC**	**Agency Preferred Alternative**
Land Use, Including Farm and Range Resources and Military Operations	Follows existing ROW. Crosses SVAPD. No significant impacts to statewide or unique farmlands, or rangelands. Runs parallel to existing linear features for 100% of the ROW. Minor impacts to Pinal Airpark and Silverbell Army Heliport from the introduction of new towers and potential radio transmission interference. **Impact Intensity: Minor**	No impacts to land use or military. No significant impacts to statewide or unique farmlands, or rangelands. **Impact Intensity: No impact**	Same as segment MA1	Same as segment MA1	Same as segment MA1	Same as segment MA1	Same as segment MA1	Same as segment MA1	No impacts to land use or military. Would result in a 10.3% impact to farmlands of unique importance. No significant impacts to rangelands. **Impact Intensity: Minor**	Same as segment MA1	No impacts to land use or military. Would result in a 31% impact to farmlands of unique importance. No significant impacts to rangelands. **Impact Intensity: Minor**	Occurs along existing rural roadways paralleling existing transmission line ROWs and would not affect existing land uses. No significant impacts to statewide or unique farmlands, or rangelands. **Impact Intensity: Minor**	Follows existing ROW. Crosses SVAPD. Parallels existing linear features for approximately 54 miles (98%) of the ROW. 31 acres of farmland of unique importance, 338 acres of prime farmland (irrigated), and 276 acres of prime farmland (other) would be temporarily impacted during construction. No significant impacts to rangelands are expected to occur. No significant impact to military operations. **Impact Intensity: Minor**
Special Designations	Crosses Arizona NST. Crosses Anza National Historic Trail (NHT) four times. Crosses Butterfield Trail two times. **Impact Intensity: Minor**	Would not intersect special designations. **Impact Intensity: No impact**	Would not intersect special designations. **Impact Intensity: No impact**	Would not intersect special designations. **Impact Intensity: No impact**	Would not intersect special designations. **Intensity: No impact**	Would not intersect special designations. **Intensity: No impact**	Crosses Anza NHT two times. **Impact Intensity: Minor**	Crosses Anza NHT. **Impact Intensity: Minor**	Would not intersect special designations. **Intensity: No impact**	Would not intersect special designations. **Intensity: No impact**	Crosses Anza NHT three times. Crosses Butterfield Trail. **Impact Intensity: Minor**	Would not intersect special designations. **Intensity: No impact**	Crosses Arizona NST. Crosses Anza NHT six times. Crosses Butterfield Trail two times. Crosses SVAPD. **Impact Intensity: Minor**
Wilderness Characteristics	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**	Does not cross any WIUs. **Impact Intensity: No impact**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

Route Group 4	Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
		MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
Recreation	Crosses Bar V Ranch. Crosses Arizona NST. Crosses Anza NHT four times. Crosses Butterfield Trail two times. Crosses Tucson Mountain Park. Crosses Tumamoc Hill. Crosses Joaquin Murrieta Park. Crosses Christopher Columbus Park. **Impact Intensity: Minor**	Negligible impacts. **Impact Intensity: No impact**	Would not substantially change existing recreation settings, experiences, or opportunities. **Impact Intensity: Minor**	Negligible impacts. **Impact Intensity: No impact**	Negligible impacts. **Impact Intensity: No impact**	Negligible impacts. **Impact Intensity: No impact**	Would not substantially change existing recreation settings, experiences, or opportunities. **Impact Intensity: Minor**	Crosses Santa Cruz River Park. Crosses Anza NHT. **Impact Intensity: Minor**	Negligible impacts. **Impact Intensity: No impact**	Crosses Santa Cruz River Park. **Impact Intensity: Minor**	Crosses Santa Cruz River Park. Crosses Anza NHT three times. Crosses Butterfield Trail. **Impact Intensity: Minor**	Negligible impacts. **Impact Intensity: No impact**	Crosses Arizona NST and Anza NHT six times. Crosses Butterfield Trail two times. Crosses Bar V Ranch, Tucson Mountain Park, Tumamoc Hill, Joaquin Murrieta Park, Santa Crus River Park, and Christopher Columbus Park. **Impact Intensity: Minor**

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

Route Group 4	Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
		MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
Socioeconomics and Environmental Justice	Project would directly and indirectly support an estimated 138 local jobs, along with 132 non-local workers, in the Upgrade Section during 2-year construction period. Corresponding increases in labor income, output, and tax revenues. Construction could create short-term shortages of temporary housing, and short-term increases in the demand for local services, in the more remote eastern portion of the Upgrade Section. Ongoing operations could benefit local communities through increased property tax revenues and improved electrical capacity to serve future growth. Multiple low-income and minority populations in the study area may be disproportionately negatively affected by localized construction and operation impacts. Given the prevalence of low-income and minority populations throughout the area, disproportionate impacts on low-income and minority populations are likely inevitable under any feasible transmission route. **Impact Intensity: Minor**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1

Table 2-18. Comparison Summary for Route Group 4: Pantano Substation to Saguaro Substation (Continued)

Route Group 4	Subroute 4.1 - Proponent Preferred (Upgrade)	Local Alternative Segments										Route Variation	Agency Preferred Alternative
		MA1	TH1a	TH1b	TH1c	TH1-Option	TH3-Option A	TH3-Option B	TH3-Option C	TH3a	TH3b	U3aPC	
Public Health and Safety	Increased potential for occupational safety hazards to occur. Increased potential for public exposure to electromagnetic fields. **Impact Intensity: Minor**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Increased potential for occupational safety hazards to occur. Increased potential for public exposure to electromagnetic fields. **Impact Intensity: Minor**	Same as subroute 4.1
Hazardous Materials and Hazardous and Solid Waste	No impact. **Impact Intensity: No impact**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1
Transportation	Temporary short-term increase in traffic on primary roadways during construction. Approximately 0.2 mile of access road type D and 11 miles of access road type E would be constructed. **Impact Intensity: Minor**	Same as subroute 4.1 Approximately 0.2 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.2 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.8 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.1 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.1 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.6 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.2 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 0.3 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 1 mile of access road type E would be constructed.	Same as subroute 4.1 Approximately 1 mile of access road type E would be constructed.	Temporary short-term increase in traffic on primary roadways during construction. Approximately 1 mile of access road type E would be constructed. **Impact Intensity: Minor**	Same as subroute 4.1. Approximately 0.2 mile of access road type D and 11 miles of access road type E would be constructed.
Intentional Acts of Destruction	Increase in potential targets for acts of sabotage or terrorism. Decrease in the potential for acts of sabotage or terrorism to cause service disruption and/or potential reduction in duration of service disruption. **Impact Intensity: No impact**	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Same as subroute 4.1	Increase in potential targets for acts of sabotage or terrorism. Decrease in the potential for acts of sabotage or terrorism to cause service disruption and/or potential reduction in duration of service disruption. **Impact Intensity: No impact**	Same as subroute 4.1

