RECLAMATION

Managing Water in the West

Draft Environmental Assessment

San Xavier Cooperative Farm Extension

U.S. Department of the Interior
Bureau of Reclamation

November 2018

Mission Statements

The Department of the Interior protects and manages the Nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities.

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

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ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council of Historic Preservation
ACS	Archaeological Resources Consulting
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AF	Acre feet
AGFD	Arizona Game and Fish Department
AMA	Active Management Area
AWPF	Arizona Water Protection Fund
AWSA	Arizona Water Settlement Act
BIA	U.S. Bureau of Indians Affairs
BMPs	Best Management Practices
CAA	Clean Air Act
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
CO	Carbon Monoxide
COE	U.S. Army Corps of Engineers
CO-Op	San Xavier Cooperative Farm
CWA	Clean Water Act
CY	Cubic yard
District	San Xavier District
DOI	Department of the Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
Farm	San Xavier Cooperative Farm
FICO	Farmers Investment Company
FHWA	U.S. Federal Highway Administration
FT	Feet
FONSI	Finding of No Significant Impact
FR	Federal Register
FWCA Act	Fish and Wildlife Coordination
GCR	General Conformity Rule
GPM	Gallons per minute
IPaC	Information, Planning and Conservation System
ITA	Indian Trust Assets
I-19	Interstate 19
MBTA	Migratory Bird Treaty Act
Mg/kg	Milligram per kilogram
Mg/L	Milligram per Liter
MPH	Miles per Hour
NAAQS	National Ambient Air Quality Standards
Nation	Tohono O'odham Nation
NEAP	Natural Events Action Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
OHWM	Ordinary High Water Mark
O&M	Operation and Maintenance
PAG	Pima Association of Governments
PDEQ	Pima County Depart. of Environmental Quality
PL	Public Law
$PM_{2.5}$	Particulate matter w/ a diameter of 2.5 microns or less
PM_{10}	Particulate matter w/ a diameter less than 10 microns
PMR	Pima Mine Road
Reclamation	U.S. Bureau of Reclamation
ROG	Reactive Organic Gases
SAR	Sodium adsorption ration
SAWRSA	Southern Arizona Water Rights Settlement Act
SXCA	San Xavier Cooperative Association
TAPA	Tucson Air Planning Area
TCP	Traditional Cultural Properties
TDS	Total dissolved solids
THPO	Tribal Historic Preservation Office
TPY	Tons per Year
USFWS	U.S. Fish and Wildlife Service
WOTUS	Waters of the United States

Chapter 1. Introduction, Background, Purpose and Need

1.1 Introduction

In accordance with the National Environmental Policy Act of 1969, (P.L. 91-190), the Bureau of Reclamation, in cooperation with the San Xavier District (District) of the Tohono O'odham Nation (Nation) and the Bureau of Indian Affairs (BIA), has prepared an Environmental Assessment (EA) to evaluate the potential impacts resulting from a proposed extension of the San Xavier Cooperative Farm (Farm).

1.2 Background

1.2.1 Colorado River Basin Project Act (P.L. No. 90-537, 82 Stat. 885 ())

As authorized in the Colorado River Basin Project Act of 1968, the Secretary of the Interior allocated 309,828 acre feet annually (afa) of Central Arizona Project (CAP) water to ten tribes. Nine of the ten tribes, including the Nation (formerly called the Papago Tribe), signed CAP water service contracts in December 1980. The contract negotiated with the Nation allocated 27,000 af of CAP water to the District annually.

1.2.2 Southern Arizona Water Rights Settlement Act (Pub. L. No. 97-293)

The Southern Arizona Water Rights Settlement Act (SAWRSA) was enacted by Congress in 1982 to settle the water claims of the San Xavier and Schuk Toak Districts of the Nation. Rights granted under SAWRSA were intended "to fully satisfy any and all claims of water rights or injuries to water rights (including water rights in both groundwater and surface water)" within these two districts. SAWRSA also modified the contract negotiated in 1980 between the Nation and the United States for delivery of CAP water. The settlement provided for delivery of CAP water to the CAP turnouts within the District and waived the Nation's responsibility to pay their proportional share of costs for construction of the CAP. SAWRSA directed the Secretary of the Interior, acting through Reclamation, to acquire and deliver annually to the San Xavier and Schuk Toak Districts 37,800 af of CAP water and 28,200 af of additional water suitable for agricultural use. Allocations to the District consisted of 27,000 af of CAP water and 23,000 af of additional water. The remaining 16,000 afa of CAP and additional water was to be delivered to the Schuk Toak District. As a condition of receiving the 66,000 afa of imported water, the Nation agreed to limit groundwater withdrawal from beneath the District and the Schuk Toak District.

1.2.3 Arizona Water Settlements Act (AWSA, Pub. L. No. 108-451, 118 Stat. 3478 (2004))

The Arizona Water Settlements Act of 2004 (AWSA) amended SAWRSA and identified the 28,200 afa of water suitable for agricultural use as CAP water with non-Indian agricultural priority and directed the Secretary of the Interior to firm such water to municipal and industrial

priority. In amending SAWRSA, Congress directed the Secretary of the Interior to annually deliver 5,200 af of the additional CAP water to Schuk Toak District and 23,000 af to the San Xavier District. Any portion of this additional water determined to be excess to the needs of the districts will be delivered to the Nation. CAP water supplies confirmed or granted by the AWSA to the Nation may be applied to agricultural, municipal, domestic, industrial, commercial, mining, underground storage, in-stream flow, riparian habitat maintenance, recreational, and other uses. This spectrum of potential uses applies to the entire 50,000 afa of CAP water allocated to the Nation and deliverable to the District.

1.2.4 San Xavier Cooperative Farm

SAWRSA also provided Federal funds to rehabilitate the original Farm and to build a pipeline to deliver CAP water to agricultural fields within the Farm. In 2000, a 5.6-mile-long pipeline (CAP Link Pipeline) linking the CAP Canal and the Farm's original water distribution system was completed. That same year, the Tohono O'odham Legislative Council approved a request by the District and San Xavier Cooperative Association (SXCA) that asked for Reclamation to proceed with the design and construction of the Farm rehabilitation and extension (Nation, 2000). At that time a planning group, consisting of the District, SXCA and its Board of Directors, the Farm Manager, and Reclamation, began developing a strategy that would best suit the needs of the community, conserve water, and provide efficient delivery of CAP water to existing agricultural fields for irrigation. The rehabilitation of the existing farm was subsequently completed in 2007.

