

monitor during construction, limiting access during certain times of the year, ceasing activities when pronghorn are observed and placing limits on the use of certain types of noise or artificial light within movement corridors (USFWS 2007).

Other Special Status Species

This section addresses the potential for other special status species to occur at each proposed tower location including federal *Species of Concern*, BLM *Sensitive* species, Arizona *Wildlife of Special Concern* and protected native plants. Table 6.3 presents the list of species observed (marked with “O”) or potentially occurring in the proposed project area (marked with an asterisk). Refer to Appendix C for the list of all other special status species reviewed for this study but determined to have potential to occur.

Table 6.3. Special status species potentially occurring within the *Organ Pipe* project area.

Common Name	Scientific Name	ESA Status	BLM Status	State Status	TCA-AJO-003	TCA-AJO-004	TCA-AJO-008	TCA-AJO-091	TCA-AJO-170	TCA-AJO-204	TCA-AJO-209	TCA-AJO-214	TCA-AJO-301	TCA-AJO-302	TCA-AJO-303	TCA-AJO-304	TCA-AJO-308	TCA-AJO-310
American peregrine falcon	<i>Falco peregrinus anatum</i>	SC		WSC				O										
cactus ferruginous pygmy owl	<i>Glaucidium ridgewayi cactorum</i>	SC		WSC	*	*	*		*	*	*				*	*	*	*
tropical kingbird	<i>Tyrannus melancholicus</i>			WSC	*	*	*	*	*	*	*	*	*	*	*	*	*	*
western burrowing owl	<i>Athene cunicularia hypugaea</i>	SC		WSC	*		*		*					*	*			*
big free-tailed bat	<i>Nyctinomops macrotis</i>	SC	S		*	*	*	*	*	*	*	*	*	*	*	*	*	*
California leaf-nosed bat	<i>Macrotus californicus</i>	SC		WSC	*	*	*	*	*	*	*	*	*	*	*	*	*	*
cave myotis	<i>Myotis velifer</i>	SC	S		*	*	*	*	*	*	*	*	*	*	*	*	*	*
greater western bonneted bat	<i>Eumops perotis californicus</i>	SC			*	*	*	*	*	*	*	*	*	*	*	*	*	*
pale Townsend's big-eared bat	<i>Corynorhinus townsendii pallescens</i>	SC			*	*	*	*	*	*	*	*	*	*	*	*	*	*
pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>		S			*					*							
spotted bat	<i>Euderma maculatum</i>		S	WSC	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Underwood's mastiff bat	<i>Eumops underwoodi</i>	SC	S		*	*	*	*	*	*	*	*	*	*	*	*	*	*
Mexican rosy boa	<i>Charina trivirgata trivirgata</i>	SC	S			*	*		*	*	*	*			*	*	*	*
red-back whiptail	<i>Aspidoscelis burti xanthonota</i>	SC						*		*	*					*		
Sonoran desert tortoise	<i>Gopherus agassizii</i>	SC		WSC	*	*	*	*	*	*	*	*		*	*	*	*	*
desert night-blooming cereus	<i>Peniocereus greggii var. transmontanus</i>			SR			O											O
Emory's barrel cactus	<i>Ferocactus emoryi</i>			SR						O	O							
Organ pipe cactus	<i>Stenocereus thurberi</i>			SR	O					O	O	O					O	
stag-horn cholla	<i>Opuntia versicolor</i>			SR							O						O	

Key to Status: S = Sensitive, SC = Species of Concern, SR = Salvage Restricted, WSC = Wildlife of Special Concern

There is potential habitat for 19 special status species in the project area including four bird species, eight bat species, and three reptile species. Four special status plant species were observed in the project area. These species have varying levels of legal protection depending on the particular species, land jurisdiction on which it occurs, and activity that is being proposed. All of the bird species are protected under the MTBA and may have additional management guidelines when potentially affected by projects on federal land. The OPCNM and BLM have species management guidelines for federal *species of concern* and *BLM-sensitive* species that may require avoidance or mitigation as part of land-use approvals. Removal of ANPL listed plant species from state or private properties requires a permit from the ADA. More information on regulatory context is presented in Section 7.0 and further discussed in Section 8.0.

Migratory Birds

Potential affects to bird species listed under the MBTA, potential loss of habitat for, or potential to kill individuals should be considered. Avoidance measures should be incorporated into project design when possible. Bird species protected under MBTA that may occur in the project area include American peregrine falcon, cactus ferruginous pygmy-owl, tropical kingbird, and western burrowing owl (see Table 6.3). The MBTA prohibits take of any migratory bird, including any part, nest, or egg of any such bird. If construction is proposed during the breeding season for these species (January through September⁷), pre-construction nesting surveys can be conducted to locate active nests. Construction should not occur within 152 m (500 ft) of an active nest.

Special Status Plants

Federally-listed species or other federal plant species of special concern do not occur within the proposed project area. Several plant species that are considered sensitive species by other resources agencies or the ASLD were observed at some tower locations (see section below and Table 6.3). Removal of these species should be avoided where possible and removal of these species from ASLD or private properties requires a permit from the ADA.

Desert Night-blooming Cereus (*Peniocereus greggii* var. *transmontanus*)

- TCA-AJO-008: multiple individuals are located along the access road.

Emory's Barrel Cactus (*Ferocactus emoryi*)

- TCA-AJO-214: one individual observed within the tower compound.
- TCA-AJO-209: four individuals observed within the tower compound.

Organ Pipe Cactus (*Stenocereus thurberi*)

- TCA-AJO-003: one individual observed along the access road.
- TCA-AJO-170: one large individual (minimum 16 heads) observed near compound center.
- TCA-AJO-204: one individual observed within the tower compound.
- TCA-AJO-209: nine individuals observed within the tower compound.
- TCA-AJO-214: four individuals observed within the tower compound.

Staghorn Cholla (*Opuntia versicolor*)

- TCA-AJO-209: Staghorn cholla observed within the tower compound.
- TCA-AJO-304: Staghorn cholla observed within the tower compound.

⁷ The specific breeding season varies by species.

7.0 REGULATORY CONTEXT

Endangered Species Act (ESA)

USFWS maintains a list of *threatened* and *endangered* species in each county. The list includes species that are candidate for listing and proposed to be listed for protection under the ESA, as amended (16 USC §1531 *et seq.*). The ESA specifically prohibits *take* of a listed species. *Take* is “...to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to engage in any such conduct” (ESA, Section 3, paragraph 19). Further, *harm* is “...an act which actually kills or injures wildlife. Such acts may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering” (50 CFR §17.3). USFWS also tracks species protected under legal conservation agreements, which precludes the need for protection through listing. Such species are typically categorized as *Species of Concern* (SC).

Migratory Birds Treaty Act (MBTA)

USFWS enforces the MBTA of 1918 (16 USC 703-712) as amended. The MBTA prohibits individuals to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, including any part, nest, or egg of any such bird.” USFWS maintains a list of birds protected under the MBTA.

Bureau of Land Management (U.S. Department of the Interior)

BLM sensitive species are taxa that are not federally listed, proposed, or candidate species. BLM policy is to provide these species with the same level of protection as is provided for candidate species. BLM Manual 6840 states that this designation is intended “to ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed”. The Sensitive Species designation is normally used for species that occur on BLM administered lands for which BLM has the capability to significantly affect the conservation status of the species through management.

The BLM Manual 6840 provides the following factors by which a native species may be listed as “*Sensitive*”:

- (1) Species that could become endangered or extirpated from a state, or within a significant portion of its range in the foreseeable future;
- (2) Species under status review by the USFWS and/or National Marine Fisheries Service;
- (3) Species undergoing significant current or predicted downward trends in: habitat capability that would reduce a species’ existing distribution; and/or population or density such that federally-listed, proposed, candidate, or State-listed status may become necessary;
- (4) Species that typically consist of small and widely dispersed populations;
- (5) Species that inhabit ecological refugia, or specialized or unique habitats; or

-
- (6) Species that are State-listed, but which may be better conserved through application of BLM sensitive species status.

Desert Tortoise

The BLM has specific guidance for desert tortoise management and compensation contained in the *Strategy for Desert Tortoise Habitat Management on Public Lands in Arizona* (BLM IM No. AZ-92-46) and *Supplemental Guidance for Desert Tortoise Compensation* (BLM IM No. AZ-99-008). Acquisition of land-use permits on BLM property that results in loss of habitat for Sonoran desert tortoise may require compensation. The *Guidelines for Handling Sonoran Desert Tortoises Encountered During Development Projects* (AGFD 1997) should be followed if desert tortoises are encountered during construction and need to be moved from the construction area.

Wildlife of Special Concern in Arizona

All resident, migratory, native and introduced wildlife in Arizona are property of the state, except fish and bullfrogs (*Rana catesbeiana*) in private ponds, or wildlife and birds held in captivity under permit. The AGFD is charged with managing wildlife under the provisions of the Arizona Revised Statutes (ARS) Title 17 and the Arizona Administrative Code (AAC) Title 12, Chapter 4. The AGFD tracks animal and native plant species. The AGFD formerly listed 116 species as extinct, endangered, threatened and candidate in Arizona (AGFD 1988). While these terms were identical to those used by USFWS, the AGFD categories were advisory and provided no legal protection for take or habitat modification. To avoid confusion, AGFD drafted a list of *Wildlife of Special Concern in Arizona* (WSC) that eliminated the endangered and threatened categories. The revised list is not yet officially approved, but it is published for public review (AGFD 1996). The AGFD HDMS currently identifies species from both lists (AGFD 1988, 1996) as WSC.

Native Plants of Arizona

The Arizona Department of Agriculture administers the Arizona Native Plant Law ([ANPL] 7 ARS §3-901 *et seq.*), although the AGFD maintains the database and tracks many of the plants protected under the legislation. The ANPL categorizes many native plants as *highly safeguarded* (HS), *salvage restricted* (SR), *salvage assessed* and *harvest restricted*. The *highly safeguarded* category includes native plants in Arizona that are in jeopardy or in danger of extinction. The *salvage restricted* category is extensive and includes native plants that are vulnerable to theft or vandalism. *Salvage assessed* plants have sufficient value to support the cost of salvage. *Harvest restricted* plants are subject to excessive harvest because of their intrinsic value.

It is unlawful to destroy, collect and transport protected native plants from private or state lands without permission from the landowner and a permit from the Arizona Department of Agriculture. No permit, tag, or seal is required to transplant native plants within the same parcel on federal or tribal lands. Landowners may legally destroy or remove plants growing on their land, but must notify the Arizona Department of Agriculture 20 to 60 days prior to the destruction of any protected native plants. Exceptions exist for destroying protected native plants that include maintenance of developed properties less than 4 ha (10 acres), maintenance of existing utilities and their associated rights of way and emergencies.

8.0 DISCUSSION

CBP is preparing a Biological Assessment and an Environmental Assessment for proposed installations within the *Organ Pipe* project area. CBP is conducting consultation with the USFWS and acquiring all applicable land-use permits from OPCNM, BLM, ASLD and other pertinent resource agencies. The APE considered for this project included all of the proposed tower locations and portions of any existing roadway that would require improvements to facilitate the project.

The lesser long-nosed bat and the Sonoran pronghorn are both federally protected species with the potential to occur within the APE. The lesser long-nosed bat is federally-listed as *endangered* and as a *wildlife species of special concern* in the State of Arizona (AGFD 2008). The species has the potential to occur at all 14 proposed tower sites. Sonoran pronghorn is federally listed as *endangered* and as a *species of concern* in the State of Arizona (AGFD 2008) and has the potential to occur at eight proposed tower sites (see Table 1.1). Other special-status species such as Sonoran desert tortoise, and birds protected by MBTA are known to occur at all proposed *Organ Pipe* tower locations (see Table 1.2).

CBP is acquiring applicable land-use permits from OPCNM, BLM, and ASLD. The OPCNM and BLM have species management guidelines for federal *species of concern* and *BLM-sensitive* species that may require avoidance or mitigation as part of land-use approvals. Direct handling of any special status wildlife species requires acquisition of appropriate scientific collecting permits. Removal of ANPL listed plant species from ASLD land or private properties requires a permit from the Arizona Department of Agriculture.

Construction and maintenance of border security infrastructure is a significant component of this project. The BMPs may apply to CBP activities where there will be ground, light and/or noise disturbance to federally-listed species near the project area because of the placement, replacement, relocation, or maintenance of facilities, including roads. Some maintenance activities may not create new ground disturbance, but may introduce noise or lighting impacts or physical off-site effects. Depending on the federally-listed species or habitat within the project area some or all of the categories of BMPs should be included in the project plan (USFWS 2007).

Construction and maintenance activities that may occur within or near the habitat of a federally-listed species should conduct species-specific surveys if habitat is present. Survey protocols exist for several species and should be followed if necessary to accurately discern presence or absence. Protocols are provided via the IPaC system⁸. If species are not found following protocol surveys, then implementation of measures to minimize disturbance to individuals would not be necessary. However, other practices may still be required to avoid, minimize and mitigate impacts to habitat if habitat components were adversely affected.

⁸ The IPaC system is a beta system and the field protocols were not yet available at the time this document was prepared.

9.0 REFERENCES CITED

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1997 Final General Management Plan Development Concept Plans Environmental Impact Statement. Organ Pipe Cactus National Monument, Arizona.

1996 Supplement to the Draft General Management Plan. Organ Pipe Cactus National Monument, Arizona.

USFWS (U. S. Fish and Wildlife Service)

2007 Final Draft Best Management Practices for Customs and Border Protection Actions.

2006 Biological Opinion for the Permanent Vehicle Barrier Project on the Barry M. Goldwater Range and Cabeza Prieta National Wildlife Refuge, Arizona.

APPENDIX A

Common and Scientific Plant Names used in this report.

Common name	Scientific name
Acuña cactus	<i>Echinomastus erectocentrus acunensis</i>
Agave	<i>Agave</i> sp.
Ajo rock daisy	<i>Perityle ajoensis</i>
Anderson wolfberry	<i>Lycium andersonii</i>
Aravaipa wood fern	<i>Thelypteris puberula sonorensis</i>
Arizona giant sedge	<i>Carex ultra</i>
Arizona rosewood	<i>Vauquelinia californica</i>
Bartram stonecrop	<i>Graptopetalum bartramii</i>
beardless chinch weed	<i>Pectis imberbis</i>
beargrass	<i>Nolina microcarpa</i>
blue palo verde	<i>Parkinsonia floridum</i>
blue sand lily	<i>Triteleopsis palmeri</i>
brittlebush	<i>Encelia farinosa</i>
broadleaf twayblade	<i>Listera convallarioides</i>
buckhorn cholla	<i>Cylindropuntia acanthocarpa</i>
buffelgrass	<i>Pennisetum ciliare</i>
burrobrush	<i>Hymenoclea salsola</i>
bursage	<i>Ambrosia</i> sp.
cactus apple	<i>Opuntia englemannii flavispina</i>
cane cholla	<i>Cylindropuntia spinosior</i>
Canelo Hills ladies' tresses	<i>Spiranthes delitescens</i>
canyon ragweed	<i>Ambrosia ambrosioides</i>
cat-claw acacia	<i>Acacia greggii</i>
chain-fruit cholla	<i>Cylindropuntia fulgida</i>
Chisos coral root	<i>Hexalectris revoluta</i>
counter-clockwise fishhook cactus	<i>Mammalaria mainiae</i>
creosote	<i>Larrea tridentata</i>
crested coral root	<i>Hexalectris spicata</i>
Dahlia rooted cereus	<i>Peniocereus striatus</i>
Dalhouse spleenwort	<i>Asplenium dalhousiae</i>
desert broom	<i>Baccharis sarothroides</i>
desert Christmas cactus	<i>Cylindropuntia leptocaulis</i>
desert honeysuckle	<i>Anisacanthus thurberi</i>
desert night-blooming cereus	<i>Peniocereus greggii</i> var. <i>transmontanus</i>
desert willow	<i>Chilopsis linearis</i>
Emory's barrel cactus	<i>Ferocactus emoryi</i>
fallen ladie's tresses	<i>Schiedeella arizonica</i>
fishhook barrel cactus	<i>Ferocactus wislizenii</i>
foothill palo verde	<i>Parkinsonia microphyllum</i>
Gentry indigobush	<i>Dalea tentaculoides</i>
golden barrel cactus	<i>Ferocactus cylindraceus eastwoodiae</i>

Appendix A (continued).

Common name	Scientific name
golden-spined hedgehog	<i>Echinocereus englemannii</i>
Goodding's onion	<i>Allium gooddingii</i>
graythorn	<i>Ziziphus obtusifolia</i>
heathleaf wild buckwheat	<i>Eriogonum ericifolium ericifolium</i>
hedgehog cactus	<i>Echinocereus</i> sp.
Huachuca golden aster	<i>Heterotheca rutteri</i>
Huachuca water umbel	<i>Lilaeopsis schaffneriana recurva</i>
ironwood	<i>Olneya tesota</i>
juniper	<i>Juniperus</i> sp.
Kearney blue star	<i>Amsonia kearneyana</i>
Kelvin cholla	<i>Cylindropuntia x kelvinensis</i>
Kofa barberry	<i>Berberis harrisoniana</i>
large-flowered blue star	<i>Amsonia grandiflora</i>
Lemmon cloak fern	<i>Notholaena lemmonii</i>
Lemmon lily	<i>Lilium parryi</i>
limberbush	<i>Jatropha</i> sp.
littleleaf false tamarind	<i>Lysiloma watsonii</i>
magenta-flower hedgehog	<i>Echinocereus fasciculatus</i>
mesquite	<i>Prosopis</i> sp.
Mexican palo verde	<i>Parkinsonia mexicana</i>
needle-spined pineapple cactus	<i>Echinomastus erectocentrus erectocentrus</i>
Nichol's turk's head cactus	<i>Echinocactus horizonthalonius nicholii</i>
night-blooming cereus	<i>Peniocereus greggii</i>
ocotillo	<i>Fouquieria splendens</i>
oleander	<i>Nerium oleander</i>
organ pipe cactus	<i>Stenocereus thurberi</i>
Palmer amaranth	<i>Amaranthus palmeri</i>
palo verde	<i>Parkinsonia</i> sp.
pencil cholla	<i>Cylindropuntia arbuscula</i>
pine-needle milkweed	<i>Asclepias linaria</i>
Pima Indian mallow	<i>Abutilon parishii</i>
Pima pineapple cactus	<i>Coryphantha scheeri robustispina</i>
Plummer onion	<i>Allium plummerae</i>
prickly-pear	<i>Opuntia</i> sp.
Pringle hawkweed	<i>Hieracium pringlei</i>
Russian thistle	<i>Salsola iberica</i>
saguaro	<i>Carnegiea gigantea</i>
saiya	<i>Amoreuxia gonzalezii</i>
San Carlos wild buckwheat	<i>Eriogonum capillare</i>
San Pedro River wild buckwheat	<i>Eriogonum terrenatum</i>
Santa Cruz striped agave	<i>Agave parviflora parviflora</i>
senita	<i>Lophocereus schottii</i>
slender adder's mouth	<i>Malaxis tenuis</i>
smoke tree	<i>Dalea spinosa</i>
staghorn cholla	<i>Cylindropuntia versicolor</i>
teddy bear cholla	<i>Cylindropuntia bigelovii</i>

Appendix A (continued).

Common name	Scientific name
Thornber fishhook cactus	<i>Mammalaria thornberi</i>
Thurber Indian mallow	<i>Abutilon thurberi</i>
Thurber's bog orchid	<i>Platanthera limosa</i>
Trelease agave	<i>Agave schottii treleasei</i>
triangle-leaf bursage	<i>Ambrosia deltoidea</i>
Tumamoc globeberry	<i>Tumamoca macdouglii</i>
varied fishhook cactus	<i>Mammalaria viridiflora</i>
velvet mesquite	<i>Prosopis velutina</i>
whisk fern	<i>Psilotum nudum</i>
wolfberry	<i>Lycium</i> sp.

Appendix B: IPaC Species List



U.S. Fish & Wildlife Service

Information, Planning and Consultation System

Trust resources list

Printed on:
Jun 5, 2008

Project location: Pima, AZ within 25 miles of the US / Mexico border

Listed species in the vicinity of your project:

Amphibians	
Chiricahua leopard frog (<i>Calopogon chiricahuensis</i>)	Threatened
Birds	
masked bobwhite (<i>Calopogon virginianus</i>)	Endangered
Mexican spotted owl (<i>Calopogon occidentalis</i>)	Threatened
southwestern willow flycatcher (<i>Calopogon traillii</i>)	Endangered
Fishes	
desert pupfish (<i>Calopogon macularius</i>)	Endangered
Gila chub (<i>Calopogon intermedia</i>)	Endangered
Gila topminnow (<i>Calopogon occidentalis</i>) Population: U.S.A. only	Endangered
Flowering Plants	
Kearney's blue-star (<i>Calopogon kearneyana</i>)	Endangered
Pima pineapple cactus (<i>Calopogon scheeri</i>)	Endangered
Mammals	
jaguar (<i>Calopogon onca</i>)	Endangered
lesser long-nosed bat (<i>Calopogon curasoae</i>)	Endangered
ocelot (<i>Calopogon pardalis</i>)	Endangered
Sonoran pronghorn (<i>Calopogon americana</i>)	Endangered

FWS Refuges in the vicinity of your project:

Buenos Aires National Wildlife Refuge	(520) 823-4251 P.O. BOX 109 SASABE, AZ 85633
Cabeza Prieta National Wildlife Refuge	(520) 387-6483 1611 NORTH SECOND AVENUE AJO, AZ 85321

APPENDIX C

Other Special Status Species Evaluated

Key to Status: HS = Highly Safeguarded, S = Sensitive, SC = Species of Concern, SR = Salvage Restricted, WSC = Wildlife of Special Concern