Summary of Significant BLM and WAPA ROD Conditions and Applicability of Those Conditions to the Southline Project

BLM ROD

The Bureau of Land Management ("BLM") right-of-way ("ROW") grants to Southline and WAPA require both WAPA and Southline to comply with the BLM and WAPA stipulations described and referenced in the attachments to the BLM Record of Decision ("ROD"). Application at Exhibit B-3 (BLM ROD), Exhibit STL-1 at B-14.14.

The BLM ROD also requires Southline and WAPA to meet the requirements of the other major authorizing agencies for the Project concerning any necessary Federal and State permits, licenses, and/or approval and consultation requirements on Federal lands as identified in Table 1-5 found on pages 20 through 23 of the Final EIS for the Southline Transmission Project. *Id.*

The BLM ROD is contingent upon Southline and WAPA meeting all terms, conditions, and stipulations contained in the BLM ROD, including the following:

- Southline and WAPA must follow the construction procedures and mitigation measures described in their application and supplements for BLM ROW grants as identified in the Final EIS as modified. These mitigation measures are included within the BLM ROD as the NEPA Plan of Development ("POD") and Framework Plans.

- Southline has provided the BLM with a NEPA POD dated March 2016 (included as Attachment A to the BLM ROD) detailing how the transmission line and associated facilities will be constructed in compliance with the BLM ROW and short-term ROW terms, conditions, and stipulations. Southline and WAPA must comply with all required environmental protection measures and Proponent Committed Environmental Measures ("PCEMs") outlined in the NEPA POD and Framework Plans to the satisfaction of the BLM.

- Southline and WAPA must construct, operate and maintain the facilities, improvements, and structures within the BLM ROW and areas authorized by the short-term BLM ROW in conformity with the NEPA POD dated March 2016.

- Southline and WAPA must comply with the terms and conditions of the Programmatic Agreement ("PA") developed between Section 106 consulting parties and signed by the BLM, the State Historic Preservation Officers in Arizona and New Mexico, the Tohono O'odham Nation and the Advisory Council on Historic Preservation ("ACHP"). The PA is included in Attachment C to the BLM ROD. Pursuant to the PA, a Historic Properties Treatment Plan ("HPTP") will be developed for the treatment of affected historic properties.

EXHIBIT
STL-40
ADMITTED

- Southline must comply with all the agreed upon plans, deliverable, activities, and funding set forth in the Memorandum of Agreement between the Arizona Game and Fish Commission and Southline.

Application at Exhibit B-3 (BLM ROD), Exhibit STL-1 at B-14.15. For a description of the POD, see Application at Exhibit B-3 (BLM ROD), Exhibit STL-1 at B-14.43 through B-14.50 (appended as Exhibit A to this Exhibit).

All of the requirements described above apply to Southline on all BLM land within the CEC Upgrade and CEC New Build Sections and to WAPA on all BLM land within the WAPA Upgrade Section. Application at Exhibit B-3 (BLM ROD), Exhibit STL-1 at B-14.10, 14.12-13, 14-16. *See also* Exhibit STL-29 (Excerpt from BLM ROD).

WAPA ROD

The WAPA ROD commits both WAPA and Southline to implement the PCEMs identified in Table 2-8, Project PCEMs by Resource, of the Final EIS. Exhibit STL-19 (WAPA ROD). The PCEMs in Table 2-8 are the same as those included in Table 8-2 of the BLM ROD. *See* Exhibit STL-30 (BLM ROD PCEMs); Direct Testimony of Cara Bellavia.

The PCEMs apply to both Southline and WAPA on the CEC Upgrade and WAPA Upgrade Sections, respectively. Exhibit STL-19 (WAPA ROD).

Southline Commitment

Southline independently commits to follow the BLM ROD POD, including the PCEMs, throughout all non-WAPA portions of the Project, including specifically the CEC Proposed Route.

- 30 miles of 345-kV double-circuit electric transmission line between New Mexico State Route 9 (NM 9) and Interstate 10 (I-10) east of Deming in Luna County, New Mexico, to provide access for potential renewable energy generation sources in southern New Mexico. This segment of the Project is included in the analysis, but development of this segment will be determined at a later date;
- one new substation in Luna County (proposed Midpoint Substation) to provide an intermediate connection point for future interconnection requests; and
- substation expansion for installation of new communications equipment at, and connection to, two existing substations in New Mexico and one in Arizona.

The Upgrade Section (Apache–Saguaro) will include:

- replacing 120 miles of Western's existing Saguaro–Tucson and Tucson–Apache 115-kV single-circuit electric wood-pole H-frame transmission lines, which date to 1951, with a 230-kV double-circuit electric steel-pole transmission line. In locations where needed and where possible, an additional 50 feet of ROW adjacent to the existing 100-foot ROW will be obtained for the new 230-kV line. This Upgrade Section is defined by endpoints at the existing Apache Substation, south of Willcox in Cochise County, Arizona, to the existing Saguaro Substation, northwest of Tucson in Pinal County, Arizona;
- 2 miles of new build double-circuit 230-kV electric transmission line to interconnect with the existing Tucson Electric Power Company (TEP) Vail Substation, located southeast of Tucson and just north of the existing 115-kV Tucson–Apache line; and
- connections to, upgrading of, and modifications to or expansions at 12 existing substations in southeastern Arizona, including installation of new bays, transformers, breakers, switches, communications equipment, and related facilities associated with the voltage increase and compatibility with the existing substations. Depending on design and engineering considerations, at some locations substation expansions may require a separate yard.