AWSA [Section 304(c)(2)] directed the Secretary of the Interior, through Reclamation, to design and construct an extension of the irrigation system to deliver CAP water to additional lands for the Farm, resulting in a system that will serve up to 2,300 net irrigable acres on the San Xavier Reservation. Following the completion of the farm rehabilitation, the SXCA held two community planning meetings with existing and proposed allottees in 2010 for the lease renewal on the existing farm and to introduce a proposal for the extension. Following cultural resource surveys of the extension area beginning in 2011 and the associated coordination with Reclamation, the Nation, District, and Farm, the footprint for the extension was established. The Farm formally adopted the 1,094-acre footprint in June 2012, and the farm extension development commenced with a farm planning and economic analysis effort beginning in July 2014. The analysis and accompanying report evaluated the current practices of the existing Farm and analyzed the potential agricultural production associated with the proposed farm extension (George Cairo Engineering [GCE], 2016). In September 2015, SXCA asked Reclamation to proceed with plans to extend the Farm.

1.3 Project Location

The project area is located within the northeastern portion of the District, which is immediately south of Tucson, Arizona, within Pima County. The proposed lands under consideration for the farm expansion are south and east of the existing farm (Figure 1). The project area is bound by Interstate 19 (I-19) to the west, the Santa Cruz River to the east, and uninhabited tribal allotted land to the north and south. The proposed lands under consideration for the farm extension are within Sections 26 and 35 of Township 15 South, Range 13 East, and Sections 1, 2, 11, and 12 of Township 16 South, Range 13 East of the Gila and Salt River Baseline and Meridian.

1.4 Purpose and Need

The proposed action would meet Reclamation's requirements under Section 304(c)(2) of the AWSA to design and construct an extension of the irrigation system for the Farm that will serve 1,094 acres of additional land proposed for agricultural use. An expansion of the Farm would allow SXCA to beneficially use a greater portion of the San Xavier Reservation's available CAP water. This would in turn allow the Farm to irrigate to the extent that they would not be able to absent the project. The farm extension would require BIA approval on the land appraisals, lease agreements, and granting of temporary and permanent easements for right-of-way associated with the Farm.

1.5 Public Involvement

On August 23, 2016, Reclamation posted a scoping notice on Reclamation's website (www.usbr.gov/lc/phoenix) and mailed scoping information on the proposal to potentially interested parties, including existing and proposed allottees, nonprofit organizations, and various federal, state, tribal and local agencies (Appendix A). Reclamation received six responses during the scoping period (Appendix B). The Arizona State Historic Preservation Office indicated that it will participate through the National Historic Preservation Act (NHPA) process; however, Reclamation later clarified that consultation under NHPA would be carried out through the Tribal Historic Preservation Office (TPHO) since the project occurs entirely within the District. The Hopi Tribe requested continued consultation under NHPA and to be notified of the Draft EA. The District's Planning Department requested additional information on the planning process and the community outreach strategy. Pima County Flood Protection expressed concern with irrigation runoff and its impact on the downstream community; it also requested that the EA address offsite flows. Freeport-McMoran responded in support of the project, while one member of the public had concerns regarding water shortage, profitability, and natural resource impacts.

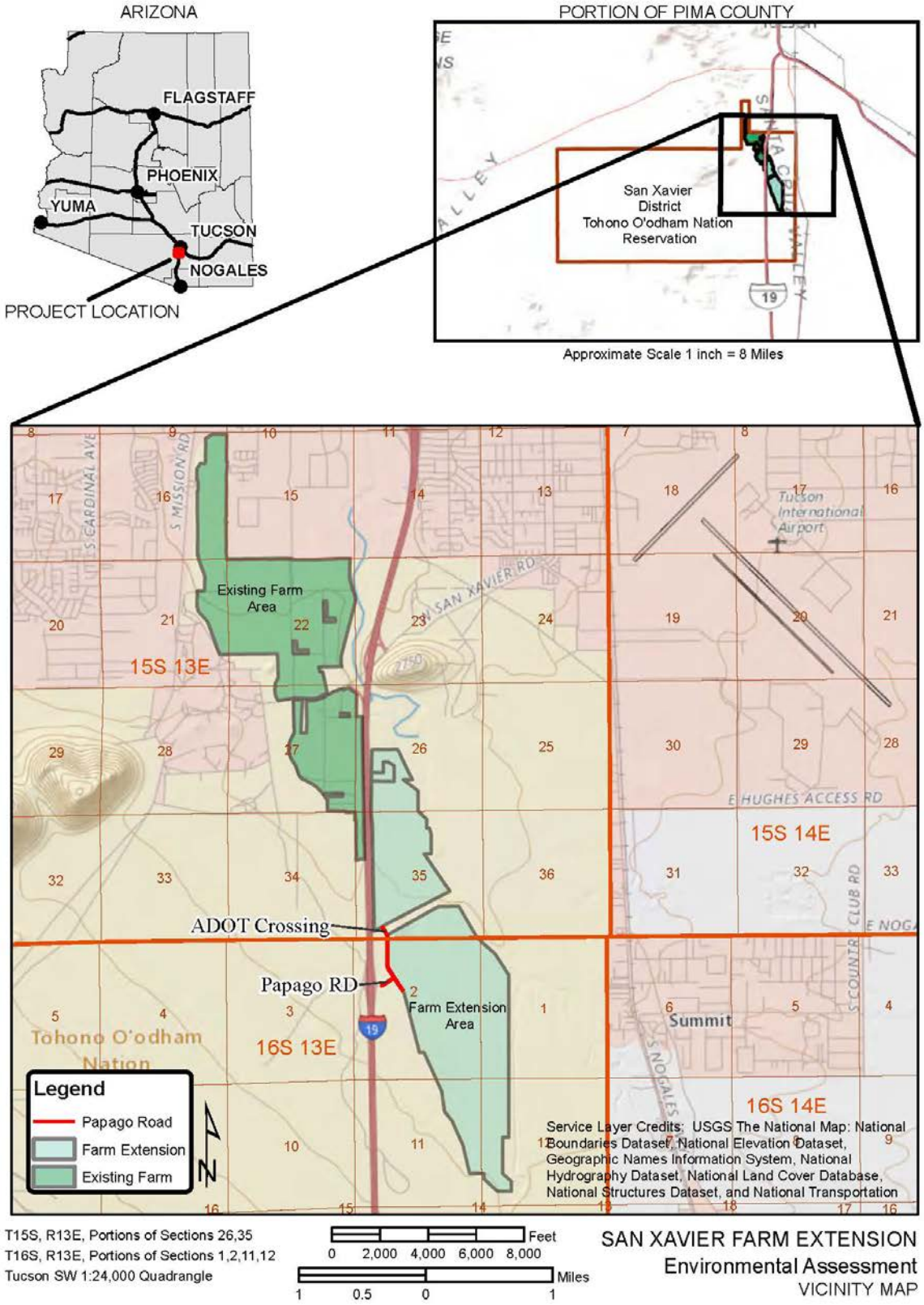
Two public scoping meetings were held in 2010.[1] Since 2010, BIA, Reclamation, the District's SAWRSA Office, and the SXCA have continued to reach out and solicit feedback from the community through SXCA quarterly and annual meetings, SXCA newsletters, and San Xavier Allottees Association meetings.