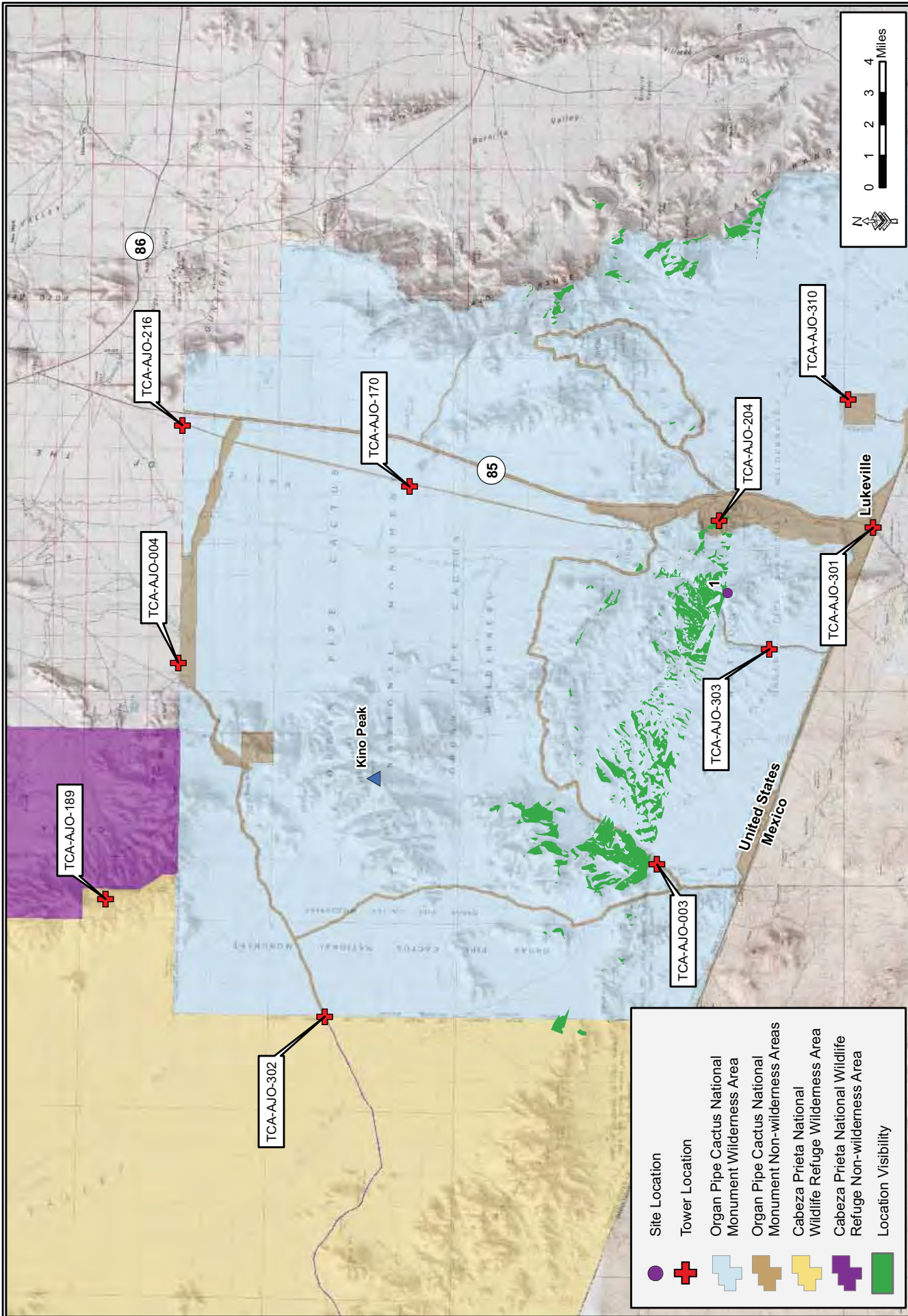
Common Name	Scientific Name	ESA Status	BLM Status	State Status
Amphibians				
Great Plains narrow-mouthed toad	<i>Gastrophryne olivacea</i>			WSC
lowland burrowing treefrog	<i>Pterohyla fodiens</i>			WSC
lowland leopard frog	<i>Lithobates yavapaiensis</i>	SC		WSC
western barking frog	<i>Eleutherodactylus augusti cactorum</i>			WSC
Birds				
baird's sparrow	<i>Ammodramus bairdii</i>	SC		WSC
black-bellied whistling duck	<i>Dendrocygna autumnalis</i>			WSC
black-capped gnatcatcher	<i>Polioptila nigriceps</i>			WSC
common black hawk	<i>Buteogallus anthracinus</i>			WSC
crested caracara	<i>Caracara cheriway</i>			WSC
elegant trogon	<i>Trogon elegans</i>			WSC
fulvous whistling duck	<i>Dendrocygna bicolor</i>	SC		
northern buff-breasted flycatcher	<i>Empidonax fulvifrons pygmaeus</i>	SC		WSC
northern goshawk	<i>Accipiter gentilis</i>	SC		WSC
northern gray hawk	<i>Buteo nitidus maximus</i>	SC		WSC
osprey	<i>Pandion haliaetus</i>			WSC
rose-throated becard	<i>Pachyrhamphus aglaiae</i>			WSC
thick-billed kingbird	<i>Tyrannus crassirostris</i>			WSC
tropical kingbird	<i>Tyrannus melancholicus</i>			WSC
Fish				
desert sucker	<i>Catostomus clarki</i>	SC	S	
Gila longfin dace	<i>Agosia chrysogaster chrysogaster</i>	SC	S	
Invertebrates				
Quitobaquito tryonia	<i>Tryonia quitobaquita</i>	SC		
Sabino Canyon damselfly	<i>Argia sabino</i>	SC		
San Xavier talussnail	<i>Sonorella eremite</i>	SC		
Mammals				
Arizona myotis	<i>Myotis occultus</i>	SC	S	
Mexican long-tongued bat	<i>Choeronycteris mexicana</i>	SC		WSC
pocketed free-tailed bat	<i>Nyctinomops femorosaccus</i>		S	
spotted bat	<i>Euderma maculatum</i>		S	WSC
western red bat	<i>Lasiurus blossevillii</i>			WSC
western yellow bat	<i>Lasiurus xanthinus</i>			WSC
yellow-nosed cotton rat	<i>Sigmodon ochrognathus</i>	SC		
Reptiles				
brown vinesnake	<i>Oxybelis aeneus</i>			WSC
canyon giant spotted whiptail	<i>Aspidoscelis burti stictogrammus</i>	SC	S	
desert rosy boa	<i>Charina trivirgata gracia</i>	SC	S	
northern Mexican gartersnake	<i>Thamnophis eques megalops</i>	SC		WSC
Texas horned lizard	<i>Phrynosoma cornutum</i>	SC	S	
Tucson shovel-nosed snake	<i>Chionactis occipitalis klauberi</i>		S	
Yuman Desert fringe-toed lizard	<i>Uma rufopunctata</i>	SC		WSC

Appendix C (continued).

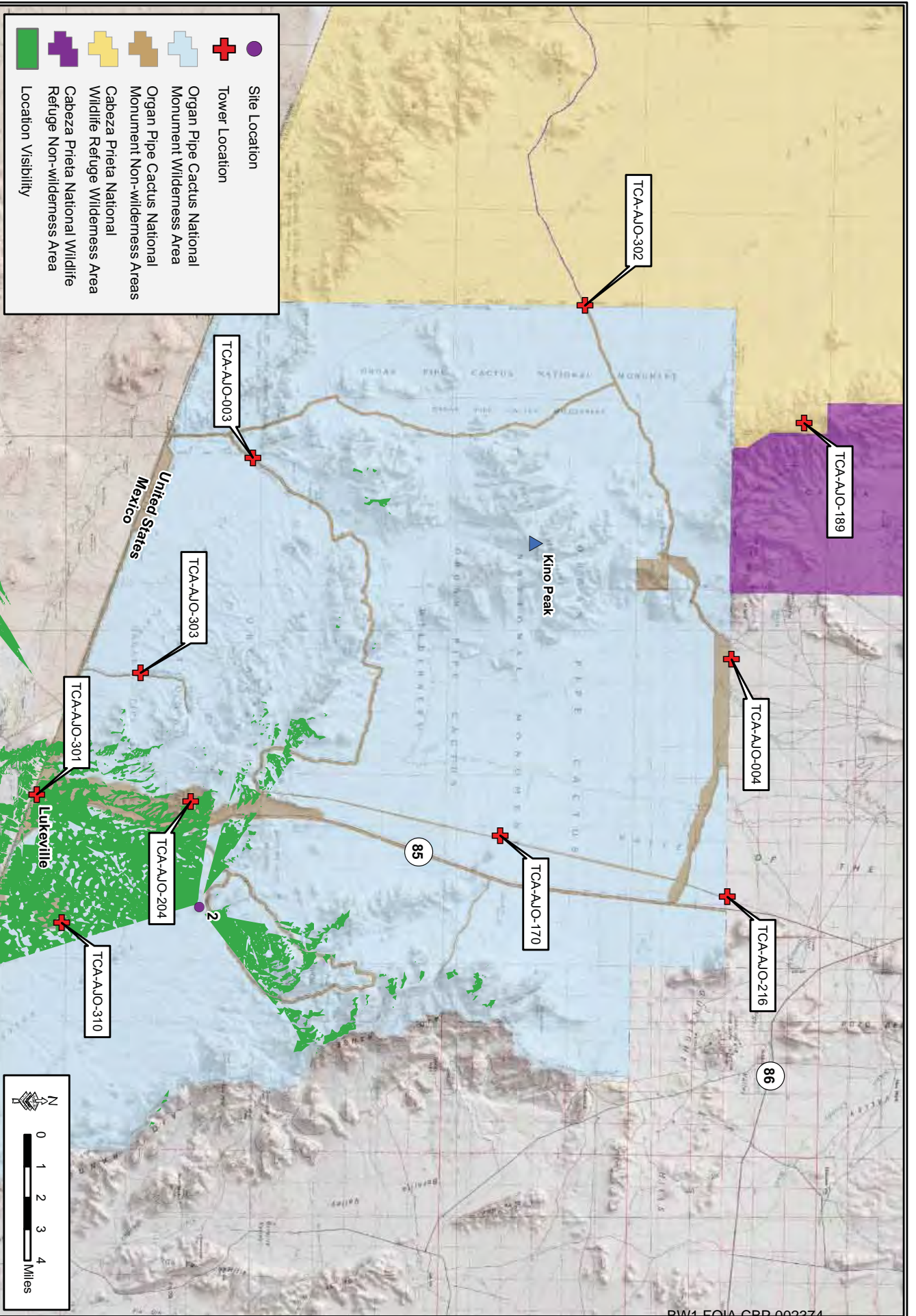
Common Name	Scientific Name	ESA	BLM	State
Plants				
Ajo rock daisy	<i>Perityle ajoensis</i>			SR
Aravaipa wood fern	<i>Thelypteris puberula sonorensis</i>		S	
Arizona giant sedge	<i>Carex ultra</i>		S	
Arizona Sonoran rosewood	<i>Vauquelinia californica sonorensis</i>		S	
Bartram stonecrop	<i>Graptopetalum bartramii</i>	SC	S	SR
beardless chinch weed	<i>Pectis imberbis</i>	SC		
blue sand lily	<i>Triteleopsis palmeri</i>		S	SR
broadleaf twayblade	<i>Listera convallarioides</i>			SR
cactus apple	<i>Opuntia englemannii flavispina</i>			SR
Catalina beardtongue	<i>Penstemon discolor</i>			HS
Chisos coral root	<i>Hexalectris revoluta</i>		S	SR
counter-clockwise fishhook cactus	<i>Mammalaria mainiae</i>			SR
crested coral root	<i>Hexalectris spicata</i>			SR
Dahlia rooted cereus	<i>Peniocereus striatus</i>			SR
Dalhouse spleenwort	<i>Asplenium dalhousiae</i>		S	
fallen ladie's tresses	<i>Schiedeella arizonica</i>			SR
Gentry indigobush	<i>Dalea tentaculoides</i>	SC	S	HS
golden barrel cactus	<i>Ferocactus cylindraceus eastwoodiae</i>			SR
Gooddings onion	<i>Allium gooddingii</i>	SC		HS
Huachuca golden aster	<i>Heterotheca rutteri</i>	SC	S	
Kelvin cholla	<i>Opuntia x kelvinensis</i>			SR
Kofa barberry	<i>Berberis harrisoniana</i>		S	
large-flowered blue star	<i>Amsonia grandiflora</i>	SC		
Lemmon cloak fern	<i>Notholaena lemmonii</i>	SC		
Lemmon lily	<i>Lilium parryi</i>	SC		SR
littleleaf false tamarind	<i>Lysiloma watsonii</i>			SR
magenta-flower hedgehog cactus	<i>Echinocereus fasciculatus</i>			SR
needle-spined pineapple cactus	<i>Echinomastus erectocentrus erectocentrus</i>	SC		SR
Pima Indian mallow	<i>Abutilon parishii</i>	SC	S	SR
Plummer onion	<i>Allium plummerae</i>			SR
Pringle hawkweed	<i>Hieracium pringlei</i>	SC		
saiya	<i>Amoreuxia gonzalezii</i>	SC		HS
San Carlos wild buckwheat	<i>Eriogonum capillare</i>	SC		SR
Sand Pedro River wild buckwheat	<i>Eriogonum terrenatum</i>		S	
Santa Cruz striped agave	<i>Agave parviflora parviflora</i>	SC		HS
senita	<i>Lophocereus schottii</i>			SR
slender adder's mouth	<i>Malaxis tenuis</i>			SR
Thornber fishhook cactus	<i>Mammalaria thornberi</i>			SR
Thurber Indian mallow	<i>Abutilon thurberi</i>			SR
Thurber's bog orchid	<i>Platanthera limosa</i>			SR
Trelease agave	<i>Agave schottii treleasei</i>	SC		HS
Tumamoc globeberry	<i>Tumamoca macdouglii</i>		S	SR
varied fishhook cactus	<i>Mammalaria viridiflora</i>			SR
whisk fern	<i>Psilotum nudum</i>			HS
Wiggins milkweed vine	<i>Metastelma mexicanum</i>	SC		

APPENDIX E
VIEWSHED MAPS



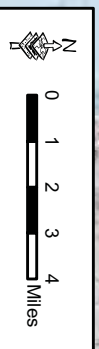


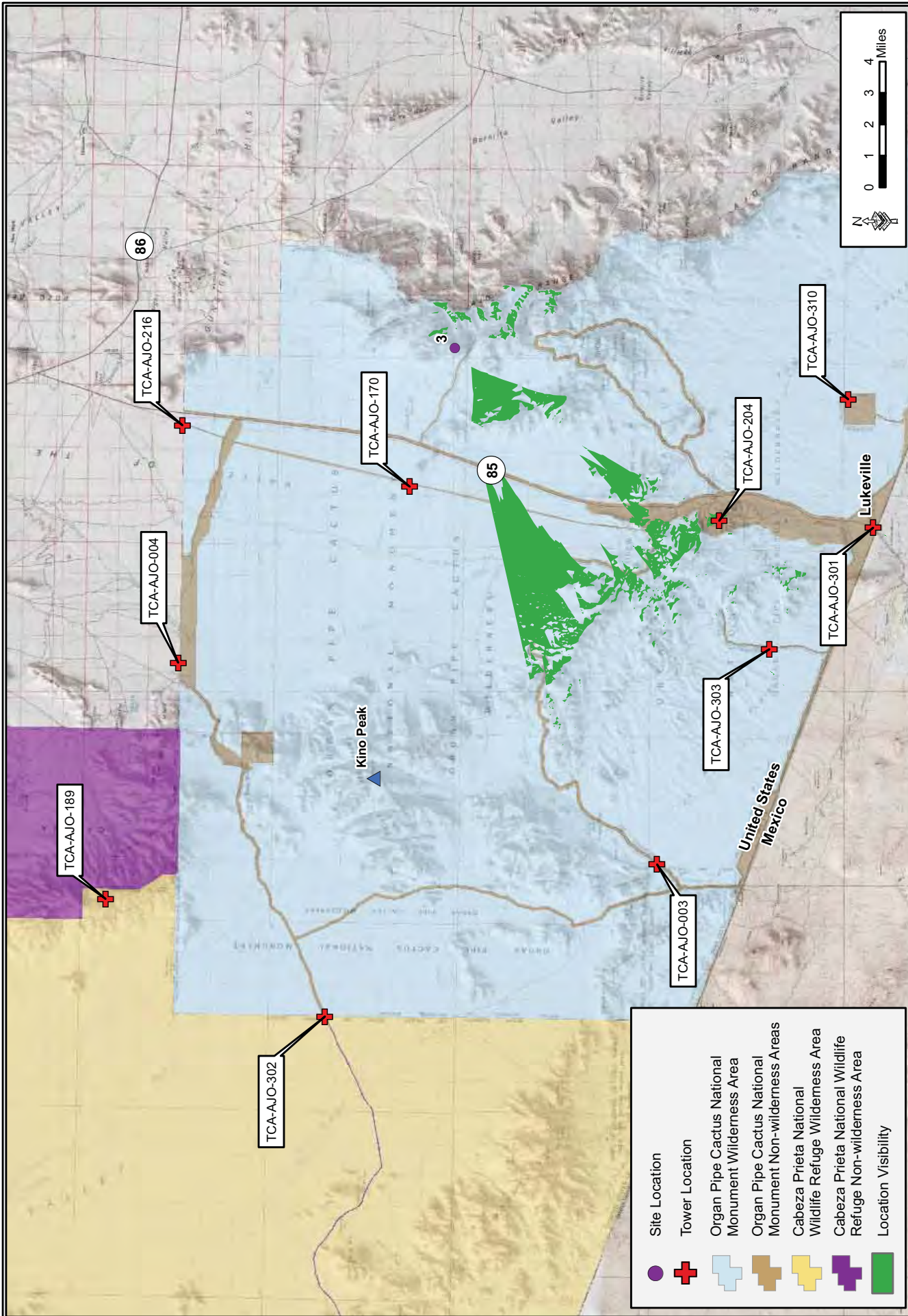
Viewshed Analysis of Location 1



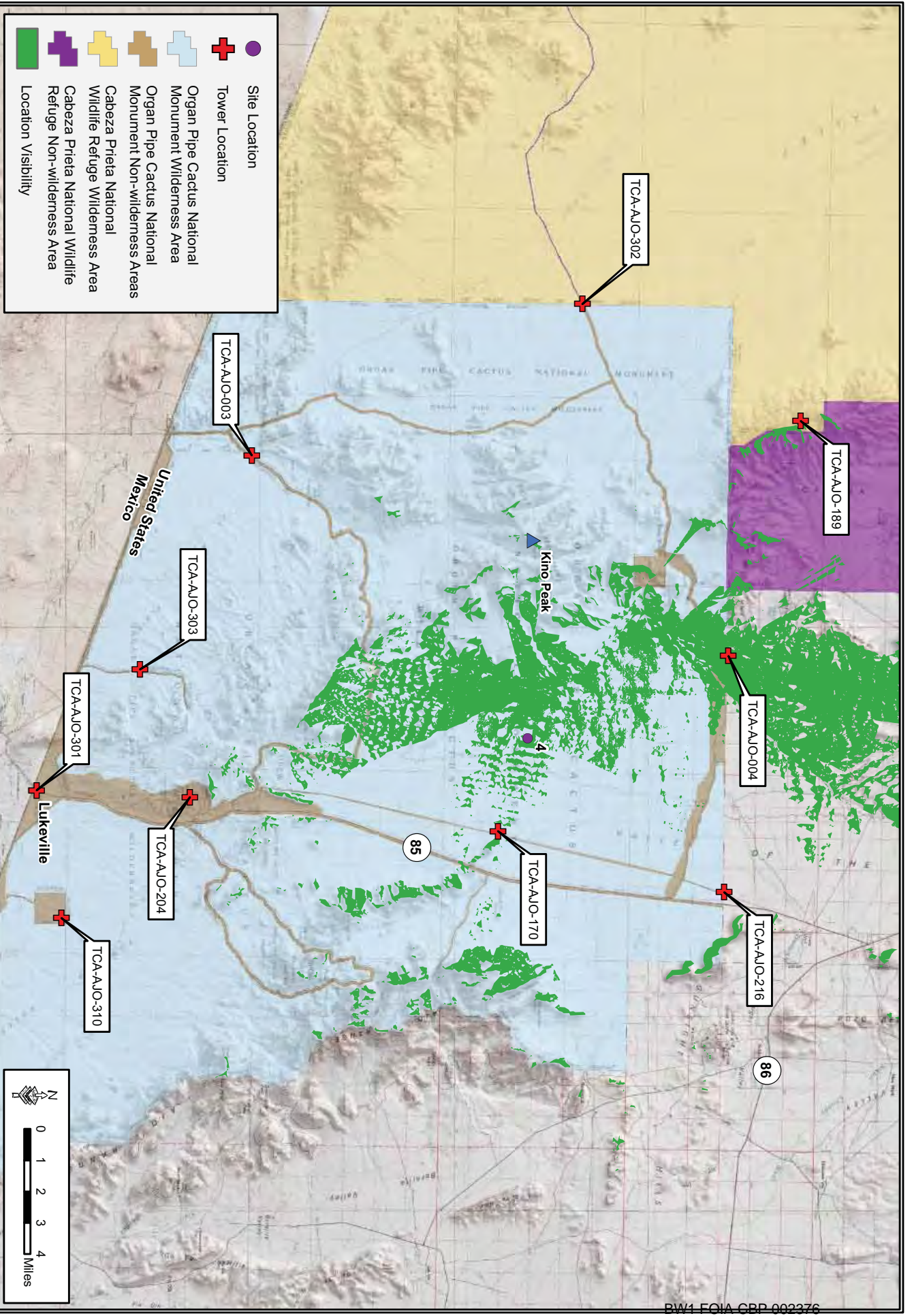
- Site Location
- + Tower Location
- Organ Pipe Cactus National Monument Wilderness Area
- Organ Pipe Cactus National Monument Non-wilderness Areas
- Cabeza Prieta National Wildlife Refuge Wilderness Area
- Cabeza Prieta National Wildlife Refuge Non-wilderness Area
- Location Visibility