1.3 PURPOSE OF THE PLAN OF DEVELOPMENT

This POD was developed to meet the requirements outlined in 43 Code of Federal Regulations (CFR) 2804.25(b). Under these requirements, the BLM may request information necessary to process a ROW application; this request for information may include a detailed construction, operation, rehabilitation, and environmental protection plan, i.e., a "Plan of Development," and any needed cultural resource surveys or inventories for threatened or endangered species. On Federal lands administered by the BLM, the POD is an enforceable stipulation of the BLM ROW grant and pertains not only to the construction of the Project, but also to the operation and maintenance phase of the Project. On other lands, Southline or Western will adopt the stipulations and measures in the POD, where appropriate.

This POD outlines the stipulations and mitigation measures (herein also Proponent Committed Environmental Measures (PCEMs)) identified in the Environmental Impact Statement (EIS) that must be followed during construction, operation, and maintenance of the Project, for which the BLM and Western are the joint lead federal agencies. The POD also is intended to be used Project-wide as (1) a summary of Project environmental requirements and protection measures, and (2) a description of the processes and procedures that will be used to ensure compliance with the requirements of the BLM, Western, and other Federal, State, and/or local agencies, as appropriate.

While neither BLM nor Western has the authority to enforce the POD and its PCEMs on State or private lands, BLM expects that most landowners would want the same protections afforded resources on BLM

administered lands to be extended to their properties as well. Therefore, BLM anticipates that the PCEMs and other specific stipulations and methods identified in the POD will largely be implemented over the entire length of the Project, regardless of jurisdiction. Since Southline and Western will have to obtain ROW leases from other Federal and State agencies, and many different private landowners, it is not possible at this time to identify the specific provisions applicable to these leases. Most of the PCEMs are based in laws, regulations, permit requirements, BMPs, and standard construction practices, and would be implemented on non-BLM lands, although inspections, monitoring, and reporting would likely be handled through different processes and procedures.

The agencies recognize that the POD is a living document and as such provisions therein may be modified, augmented, or deleted as appropriate. For non-BLM administered lands Western will likely be the lead Federal agency overseeing implementation of and compliance with the suite of PCEMs and other environmental protections identified in the EIS and supporting documents. State and private landowners may add additional requirements to those identified in the EIS and POD, or opt out of certain measures, as negotiated by Southline and/or Western with each landowner during ROW acquisition. Certain parts of the POD will not be applicable to or appropriate for non-BLM administered lands; examples include BLM reporting requirements, stipulations specific to the BLM's ROW grant, or the BLM variance process. BLM's environmental inspection and verification process is also quite different from Western's, and Western's process would be followed on State and private lands. Regardless of which agency is the lead, or the differences in the process followed, the environmental protections identified and committed to in the EIS will be implemented (with the possible exception of the landowner required additions or deletions mentioned above). On BLM administered land, all stipulations and PCEMs identified as applicable in any of the POD volumes should be adhered to for the life of the BLM ROW grant.

The BLM Las Cruces District Office and the Safford and Tucson field offices have required ROW grant holders to contract with an independent entity (i.e., a compliance inspection contractor (CIC)), who will conduct environmental compliance inspections during the construction phase of the Project. The objective is to monitor for compliance with environmental stipulations designed to protect the environment and prevent impacts from exceeding those described in the EIS or other permit approvals. The CIC will monitor and oversee implementation of the POD on all BLM-administered lands, as described in Appendix A6 – Environmental Compliance Management Plan of this POD.

1.4 ORGANIZATION OF THE PLAN OF DEVELOPMENT

The POD is organized into two major volumes. Volume I contains chapters 1 through 6 and the appendices. Volume II includes engineering, mitigation, and environmental mapping, which support information presented in Volume I. Following is an overview of the information contained in these two volumes.

1.4.1 Volume I

Volume I of the POD is intended to provide the reader with a general overview of the Project and key elements of the POD (chapters 1–6) and detailed information regarding the required PCEMs, protocols, and procedures for the construction, operation, and maintenance of the transmission line and ancillary facilities (appendices). While chapters 1 through 6 provide general information, the appendices (along with the mapping materials in Volume II) are more detailed and have been designed to serve as stand-alone documents that may be readily updated and refined. Following is an outline summary of the information and materials presented in chapters 1 through 6 and the appendices of this POD.

Chapters 1 through 6 include the following information:

Chapter 1 – Introduction – Introduces the Project, discusses the purpose and organization of the POD; explains the POD's relationship to other documents; and lists required authorizations, permits, and approvals required for construction.

Chapter 2 – Roles and Responsibilities – Explains the roles and responsibilities of the Project team, and discusses Project communications and notification procedures.

Chapter 3 – Project Description – Describes the Project components/facilities (structures, foundations, conductors, access roads, substations, etc.), land requirements, construction disturbance, ROWs, and the Project's relationship with other related ROWs and utilities.

Chapter 4 – Operation and Maintenance – Provides information related to the operation and maintenance of the Project's transmission line(s) once construction is complete, including public and environmental protection and vegetation management.

Chapter 5 – Environmental Mitigation Measures – Includes a brief overview and introduction of the key environmental concerns associated with the construction of the Project and relevant mitigation measures/PCEMs to be applied in order to avoid or minimize potential effects.

Chapter 6 – Literature Cited – Provides the references and literature cited in preparing the POD.