1.6 Cooperating Agencies

Reclamation is the lead Federal agency responsible for preparing the EA. The cooperating agencies to the EA include the District and BIA, which has a responsibility for protecting Indian Trust Assets and issuing permits. BIA will be the approving party to the land appraisals, lease agreements, and granting of temporary and permanent easements for right-of-way associated with the Farm. This EA will serve as the NEPA review for BIA's actions as well.

[1] In accordance with BIA's leasing and permitting procedures, scoping meetings were conducted by SXCA Board of Directors and the Farm Manager on June 19, 2010 and July 17, 2010 to introduce the proposed extension to the affected allottees and the community. In 2010, the SXCA envisioned that the farm extension would occur in phases. Thus, the initial scoping meetings only included 350 acres out of the 1,094 acres currently proposed. Once it was determined that the entire farm extension would be evaluated, all allottees within the proposed 1,094-acre farm extension were notified of the proposed project through BIA's permitting process in 2011, 2014, 2016, and 2017. As part of the permitting process, BIA issued a notice of intent to the allottees that BIA would be granting Reclamation a revocable permit for pre-development activities associated with the project. The current revocable permit will expire on October 31, 2021.

Figure 1. Project Vicinity



Chapter 2. Proposed Action and Alternatives

2.1 Description of the Proposed Action

The planning group for the farm extension project consisted of the District, SXCA and its Board of Directors, Reclamation, and a consultant. During the early stages of planning, a Farm Planning and Economic Analysis Report was prepared to evaluate the current practices of the existing Farm and to provide the Farm with opportunities for improved operational efficiencies, greater profitability, and a strengthened business presence within southeastern Arizona (GCE, 2016). After an extensive study and review process that was coupled with input from community members, the SXCA Board passed a resolution to select an all-natural and organic farm production method that utilizes both center pivot and level-basin flood irrigation (SXCA, 2015). The farm design has been refined through additional engineering studies, and input from the Farm Manager and SXCA Board, and is presented in this EA as the proposed action (Figure 2 and 3).

In accordance with AWSA, Reclamation would construct a water delivery system on 1,094 acres of land proposed for agricultural use. This land is adjacent to the existing 1,046-acre farm that was rehabilitated in 2007. The proposed farm boundary is divided among two parcels of land. The northern parcel is 298 acres, and the southern parcel is 796 acres. The two parcels are divided by a large drainage channel, herein referred to as the ADOT flood control channel.

The lands under consideration currently contain three fields (Fields 49, 50, and 51) that are actively farmed by SXCA. These fields would be subsumed into the design for the farm extension. Within the proposed farm extension footprint, there are three protected areas, totaling 60 acres, that would not be disturbed as part of the proposed development. The three protected areas, otherwise referred to as exclusion areas, are Traditional Cultural Properties (TCP). As exclusion areas, their acreage is not included in the proposed farm extension footprint of 1,094 acres. SXCA and Reclamation have agreed that 2,140 acres (a combined total of 1,094 acres for the farm extension and the existing 1,046-acre farm) would constitute the final acreage for the Farm authorized by AWSA.

Within the 1,094-acre footprint for the farm extension, 835 acres will be irrigated. An additional 43 acres would be supplementally planted with mesquite and other native plants that have been traditionally harvested by the Nation. The supplemental planting areas are a mitigation measure for lost habitat within the project area. They would also provide the Farm with harvesting opportunities. The supplemental planting areas, otherwise referred to as mitigation areas, would be equipped for flood irrigation.

2.1.1 Water Distribution System

As part of the proposed action, a water delivery system would be constructed to allow irrigation within the 1,094-acre farm footprint (Figure 3). Water from the CAP Link Pipeline would be conveyed throughout the farm by a main pipeline and a series of sub-laterals. A 30-inch (in) diameter turnout at the CAP Link Pipeline would provide the flow and pressure needs of the main and sub-lateral lines. The CAP Link turnout would have a maximum capacity of 29 cfs.

The main (high pressure) line would stem from the CAP Link turnout and would connect 11 center pivots that would be used to irrigate the available land. Various sub-laterals would branch off of the main pipeline to supply the center pivots. The high pressure pipeline ranges in size from 6 to 30-in in diameter with a total length of approximately 4.6 miles. The high pressure, gravity flow system would have a capacity of 19.26 cfs or 8,644 gallons per minute (gpm) to cover the 720 acres proposed for center pivot irrigation. The high pressure line would provide irrigation water to the center pivots and their hydraulically driven turbines to power the center pivots. Under this configuration, this system would eliminate the need for electricity and significantly reduce operating expenses on the farm extension. Any lighting or control power required would be provided by solar power or with an alternator stationed at the center pivot.

A low pressure line would also branch from the high pressure line on the southern end, and from the District's Arizona Water Protection Fund (AWPF) pipeline in the north. The low-pressure line, with a maximum capacity of 10 cfs, would flood irrigate 115 acres of farms fields (primarily in areas the center pivots will not reach) and 43 acres of mitigation land. The flood irrigated fields and mitigation areas would be supplied by a 12 to 18-in diameter pipe connected to alfalfa valves. The low pressure pipeline would span approximately 2.7 miles.

The depth of excavation needed for pipeline installation would vary depending on the size of the pipe used, however the maximum depth would be approximately 15-ft. Earthen material removed from the pipeline alignment during excavation would serve as backfill.