Viewshed Analysis of Location 2

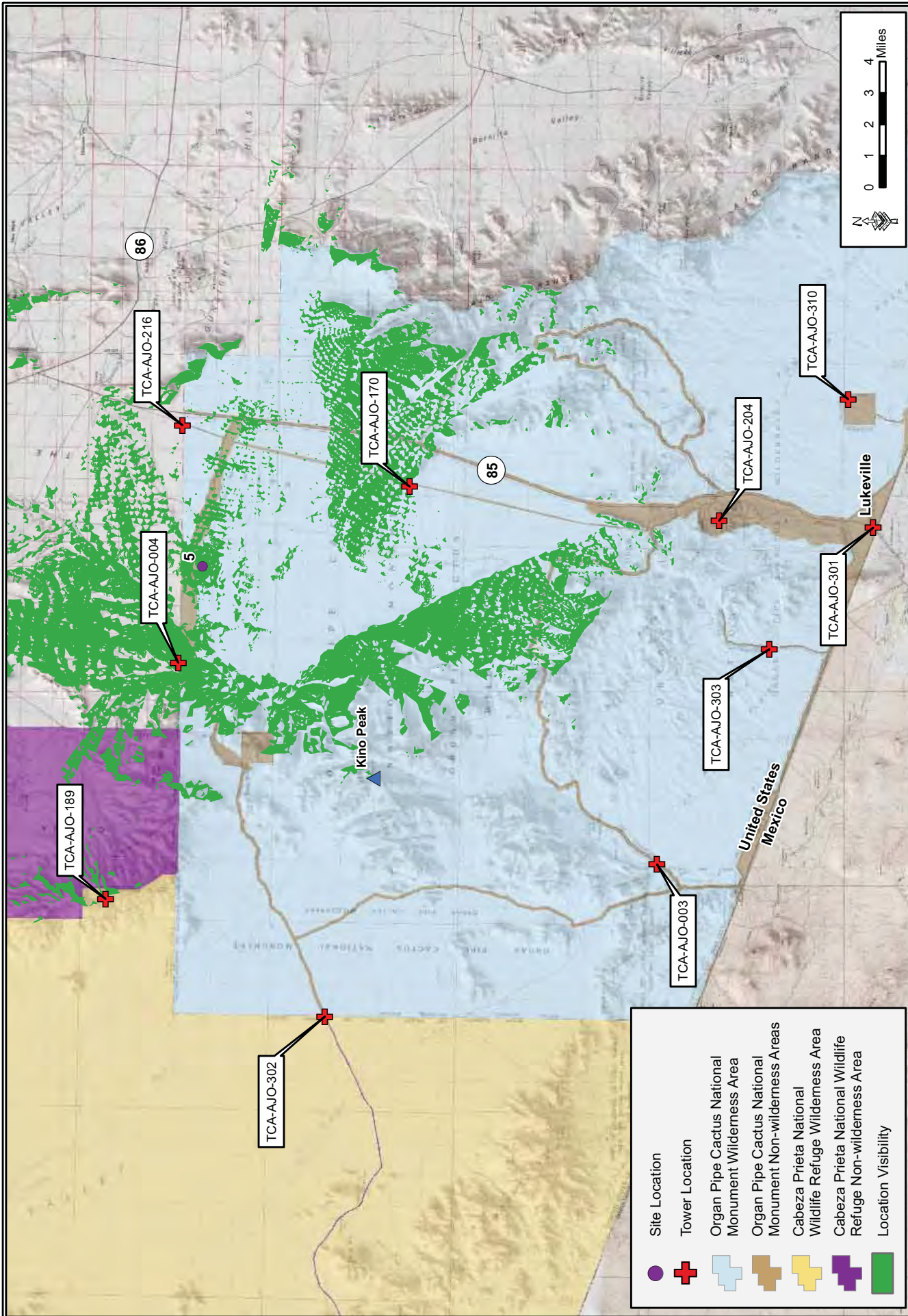




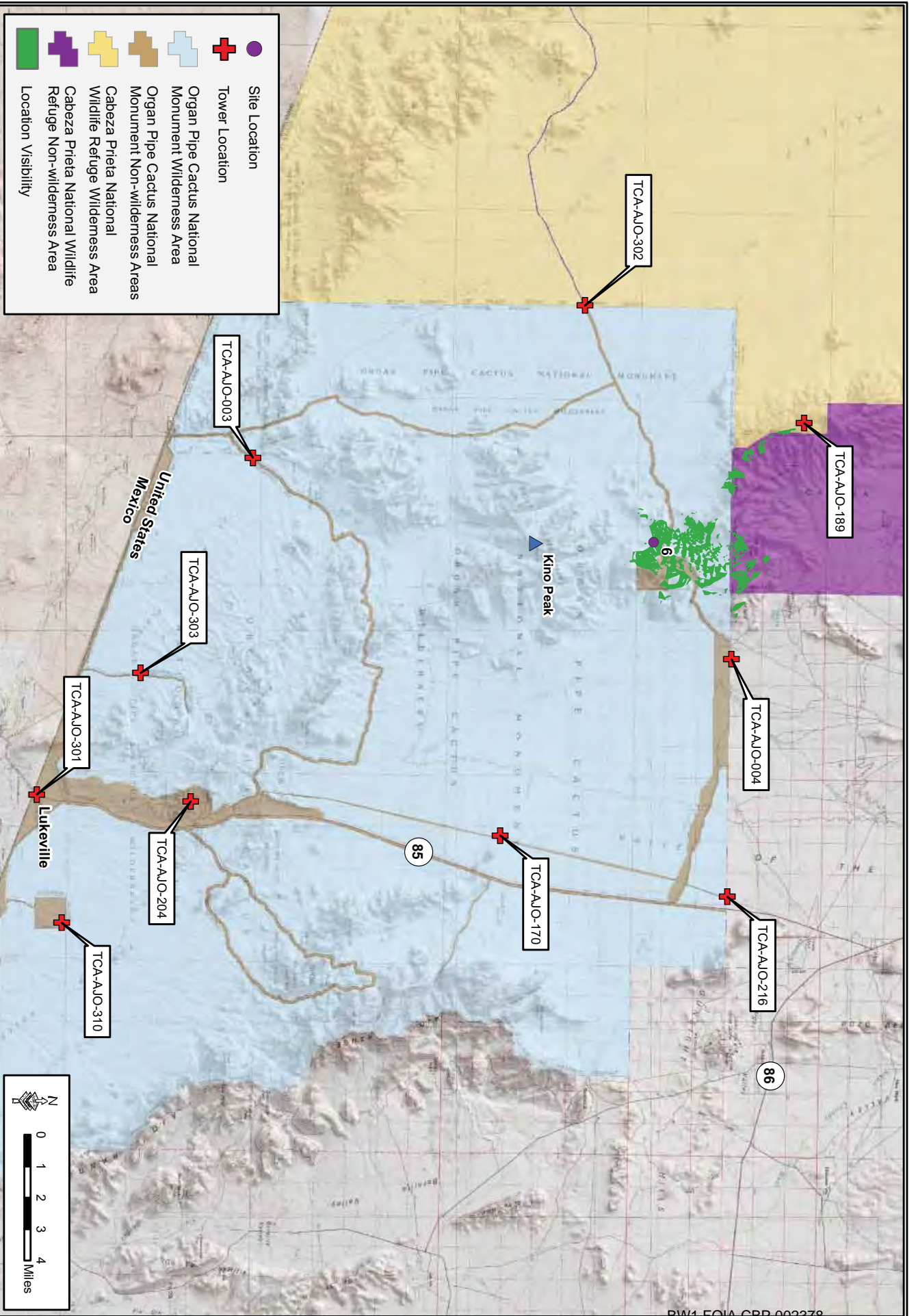
Viewshed Analysis of Location 3



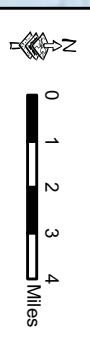
Viewshed Analysis of Location 4



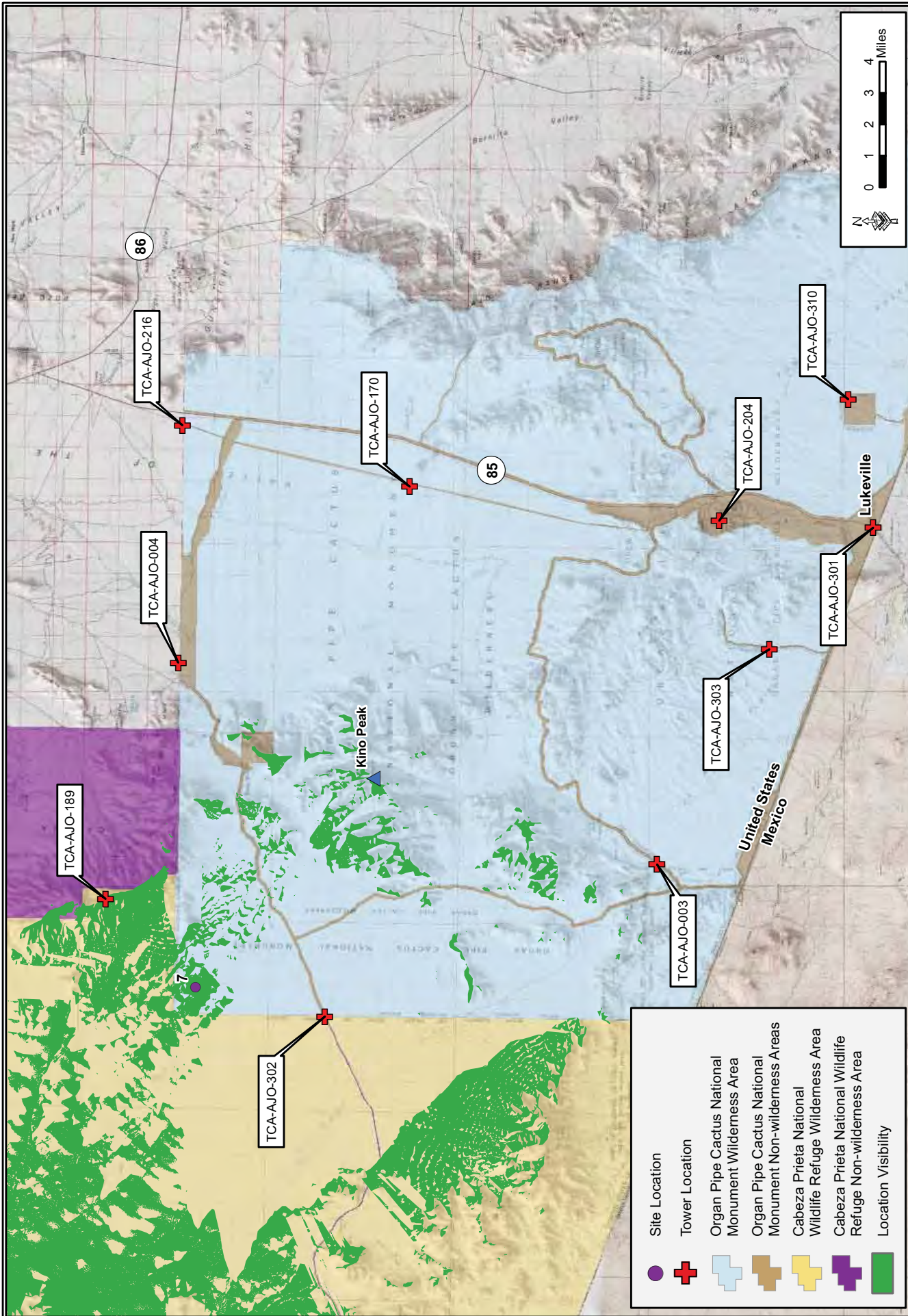
Viewshed Analysis of Location 5



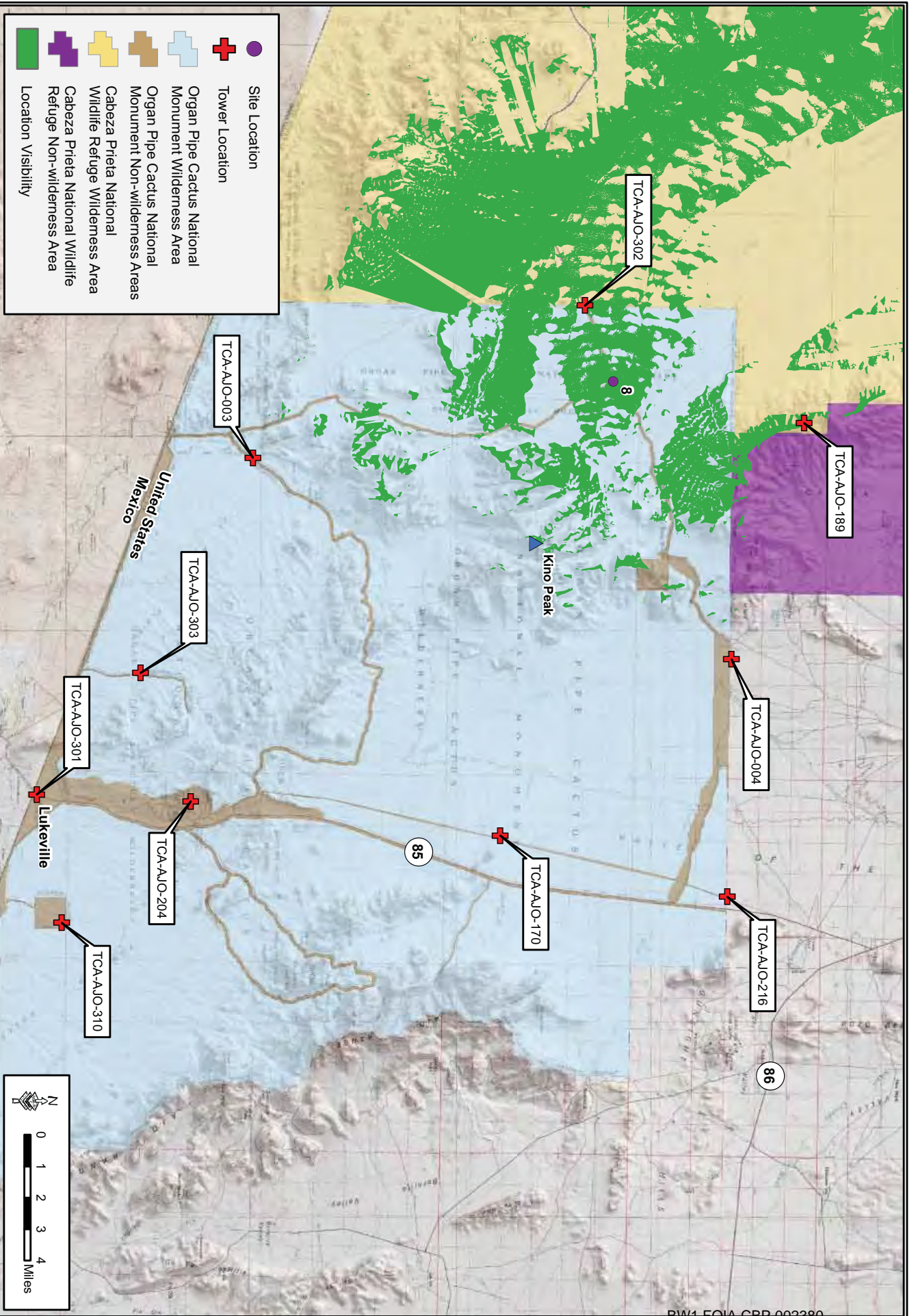
- Site Location
- + Tower Location
- Organ Pipe Cactus National Monument Wilderness Area
- Organ Pipe Cactus National Monument Non-wilderness Areas
- Cabeza Prieta National Wildlife Refuge Wilderness Area
- Cabeza Prieta National Wildlife Refuge Non-wilderness Area
- Location Visibility



Viewshed Analysis of Location 6



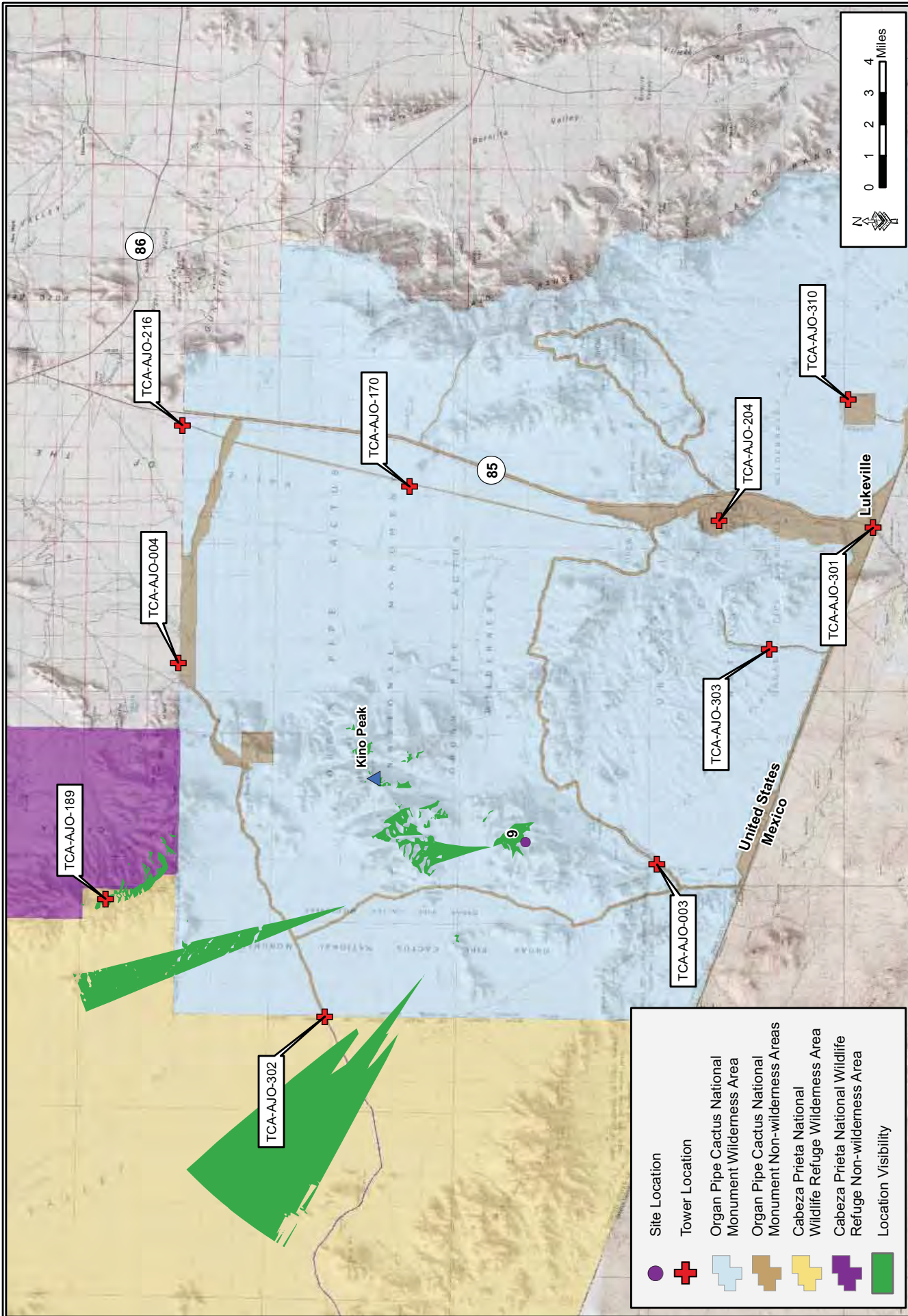
Viewshed Analysis of Location 7



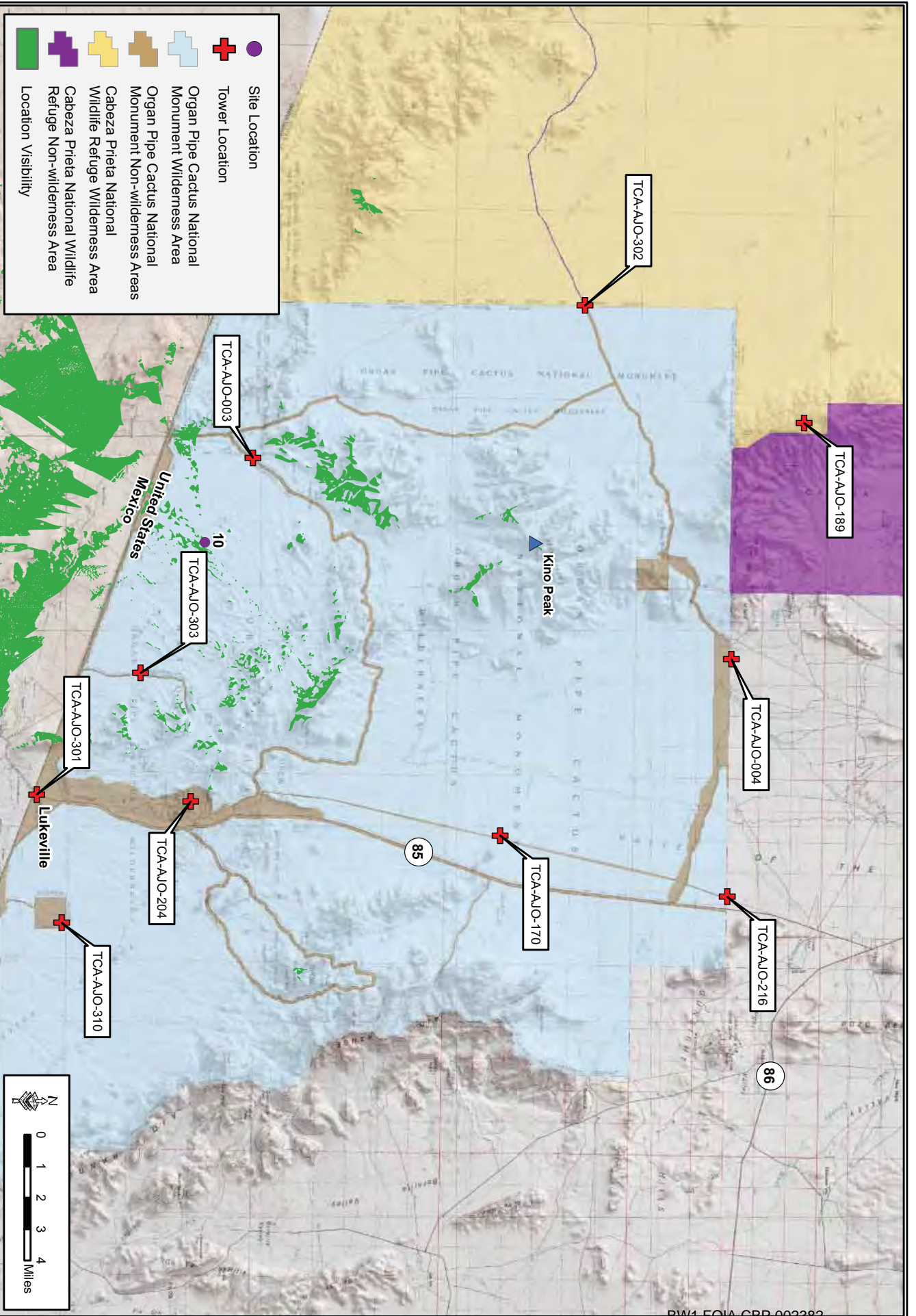
- Site Location
- + Tower Location
- Organ Pipe Cactus National Monument Wilderness Area
- Organ Pipe Cactus National Monument Non-wilderness Areas
- Cabeza Prieta National Wildlife Refuge Wilderness Area
- Cabeza Prieta National Wildlife Refuge Non-wilderness Area
- Location Visibility