There are four appendices (A through D), organized as presented below:

Appendix A – Construction Considerations – This appendix provides detailed information about the specifics of construction, including the following:

A1 Flagging, Fencing, and Signage Plan
A2 Geotechnical Investigation
A3 Project Construction
A4 Special Construction Techniques
A5 Construction Workforce
A6 Environmental Compliance Management Plan

Appendix B – Environmental Protection / Framework Plans – This appendix includes the following:

B1 Access Road Plan
B2 Traffic and Transportation Management Plan
B3 Stormwater Pollution Prevention Plan
B4 Spill Prevention, Control, and Countermeasures Plan
B5 Historic Properties Treatment Plan
B6 Blasting Plan
B7 Plant and Wildlife Species Conservation Measures Plan
B8 Erosion, Dust Control, and Air Quality Plan
B9 Hazardous Materials Management Plan (HMMP)
B10 Emergency Preparedness and Response Plan
B11 Noxious Weed Management Plan
B12 Fire Protection Plan
B13 Stream, Wetland, Well, and Spring Protection Plan
B14 Soil Management Plan
B15 Reclamation, Vegetation, and Monitoring Plan
B16 Health and Safety Plan (HASP)
B17 Avian Protection Plan (APP)

B18 Waste Management Plan
B19 Helicopter Flight Plan/Flight and Safety Plan
B20 Decommissioning Plan

Appendix C – Transmission Construction and Vegetation Management Standards – This appendix includes the following:

C1 Transmission Construction Standards
C2 Vegetation Management Standards

1.4.2 Volume II

Three sets of maps form Volume II of the Final POD. These maps contain regional to detailed information, including site-specific instructions to guide the construction of the transmission line and associated facilities as described below. ***Files to be included with Final POD (post Final EIS) – not included herein.***

1.5 RELATIONSHIP WITH OTHER ENVIRONMENTAL DOCUMENTS

This POD includes measures for avoidance, minimization, and mitigation of environmental impacts resulting from the implementation of this Project as identified in the EIS (called PCEMs) and approved in the BLM Record of Decision (ROD). This POD incorporates the various regulatory approvals, permits, and other authorizations that contain environmental requirements, including those measures stipulated in Resource Management Plans (RMPs) for the BLM Las Cruces District Office and the Safford and Tucson field offices. The relevant approved and proposed management plans (and plan amendments) are presented in table 1.

Table 1. Applicable BLM Land Use Plans and Planning Documents

Resource Management Plan	Plan Date	Lead Office	Project Applicability
Mimbres Resource Area*	December 1993	Las Cruces District Office	Afton–Apache
Safford District RMP	August 1991	Safford District Office	Apache–Saguaro
Las Cienegas RMP	July 2003	Tucson Field Office	Apache–Saguaro
Phoenix RMP	December 1988	Phoenix District Office, Tucson Field Office, Safford Field Office	Apache–Saguaro
Restoration Design Energy Project	January 2013	Arizona State Office	Arizona
Solar Programmatic EIS (PEIS)	October 2012	BLM Department of the Interior (DOI)	Arizona, New Mexico
West-wide Energy Corridor PEIS	November 2008	BLM DOI	Arizona, New Mexico

* The TriCounty RMP is in progress. When approved, the TriCounty RMP would amend the portion of the 1993 Mimbres RMP (BLM 1993) that covers Doña Ana County.

1.6 FEDERAL, STATE, AND LOCAL PERMITS

Table 2 provides a listing of the laws, regulations, and guidelines that are related to energy generation and development of transmission infrastructure and the associated permits and approvals.

Table 2. List of Required Federal and State Permits and Approvals

Regulatory Authority/Agency	Permit/Approval	Project Trigger	Relevant Law/Regulation
Federal			
BLM	ROW grant, land use plan amendment	Request for ROW across BLM lands	43 United States Code (U.S.C.) 1761–1771
BLM	Permit for archaeological investigations	Federal undertaking with the potential to affect historic properties	Archaeological Resources Protection Act (ARPA), Antiquities Act of 1906, Federal Land Policy and Management Act (FLPMA)
BLM	Permit for collection of paleontological resources	Potential for disturbance of paleontological resources and need for collection	Paleontological Resources Preservation Act, FLPMA
BLM *In consultation with Western, State Historic Preservation Offices (SHPOs), Advisory Council on Historic Preservation, tribes, other Federal, State, and local agencies and consulting parties*	Compliance with Section 106 of the National Historic Preservation Act (NHPA)	Potential to disturb historic properties	NHPA (16 U.S.C. 470); 36 CFR 800
Western	Determine whether Southline can upgrade Western's lines and use existing transmission easements as part of the Project; determine feasibility and impacts of Project; and determine the nature of Western's participation in the Project	Proposal to upgrade a segment of Western's transmission system and have Western obtain updated and new transmission line easements, and to use Western funding	Hoover Power Plant Act 98-381, as amended Reclamation Law, including but not limited to the Reclamation Act of 1902, 43 U.S.C. 391, Hayden O'Mahoney Amendment, 43 U.S.C. 391a-1 and 392a; the Reclamation Project Act of 1939, Section (c) 43 U.S.C. 485h(c); Flood Control Act of 1944, Section 5, 16 U.S.C. 825s; Department of Energy Organization Act, 42 U.S.C. 7152a; Energy Policy Act of 1992, 16 U.S.C. 796, 824j, 824k, and 824l; Energy Policy Act of 2005 Contributed Funds Act, 43 U.S.C. 395; Antideficiency Act, 31 U.S.C. 1341; and associated regulations, orders, and policies

Table 2. List of Required Federal and State Permits and Approvals (Continued)