2.1.2 AWPF Line Improvements

The District's AWPF Pipeline (see Section 3.2.1) that leads to two riparian restoration sites (Wa:k Hikdan and Site 2) ties into the CAP Link Pipeline (Figure 3). As part of the proposed action, the AWPF Pipeline would act as the low pressure line for the flood irrigation fields in the northern parcel of the farm footprint and would continue to supply CAP water to Wa:k Hikdan and Site 2. Currently, the Wa:k Hikdan utilizes approximately 1 cfs of CAP water, while Site 2 requires approximately 0.1 cfs.

The 25-ft right-of-way for the AWPF Pipeline leading to the Wa:k Hikdan would be used to access the most northern extent of the farm extension. Additionally, a portion (approximately 2,000-ft) of the AWPF Pipeline would be replaced and upgraded to supply the water needs for Flood Irrigation Field 9 and 10. Any improvements to the AWPF Pipeline leading to the Wa:k Hikdan would occur within the existing right-of-way, which partially falls outside of the farm footprint.

The AWPF Pipeline leading to Site 2 would be buried beneath Center Pivot Field 9 within its existing right-of-way. The road leading to Site 2 would then utilize the main access road and a portion of its existing road alignment along the Santa Cruz River.

Figure 2. Project Design: Fields, Roads, Fencing, and Wells

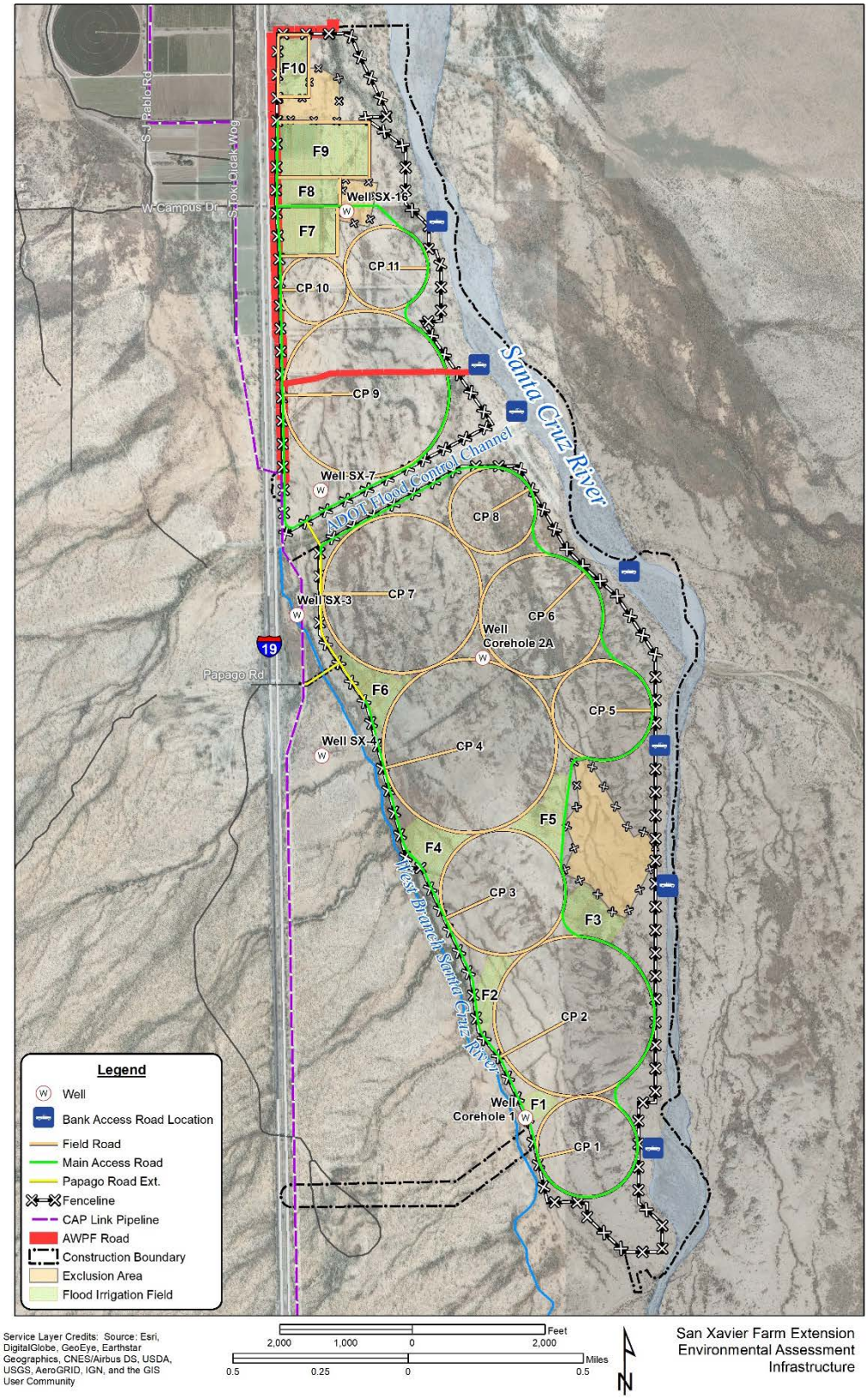
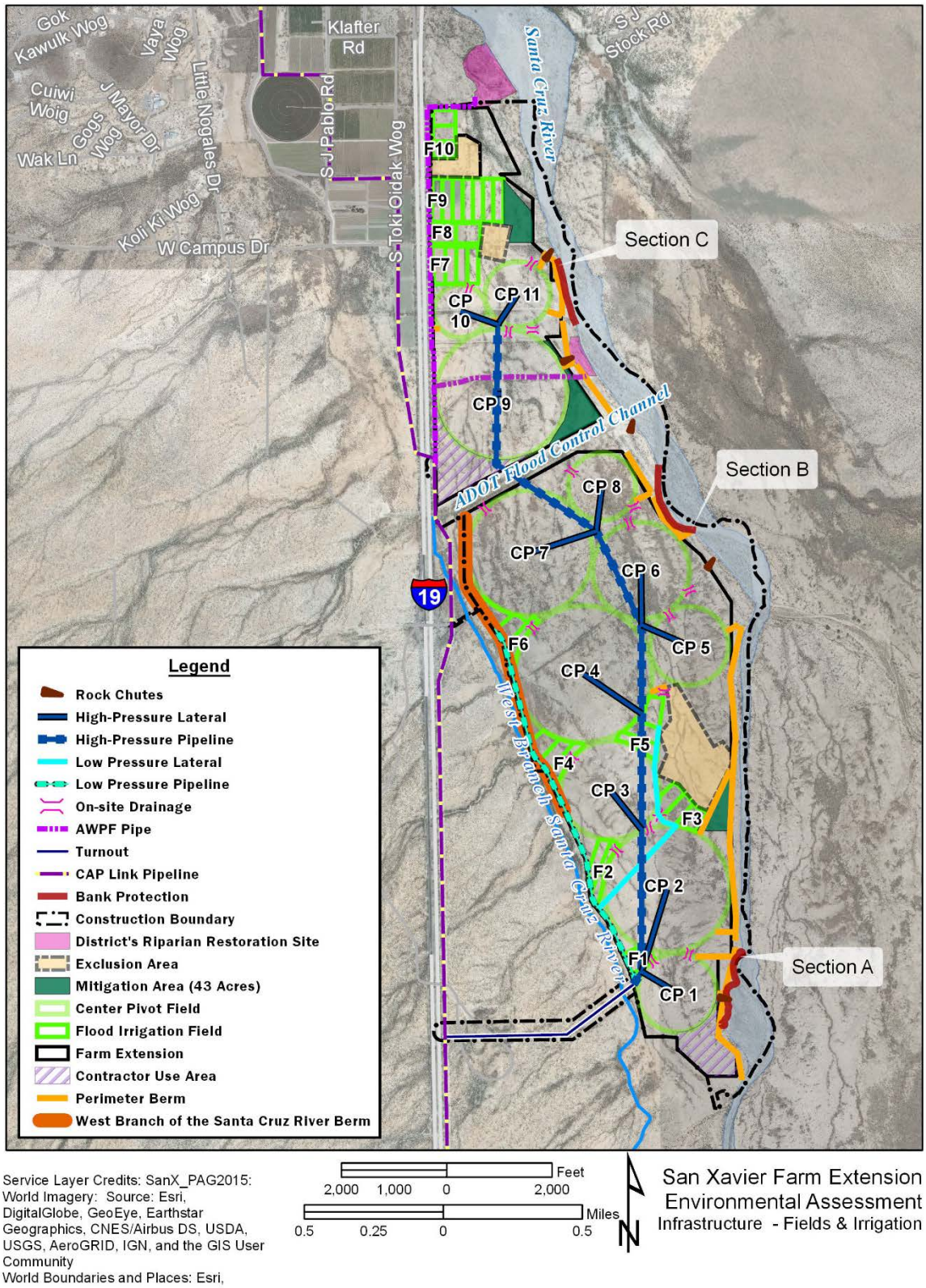