Viewshed Analysis of Location 8

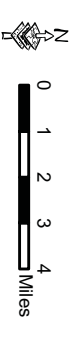


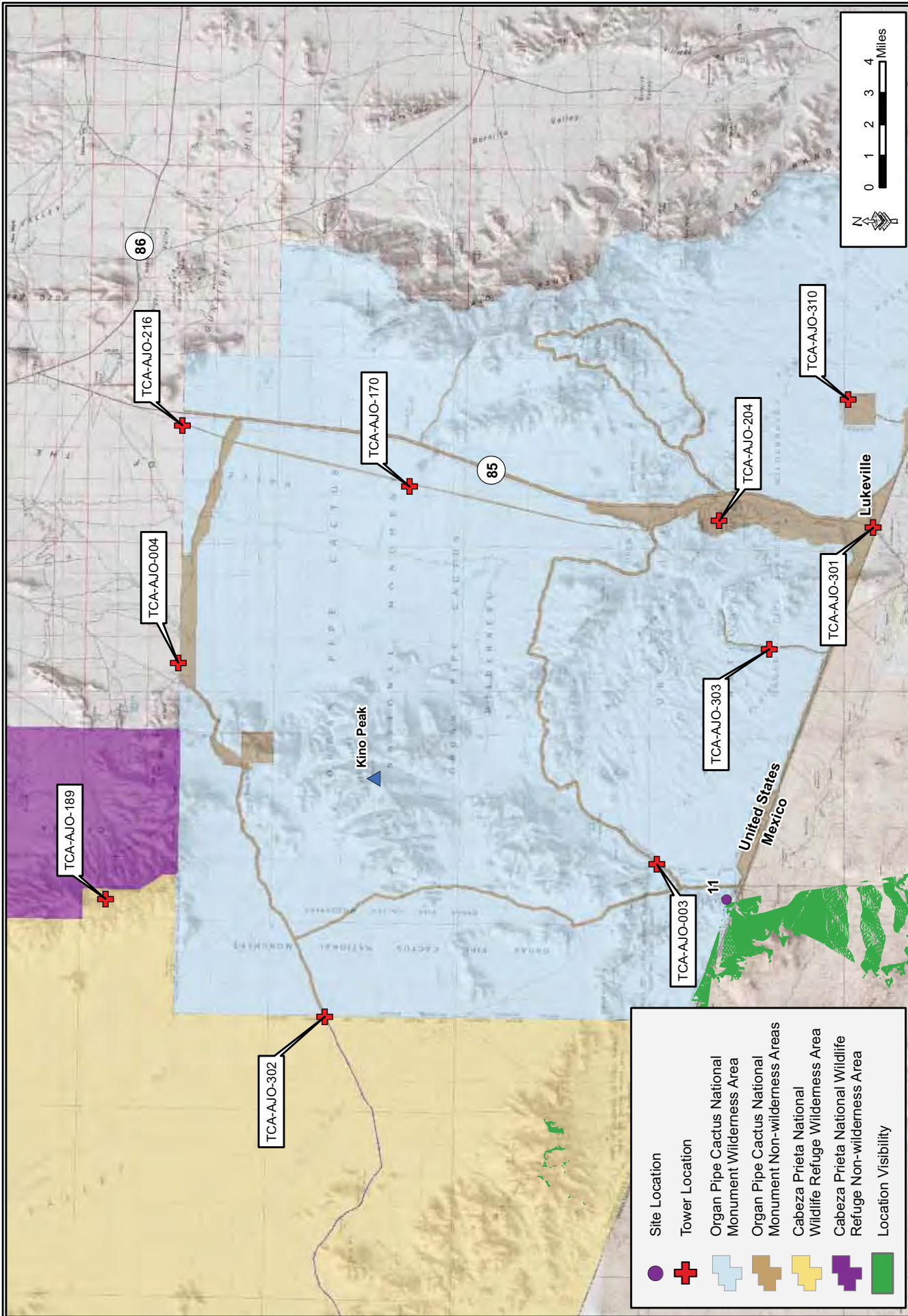


Viewshed Analysis of Location 9



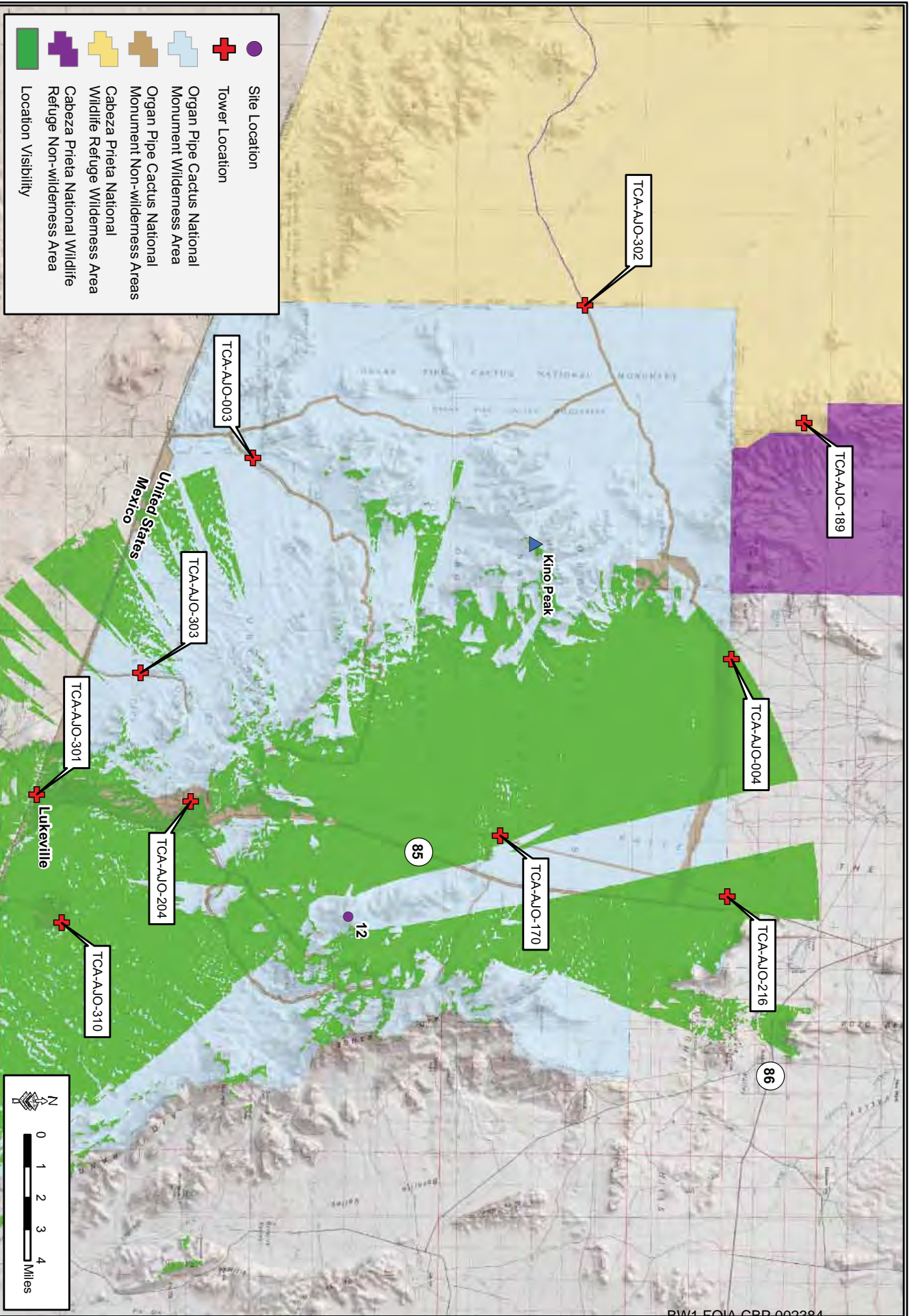
Viewshed Analysis of Location 10



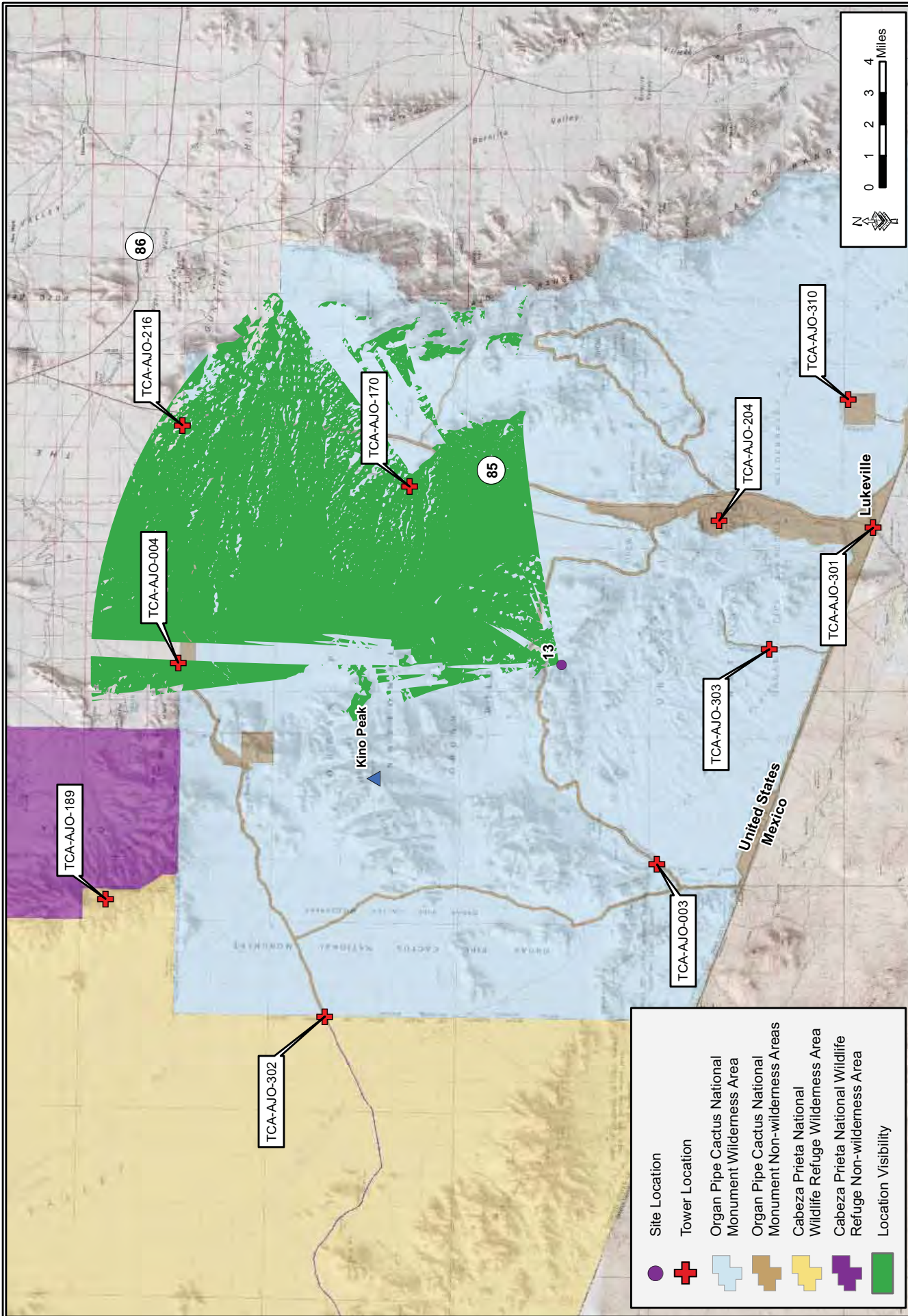









- Site Location
- ⊕ Tower Location
- Organ Pipe Cactus National Monument Wilderness Area
- Organ Pipe Cactus National Monument Non-wilderness Areas
- Cabeza Prieta National Wildlife Refuge Wilderness Area
- Cabeza Prieta National Wildlife Refuge Non-wilderness Area
- Location Visibility

Viewshed Analysis of Location 11

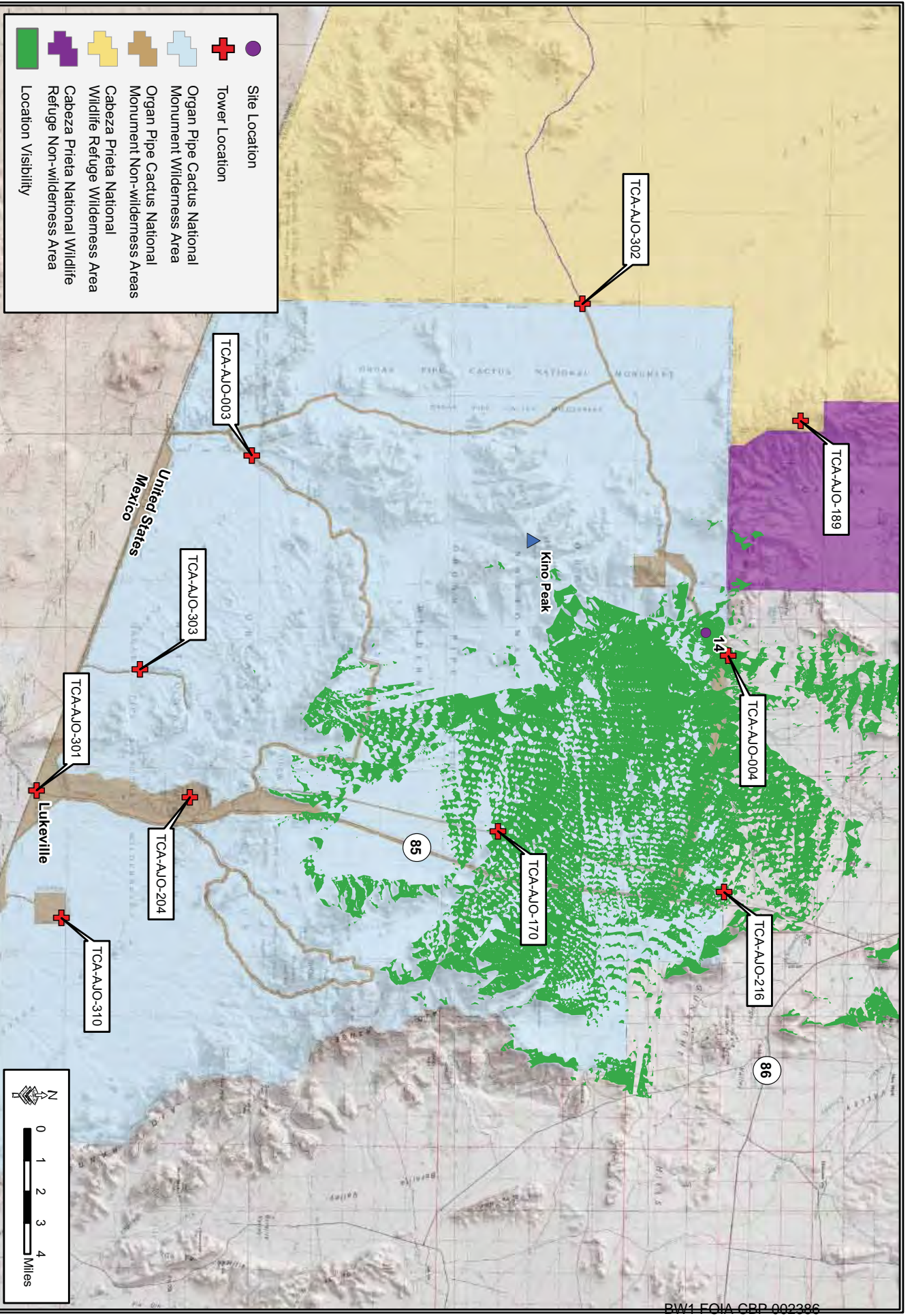


Viewshed Analysis of Location 12



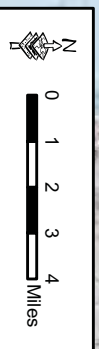
	Site Location
	Tower Location
	Organ Pipe Cactus National Monument Wilderness Area
	Organ Pipe Cactus National Monument Non-wilderness Areas
	Cabeza Prieta National Wildlife Refuge Wilderness Area
	Cabeza Prieta National Wildlife Refuge Non-wilderness Area
	Location Visibility

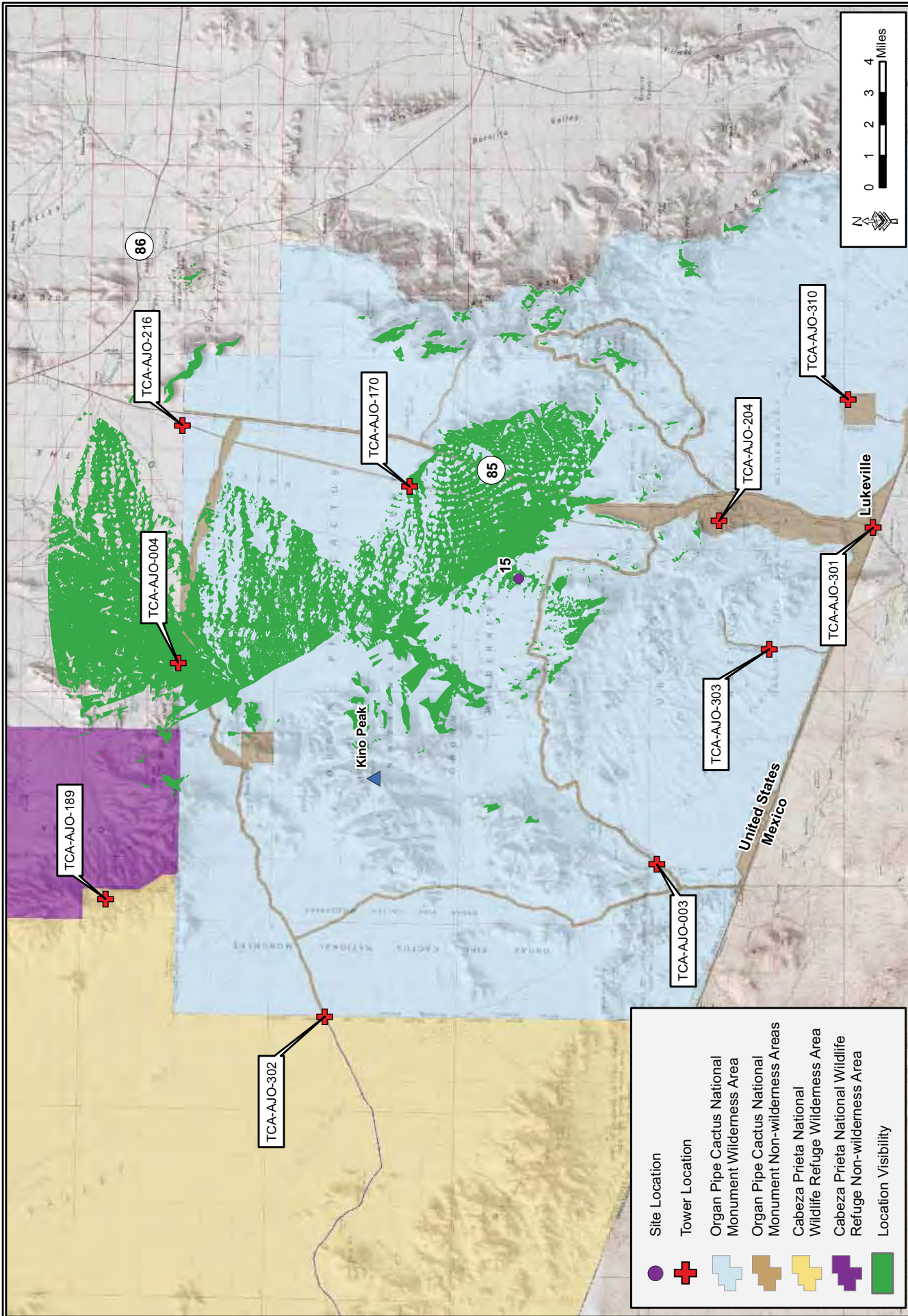
Viewshed Analysis of Location 13



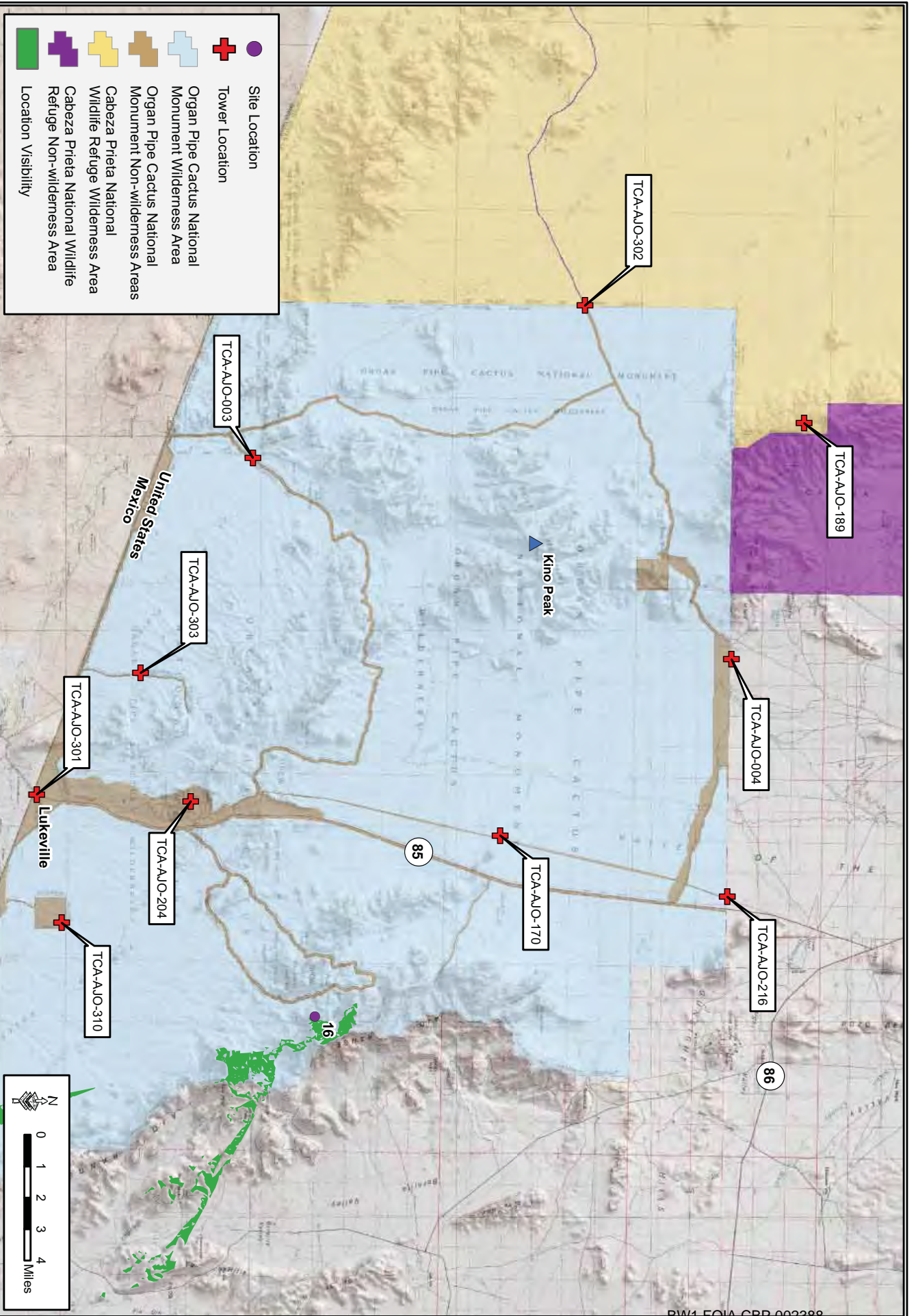
- Site Location
- ✚ Tower Location
- Organ Pipe Cactus National Monument Wilderness Area
- Organ Pipe Cactus National Monument Non-wilderness Areas
- Cabeza Prieta National Wildlife Refuge Wilderness Area
- Cabeza Prieta National Wildlife Refuge Non-wilderness Area
- Location Visibility

Viewshed Analysis of Location 14



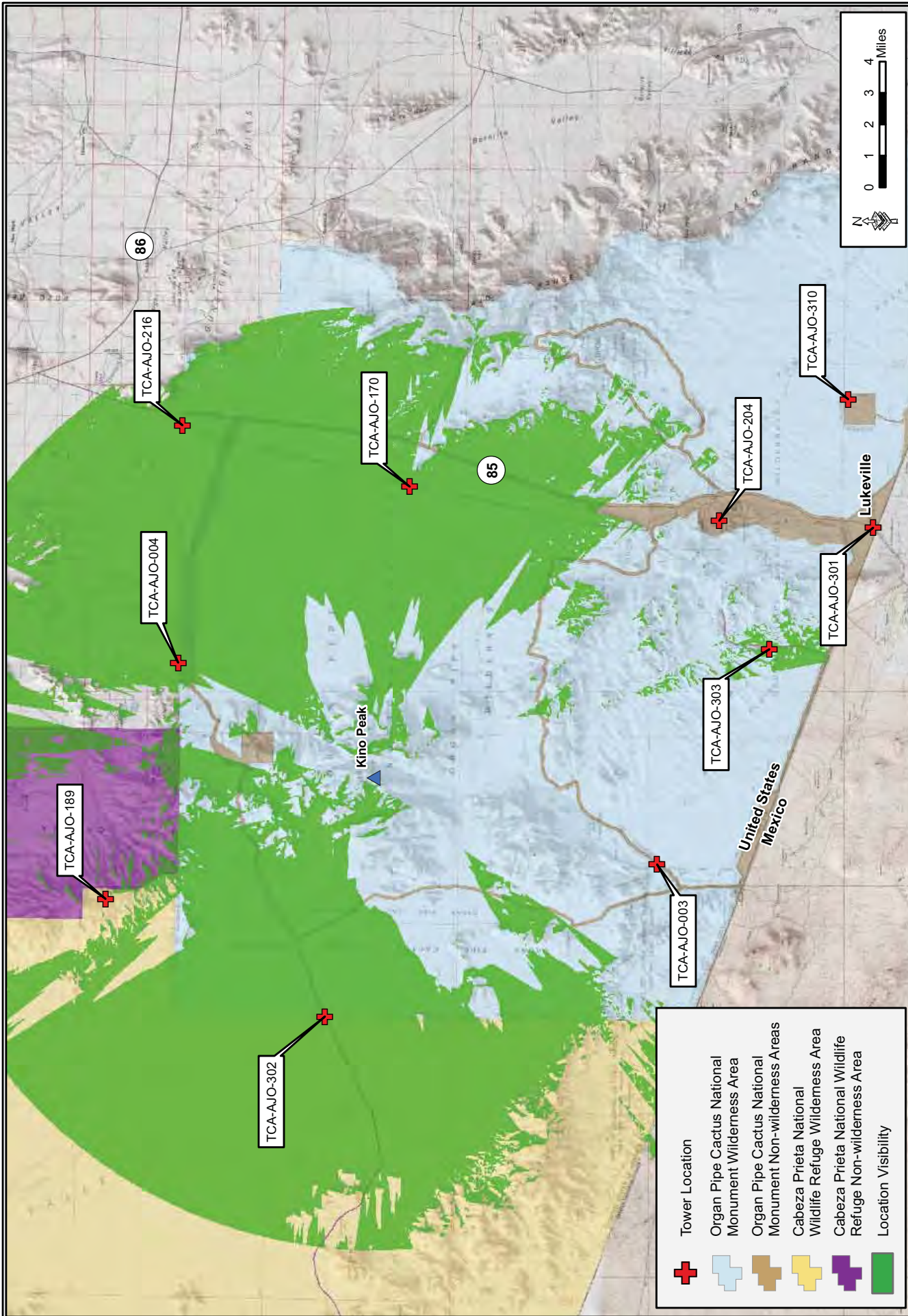


Viewshed Analysis of Location 15



	Site Location
	Tower Location
	Organ Pipe Cactus National Monument Wilderness Area
	Organ Pipe Cactus National Monument Non-wilderness Areas
	Cabeza Prieta National Wildlife Refuge Wilderness Area
	Cabeza Prieta National Wildlife Refuge Non-wilderness Area
	Location Visibility