Regulatory Authority/Agency	Permit/Approval	Project Trigger	Relevant Law/Regulation
Federal, cont'd.			
Bureau of Reclamation	Easement or ROW use authorization	Substation expansion	The Reclamation Act of June 17, 1902, 32 Stat. 388, 43 U.S.C. 371, et seq., specifically 32 Stat. 389, 43 U.S.C. 421 and the Flood Control Act of 1944, 58 Stat. 887, 890, 16 U.S.C. 825s, as amended and supplemented by subsequent acts or enactments; the Reclamation Project Act of 1939, 53 Stat. 1187, 43 U.S.C. 485; the Rivers and Harbors Act of August 30, 1935, 49 Stat. 1028, 1039, 33 U.S.C. 540; the Act of May 28, 1954, Ch. 12, 68 Stat. 143, and other acts specifically applicable to this project; the Act of August 1, 1888, 25 Stat. 357, 40 U.S.C. 257, repealed and reenacted as 40 U.S.C. 3113; the Act of February 26, 1931, 46 Stat. 1421, 40 U.S.C. 3114; the Department of Energy Organization Act of August 4, 1977, 91 Stat. 565, 42 U.S.C. 7101, specifically 91 Stat. 578, 42 U.S.C. 7152; and the Omnibus Appropriations Bill of FY 2009, PL 111-8
Bureau of Indian Affairs	ROW Easement	Upgrade of existing Western line across tribal land	25 CFR 169
U.S. Forest Service	Special use permit (SUP)	Upgrade of existing Western line across Coronado National Forest	36 CFR 212.51(a)(8)
U.S. Forest Service – Coronado National Forest	SUP	Potential for disturbance of cultural resources on the Coronado National Forest	ARPA, FLPMA
U.S. Army Corps of Engineers	Section 404 permit	Impacts to jurisdictional waters of the U.S.	Clean Water Act, 33 U.S.C. 1251, et seq.
U.S. Fish and Wildlife Service	Biological opinion, concurrence, or incidental take permit	Potential impact to threatened or endangered species	Endangered Species Act, 16 U.S.C. 1531–1544
U.S. Environmental Protection Agency	National Pollutant Discharge Elimination System (New Mexico)	Stormwater management from potential discharges greater than 5 acres	40 CFR 122.26
Department of Defense (DOD)	Easement or ROW use authorization	Construction, operation, and decommissioning of transmission line across DOD-administered land	10 U.S.C. 2668
Federal Aviation Administration (FAA)	A "No-hazard Declaration" required if structure is more than 200 feet high	Location of structure relative to airports and airspace if structure is more than 200 feet high	FAA Act of 1958, 14 CFR 77

Table 2. List of Required Federal and State Permits and Approvals (Continued)

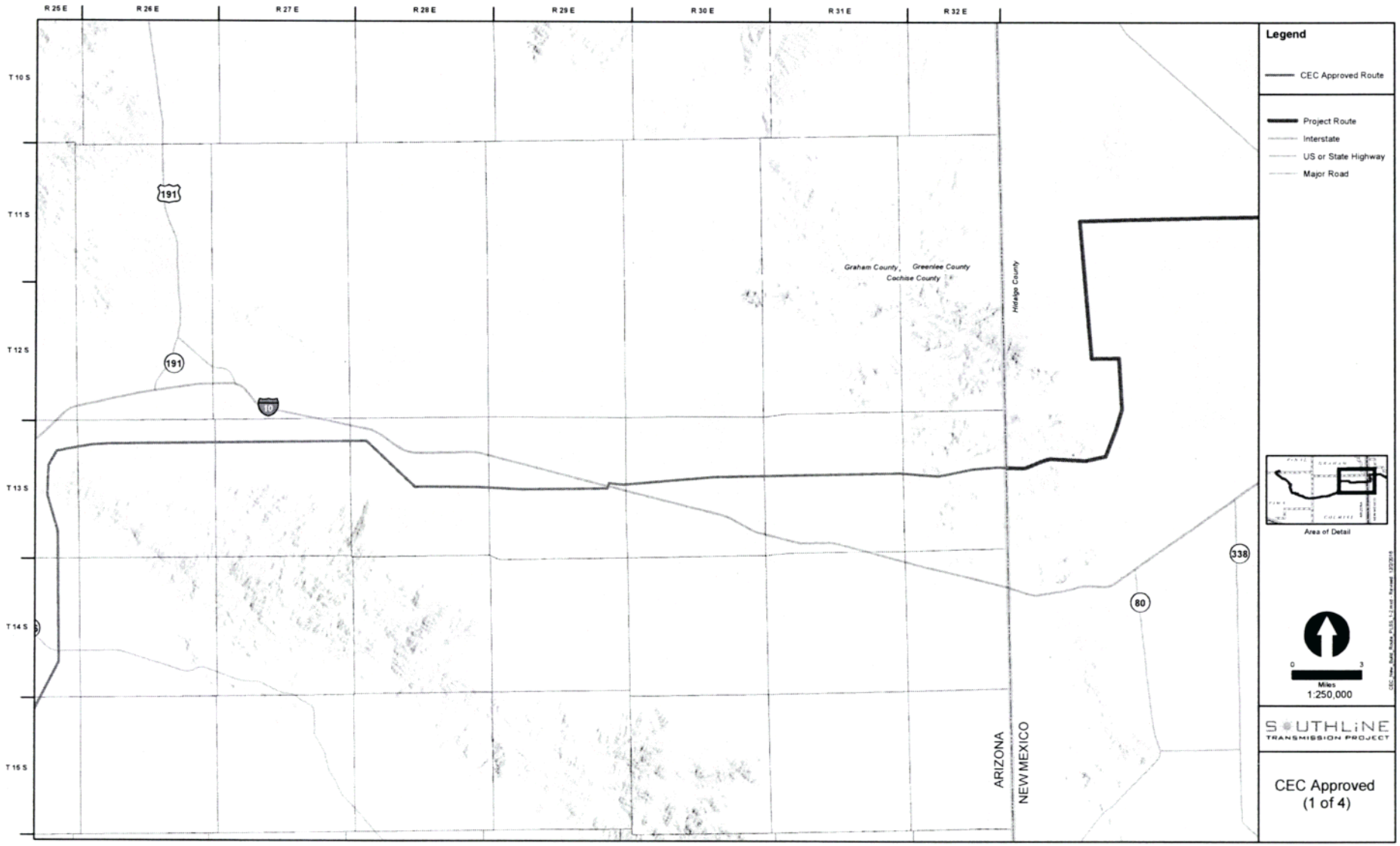
Regulatory Authority/Agency	Permit/Approval	Project Trigger	Relevant Law/Regulation
New Mexico			
New Mexico Public Regulation Commission	Application for approval of location of transmission line and certificate of public convenience and need	Construction of a transmission line greater than 230 kV	New Mexico Statutes Annotated (NMSA) 62-9-3; 17.9.592 New Mexico Administrative Code (NMAC), and NMSA 62-9-1; 17.1.2.9 NMAC
New Mexico Department of Transportation (DOT)	Access or public highway utility accommodation permit	Upgrading access roads, use of public highway to transport oversize loads, or installation of transmission lines within DOT ROW	18.31.6 NMAC, and 17.4.2 NMAC
New Mexico State Land Office	ROW or easement permit	Construction, operation of a transmission line on State lands	NMSA 19-7-57
New Mexico SHPO		Federal undertaking with the potential to affect historic properties	NHPA, Section 106 (36 CFR 800)
New Mexico State Historic Preservation Division	Permit for archaeological investigations	Potential for disturbance of cultural resources on State land	NMSA 18-6
New Mexico Department of Energy, Minerals, and Natural Resources Forestry Division	Collection permit	Displacement or removal of any State endangered plant species	NMSA 75-6-1; 19.21.2 NMAC
Arizona			
Arizona Corporation Commission	Certificate of Environmental Compatibility	Construction of a transmission line greater than 115 kV	Title 40 Arizona Revised Statutes (ARS) Chapter 2, Article 6.2 (40-360–40-360.13)
Arizona State Land Department	ROW/right-of-entry permit	Survey, construction, operation of a transmission line on State lands	ARS 37-461
Arizona DOT	Crossing or encroachment permit, permit for use of highway ROW	Construction, operation, abandonment of transmission lines within State highway ROW	ARS 28-7053, Arizona Administrative Code R17-3-501–509
Arizona SHPO		Federal undertaking with the potential to affect historic properties	NHPA, Section 106 (36 CFR 800)
Arizona State Museum (ASM)	Arizona Antiquities Act (AAA) blanket permit or Project-specific permit	Potential for disturbance of cultural resources on State land	AAA ARS 41-841 through 41-847
ASM	Permission to disturb human remains	Potential for disturbance of human or funerary objects remains on State or private land	AAA ARS 41-844 and ARS 41-865
ASM	AAA blanket permit	Potential for disturbance of paleontological resources on State land	AAA ARS 41-841