Figure 3. Project Design: Fields, High and Low Pressure Lines, On-site Drainage Measures, and Flood Protection Features



2.1.3 Irrigation Efficiency

Under the proposed action, 115 acres would be cut and filled to a level plane to allow an efficient application of flood irrigation. Of the 835 acres proposed for production, 720 acres would be irrigated with center pivots. The center pivot sprinklers are designed to apply a uniform amount of water across the length of the system, assuring high irrigation efficiencies.

2.1.4 Roads

The main access road would be oriented mostly along the perimeter of the farm and would carry the greater volume of the farm traffic (Figure 2). It would span approximately 8 miles and would be 16-ft wide. The road would be compacted and surfaced with an aggregate base for all-weather use by farm equipment.

Approximately 16 miles of secondary farm roads would provide access to the individual fields. The 12-ft wide, gravel surfaced roads would border the flood irrigated and center pivot fields and would provide access to the pivot points. Flood Irrigation Fields 9 and 10 would be accessed through an existing perimeter road that lies just outside of the farm extension footprint. The existing road leads to the Wa:k Hikdan. As part of the proposed action, the existing perimeter road, from Campus Drive to the northern boundary of the farm extension, would be improved in order to accommodate farm equipment.

A 24-ft wide road spanning approximately 2,950 linear feet would be constructed to provide a secondary access to the farm extension. The road would extend east from the Papago Road interchange exit to the farm extension footprint. It would then proceed north where it would converge with the main access road on the north side of the ADOT flood control channel (Figure 2). From the point where Papago Road enters the farm footprint, the 24-ft wide road would also extend south 673-ft (Figure 2). The access road alignment would require crossing the West Branch of the Santa Cruz River and the ADOT flood control channel. A concrete crossing designed for a 100-year flood (1,245 cfs) would be installed across the West Branch of the Santa Cruz River. The crossing would be approximately 200-ft by 80-ft (0.4 acre). The on-grade crossing associated with the ADOT flood control channel is approximately 436-ft by 100-ft (1 acre), and would be roughly 215-ft to the east of the existing on-grade crossing. A concrete apron would be installed in the bed of the channel for the new on-grade crossing. The ADOT flood control channel crossing would connect the north and south parcels of the farm extension.

Up to seven roads are being considered for temporary construction and long-term operation and maintenance (O&M) access to the bank stabilization sites and rock chutes within the Santa Cruz River (Figure 2). The O&M access roads would be 24-ft wide and would extend a total of 1.5 miles, if all 7 access roads are required. The access roads would lead from the top of the bank down to the river channel and would span the length of the bank stabilization areas and/or rock chutes.

2.1.5 Fencing

Approximately 13 miles of wildlife compatible, barbed-wire fencing would be installed around the perimeter of the farm extension to discourage trespassers and livestock (Figure 2). This same fencing would also be installed around the designated exclusion areas. Where the main access

road bisects one of the exclusion areas (i.e. along Campus Drive), the boundary fence would be broken up into two sections: one to the north and one to the south of the road. Fencing, gates, and cattle guards would also be installed near the Papago Road interchange exit to deter trespassers and livestock.

2.1.6 On-site Drainage

Due to the ground slope, which progresses south to north, and the containment berms (i.e. secondary farm roads) associated with each center pivot field, rain runoff or sheet flow would pool on the northern side of these fields. To drain the sheet flow from these fields, the secondary access roads would have a drainage feature. Flows would then be directed through a network of shallow ditches to the mitigation areas, the West Branch of the Santa Cruz River, the ADOT flood control channel, or the Santa Cruz River (Figure 3). The overflow that is directed to the Santa Cruz River would utilize rock chutes at 2:1 to 3:1 slopes to prevent head cutting erosion at the farm level (Figure 3). The plunge pool at the base of the chute would also be sufficiently armored to prevent a scour hole from developing. In locations where rock chutes can tie into bank stabilization, material quantities may be reduced. The rock chutes would vary in size depending on the volume of runoff within a particular area, but the area of disturbance associated with each chute would be no larger than 0.5 acres.