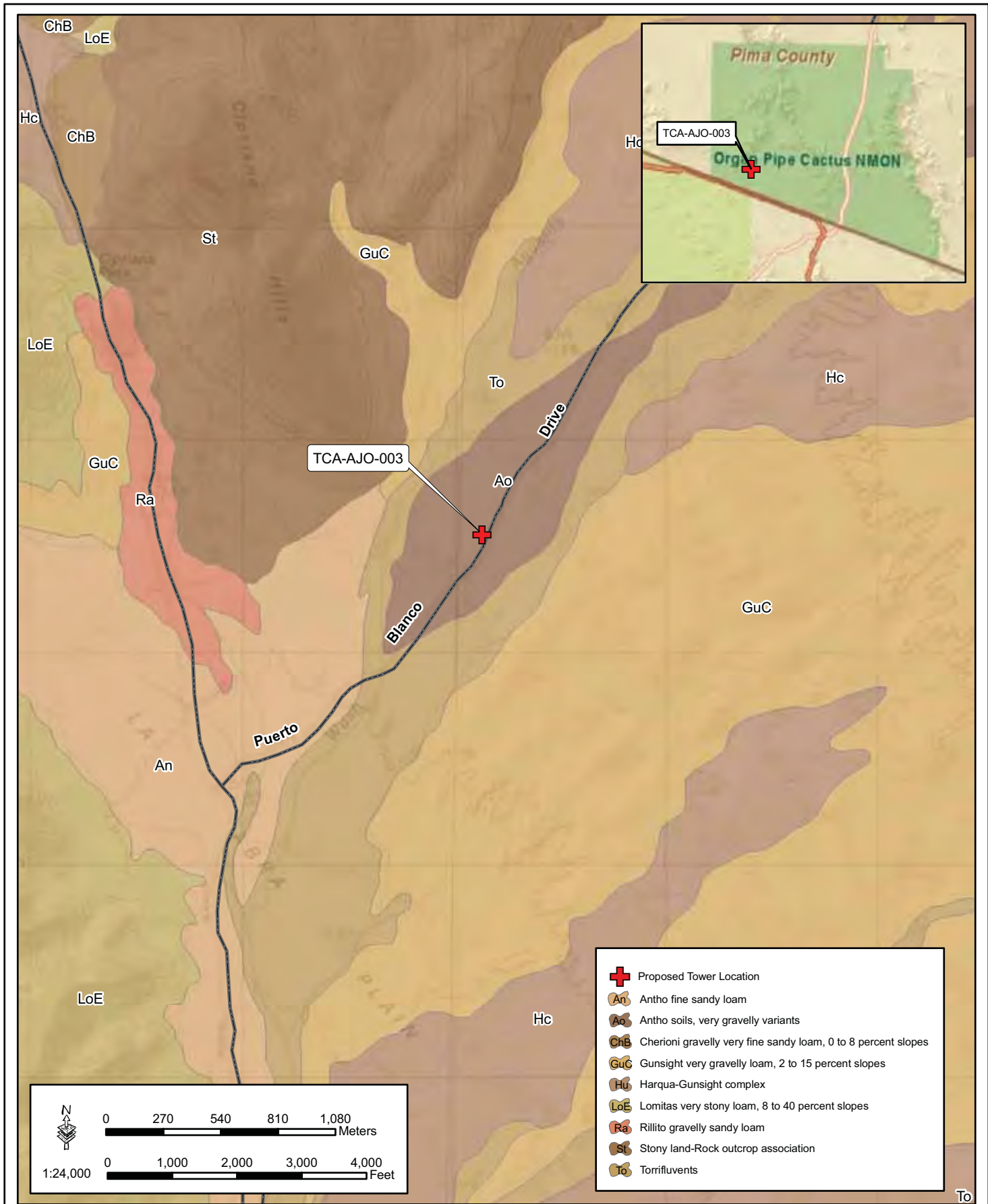
Viewshed Analysis of Location 16



Viewshed Analysis of Kino Peak

APPENDIX F
SOIL MAPS

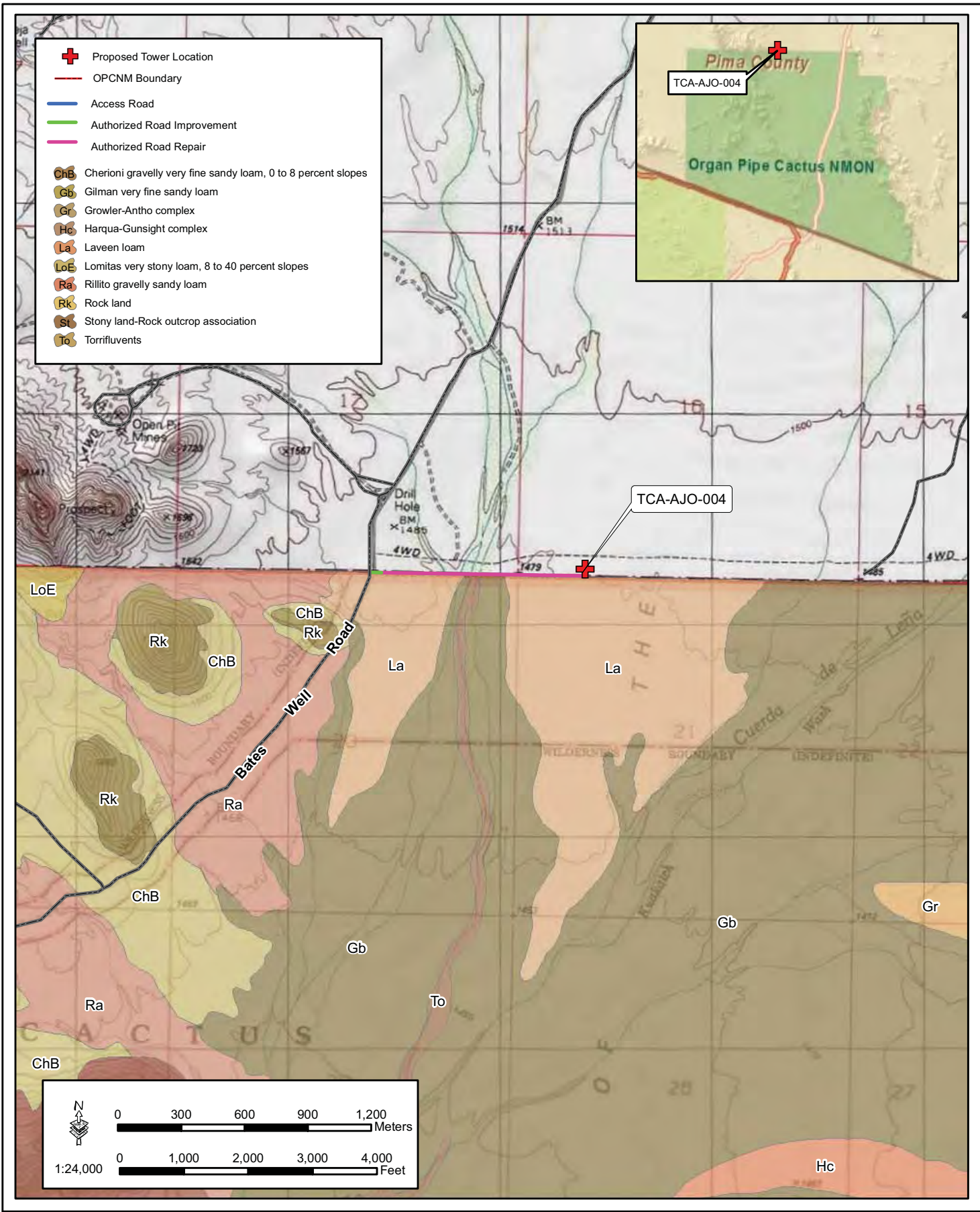




TCA-AJO-003 Tower Soil Survey Map



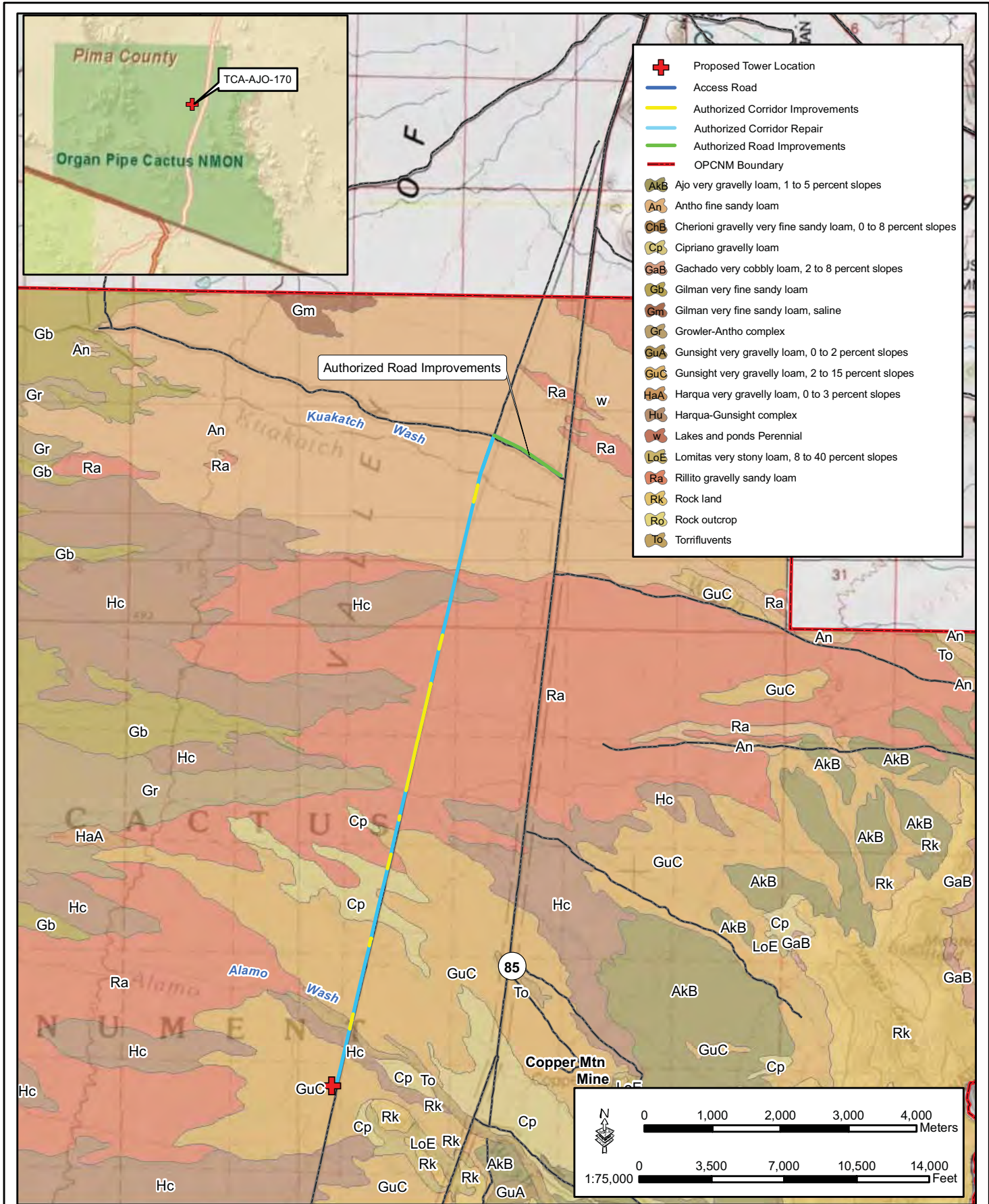
July 2009



TCA-AJO-004 Tower and Approach Road Soil Survey Map



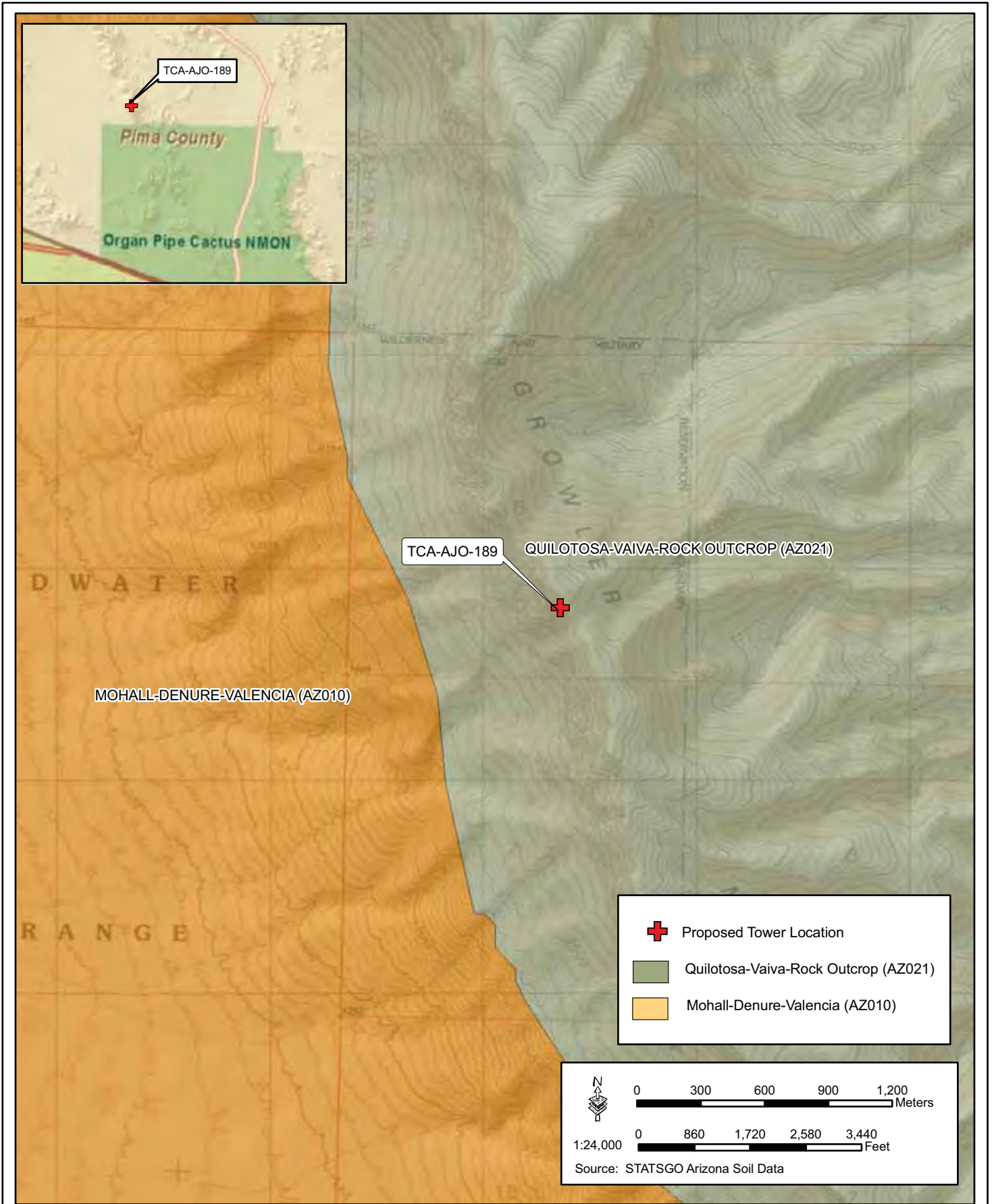
August 2009



TCA-AJO-170 Tower and Approach Road Soil Survey Map



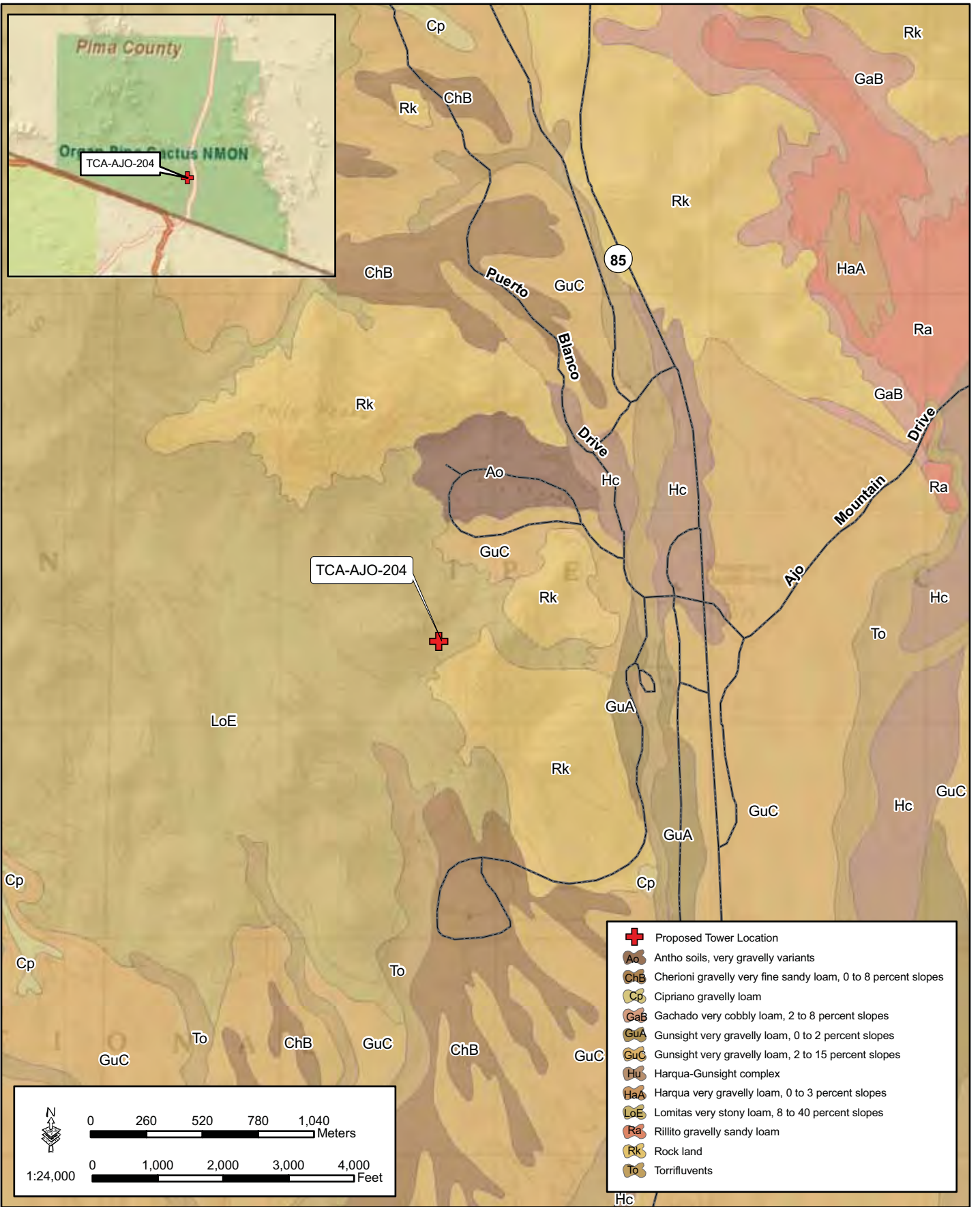
August 2009



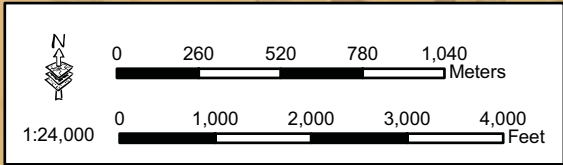
TCA-AJO-189 Tower Soil Survey Map



July 2009



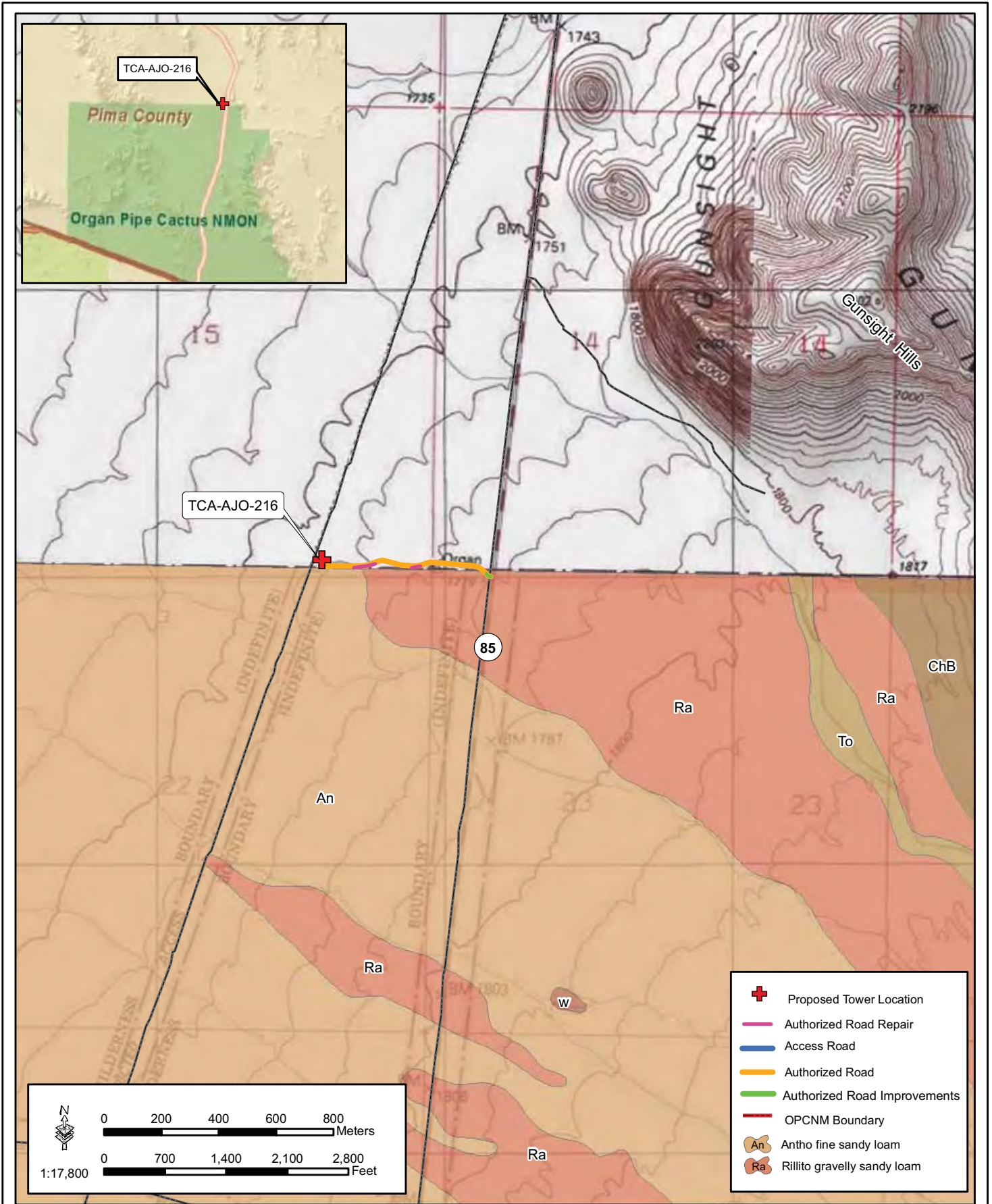
- Proposed Tower Location
- Antho soils, very gravelly variants
- Cherioni gravelly very fine sandy loam, 0 to 8 percent slopes
- Cipriano gravelly loam
- Gachado very cobbly loam, 2 to 8 percent slopes
- Gunsight very gravelly loam, 0 to 2 percent slopes
- Gunsight very gravelly loam, 2 to 15 percent slopes
- Harqua-Gunsight complex
- Harqua very gravelly loam, 0 to 3 percent slopes
- Lomitas very stony loam, 8 to 40 percent slopes
- Rillito gravelly sandy loam
- Rock land
- Torrifluvents