Table 2. List of Required Federal and State Permits and Approvals (Continued)

Regulatory Authority/Agency	Permit/Approval	Project Trigger	Relevant Law/Regulation
Arizona, cont'd.			
Arizona Department of Environmental Quality	Arizona Pollutant Discharge Elimination System	Stormwater management from potential discharges greater than 5 acres	ARS 49-255.01
Tohono O'odham Nation	Permit to conduct archaeological work	Potential for disturbance of cultural resources on Tohono O'odham Nation land	Title 8, Chapter 1, "Archaeological Resources Protection" (Ordinance No. 06-84) of the Tohono O'odham Nation Tribal Code
Arizona Department of Agriculture	Application for Arizona native plant and wood removal	Displacement or removal of any listed native plant species	Native Plant Law, ARS Title 3 (Chapter 7)
Local*			
Development Services, Public Works, DOT	ROW use permit, encroachment permit	Potential encroachment onto County/City ROW	Varies; County/local ordinance or municipal code
Planning and Zoning, Community Development	Special use, conditional use permits	Change zoning or land use to allow construction of the transmission line and associated facilities	Varies; County/local ordinance or municipal code
Floodplain Departments	Floodplain use permit	Construction of project facilities in flood-prone areas as defined by Federal Emergency Management Agency	Varies; County ordinance
Public Works Department	Grading/excavation/building permit	Construction	Varies; County/local ordinance or municipal code
Department of Environmental Quality, Air Quality Districts	Fugitive dust control permits	Construction	Varies; County ordinance

Note: This list is not exhaustive.

* Local permits are only examples of permits that may be required by various local agencies (County/City).