An additional on-site drainage feature includes a 3.5 mile long perimeter berm that would parallel the majority of the Santa Cruz River within the project area (Figure 3). The berm would prevent erosion or head cutting of the farm level terrace along the river that is associated with rain runoff and focus the flows through rock-lined chutes to the river level. The 2-ft high berm would be offset approximately 50 to 200-ft west of the riverbank. The earthen material used to construct the berm would come from the area immediately adjacent to the berm, from soils displaced during the farm subjugation or from an approved borrow source.

2.1.7 Flood Protection

2.1.7.1 Berm along West Branch of the Santa Cruz

Within the farm extension footprint, a 1.1 mile long berm would be placed just east (the closest extent being 120-ft) of the eastern bank of the West Branch of the Santa Cruz River (Figure 3). The berm would protect the farm's infrastructure and minimize potential damage to crops. The berm would be armored with riprap on the slope facing the West Branch of the Santa Cruz River. Beginning just south of the ADOT flood control channel, the berm would be 6-ft tall and would gradually taper down to approximately one foot near Center Pivot Field 3. The top of the berm would also function as the main access road within this section of the farm. The earthen material used to construction the berm would come from the soils displaced during the farm subjugation or from an environmentally approved borrow source.

2.1.7.2 Santa Cruz River Bank Protection

Three areas along the western bank of the Santa Cruz River would have bank protection features (Figure 3). The bank protection areas would armor the riverbank from continued erosion and would protect the farm's infrastructure from potential river encroachment.

The bank protection areas would be designed to withstand a 55,000 cfs flood event, which is Pima County's Design Discharge at the Continental Gage station 14 miles upstream of the project area. During construction, unstable soils would be excavated from the vertical bank. The vertical bank of the river would be stabilized with compacted fill material placed on a 2:1 slope and then armored with riprap (Table 1). Additionally, a 10-ft deep key trench would be excavated at the toe of the compacted fill slope for scour protection. The key trench would be backfilled with riprap. All material excavated would be used in constructing the compacted fill slope. Borrow would be used where excavated materials are not suitable for use or of insufficient quantity. The additional material needed for construction would be obtained from an approved source.

A perimeter berm (see Section 2.1.6) would be constructed along the east side of the farm extension to prevent runoff from cascading over the eroded river bank and contributing to head cutting issues.

Alternatives identified in the Value Engineering Study for bank protection along the Santa Cruz River are being considered (Reclamation, 2018a). The approach for bank protection may change as the project design progresses, however, any changes that would occur would only result in a smaller footprint.

Table 1. Bank Stabilization Impacts

Bank Stabilization Area	Approximate Length (feet)	Greatest Extent Into River* (feet)	Height (feet)	Area of Disturbance for Construction (acres)
A	733	50	27	2
B	2,431	30	5 to 18	6
C	1,391	20	13 to 15	4
* From The Toe of the Bank			**Total**	**12**

2.1.8 Construction Considerations

The active construction corridor includes the alignments for the following features of the farm extension: main and sub-lateral pipelines for the high pressure and low pressure lines, farm fields, roads, on-site drainage features, flood protection areas, mitigation fields, and areas needed for material and equipment staging. Two contractor use areas, totaling 44.5 acres, would be used for material and equipment staging. Both contractor use areas are within the farm footprint. The construction corridor outside of the farm footprint consists of (1) a water distribution line that would connect the CAP Link Pipeline to the farm footprint, (2) a portion of the right-of-way for the AWPF Pipeline, (3) a portion of the perimeter berm, (4) five rock chutes, (5) three bank protection areas within the Santa Cruz River, (6) O&M access to the bank protection areas, (7) the Papago Road extension, and (8) a road crossing over the ADOT flood control channel. The temporary construction right-of-way associated with these features is listed in Table 2. Any area not designated for construction would be left untouched.

Table 2. Construction right-of-way associated with features outside of the farm footprint

Feature of the Farm (outside of the farm extension footprint)	Area of Disturbance
Main line	3,892 ft x 100 ft (9 acres)
Papago Road extension and its associated crossing over the West Branch of the Santa Cruz River	673 ft X 100 ft (1.5 acres)
ADOT Flood Control Channel crossing	436 ft X 100 ft (1 acre)
AWPF pipeline and road	4.6 acres
Perimeter berm	2.1 acres
Bank protection	Up to 12 acres
O&M access to bank protection areas	4.36 acres
Rock chutes	2.5 acres

2.1.9 Crop Mix and Organic Production

It is anticipated that no less than 720 acres would be dedicated to alfalfa within the farm extension. Traditional crops are also being considered for the flood irrigation fields. For a complete list of traditional crops that could be grown within the extension see Appendix C. Mesquite and other native plants traditionally harvested, like devil's claw, wolfberry, saltbush, and graythorn, would also be grown within the designated mitigation areas.

Like the existing farm, SXCA plans to utilize natural agricultural production methods for the farm extension. Natural management would incorporate sufficient biological diversity within the crop mix to disrupt habitat for pest organisms and allow for replenishment of soil fertility through the application of conservation tillage, composting, and biologically based soil amendments. Weeds would be controlled through crop rotation, mechanical tillage, cover crops, mulches, and other management methods. No synthetic pesticides, herbicides, or fertilizers would be utilized.

The Farm has also indicated that it has an interest in integrating certain organic farming practices that could lead to organic certification of portions or all of the expansion area and the existing farm. Organic farming practices would necessitate additional production constraints that are designed primarily to reduce or eliminate the threat of contamination from non-organic sources.