TCA-AJO-204 Tower Soil Survey Map



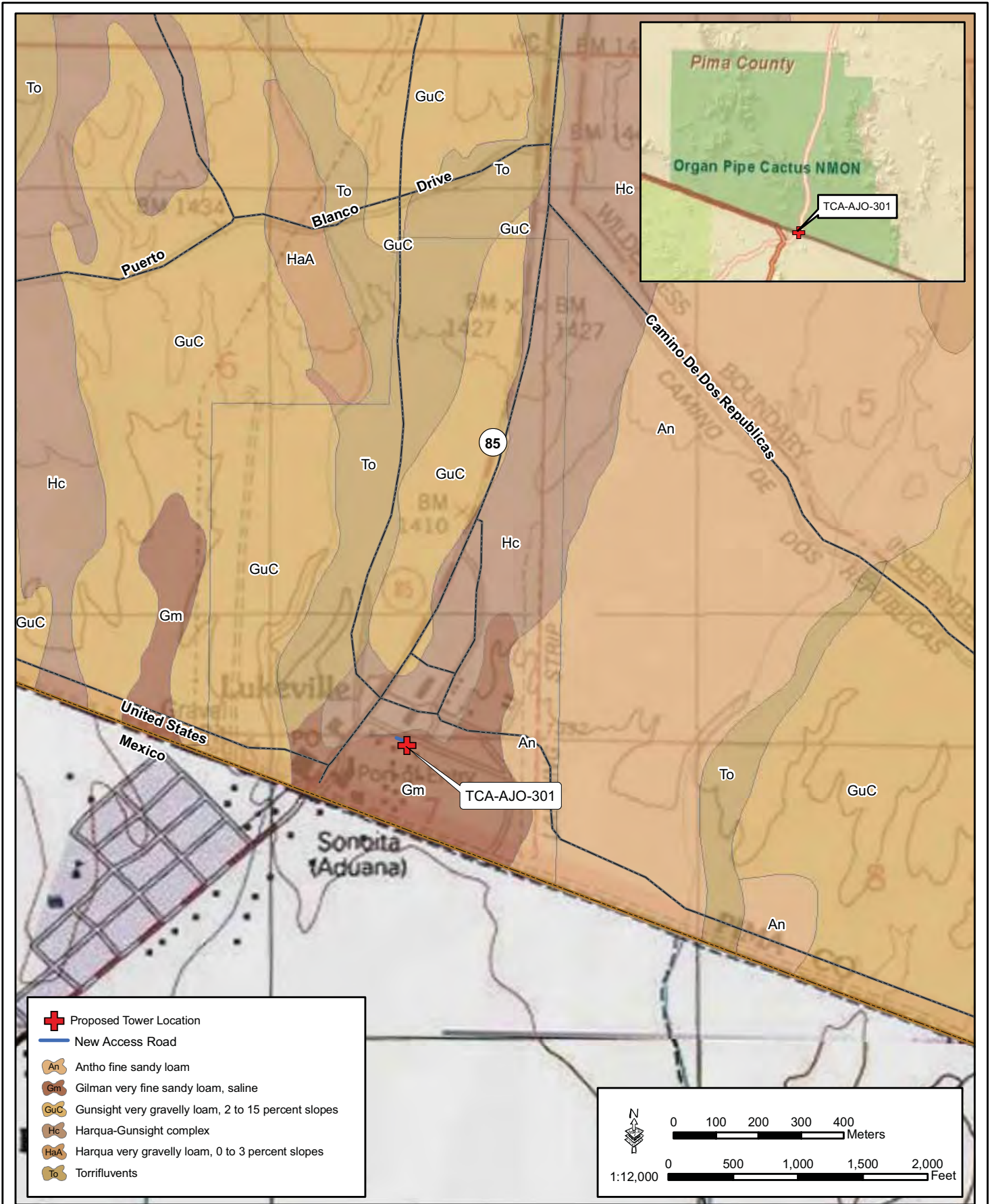
July 2009



TCA-AJO-216 Tower and Approach Road Soil Survey Map

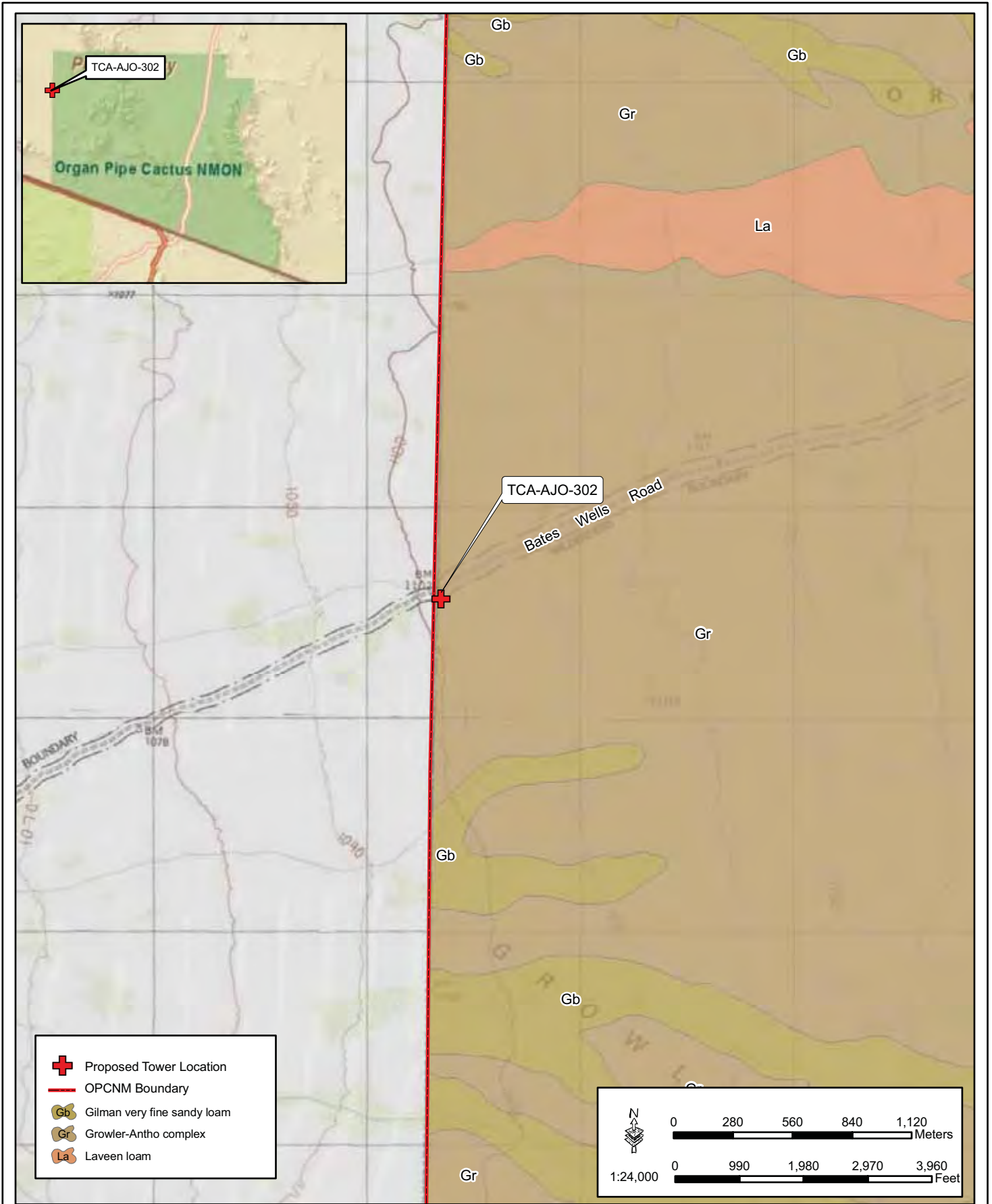


August 2009



TCA-AJO-301 Tower and Access Road Soil Survey Map

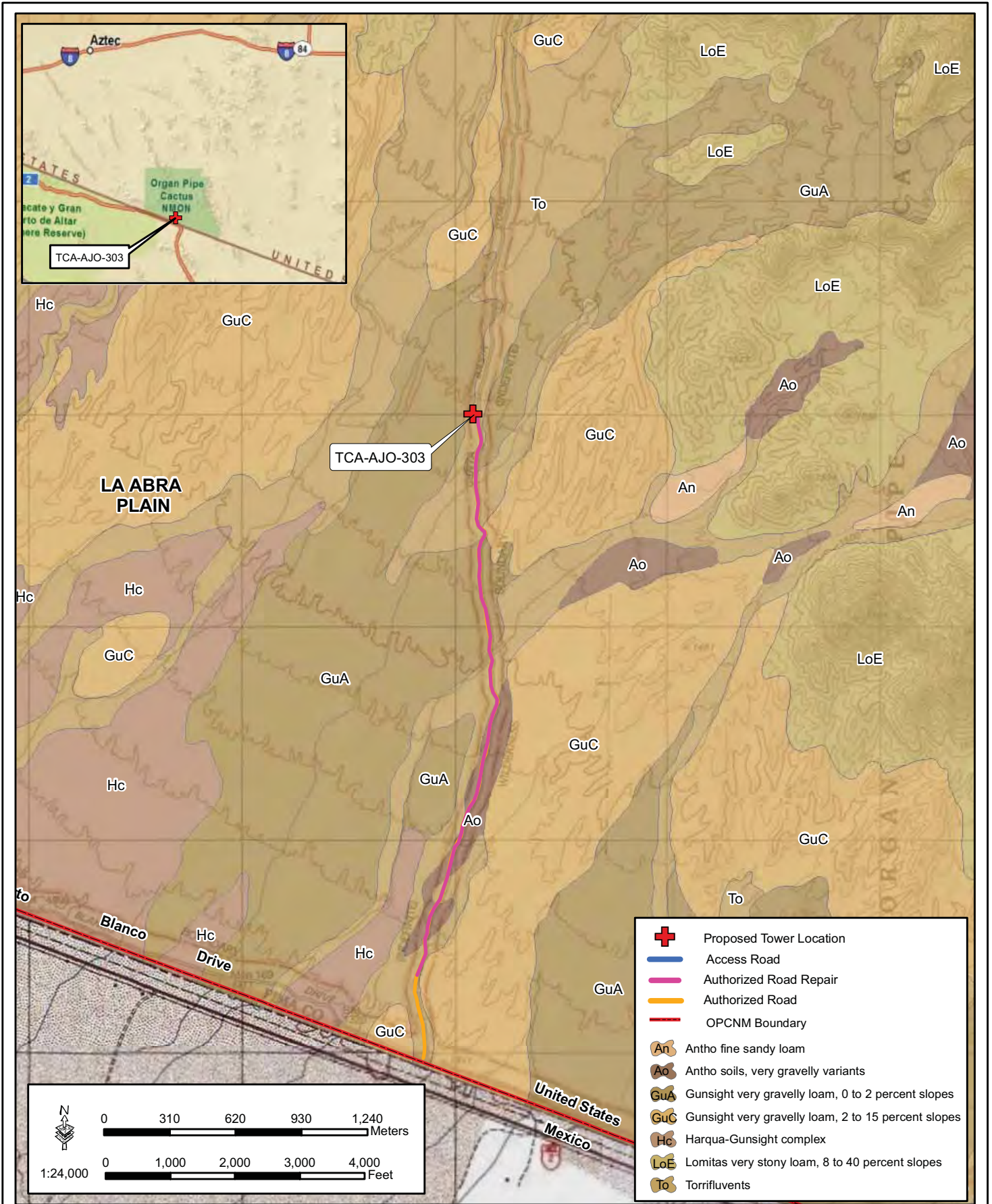




TCA-AJO-302 Tower Soil Survey Map



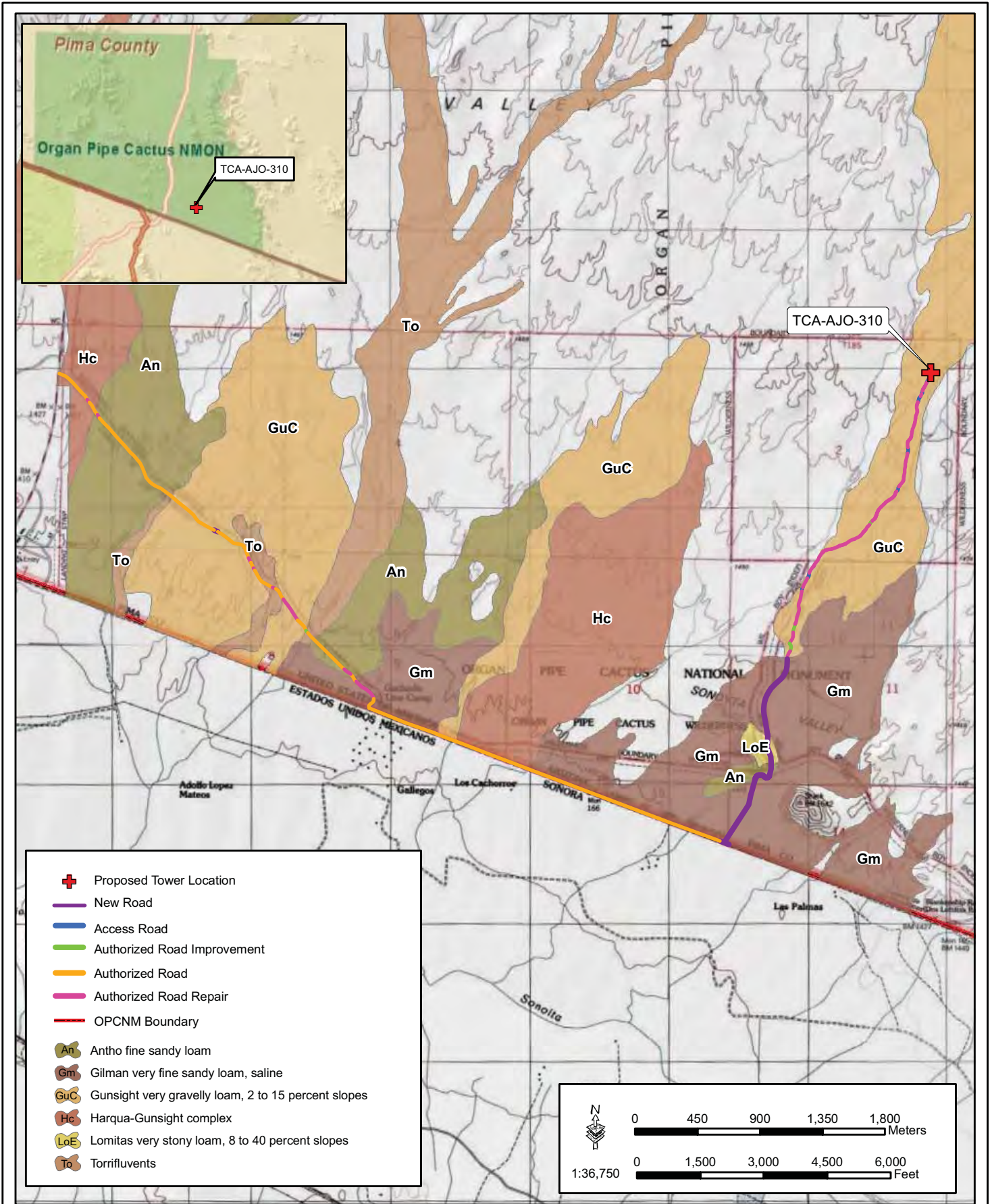
July 2009



TCA-AJO-303 Tower and Approach Road Soil Survey Map



September 2009



TCA-AJO-310 Tower and Access Road Soil Survey Map



August 2009

APPENDIX G
WATERS OF THE U.S.



Waters of the U.S. Associated with the Proposed Tower Sites and Approach and Access Roads

Tower ID	Drainage Type	Periodicity	Width of Channel (ft)	Width of Road (feet)	Proposed Action	Impact (acre)
TCA-AJO-004	Wash	Ephemeral	8	16	Grading	0.003
TCA-AJO-004	Wash	Ephemeral	8	16	Grading	0.003
TCA-AJO-004	Wash	Ephemeral	54	16	Grading	0.020
TCA-AJO-004	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-004	Wash	Ephemeral	75	16	Grading	0.028
TCA-AJO-004	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-004	Wash	Ephemeral	21	16	Grading	0.008
TCA-AJO-004	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-004	Wash	Ephemeral	9	16	Grading	0.003
TCA-AJO-004	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-004	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-004	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-004	Wash	Ephemeral	20	16	Grading	0.007
TCA-AJO-004	Wash	Ephemeral	45	16	Grading	0.017
TCA-AJO-004	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-004	Wash	Ephemeral	30	16	Grading	0.011
TCA-AJO-170	Wash	Ephemeral	15	16	Grading	0.006
TCA-AJO-170	Wash	Ephemeral	15	16	Grading	0.006
TCA-AJO-170	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-170	Wash	Ephemeral	60	16	Grading	0.022
TCA-AJO-170	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-170	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-170	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-170	Wash	Ephemeral	18	16	Grading	0.007
TCA-AJO-170	Wash	Ephemeral	42	16	Grading	0.015
TCA-AJO-170	Wash	Ephemeral	2	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	9	16	Grading	0.003
TCA-AJO-170	Wash	Ephemeral	15	16	Grading	0.006
TCA-AJO-170	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	2	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-170	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-170	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	2	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	8	16	Grading	0.003
TCA-AJO-170	Wash	Ephemeral	1	16	Grading	0.000
TCA-AJO-170	Wash	Ephemeral	14	16	Grading	0.005
TCA-AJO-170	Wash	Ephemeral	15	16	Grading	0.006
TCA-AJO-170	Wash	Ephemeral	2	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	1	16	Grading	0.000
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-170	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-170	Wash	Ephemeral	1	16	Grading	0.000
TCA-AJO-301	Wash	Ephemeral	30	16	Grading	0.011
TCA-AJO-301	Wash	Ephemeral	12	16	Grading	0.004
TCA-AJO-301	Wash	Ephemeral	24	16	Grading	0.009
TCA-AJO-301	Wash	Ephemeral	18	16	Grading	0.007
TCA-AJO-301	Wash	Ephemeral	24	16	Grading	0.009
TCA-AJO-301	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-301	Wash	Ephemeral	18	16	Grading	0.007
TCA-AJO-301	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-301	Wash	Ephemeral	6	16	Grading	0.002
TCA-AJO-301	Wash	Ephemeral	15	16	Grading	0.006
TCA-AJO-301	Wash	Ephemeral	10	16	Grading	0.004
TCA-AJO-204	Wash	Ephemeral	10	16	Grading	0.004
TCA-AJO-204	Wash	Ephemeral	1	16	Grading	0.000
TCA-AJO-204	Wash	Ephemeral	3	16	Grading	0.001
TCA-AJO-204	Wash	Ephemeral	4	16	Grading	0.001
TCA-AJO-305	Wash	Ephemeral	3	16	Grading	0.001

APPENDIX H
FEDERAL AND STATE PROTECTED SPECIES LISTS

Pima County

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Large, adults have white head and tail. Height 28-38 inches; wingspan 66-96 inches. Dark with varying degrees of mottled brown plumage. Feet bare of feathers.	Apache, Cochise, Coconino, Gila, Graham, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	Varies	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.	Some birds are nesting residents while a larger number winters along rivers and reservoirs. An estimated 200 to 300 birds winter in Arizona. Once endangered (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) because of reproductive failures from pesticide poisoning and loss of habitat, this species was down listed to threatened on August 11, 1995. Illegal shooting, disturbance, and loss of habitat continues to be a problem. Species has been proposed for delisting (64 FR 36454) but still receives full protection under the ESA.
Cactus ferruginous pygmy-owl	<i>Glaucidium brasilianum cactorum</i>	Endangered	Small (Approx. 7inches), diurnal owl reddish brown overall with cream-colored belly streaked with reddish brown. Some individuals are grayish brown.	Cochise, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, Yuma	<4000 ft	Mature cottonwood/willow, mesquite bosques, and Sonoran desertscrub.	Historical distribution in Arizona is from New River (North) to Gila Box (East) to Cabeza Prieta Mountains (West). Only a few documented sites where this species persists are known, additional surveys are needed. Species has been proposed for delisting (70 FR 44547) but still receives full protection under the ESA.
California Brown pelican	<i>Pelecanus occidentalis californicus</i>	Endangered	Large dark gray-brown water bird with a pouch underneath long bill and webbed feet. Adults have a white head and neck, brownish black breast, and silver gray upper parts.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	Varies	Coastal land and islands; species found around many Arizona lakes and rivers.	Subspecies is found on Pacific Coast and is endangered due to pesticides. It is an uncommon transient in Arizona on many Arizona lakes and rivers. Individuals wander up from Mexico in summer and fall. No breeding records in Arizona.
Chiricahua leopard frog	<i>Rana chiricahuensis</i>	Threatened	Cream colored tubercles (spots) on a dark background on the rear of the thigh, dorsolateral folds that are interrupted and deflected medially, and a call given out of water distinguish this spotted frog from other leopard frogs.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, Navajo, Pima, Santa Cruz, Yavapai	3300-8900 ft	Streams, rivers, backwaters, ponds, and stock tanks that are mostly free from introduced fish, crayfish, and bullfrogs.	Require permanent or nearly permanent water sources. Populations north of the Gila River may be a closely-related, but distinct, undescribed species. A special rule allows take of frogs due to operation and maintenance of livestock tanks on State and private lands.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Desert pupfish	<i>Cyprinodon macularius</i>	Endangered	Small (2 inches) smoothly rounded body shape with narrow vertical bars on the sides. Breeding males blue on head and sides with yellow on tail. Females and juveniles tan to olive colored back and silvery sides.	Graham, La Paz, Maricopa, Pima, Pinal, Santa Cruz, Yavapai	< 5,000 ft	Shallow springs, small streams, and marshes. Tolerates saline and warm water.	Critical habitat includes Quitobaquito Springs, Pima County, portions of San Felipe Creek, Carrizo Wash, and Fish Creek Wash, Imperial County, California. Two subspecies are recognized: Desert Pupfish (<i>C.m.macularis</i>) and Quitobaquito Pupfish (<i>C.m.eremus</i>).
Gila chub	<i>Gila intermedia</i>	Endangered	Deep compressed body, flat head. Dark olive-gray color above, silver sides. Endemic to Gila River Basin.	Cochise, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, Yavapai	2,000 - 5,500 ft	Pools, springs, cienegas, and streams.	Found on multiple private lands, including the Nature Conservancy, the Audubon Society, and others. Also occurs on Federal and state lands and in Sonora, Mexico. Critical habitat occurs in Cochise, Gila, Graham, Greenlee, Pima, Pinal, Santa Cruz and Yavapai counties.
Gila topminnow	<i>Poeciliopsis occidentalis occidentalis</i>	Endangered	Small (2 inches), guppy-like, live bearing, lacks dark spots on its fins. Breeding males are jet black with yellow fins.	Gila, Graham, La Paz, Maricopa, Pima, Pinal, Santa Cruz, Yavapai	< 4,500 ft	Small streams, springs, and cienegas vegetated shallows.	Species historically occurred in backwaters of large rivers but is currently isolated to small streams and springs.
Huachuca water umbel	<i>Lilaeopsis schaffneriana ssp. recurva</i>	Endangered	Herbaceous, semi-aquatic perennial in the parsley family (Umbelliferae) with slender erect, hollow, leaves that grow from the nodes of creeping rhizomes. Flower: 3 to 10 flowered umbels arise from root nodes.	Cochise, Pima, Santa Cruz	3500-6500 ft	Cienegas, perennial low gradient streams, wetlands.	Species also occurs in adjacent Sonora, Mexico, west of the continental divide. Critical habitat in Cochise and Santa Cruz counties (64 FR 37441, July 12, 1999).
Jaguar	<i>Panthera onca</i>	Endangered	Largest species of cat native to Southwest. Muscular, with relatively short, massive limbs, and a deep-chested body. Usually cinnamon-buff in color with many black spots. Weights ranges from 40-135 kg (90-300 lbs).	Cochise, Santa Cruz, Pima	1,800 - >9,000 ft	Found in Sonoran desertscrub up through subalpine conifer forest.	Also occurs in New Mexico. A Jaguar conservation team is being formed that is being led by Arizona and New Mexico state entities along with private organizations.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Kearney blue star	<i>Amsonia kearneyana</i>	Endangered	A herbaceous perennial about 2 feet tall in the dogbane family (Apocynaceae). Thickened woody root and many pubescent (hairy) stems that rarely branch. Flowers: white terminal inflorescence in April and May.	Pima	3600-3800 ft	West-facing drainages in the Baboquivari Mountains.	Plants grow in stable, partially shaded, coarse alluvium along a dry wash in the Baboquivari Mountains. Range is extremely limited. Protected by Arizona Native Plant Law.
Lesser long-nosed bat	<i>Leptonycteris curasoae yerbabuena</i>	Endangered	Elongated muzzle, small leaf nose, and long tongue. Yellowish brown or gray above and cinnamon brown below. Tail minute and appears to be lacking. Easily disturbed.	Cochise, Gila, Graham, Greenlee, Pima, Pinal, Maricopa, Santa Cruz	< 6000 ft	Desert scrub habitat with agave and columnar cacti present as food plants.	Day roosts in caves and abandoned tunnels. Forages at night on nectar, pollen, and fruit of paniculate agaves and columnar cacti. This species is migratory and is present in Arizona usually from April to September and south of the border the remainder of the year.
Masked bobwhite	<i>Colinus virginianus ridgewayi</i>	Endangered	Males brick-red breast and black head and throat. Females are generally nondescript but resemble other races such as the Texas bobwhite.	Pima	1000-4000 ft	Desert grasslands with diversity of dense native grasses, forbs, and brush.	Species is closely associated with <i>Acacia angustissima</i> . Formerly occurred in Altar and Santa Cruz valleys, as well as Sonora, Mexico. Presently only known from reintroduced populations on Buenos Aires NWR.
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	Medium sized with dark eyes and no ear tufts. Brownish and heavily spotted with white or beige.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai	4100-9000 ft	Nests in canyons and dense forests with multi-layered foliage structure.	Generally nest in older forests of mixed conifer or ponderosa pine/gambel oak type, in canyons, and use variety of habitats for foraging. Sites with cool microclimates appear to be of importance or are preferred. Critical habitat was finalized on August 31, 2004 (69 FR 53182). Critical habitat in Arizona occurs in Apache, Cochise, Coconino, Gila, Graham, Greenlee, Maricopa, Navajo, Pima, Pinal, Santa Cruz, and Yavapai counties.
Nichol Turk's head cactus	<i>Echinocactus horizonthalonius var. nicholii</i>	Endangered	Blue-green to yellowish-green, columnar, 18 inches tall, 8 inches in diameter. Spine clusters have 5 radial and 3 central spines; one downward short; 2 spines upward and red or vasally gray. Flower: pink fruit: woolly white.	Pima, Pinal	2400-4100 ft	Sonoran desertscrub.	Found in unshaded microsites in Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains and on inclined terraces and saddles on limestone mountain sides.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Ocelot	<i>Leopardus (=Felis) pardalis</i>	Endangered	Medium-sized spotted cat whose tail is about 1/2 the length of head and body. Yellowish with black streaks and stripes running from front to back. Tail is spotted and face is less heavily streaked than the back and sides.	Cochise, Pima, Santa Cruz	< 8000 ft	Humid tropical and subtropical forests, savannahs, and semi-arid thornscrub.	May persist in partly-cleared forests, second-growth woodland, and abandoned cultivated areas reverted to brush. Universal component is presence of dense cover. Unconfirmed reports of individuals in the southern part of the State continue to be received.
Pima pineapple cactus	<i>Coryphantha scheeri var. robustispina</i>	Endangered	Hemispherical stems 4-7 inches tall 3-4 inches diameter. Central spine 1 inch long straw colored hooked surrounded by 6-15 radial spines. Flower: yellow, salmon, or rarely white narrow floral tube..	Pima, Santa Cruz	2300-5000 ft	Sonoran desertscrub or semi-desert grassland communities.	Occurs in alluvial valleys or on hillsides in rocky to sandy or silty soils. This species can be confused with juvenile barrel cactus (<i>Ferocactus</i>). However, the spines of the later are flattened, in contrast with the round cross-section of the <i>Coryphantha</i> spines. 80-90% of individuals on state or private land.
Sonoran pronghorn	<i>Antilocapra americana sonoriensis</i>	Endangered	Buff on back and white below, hooped with slightly curved black horns having a single prong. Smallest and palest of the pronghorn subspecies	Maricopa, Pima, Yuma	500 - 2,000 ft	Broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations.	Typically, bajadas are used as fawning areas and sandy dune areas provide food seasonally. Historical range was probably larger than exists today. This subspecies also occurs in Mexico.
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Small passerine (about 6 inches) grayish-green back and wings, whitish throat, light olive-gray breast and pale yellowish belly. Two wingbars visible. Eye-ring faint or absent.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	<8500 ft	Cottonwood/willow and tamarisk vegetation communities along rivers and streams.	Migratory riparian-obligate species that occupies breeding habitat from late April to September. Distribution within its range is restricted to riparian corridors. Difficult to distinguish from other members of the <i>Empidonax</i> complex by sight alone. Training seminar required for those conducting flycatcher surveys. Critical habitat was finalized on October 19, 2005 (50 CFR 60886) and can be viewed at http://arizonaes.fws.gov . In Arizona there are critical habitat segments in Apache, Cochise, Gila, Graham, Greenlee, Maricopa, Mohave, Pima, Pinal, and Yavapai counties.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Acuna cactus	<i>Echinomastus erectocentrus</i> var. <i>acunensis</i>	Candidate	<12 inches high; spine clusters borne on tubercles, each with a groove on the upper surface. 2-3 central spines and 12 radial spines. Flowers pink to purple.	Pima, Pinal	1300-2000 ft	Well drained knolls and gravel ridges in Sonoran desertscrub.	Immature plants distinctly different from mature plants. They are disc-shaped or spherical and have no central spines until they are about 1.5 inches. Radial spines are dirty white with maroon tips.
Sonoyta mud turtle	<i>Kinosternon sonoriense longifemorale</i>	Candidate	Primarily a pond turtle, prefers mud or sandy bottoms. Body 3 1/2 to 6 1/2 inches. Head and neck mottled with contrasting light and dark markings. Found in Quitobaquito Springs.	Pima	1,100 ft	Ponds and streams.	Species also found in Rio Sonoyta, Sonora, Mexico.
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate	Medium-sized bird with a slender, long-tailed profile, slightly down-curved bill, which is blue-black with yellow on the lower half of the bill. Plumage is grayish-brown above and white below, with rufous primary flight feathers.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	< 6,500 ft	Large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries).	Listing was found warranted, but precluded as a distinct vertebrate population segment in the western U.S. on July 25, 2001. This finding indicates that the Service has sufficient information to list the bird, but other, higher priority listing actions prevent the Service from addressing the listing of the cuckoo at this time.
Gooddings onion	<i>Allium gooddingii</i>	Conservation Agreement	Herbaceous perennial plant; broad, flat, rather blunt leaves; flowering stalk 14-17 inches tall, flattened, and narrowly winged toward apex; fruit is broader than long; seeds are short and thick.	Apache, Greenlee, Pima	> 7,500 ft	Forested drainage bottoms and on moist north facing slopes of mixed conifer and spruce fir forests.	Conservation agreement between the Service and the Forest Service signed in February 1998. In New Mexico on the Lincoln and Gila National Forests.
San Xavier talussnail	<i>Sonorella eremita</i>	Conservation Agreement	Land snail, less than one inch in diameter (about .75 inches), 4.5 whorls, round shell, white to pinkish tint.	Pima	3,850-3,920 ft	Deep, limestone rockslide with outcrops of limestone and decomposed granite.	Conservation agreement signed by the Service, Arizona Game and Fish Department, El Paso Natural Gas Company, and Arizona Electric Power Cooperative, Inc. in September 1998.