EXHIBIT
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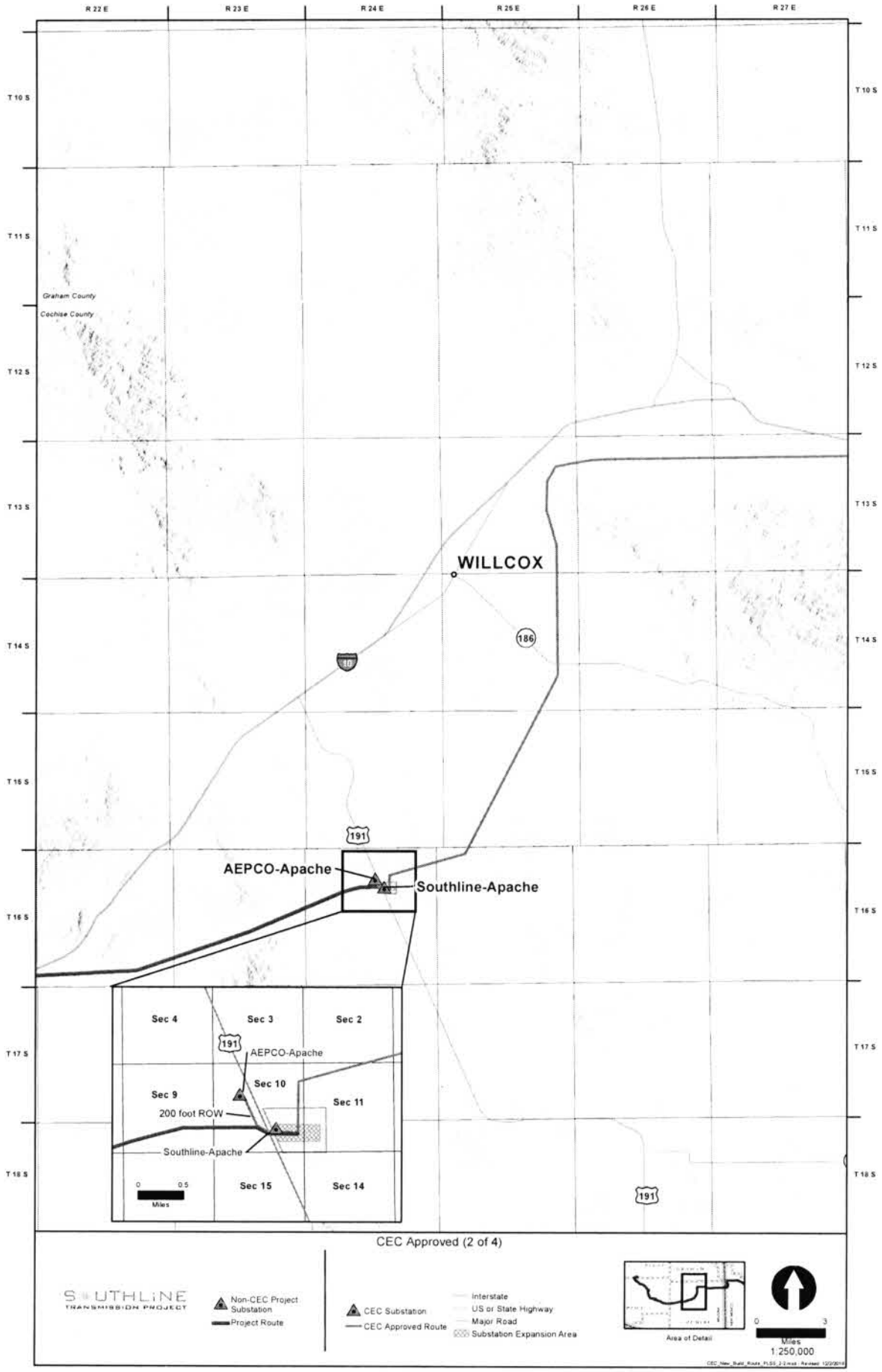
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CEC Approved (2 of 4)
SOUTHLINE
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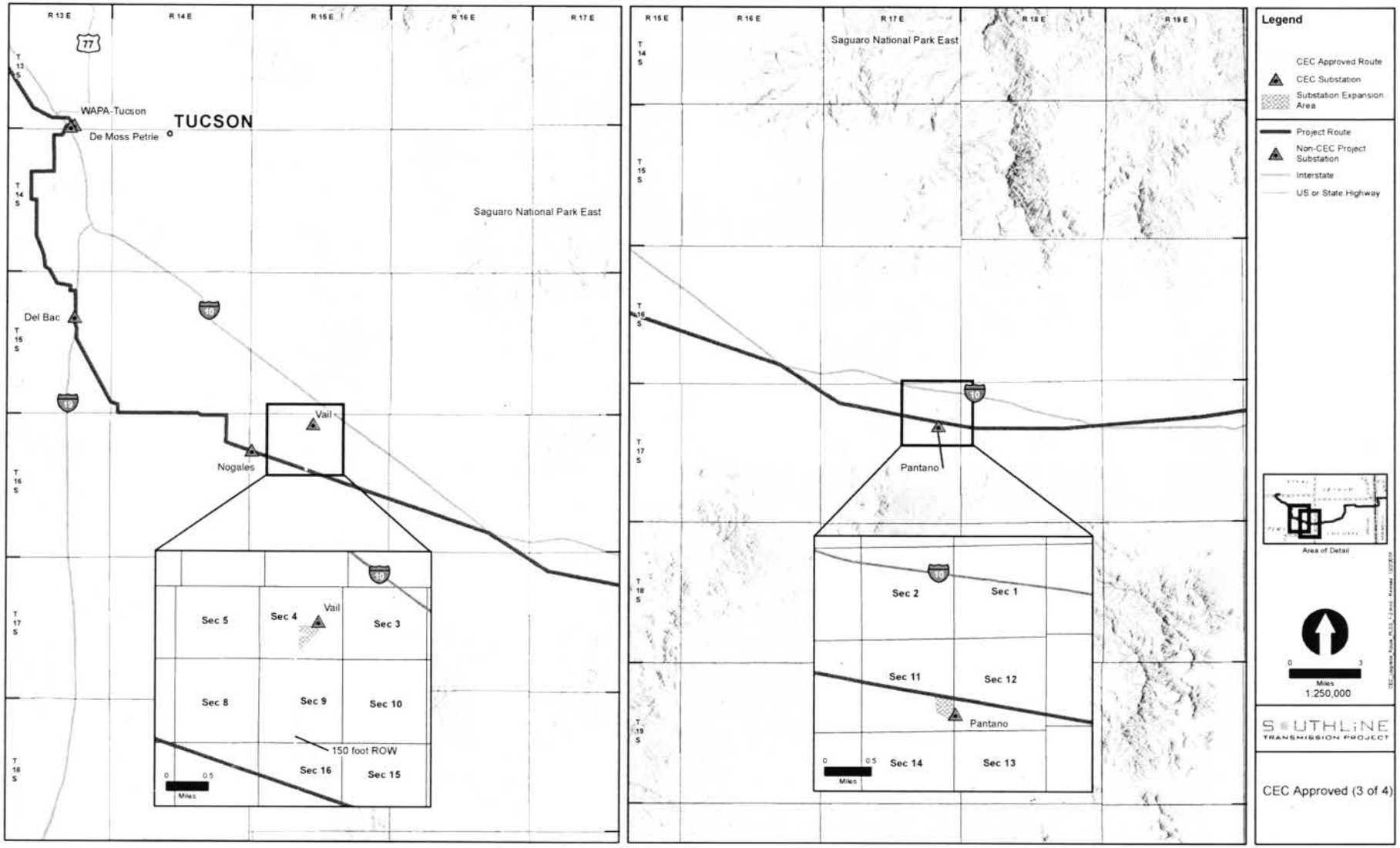
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Sec 14
Sec 13
Legend
CEC Approved Route
CEC Substation
Substation Expansion Area
Project Route
Non-CEC Project Substation