2.1.10 Water Budget

2.1.10.1 Farm Considerations

GCE (2016) prepared a water budget analysis to evaluate projected peak season and operational demand based on likely crop mix, available water supply, expected irrigation efficiency, soil type, field size, and environmental conditions. Based on climate and the likely crop mix, June

is the highest water use month for the Farm. Assuming that all of the fields are planted with alfalfa, only 75 percent of the fields could be irrigated at any given time due to planting, cutting, drying, and bailing operations (Reclamation, 2018b). In June, with the high pressure irrigation system running at 75 percent capacity and the crop cover being alfalfa, 17.41 cfs of the available 19.24 cfs would be required. Similarly, the low pressure irrigation system can be expected to utilize less than the available 10 cfs, even during high water use months. The mitigation fields would be worked into the farm production schedule and unutilized water from the low pressure irrigation system may be used to water the mitigation fields.

2.1.10.2 CAP Water

The irrigation requirements of the Farm rely primarily on CAP water. The CAP Link Pipeline can provide up to 23 cfs of water to the existing rehabilitated farm and 29 cfs (approximately 1,766 af per month and 21,183 af per year) for the proposed farm extension. The Central Arizona Water Conservation District (CAWCD), the CAP operator, has raised some concerns regarding the ability of the CAP San Xavier Turnout No. 2 to handle the additional flow for the farm extension. The turnout was designed to handle the full 52 cfs, but CAP is concerned that water level fluctuations in the operating tank could create pressure issues in the Farm's irrigation systems. CAWCD and Reclamation have begun to evaluate the hydraulics and will determine if a modification to the turnout is required. If a modification is required, Reclamation will complete the necessary environmental compliance for the project.

Due to required maintenance along the CAP system, the CAP Link annually experiences a one month long dry-up period. The dry-up period typically occurs in the fall, generally during the month of October. The Farm is annually notified of the dry-up period and plans agricultural activities accordingly. If needed, stored water at the Black Mountain Reservoir may provide limited flow during the dry-up period.

2.1.10.3 Groundwater

In the vicinity of the farm extension between the Santa Cruz River and I-19, there are 11 wells. None of these wells are currently capable of providing water. Under the proposed action, five wells (SX-6, SX-10A, Core 1, Core 2A, and O1A-4) within the farm footprint would be abandoned and capped, while the remaining wells would be used to monitor groundwater levels.

2.1.11 Approval Process for Land Appraisals, Lease Agreements and Granting of Temporary and Permanent Easements for Right-of-Way

Under the proposed actions, the BIA Papago Agency, with the consent from the majority of the allottees, the District, and Nation, would be the approving party to the land appraisals, lease agreements, and granting of temporary or permanent right-of-way associated with the Farm.

Prior to approving the lease for the Farm or granting Reclamation temporary and permanent right-of-way for infrastructure associated with the extension, BIA would require a land appraisal.

As part of the proposed action, Reclamation would need to acquire temporary and permanent rights-of-way (easements) within the extension to support farm operations. Temporary construction easements would allow for access and construction of all aspects of the farm

extension outside of the farm footprint. Permanent right-of-way would help to facilitate O&M of those features. With the issuance of perpetual easements, the landowners of the affected acreage would be compensated.

A long-term lease, by SXCA, is proposed. The long-term lease would include the lands within the existing farm as well as the expansion area. As a condition of the lease, individual allottees within the leased area would be paid long-term rent payments, which would be determined by the appraisal. The rent payment would then be adjusted every five years by re-appraisal. In exchange for leasing their land, members may also be entitled to a proportionate share of the Farm's net profits.

2.2 No Action Alternative

Under this alternative, no Federal funding would be provided to expand the Farm as described in this EA. Economic constraints associated with the existing farm operation could prevent the Farm from expanding. Any future land leveling would likely be restricted to Fields 49, 50, and 51, which are capable of receiving water through the existing distribution system. This alternative would also preclude Reclamation from fulfilling its responsibilities under the AWSA.

2.3 Alternatives Considered but Eliminated from Further Study

The SXCA considered other farm methods beyond the all-natural and organic production. Those methods included an all-conventional production and a combination of natural and conventional production. These alternatives were rejected by SXCA based upon its mission of providing a reasonable financial return to the lessees through the sustainable, efficient, and profitable use of its resources. Conventional production conflicts with the sustainability approach of the Farm and is not consistent with the current farm strategy used on the existing Farm. The existing farm applies an all-natural approach.

Chapter 3. Affected Environment and Environmental Consequences

This chapter presents the existing conditions in the project area and the environmental consequences that can be expected from implementing the proposed action and no action. Environmental consequences are analyzed based on direct, indirect, and cumulative effects to resources under consideration within the project area.

In order to quantify cumulative effects, it was necessary to identify other ongoing or reasonably foreseeable future projects within the vicinity of the project area. The geographic scope for this analysis includes actions both within and outside of the project area. The temporal scope includes projects within a range of approximately twenty years. Under these parameters, the following projects were identified for the purpose of conducting the cumulative effects analysis:

- Construction and operation of the CAP Link Pipeline (past and present).
- Rehabilitation of the existing Farm (past).
- Construction and implementation of a pilot project within the District for groundwater recharge (past).
- Construction and operation of riparian restoration sites within the District (past and present).
- Ongoing operation of Farm (present).
- Construction and operation of a CAP water delivery pipeline to FICO Pecan Orchard Groundwater Savings Facility (future).
- Construction and operation of a new transportation corridor, known as the Sonoran Corridor (future).
- Construction of CAP reliability facilities within the District (future). The facilities would provide water to the District during annual CAP maintenance outages.

3.1 Resources Eliminated from Further Study

The following resources were considered but are not addressed further in this EA because it was determined that the resources are not present or that minimal or no impacts would result from the proposed action.

3.1.1 Threatened and Endangered Species

Effects to federally-listed threatened and endangered species were considered under the proposed action. The U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC) Trust Resource Report generated a list of species and critical habitat to be considered under Section 7 of the Endangered Species Act. The USFWS IPaC report, generated multiple times throughout the life of the project, identified three listed species with the potential to occur within the project area: the endangered Pima pineapple cactus (*Coryphantha scheeri*

var. robustispina), the endangered California least tern (*Sterna antillarum brownie*), and the endangered lesser long-nosed bat (*Leptonycteris curasoae Yerbabuenae*) that has since been delisted.[2] No designated critical habitat was identified within the project area.

In October through December 2015, Reclamation conducted surveys for the Pima pineapple cactus and documented the foraging and roost potential for the lesser long-nosed bat within the project area. No Pima pineapple cactus were detected. In addition, it was determined that project activities would not result in any loss of breeding, roosting, or foraging habitat for the lesser long-nosed bat since only one saguaro was documented within the project area.