Yuma County

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Large, adults have white head and tail. Height 28-38 inches; wingspan 66-96 inches. Dark with varying degrees of mottled brown plumage. Feet bare of feathers.	Apache, Cochise, Coconino, Gila, Graham, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	Varies	Large trees or cliffs near water (reservoirs, rivers, and streams) with abundant prey.	Some birds are nesting residents while a larger number winters along rivers and reservoirs. An estimated 200 to 300 birds winter in Arizona. Once endangered (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) because of reproductive failures from pesticide poisoning and loss of habitat, this species was down listed to threatened on August 11, 1995. Illegal shooting, disturbance, and loss of habitat continues to be a problem. Species has been proposed for delisting (64 FR 36454) but still receives full protection under the ESA.
Cactus ferruginous pygmy-owl	<i>Glaucidium brasilianum cactorum</i>	Endangered	Small (Approx. 7inches), diurnal owl reddish brown overall with cream-colored belly streaked with reddish brown. Some individuals are grayish brown.	Cochise, Gila, Graham, Greenlee, Maricopa, Pima, Pinal, Santa Cruz, Yuma	<4000 ft	Mature cottonwood/willow, mesquite bosques, and Sonoran desertscrub.	Historical distribution in Arizona is from New River (North) to Gila Box (East) to Cabeza Prieta Mountains (West). Only a few documented sites where this species persists are known, additional surveys are needed. Species has been proposed for delisting (70 FR 44547) but still receives full protection under the ESA.
California Brown pelican	<i>Pelecanus occidentalis californicus</i>	Endangered	Large dark gray-brown water bird with a pouch underneath long bill and webbed feet. Adults have a white head and neck, brownish black breast, and silver gray upper parts.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	Varies	Coastal land and islands; species found around many Arizona lakes and rivers.	Subspecies is found on Pacific Coast and is endangered due to pesticides. It is an uncommon transient in Arizona on many Arizona lakes and rivers. Individuals wander up from Mexico in summer and fall. No breeding records in Arizona.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Razorback sucker	<i>Xyrauchen texanus</i>	Endangered	Large, up to 3 feet long and up to 6 lbs, high sharp-edged keel-like hump behind the head. Head flattened on top. Olive-brown above to yellowish below.	Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Pinal, Yavapai, Yuma	< 6000 ft	Riverine and lacustrine areas, generally not in fast moving water and may use backwaters.	Species is also found in Horseshoe reservoir (Maricopa County). Critical habitat includes the 100-year floodplain of the river through the Grand Canyon from confluence with Paria River to Hoover Dam; Hoover Dam to Davis Dam; Parker Dam to Imperial Dam. Also Gila River from Arizona/New Mexico border to Coolidge Dam; and Salt River from Hwy 60/SR77 Bridge to Roosevelt Dam; Verde River from FS boundary to Horseshoe Lake.
Sonoran pronghorn	<i>Antilocapra americana sonoriensis</i>	Endangered	Buff on back and white below, hooped with slightly curved black horns having a single prong. Smallest and palest of the pronghorn subspecies	Maricopa, Pima, Yuma	500 - 2,000 ft	Broad intermountain alluvial valleys with creosote-bursage and palo verde-mixed cacti associations.	Typically, bajadas are used as fawning areas and sandy dune areas provide food seasonally. Historical range was probably larger than exists today. This subspecies also occurs in Mexico.
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	Small passerine (about 6 inches) grayish-green back and wings, whitish throat, light olive-gray breast and pale yellowish belly. Two wingbars visible. Eye-ring faint or absent.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	<8500 ft	Cottonwood/willow and tamarisk vegetation communities along rivers and streams.	Migratory riparian-obligate species that occupies breeding habitat from late April to September. Distribution within its range is restricted to riparian corridors. Difficult to distinguish from other members of the Empidonax complex by sight alone. Training seminar required for those conducting flycatcher surveys. Critical habitat was finalized on October 19, 2005 (50 CFR 60886) and can be viewed at http://arizonaes.fws.gov . In Arizona there are critical habitat segments in Apache, Cochise, Gila, Graham, Greenlee, Maricopa, Mohave, Pima, Pinal, and Yavapai counties.
Yuma clapper rail	<i>Rallus longirostris yumanensis</i>	Endangered	Water bird with long legs and short tail. Long, slender decurved bill. Mottled brown or gray on its rump. Flanks and undersides are dark gray with narrow vertical stripes producing a barring effect.	Gila, La Paz, Maricopa, Mohave, Pinal, Yuma	< 4,500 ft	Fresh water and brackish marshes.	Species is associated with dense emergent riparian vegetation. Requires wet substrate (mudflat, sandbar) with dense herbaceous or woody vegetation for nesting and foraging. Channelization and marsh destruction are primary sources of habitat loss.

COMMON NAME	SCIENTIFIC NAME	STATUS	DESCRIPTION	COUNTY	ELEVATION	HABITAT	COMMENTS
Flat-tailed horned lizard	<i>Phrynosoma mcallii</i>	Proposed	Typical flattened body shape of horned lizards; dark vertebral stripe; lacks external ear openings; color is cryptic ranging from pale gray to light rust brown; has two rows of fringed scales on each side of body.	Yuma	500 ft	Sandy flats or areas with fine, windblown sand; creosote-white bursage series of Sonoran Desert.	Proposed rule reinstated on August 30, 2005 (Tucson Herpetological Society v. Norton, 04-75 PHX NVW, D. Ariz). Conservation Agreement finalized in May 1997. Species also found in portions of San Diego County, central Riverside County, and Imperial County, California; also Sonora and Baja California, Mexico.
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate	Medium-sized bird with a slender, long-tailed profile, slightly down-curved bill, which is blue-black with yellow on the lower half of the bill. Plumage is grayish-brown above and white below, with rufous primary flight feathers.	Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, Yuma	< 6,500 ft	Large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries).	Listing was found warranted, but precluded as a distinct vertebrate population segment in the western U.S. on July 25, 2001. This finding indicates that the Service has sufficient information to list the bird, but other, higher priority listing actions prevent the Service from addressing the listing of the cuckoo at this time.

Special Status Species in the Arizona HDMS, listed alphabetically by county, by taxon, by scientific name.

Updated April 2006

COUNTY	TAXON	SCIENTIFIC NAME	COMMON NAME	ESA	BLM	USFS	STATE
Navajo	FISH	Catostomus sp. 3	Little Colorado Sucker	SC	S	S	WSC
Navajo	FISH	Gila robusta	Roundtail Chub	SC		S	WSC
Navajo	FISH	Lepidomeda vittata	Little Colorado Spinedace	LT		S	WSC
Navajo	FISH	Rhinichthys osculus	Speckled Dace	SC	S		
Navajo	INVERTEBRATE	Anodonta californiensis	California Floater	SC		S	
Navajo	INVERTEBRATE	Cicindela oregona maricopa	Maricopa Tiger Beetle	SC	S	S	
Navajo	MAMMAL	Corynorhinus townsendii pallescens	Pale Townsend's Big-eared Bat	SC			
Navajo	MAMMAL	Idionycteris phyllotis	Allen's Big-eared Bat	SC	S		
Navajo	MAMMAL	Microtus mexicanus navaho	Navajo Mexican Vole	SC		S	WSC
Navajo	MAMMAL	Myotis evotis	Long-eared Myotis	SC	S		
Navajo	MAMMAL	Myotis occultus	Arizona Myotis	SC	S		
Navajo	MAMMAL	Myotis thysanodes	Fringed Myotis	SC	S		
Navajo	MAMMAL	Myotis volans	Long-legged Myotis	SC	S		
Navajo	MAMMAL	Panthera onca	Jaguar	LE		S	WSC
Navajo	MAMMAL	Perognathus flavus goodpasteri	Springerville Pocket Mouse	SC		S	
Navajo	PLANT	Amsonia peeblesii	Peebles Blue Star		S		
Navajo	PLANT	Asclepias welshii	Welsh's Milkweed	LT			HS
Navajo	PLANT	Astragalus xiphoides	Gladiator Milk Vetch	SC			SR
Navajo	PLANT	Carex speculicola	Navajo Sedge	LT			HS
Navajo	PLANT	Chrysothamnus molestus	Tusayan Rabbitbrush	SC		S	
Navajo	PLANT	Errazurizia rotundata	Roundleaf Errazurizia		S		SR
Navajo	PLANT	Pediocactus papyracanthus	Paper-spined Cactus	SC			SR
Navajo	PLANT	Pediocactus peeblesianus var. peeblesianus	Peebles Navajo Cactus	LE			HS
Navajo	PLANT	Penstemon nudiflorus	Flagstaff Beardtongue			S	
Navajo	PLANT	Platanthera zothecina	Alcove Bog-orchid	SC			
Navajo	REPTILE	Thamnophis eques megalops	Northern Mexican Gartersnake	SC		S	WSC
Navajo	REPTILE	Thamnophis rufipunctatus	Narrow-headed Gartersnake	SC		S	WSC
Pima	AMPHIBIAN	Eleutherodactylus augusti cactorum	Western Barking Frog			S	WSC
Pima	AMPHIBIAN	Gastrophryne olivacea	Great Plains Narrow-mouthed Toad				WSC
Pima	AMPHIBIAN	Pterohyla fodiens	Lowland Burrowing Treefrog				WSC
Pima	AMPHIBIAN	Rana chiricahuensis	Chiricahua Leopard Frog	LT		S	WSC
Pima	AMPHIBIAN	Rana yavapaiensis	Lowland Leopard Frog	SC		S	WSC
Pima	BIRD	Accipiter gentilis	Northern Goshawk	SC		S	WSC
Pima	BIRD	Ammodramus bairdii	Baird's Sparrow	SC			WSC
Pima	BIRD	Asturina nitida maxima	Northern Gray Hawk	SC	S	S	WSC
Pima	BIRD	Athene cunicularia hypugaea	Western Burrowing Owl	SC	S		
Pima	BIRD	Buteogallus anthracinus	Common Black-Hawk			S	WSC

Special Status Species in the Arizona HDMS, listed alphabetically by county, by taxon, by scientific name.

Updated April 2006

COUNTY	TAXON	SCIENTIFIC NAME	COMMON NAME	ESA	BLM	USFS	STATE
Pima	BIRD	<i>Caracara cheriway</i>	Crested Caracara				WSC
Pima	BIRD	<i>Coccyzus americanus occidentalis</i>	Western Yellow-billed Cuckoo	C		S	WSC
Pima	BIRD	<i>Colinus virginianus ridgwayi</i>	Masked Bobwhite	LE			WSC
Pima	BIRD	<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-Duck				WSC
Pima	BIRD	<i>Dendrocygna bicolor</i>	Fulvous Whistling-Duck	SC	S		
Pima	BIRD	<i>Empidonax fulvifrons pygmaeus</i>	Northern Buff-breasted Flycatcher	SC			WSC
Pima	BIRD	<i>Empidonax traillii extimus</i>	Southwestern Willow Flycatcher	LE		S	WSC
Pima	BIRD	<i>Falco peregrinus anatum</i>	American Peregrine Falcon	SC		S	WSC
Pima	BIRD	<i>Glaucidium brasilianum cactorum</i>	Cactus Ferruginous Pygmy-owl	LE			WSC
Pima	BIRD	<i>Pachyramphus aglaiae</i>	Rose-throated Becard				WSC
Pima	BIRD	<i>Pandion haliaetus</i>	Osprey				WSC
Pima	BIRD	<i>Polioptila nigriceps</i>	Black-capped Gnatcatcher				WSC
Pima	BIRD	<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail	LE			WSC
Pima	BIRD	<i>Strix occidentalis lucida</i>	Mexican Spotted Owl	LT		S	WSC
Pima	BIRD	<i>Trogon elegans</i>	Elegant Trogon				WSC
Pima	BIRD	<i>Tyrannus crassirostris</i>	Thick-billed Kingbird				WSC
Pima	BIRD	<i>Tyrannus melancholicus</i>	Tropical Kingbird				WSC
Pima	FISH	<i>Agosia chrysogaster chrysogaster</i>	Gila Longfin Dace	SC	S		
Pima	FISH	<i>Catostomus clarki</i>	Desert Sucker	SC	S		
Pima	FISH	<i>Cyprinodon eremus</i>	Quitobaquito Desert Pupfish	LE			WSC
Pima	FISH	<i>Cyprinodon macularius</i>	Desert Pupfish	LE			WSC
Pima	FISH	<i>Gila intermedia</i>	Gila Chub	LE		S	WSC
Pima	FISH	<i>Poeciliopsis occidentalis occidentalis</i>	Gila Topminnow	LE			WSC
Pima	INVERTEBRATE	<i>Agathymus aryxna</i>	Arizona Giant Skipper			S	
Pima	INVERTEBRATE	<i>Agathymus polingi</i>	Poling's Giant Skipper			S	
Pima	INVERTEBRATE	<i>Anthocharis cethura</i>	Felder's Orange Tip			S	
Pima	INVERTEBRATE	<i>Argia sabino</i>	Sabino Canyon Damselfly	SC		S	
Pima	INVERTEBRATE	<i>Calephelis rawsoni arizonensis</i>	Arizona Metalmark			S	
Pima	INVERTEBRATE	<i>Limenitis archippus obsoleta</i>	Obsolete Viceroy Butterfly			S	
Pima	INVERTEBRATE	<i>Neophasia terlooii</i>	Chiricahua Pine White			S	
Pima	INVERTEBRATE	<i>Sonorella eremita</i>	San Xavier Talussnail	SC			
Pima	INVERTEBRATE	<i>Tryonia quitobaquitae</i>	Quitobaquito Tryonia	SC		S	
Pima	MAMMAL	<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn	LE		S	WSC
Pima	MAMMAL	<i>Choeronycteris mexicana</i>	Mexican Long-tongued Bat	SC	S		WSC
Pima	MAMMAL	<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat	SC			
Pima	MAMMAL	<i>Eumops perotis californicus</i>	Greater Western Bonneted Bat	SC			
Pima	MAMMAL	<i>Eumops underwoodi</i>	Underwood's Bonneted Bat	SC	S		

Special Status Species in the Arizona HDMS, listed alphabetically by county, by taxon, by scientific name.

Updated April 2006

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Pima	MAMMAL	<i>Lasiurus blossevillii</i>	Western Red Bat				WSC
Pima	MAMMAL	<i>Lasiurus xanthinus</i>	Western Yellow Bat				WSC
Pima	MAMMAL	<i>Leptonycteris curasoae yerbabuenae</i>	Lesser Long-nosed Bat	LE		S	WSC
Pima	MAMMAL	<i>Macrotus californicus</i>	California Leaf-nosed Bat	SC	S		WSC
Pima	MAMMAL	<i>Myotis occultus</i>	Arizona Myotis	SC	S		
Pima	MAMMAL	<i>Myotis velifer</i>	Cave Myotis	SC	S		
Pima	MAMMAL	<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat		S		
Pima	MAMMAL	<i>Nyctinomops macrotis</i>	Big Free-tailed Bat	SC	S		
Pima	MAMMAL	<i>Panthera onca</i>	Jaguar	LE		S	WSC
Pima	MAMMAL	<i>Sigmodon ochrognathus</i>	Yellow-nosed Cotton Rat	SC			
Pima	PLANT	<i>Abutilon parishii</i>	Pima Indian Mallow	SC		S	SR
Pima	PLANT	<i>Abutilon thurberi</i>	Thurber Indian Mallow				SR
Pima	PLANT	<i>Acacia farnesiana</i>	Sweet Acacia			S	
Pima	PLANT	<i>Agave parviflora</i> ssp. <i>parviflora</i>	Santa Cruz Striped Agave	SC	S	S	HS
Pima	PLANT	<i>Agave schottii</i> var. <i>treleasei</i>	Trelease Agave	SC		S	HS
Pima	PLANT	<i>Allium gooddingii</i>	Goodding Onion	SC		S	HS
Pima	PLANT	<i>Allium plummerae</i>	Plummer Onion				SR
Pima	PLANT	<i>Amoreuxia gonzalezii</i>	Saiya	SC		S	HS
Pima	PLANT	<i>Amsonia grandiflora</i>	Large-flowered Blue Star	SC		S	
Pima	PLANT	<i>Amsonia kearneyana</i>	Kearney's Blue Star	LE			HS
Pima	PLANT	<i>Asclepias lemmonii</i>	Lemmon Milkweed			S	
Pima	PLANT	<i>Asplenium dalhousiae</i>	Dalhouse Spleenwort		S		
Pima	PLANT	<i>Berberis harrisoniana</i>	Kofa Barberry		S		
Pima	PLANT	<i>Boerhavia megaptera</i>	Tucson Mountain Spiderling			S	
Pima	PLANT	<i>Capsicum annuum</i> var. <i>glabriusculum</i>	Chiltepin			S	
Pima	PLANT	<i>Cardiospermum corindum</i>	Balloon Vine		S		
Pima	PLANT	<i>Carex chihuahuensis</i>	A Sedge			S	
Pima	PLANT	<i>Carex ultra</i>	Arizona Giant Sedge		S	S	
Pima	PLANT	<i>Cathastecum erectum</i>	False Grama		S		
Pima	PLANT	<i>Coryphantha scheeri</i> var. <i>robustispina</i>	Pima Pineapple Cactus	LE			HS
Pima	PLANT	<i>Dalea tentaculoides</i>	Gentry Indigo Bush	SC	S	S	HS
Pima	PLANT	<i>Desmanthus covillei</i>	Coville Bundleflower			S	
Pima	PLANT	<i>Echinocactus horizontalonius</i> var. <i>nicholii</i>	Nichol Turk's Head Cactus	LE			HS
Pima	PLANT	<i>Echinocereus fasciculatus</i>	Magenta-flower Hedgehog-cactus				SR
Pima	PLANT	<i>Echinomastus erectocentrus</i> var. <i>acunensis</i>	Acuna Cactus	C			HS
Pima	PLANT	<i>Echinomastus erectocentrus</i> var. <i>erectocentrus</i>	Needle-spined Pineapple Cactus	SC		S	SR
Pima	PLANT	<i>Erigeron arisolius</i>				S	

Special Status Species in the Arizona HDMS, listed alphabetically by county, by taxon, by scientific name.

Updated April 2006

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Pima	PLANT	<i>Eriogonum capillare</i>	San Carlos Wild-buckwheat	SC			SR
Pima	PLANT	<i>Eriogonum ericifolium</i> var. <i>ericifolium</i>	Heathleaf Wild-buckwheat			S	
Pima	PLANT	<i>Euphorbia gracillima</i>	Mexican Broomspurge			S	
Pima	PLANT	<i>Ferocactus cylindraceus</i> var. <i>eastwoodiae</i>	Golden Barrel Cactus				SR
Pima	PLANT	<i>Ferocactus emoryi</i>	Emory's Barrel-cactus				SR
Pima	PLANT	<i>Graptopetalum bartramii</i>	Bartram Stonecrop	SC	S	S	SR
Pima	PLANT	<i>Hackelia ursina</i>	Chihuahuan Stickseed			S	
Pima	PLANT	<i>Hedeoma dentatum</i>	Mock-pennyroyal			S	
Pima	PLANT	<i>Hermannia pauciflora</i>	Sparseleaf Hermannia			S	
Pima	PLANT	<i>Heterotheca rutteri</i>	Huachuca Golden Aster	SC	S	S	
Pima	PLANT	<i>Hexalectris revoluta</i>	Chisos Coral-root		S	S	SR
Pima	PLANT	<i>Hexalectris spicata</i>	Crested Coral Root				SR
Pima	PLANT	<i>Hieracium pringlei</i>	Pringle Hawkweed	SC		S	
Pima	PLANT	<i>Ibervillea tenuisecta</i>	Texas Globe Berry		S		
Pima	PLANT	<i>Lilaeopsis schaffneriana</i> var. <i>recurva</i>	Huachuca Water Umbel	LE			HS
Pima	PLANT	<i>Lilium parryi</i>	Lemmon Lily	SC		S	SR
Pima	PLANT	<i>Listera convallarioides</i>	Broadleaf Twayblade				SR
Pima	PLANT	<i>Lophocereus schottii</i>	Senita				SR
Pima	PLANT	<i>Lupinus huachucanus</i>	Huachuca Mountain Lupine			S	
Pima	PLANT	<i>Lysiloma watsonii</i>	Littleleaf False Tamarind				SR
Pima	PLANT	<i>Malaxis tenuis</i>	Slender Adders Mouth				SR
Pima	PLANT	<i>Mammillaria mainiae</i>	Counter Clockwise Fishhook Cactus			S	SR
Pima	PLANT	<i>Mammillaria thornberi</i>	Thornber Fishhook Cactus				SR
Pima	PLANT	<i>Mammillaria viridiflora</i>	Varied Fishhook Cactus				SR
Pima	PLANT	<i>Manihot davisiae</i>	Arizona Manihot			S	
Pima	PLANT	<i>Matelea cordifolia</i>	Sonoran Milkweed Vine			S	
Pima	PLANT	<i>Metastelma mexicanum</i>	Wiggins Milkweed Vine	SC		S	
Pima	PLANT	<i>Muhlenbergia dubioides</i>	Box Canyon Muhly			S	
Pima	PLANT	<i>Muhlenbergia xerophila</i>	Weeping Muhly			S	
Pima	PLANT	<i>Notholaena lemmonii</i>	Lemmon Cloak Fern	SC			
Pima	PLANT	<i>Opuntia engelmannii</i> var. <i>flavispina</i>					SR
Pima	PLANT	<i>Opuntia versicolor</i>	Stag-horn Cholla				SR
Pima	PLANT	<i>Opuntia x kelvinensis</i>	Kelvin Cholla				SR
Pima	PLANT	<i>Passiflora foetida</i>	Foetid Passionflower			S	
Pima	PLANT	<i>Pectis imberbis</i>	Beardless Chinch Weed	SC		S	
Pima	PLANT	<i>Peniocereus greggii</i> var. <i>transmontanus</i>	Desert Night-blooming Cereus				SR
Pima	PLANT	<i>Peniocereus striatus</i>	Dahlia Rooted Cereus				SR

Special Status Species in the Arizona HDMS, listed alphabetically by county, by taxon, by scientific name.