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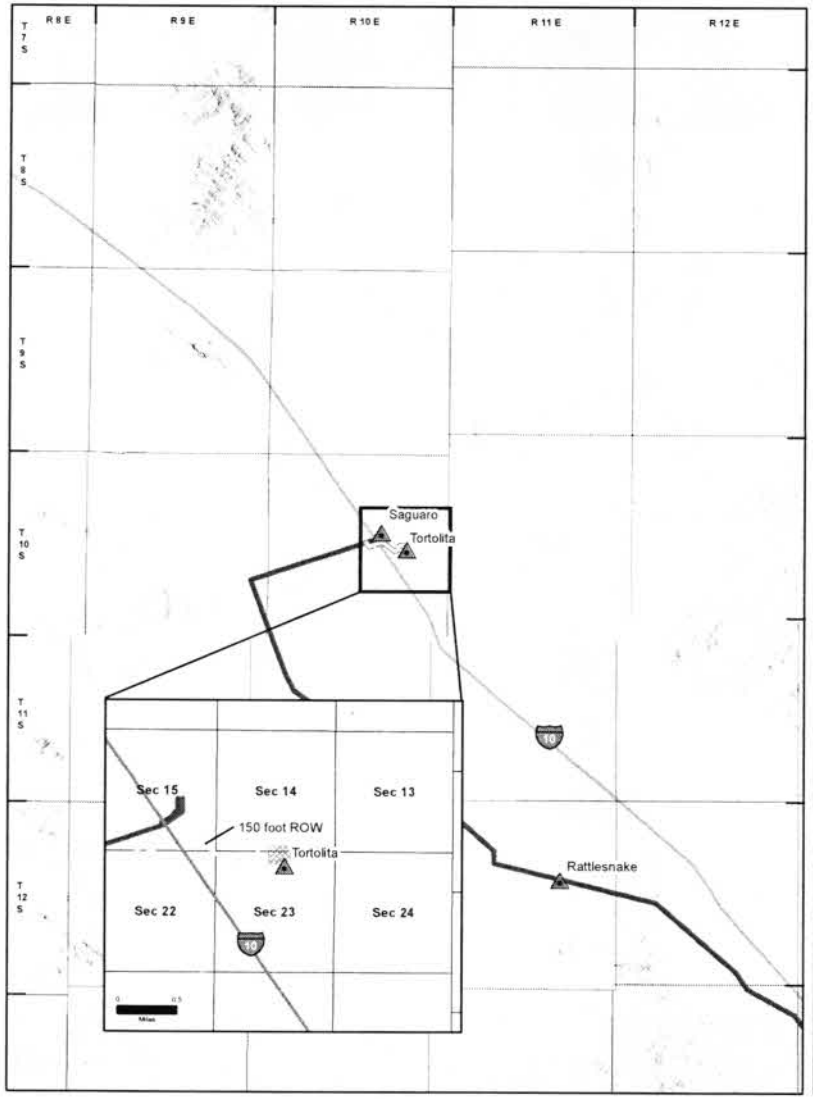
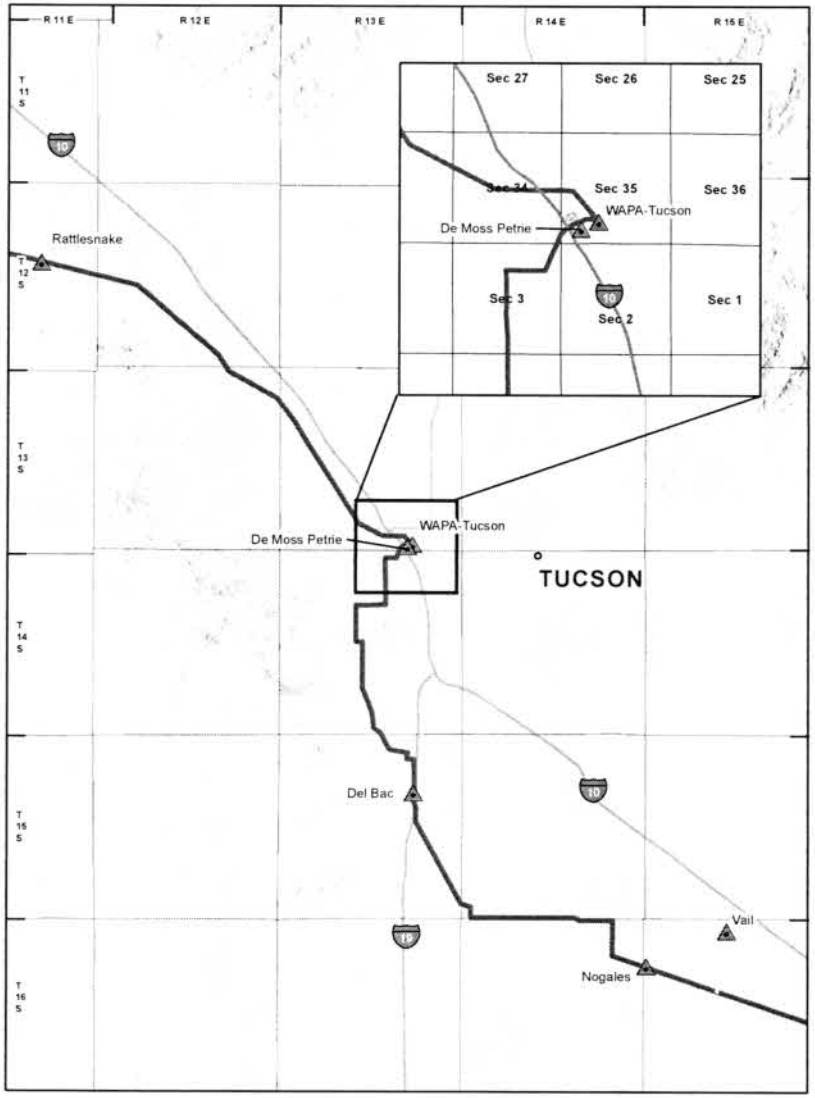
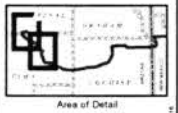
SOUTHLINE
TRANSMISSION PROJECT
CEC Approved (3 of 4)





Legend

- CEC Approved Route
- CEC Substation
- Substation Expansion Area
- Project Route
- Non-CEC Project Substation
- Interstate
- US or State Highway
- Major Road



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SOUTHLINE TRANSMISSION PROJECT

CEC Approved (4 of 4)