Updated April 2006

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Pima	PLANT	<i>Penstemon discolor</i>	Catalina Beardtongue			S	HS
Pima	PLANT	<i>Penstemon superbus</i>	Superb Beardtongue			S	
Pima	PLANT	<i>Perityle ajoensis</i>	Ajo Rock Daisy				SR
Pima	PLANT	<i>Petalonyx linearis</i>	Longleaf Sandpaper Plant		S		
Pima	PLANT	<i>Physalis latiphysa</i>	Broad-leaf Ground-cherry			S	
Pima	PLANT	<i>Platanthera limosa</i>	Thurber's Bog Orchid				SR
Pima	PLANT	<i>Psilotum nudum</i>	Whisk Fern				HS
Pima	PLANT	<i>Samolus vagans</i>	Chiricahua Mountain Brookweed			S	
Pima	PLANT	<i>Schiedeella arizonica</i>	Fallen Ladies'-tresses				SR
Pima	PLANT	<i>Senecio carlomasonii</i>	Seemann Groundsel			S	
Pima	PLANT	<i>Senecio neomexicanus</i> var. <i>toumeyi</i>	Toumey Groundsel			S	
Pima	PLANT	<i>Sisyrinchium cernuum</i>	Nodding Blue-eyed Grass			S	
Pima	PLANT	<i>Solanum lumholtzianum</i>	Lumholtz Nightshade			S	
Pima	PLANT	<i>Stenocereus thurberi</i>	Organ Pipe Cactus		S		SR
Pima	PLANT	<i>Stevia lemmonii</i>	Lemmon's Stevia			S	
Pima	PLANT	<i>Tephrosia thurberi</i>	Thurber Hoary Pea			S	
Pima	PLANT	<i>Thelypteris puberula</i> var. <i>sonorensis</i>	Aravaipa Wood Fern		S		
Pima	PLANT	<i>Tragia laciniata</i>	Sonoran Noseburn			S	
Pima	PLANT	<i>Triteleopsis palmeri</i>	Blue Sand Lily		S		SR
Pima	PLANT	<i>Tumamoca macdougalii</i>	Tumamoc Globeberry		S	S	SR
Pima	PLANT	<i>Vauquelinia californica</i> ssp. <i>sonorensis</i>	A Arizona Rosewood		S		
Pima	PLANT	<i>Viola umbraticola</i>	Shade Violet			S	
Pima	REPTILE	<i>Aspidoscelis burti stictogrammus</i>	Giant Spotted Whiptail	SC	S	S	
Pima	REPTILE	<i>Aspidoscelis burti xanthonota</i>	Red-back Whiptail	SC	S	S	
Pima	REPTILE	<i>Charina trivirgata gracia</i>	Desert Rosy Boa	SC	S	S	
Pima	REPTILE	<i>Charina trivirgata trivirgata</i>	Mexican Rosy Boa	SC	S		
Pima	REPTILE	<i>Chionactis palarostris organica</i>	Organ Pipe Shovel-nosed Snake			S	
Pima	REPTILE	<i>Gopherus agassizii</i> (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC
Pima	REPTILE	<i>Kinosternon sonoriense longifemorale</i>	Sonoyta Mud Turtle	C		S	
Pima	REPTILE	<i>Masticophis bilineatus lineolatus</i>	Ajo Mountain Whipsnake			S	
Pima	REPTILE	<i>Oxybelis aeneus</i>	Brown Vinesnake				WSC
Pima	REPTILE	<i>Phrynosoma cornutum</i>	Texas Horned Lizard	SC	S		
Pima	REPTILE	<i>Phyllorhynchus browni lucidus</i>	Maricopa Leaf-nosed Snake			S	
Pima	REPTILE	<i>Thamnophis eques megalops</i>	Northern Mexican Gartersnake	SC		S	WSC
Pima	REPTILE	<i>Uma rufopunctata</i>	Yuman Desert Fringe-toed Lizard	SC	S	S	WSC
Pinal	AMPHIBIAN	<i>Gastrophyne olivacea</i>	Great Plains Narrow-mouthed Toad				WSC
Pinal	AMPHIBIAN	<i>Rana yavapaiensis</i>	Lowland Leopard Frog	SC		S	WSC

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Updated April 2006

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Yavapai	PLANT	Carex ultra	Arizona Giant Sedge		S	S	
Yavapai	PLANT	Cymopterus megacephalus	Cameron Water-parsley	SC		S	
Yavapai	PLANT	Erigeron saxatilis	Rock Fleabane			S	
Yavapai	PLANT	Eriogonum apachense	Apache Wild-buckwheat	SC			SR
Yavapai	PLANT	Eriogonum ericifolium var. ericifolium	Heathleaf Wild-buckwheat			S	
Yavapai	PLANT	Eriogonum ripleyi	Ripley Wild-buckwheat	SC		S	SR
Yavapai	PLANT	Escobaria vivipara var. rosea	Viviparous Foxtail Cactus				SR
Yavapai	PLANT	Ferocactus cylindraceus var. eastwoodiae	Golden Barrel Cactus				SR
Yavapai	PLANT	Fremontodendron californicum	Flannel Bush		S		SR
Yavapai	PLANT	Hedeoma diffusum	Flagstaff Pennyroyal			S	SR
Yavapai	PLANT	Heuchera eastwoodiae	Eastwood Alum Root			S	
Yavapai	PLANT	Hexalectris spicata	Crested Coral Root				SR
Yavapai	PLANT	Lupinus latifolius ssp. leucanthus	Broadleaf Lupine			S	
Yavapai	PLANT	Mammillaria viridiflora	Varied Fishhook Cactus				SR
Yavapai	PLANT	Penstemon nudiflorus	Flagstaff Beardtongue			S	
Yavapai	PLANT	Phlox amabilis	Arizona Phlox			S	
Yavapai	PLANT	Polygala rusbyi	Hualapai Milkwort			S	
Yavapai	PLANT	Puccinellia parishii	Parish Alkali Grass	SC			HS
Yavapai	PLANT	Purshia subintegra	Arizona Cliff Rose	LE			HS
Yavapai	PLANT	Salvia dorrii ssp. mearnsii	Verde Valley Sage	SC		S	SR
Yavapai	PLANT	Talinum validulum	Tusayan Flame Flower	SC			SR
Yavapai	PLANT	Thelypteris puberula var. sonorensis	Aravaipa Wood Fern		S		
Yavapai	PLANT	Triteleia lemmoniae	Mazatzal Triteleia				SR
Yavapai	PLANT	Washingtonia filifera	California Fan Palm				SR
Yavapai	REPTILE	Charina trivirgata gracia	Desert Rosy Boa	SC	S	S	
Yavapai	REPTILE	Gopherus agassizii (Sonoran Population)	Sonoran Desert Tortoise	SC			WSC
Yavapai	REPTILE	Heloderma suspectum cinctum	Banded Gila Monster	SC	P		
Yavapai	REPTILE	Thamnophis eques megalops	Northern Mexican Gartersnake	SC		S	WSC
Yavapai	REPTILE	Thamnophis rufipunctatus	Narrow-headed Gartersnake	SC		S	WSC
Yavapai	REPTILE	Xantusia arizonae	Arizona Night Lizard			S	
Yuma	BIRD	Ardea alba	Great Egret				WSC
Yuma	BIRD	Athene cunicularia hypugaea	Western Burrowing Owl	SC	S		
Yuma	BIRD	Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo	C		S	WSC
Yuma	BIRD	Egretta thula	Snowy Egret				WSC
Yuma	BIRD	Empidonax traillii extimus	Southwestern Willow Flycatcher	LE		S	WSC
Yuma	BIRD	Glaucidium brasilianum cactorum	Cactus Ferruginous Pygmy-owl	LE			WSC
Yuma	BIRD	Haliaeetus leucocephalus (wintering pop.)	Bald Eagle	LT,PDL		S	WSC

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Updated April 2006

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Yuma	BIRD	<i>Ixobrychus exilis</i>	Least Bittern				WSC
Yuma	BIRD	<i>Lanius ludovicianus</i>	Loggerhead Shrike	SC	S		
Yuma	BIRD	<i>Laterallus jamaicensis coturniculus</i>	California Black Rail	SC		S	WSC
Yuma	BIRD	<i>Rallus longirostris yumanensis</i>	Yuma Clapper Rail	LE			WSC
Yuma	FISH	<i>Xyrauchen texanus</i>	Razorback Sucker	LE		S	WSC
Yuma	MAMMAL	<i>Antilocapra americana sonoriensis</i>	Sonoran Pronghorn	LE		S	WSC
Yuma	MAMMAL	<i>Corynorhinus townsendii pallescens</i>	Pale Townsend's Big-eared Bat	SC			
Yuma	MAMMAL	<i>Euderma maculatum</i>	Spotted Bat	SC	S		WSC
Yuma	MAMMAL	<i>Eumops perotis californicus</i>	Greater Western Bonneted Bat	SC			
Yuma	MAMMAL	<i>Lasiurus xanthinus</i>	Western Yellow Bat				WSC
Yuma	MAMMAL	<i>Macrotus californicus</i>	California Leaf-nosed Bat	SC	S		WSC
Yuma	MAMMAL	<i>Myotis yumanensis</i>	Yuma Myotis	SC			
Yuma	MAMMAL	<i>Nyctinomops femorosaccus</i>	Pocketed Free-tailed Bat		S		
Yuma	MAMMAL	<i>Sigmodon hispidus eremicus</i>	Yuma Hispid Cotton Rat	SC			
Yuma	PLANT	<i>Allium parishii</i>	Parish Onion		S		SR
Yuma	PLANT	<i>Berberis harrisoniana</i>	Kofa Barberry		S		
Yuma	PLANT	<i>Cryptantha ganderi</i>	Gander's Cryptantha	SC			

APPENDIX I
AIR QUALITY CALCULATIONS

CALCULATION SHEET-COMBUSTIBLE EMISSIONS

Assumptions for Combustible Emissions					
Type of Construction Equipment	Num. of Units	HP Rated	Hrs/day	Days/yr	Total hp-hrs
Water Truck	1	300	8	240	576000
Diesel Road Compactors	1	100	8	40	32000
Diesel Dump Truck	1	300	8	90	216000
Diesel Excavator	1	300	8	90	216000
Diesel Hole Trenchers	1	175	8	90	126000
Diesel Bore/Drill Rigs	1	300	8	90	216000
Diesel Cement & Mortar Mixers	1	300	8	90	216000
Diesel Cranes	2	175	8	90	252000
Diesel Graders	1	300	8	90	216000
Diesel Tractors/Loaders/Backhoes	1	100	8	180	144000
Diesel Bull Dozers	1	300	8	40	96000
Diesel Front End Loaders	1	300	8	40	96000
Diesel Fork Lifts	2	100	8	40	64000
Diesel Generator Set	6	40	8	40	76800

Emission Factors							
Type of Construction Equipment	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM-10 g/hp-hr	PM-2.5 g/hp-hr	SO2 g/hp-hr	CO2 g/hp-hr
Water Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Road Compactors	0.370	1.480	4.900	0.340	0.330	0.740	536.200
Diesel Dump Truck	0.440	2.070	5.490	0.410	0.400	0.740	536.000
Diesel Excavator	0.340	1.300	4.600	0.320	0.310	0.740	536.300
Diesel Trenchers	0.510	2.440	5.810	0.460	0.440	0.740	535.800
Diesel Bore/Drill Rigs	0.600	2.290	7.150	0.500	0.490	0.730	529.700
Diesel Cement & Mortar Mixers	0.610	2.320	7.280	0.480	0.470	0.730	529.700
Diesel Cranes	0.440	1.300	5.720	0.340	0.330	0.730	530.200
Diesel Graders	0.350	1.360	4.730	0.330	0.320	0.740	536.300
Diesel Tractors/Loaders/Backhoes	1.850	8.210	7.220	1.370	1.330	0.950	691.100
Diesel Bull Dozers	0.360	1.380	4.760	0.330	0.320	0.740	536.300
Diesel Front End Loaders	0.380	1.550	5.000	0.350	0.340	0.740	536.200
Diesel Fork Lifts	1.980	7.760	8.560	1.390	1.350	0.950	690.800
Diesel Generator Set	1.210	3.760	5.970	0.730	0.710	0.810	587.300

CALCULATION SHEET-COMBUSTIBLE EMISSIONS

Emission factors (EF) were generated from the NONROAD2005 model for the 2006 calendar year. The VOC EFs includes exhaust and evaporative emissions. The VOC evaporative components included in the NONROAD2005 model are diurnal, hotsoak, running loss, tank permeation, hose permeation, displacement, and spillage. The construction equipment age distribution in the NONROAD2005 model is based on the population in U.S. for the 2006 calendar year.

Emission Calculations							
Type of Construction Equipment	VOC tons/yr	CO tons/yr	NOx tons/yr	PM-10 tons/yr	PM-2.5 tons/yr	SO2 tons/yr	CO2 tons/yr
Water Truck	0.279	1.314	3.485	0.260	0.254	0.470	340.227
Diesel Road Paver	0.013	0.052	0.173	0.012	0.012	0.026	18.909
Diesel Dump Truck	0.105	0.493	1.307	0.098	0.095	0.176	127.585
Diesel Excavator	0.081	0.309	1.095	0.076	0.074	0.176	127.657
Diesel Hole Cleaners\Trenchers	0.071	0.339	0.807	0.064	0.061	0.103	74.397
Diesel Bore/Drill Rigs	0.143	0.545	1.702	0.119	0.117	0.174	126.086
Diesel Cement & Mortar Mixers	0.145	0.552	1.733	0.114	0.112	0.174	126.086
Diesel Cranes	0.122	0.361	1.588	0.094	0.092	0.203	147.239
Diesel Graders	0.083	0.324	1.126	0.079	0.076	0.176	127.657
Diesel Tractors/Loaders/Backhoes	0.294	1.303	1.146	0.217	0.211	0.151	109.669
Diesel Bull Dozers	0.038	0.146	0.504	0.035	0.034	0.078	56.736
Diesel Front End Loaders	0.040	0.164	0.529	0.037	0.036	0.078	56.726
Diesel Aerial Lifts	0.140	0.547	0.604	0.098	0.095	0.067	48.721
Diesel Generator Set	0.102	0.318	0.505	0.062	0.060	0.069	49.705
Total Emissions	1.656	6.767	16.302	1.365	1.328	2.120	1537.398

Conversion factors	
Grams to tons	1.102E-06

CALCULATION SHEET-TRANSPORTATION COMBUSTIBLE EMISSIONS

Construction Worker Personal Vehicle Commuting to Construction Site-Passenger and Light Duty Trucks									
Pollutants	Emission Factors		Assumptions				Results by Pollutant		
	Passenger Cars g/mile	Pick-up Trucks, SUVs g/mile	Mile/day	Day/yr	Number of cars	Number of trucks	Total Emissions Cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	1.36	1.61	60	240	15	15	0.32	0.38	0.71
CO	12.4	15.7	60	240	15	15	2.95	3.74	6.69
NOx	0.95	1.22	60	240	15	15	0.23	0.29	0.52
PM-10	0.0052	0.0065	60	240	15	15	0.00	0.00	0.00
PM 2.5	0.0049	0.006	60	240	15	15	0.00	0.00	0.00

Heavy Duty Trucks Delivery Supply Trucks to Construction Site									
Pollutants	Emission Factors		Assumptions				Results by Pollutant		
	10,000-19,500 lb Delivery Truck	33,000-60,000 lb semi trailer rig	Mile/day	Day/yr	Number of trucks	Number of trucks	Total Emissions Cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	0.29	0.55	60	240	2	2	0.01	0.02	0.03
CO	1.32	3.21	60	240	2	2	0.04	0.10	0.14
NOx	4.97	12.6	60	240	2	2	0.16	0.40	0.56
PM-10	0.12	0.33	60	240	2	2	0.00	0.01	0.01
PM 2.5	0.13	0.36	60	240	2	2	0.00	0.01	0.02

Daily Commute New Residents									
Pollutants	Emission Factors		Assumptions				Results by Pollutant		
	Passenger Cars g/mile	Pick-up Trucks, SUVs g/mile	Mile/day	Day/yr	Number of Cars	Number of trucks	Total Emissions cars tns/yr	Total Emissions Trucks tns/yr	Total tns/yr
VOCs	1.36	1.61	15	240	126	127	0.68	0.81	1.49
CO	12.4	15.7	15	240	126	127	6.20	7.91	14.11
NOx	0.95	1.22	15	240	126	127	0.47	0.61	1.09
PM-10	0.0052	0.0065	15	240	126	127	0.00	0.00	0.01
PM 2.5	0.0049	0.006	15	240	126	127	0.00	0.00	0.01

Truck Emission Factor Source: USEPA 2005 Emission Facts: Average annual emissions and fuel consumption for gasoline-fueled passenger cars and light trucks. EPA 420-F-05-022 August 2005. Emission rates were generated using MOBILE.6 highway vehicle emission factor model.

AIR EMISSIONS PROPANE GENERATORS

ONGOING EMISSIONS FROM PROPANE GENERATOR

Assumptions for Combustible Emissions					
Type of Construction Equipment	Num. of Units	HP Rated	Hrs/day	Days/yr	Total hp-hrs
Propane Generator Set	8	40	4	365	467200

Emission Factors							
Type of Construction Equipment	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM-10 g/hp-hr	PM-2.5 g/hp-hr	SO2 g/hp-hr	CO2 g/hp-hr
Propane Generator Set	2.03	31.91	9.93	0.06	0.06	0.01	653.9

Emission factors (EF) were generated from the NONROAD2005 model for the 2006 calendar year. The VOC EFs includes exhaust and evaporative emissions. The VOC evaporative components included in the NONROAD2005 model are diurnal, hotsoak, running loss, tank permeation, hose permeation, displacement, and spillage. The construction equipment age distribution in the NONROAD2005 model is based on the population in U.S. for the 2006 calendar year.

Emission Calculations							
Type of Construction Equipment	VOC tons/yr	CO tons/yr	NOx tons/yr	PM-10 tons/yr	PM-2.5 tons/yr	SO2 tons/yr	CO2 tons/yr
Propane Generator Set	1.047	16.432	5.111	0.029	0.029	0.007	336.640
Total Emissions	1.047	16.432	5.111	0.029	0.029	0.007	336.640

Conversion factors	
Grams to tons	1.102E-06

CALCULATION SHEET-FUGITIVE DUST

Construction Fugitive Dust Emissions

Construction Fugitive Dust Emission Factors

	Emission Factor	Units	Source
General Construction Activities	0.19 ton PM10/acre-month		MRI 1996; EPA 2001; EPA 2006
New Road Construction	0.42 ton PM10/acre-month		MRI 1996; EPA 2001; EPA 2006

PM2.5 Emissions

PM2.5 Multiplier	0.10	(10% of PM10 emissions assumed to be PM2.5)	EPA 2001; EPA 2006
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Control Efficiency

0.50	(assume 50% control efficiency for PM10 and PM2.5 emissions)	EPA 2001; EPA 2006
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Project Assumptions

Road Upgrade and General Construction Area (0.19 ton PM10/acre-month)

Duration of Construction Project	12	months
Length	0	miles
Length (converted)	0	feet
Width	0	feet
Area	16.00	acres

Conversion Factors

0.000022957	acres per feet
5280	feet per mile

New Roads (0.42 ton PM/acre-month)

Duration of Construction Project	3	months
Length		miles
Length (converted)		feet
Width		feet
Area	0.26	acres

	Project Emissions (tons/year)			
	PM10 uncontrolled	PM10 controlled	PM2.5 uncontrolled	PM2.5 controlled
Road Upgrade and General Construction	36.48	18.24	3.65	1.82
New Roads (0.42 ton PM/acre-month)	0.33	0.16	0.03	0.02
Total	36.81	18.40	3.68	1.84

Construction Fugitive Dust Emission Factors

General Construction Activities Emission Factor

0.19 ton PM10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The area-based emission factor for construction activities is based on a study completed by the Midwest Research Institute (MRI) Improvement of Specific Emission Factors (BACM Project No. 1), March 29, 1996. The MRI study evaluated seven construction projects in Nevada and California (Las Vegas, Coachella Valley, South Coast Air Basin, and the San Joaquin Valley). The study determined an average emission factor of 0.11 ton PM10/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM10/acre-month was calculated for sites with active large-scale earth moving operations. The monthly emission factors are based on 168 work-hours per month (MRI 1996). A subsequent MRI Report in 1999, Estimating Particulate Matter Emissions From Construction Operations, calculated the 0.19 ton PM10/acre-month emission factor by applying 25% of the large-scale earthmoving emission factor (0.42 ton PM10/acre-month) and 75% of the average emission factor (0.11 ton PM10/acre-month).

The 0.19 ton PM10/acre-month emission factor is referenced by the EPA for non-residential construction activities in recent procedures documents for the National Emission Inventory (EPA 2001; EPA 2006). The 0.19 ton PM10/acre-month emission factor represents a refinement of EPA's original AP-42 area-based total suspended particle (TSP) emission factor in Section 13.2.3 Heavy Construction Operations. In addition to the EPA, this methodology is also supported by the South Coast Air Quality Management District and the Western Regional Air Partnership (WRAP) which is funded by the EPA and is administered jointly by the Western Governor's Association and the National Tribal Environmental Council. The emission factor is assumed to encompass a variety of non-residential construction activities including building construction (commercial, industrial, institutional, governmental), public works, and travel on unpaved roads. The EPA National Emission Inventory documentation assumes that the emission factors are uncontrolled and recommends a control efficiency of 50% for PM10 and PM2.5 in PM nonattainment areas.

New Road Construction Emission Factor

0.42 ton PM10/acre-month Source: MRI 1996; EPA 2001; EPA 2006

The emission factor for new road construction is based on the worst-case conditions emission factor from the MRI 1996 study described above (0.42 tons PM10/acre-month). It is assumed that road construction involves extensive earthmoving and heavy construction vehicle travel resulting in emissions that are higher than other general construction projects. The 0.42 ton PM10/acre-month emission factor for road construction is referenced in recent procedures documents for the EPA National Emission Inventory (EPA 2001; EPA 2006).

PM2.5 Multiplier

0.10

PM2.5 emissions are estimated by applying a particle size multiplier of 0.10 to PM10 emissions. This methodology is consistent with the procedures documents for the National Emission Inventory (EPA 2006).

Control Efficiency for PM10 and PM2.5

0.50

The EPA National Emission Inventory documentation recommends a control efficiency of 50% for PM10 and PM2.5 in PM nonattainment areas. Wetting controls will be applied during project construction (EPA 2006).

References:

EPA 2001. *Procedures Document for National Emissions Inventory, Criteria Air Pollutants, 1985-1999*. EPA-454/R-01-006. Office of Air Quality Planning and Standards, United States Environmental Protection Agency. March 2001.

EPA 2006. *Documentation for the Final 2002 Nonpoint Sector (Feb 06 version) National Emission Inventory for Criteria and Hazardous Air Pollutants*. Prepared for: Emissions Inventory and Analysis Group (C339-02) Air Quality Assessment Division Office of Air Quality Planning and Standards, United States Environmental Protection Agency. July 2006.

MRI 1996. *Improvement of Specific Emission Factors (BACM Project No. 1)*. Midwest Research Institute (MRI). Prepared for the California South Coast Air Quality Management District, March 29, 1996.

CALCULATION SHEET-SUMMARY OF EMISSIONS

Proposed Action Construction Emissions for Criteria Pollutants (tons per year)						
Emission source	VOC	CO	NOx	PM-10	PM-2.5	SO2
Combustible Emissions	1.66	6.77	16.30	1.37	1.33	2.12
Construction Site-fugitive PM-10	NA	NA	NA	18.40	1.84	NA
Construction Workers Commuter & Trucking	0.73	6.83	1.07	0.02	0.02	NA
Total emissions	2.39	13.60	17.38	19.79	3.19	2.12
De minimis threshold (1)	NA	100.00	NA	100.00	NA	100.00
Annual Auto Emissions from bi-monthly maintenance	1.49	14.11	1.09	0.01	0.01	NA
Propane Generator-power source for towers	1.05	16.43	5.11	0.03	0.03	0.01
Total Ongoing Emission/yr	2.54	30.54	6.20	0.03	0.03	0.01

1. De-minimis thresholds for County.