No species specific surveys were conducted for the California least tern. Though the habitat is suitable for the tern, nesting is not known to occur within Pima County. Only transitory migrants have been documented within Pima County. Therefore, the impact to California least terns would be negligible and discountable.

3.1.2 Noise

In general, noise impacts on sensitive land uses would be greatest when equipment is operating within 500-ft of sensitive noise receptors, such as residential areas, the San Xavier Mission, San Xavier Mission School, and San Xavier Health Center. The project area is beyond 500-ft from the nearest sensitive noise receptor. The nearest sensitive noise receptor (a residential area) is approximately 1,162-ft from the farm extension.

Noise from construction activities and ongoing farm operations would be incremental to other sources of noise affecting the project area. Temporary, localized increases in noise would result from construction activities associated with the farm extension and the subsequent operation of the Farm. However, under baseline conditions, the project area is exposed to frequent loud aircraft noise from Tucson International Airport, vehicular traffic noise associated with I-19, and farm equipment noise resulting from the operation of the existing Farm. The temporary and localized noise generated by construction activities and the subsequent farm operation would be minimal.

3.2 Land Use

3.2.1 Affected Environment

Farming. The Tohono O'odham people have a long-standing tradition as agriculturists. The earliest historic records of farming in the San Xavier area dates back to the early 1700s when Spanish missionaries documented expansive fields that were supplied by numerous irrigation ditches (Gregory, Punzmann, Bastin, Davis, Jones, & Ossa, 2016). Until the early 1900s, the farm fields were irrigated with water from the Santa Cruz River, but non-Indian diversions and groundwater pumping depleted the perennial surface water supply. As a result, farmers became more dependent on groundwater. Flooding and drought also impacted agricultural activity within the District. As a result, BIA implemented several water infrastructure projects from

[2] The lesser long-nosed bat was delisted on May 18, 2018.

1915 to 1940. Despite these attempts, declining groundwater levels and deteriorating infrastructure substantially reduced agricultural production during the ensuing decades. In 2000, the CAP Link Pipeline was constructed to provide CAP water to the Farm. The subsequent rehabilitation of the Farm in 2007 allowed for up 861 acres to be put into production, including 41 acres designated for mesquite and fruit/nut trees. At the time of the rehabilitation, three fields (Fields 49, 50, and 51) were constructed within the current proposed project area. The remainder of the land within the proposed farm extension is fallow or has been grazed or used for wood gathering.

The SXCA was established to revive agriculture in the District and to operate the Farm. Members of the District who own allotted farm land and who agree to lease their interest in the land to SXCA are eligible for membership. In exchange for leasing their land, members are entitled to a proportionate share of the net profits for the term of the lease. Overall, the existing, 1,046-acre Farm is comprised of 55 allotments plus tribal land. It is managed by a Farm Manager hired by the SXCA's Board of Directors.

On April 28, 2017, BIA issued a notice of intent to grant a new 5-year lease of tribal and allotted land to the SXCA, retroactively extending the term of the current lease, which expired in October 2016. The original 25-year lease was extended for two years in October 2014, upon the payment of a one-time extension fee by the Farm. The new 5-year lease is needed to allow the Farm to continue operations and Reclamation to create permanent rights-of-way to support farm operations. A new long-term lease will need to be negotiated and executed for Reclamation to complete the work needed to expand the Farm and provide the landowners with longer-term rent payments determined by appraisal for both the existing and the expanded farm.

Ranching. Ranching within the District dates back to the 1700s. Since the mid-1800s, it has become an important source of income for local families. During the 1970s and early 1980s, the Farm "ran a cow-calf operation on the allotted lands east of Mission Road combined with irrigated pastures" (District & Uam Komalik Livestock Association, 2012). However, the District and Farm's livestock operation slowly declined with "the disappearance of reliable water sources, vandalism of water storage tanks, and theft of fences, windmills and livestock by non-tribal members" (District & Uam Komalik Livestock Association, 2012). In the early 1990s, livestock owners from the District formed the Uam Komalik Livestock Association. The Uam Komalik Livestock Association and the District have since developed a Range Management Plan that restricts grazing to Tribal lands within the western portion of the District. In doing so, they are working to exclude livestock from the east side of the I-19.

Riparian Restoration. Between 2001 and 2007, the District constructed two riparian restoration sites, totaling 14 acres, along the Santa Cruz River. The sites occur within an area that once supported an extensive mesquite bosque, deciduous riparian gallery forest, and cienega (Fabre & Cayla, 2009; PAG, 2004). Due to the groundwater depletion in the early twentieth century, the District lost the majority of its riparian habitat along the Santa Cruz River. In an effort to enhance and restore the riparian habitat within the reservation, the District adopted a Vision document in 1990 and a Land Use Plan in 1992 that developed a long-term plan for riparian restoration. Shortly thereafter, the District received a grant through the Arizona Water

Protection Fund to restore some of its lands along the Santa Cruz River. The riparian restoration sites that were established, as a result of the grant, utilize CAP water. The CAP water is delivered through a pipeline (AWPF Pipeline) that branches off of the CAP Link Pipeline.

The two riparian restoration sites fall immediately outside of the farm boundary; however, their access roads either cross or border the farm extension. Wa:k Hikdan is north of the project area, while Site 2 is 950-ft north of the ADOT flood control channel drop structure in the Santa Cruz River. The access road leading to Wa:k Hikdan borders the northwestern section of the farm extension, whereas the road to Site 2 crosses through the northern parcel of the farm extension.

3.2.2 Environmental Consequences

3.2.2.1 No Action

Existing land use patterns would continue into the foreseeable future. The Farm would be limited to its existing footprint of 1,046 acres and the additional 27 acres (Fields 49, 50, and 51) within the extension area. The AWSA requirement for the farm extension would remain unfulfilled. Residential and commercial development outside the District is expected to continue.

3.2.2.2 Proposed Action

Under the proposed action, the farm footprint would expand by 1,094 acres. Approximately 1,039 acres of low to high quality Sonoran Desertscrub and Sonoran Riparian Scrubland habitat would be converted to farmland and supporting infrastructure (e.g., irrigation conveyance system, roads, on-site drainage measures, and flood protection features). This would substantially increase the agricultural production of the Farm, as a whole. With the inclusion of the additional land, the number of acres that could be cultivated would increase from 820 acres (on the current farm) to 1,655 acres (a combined total for the existing farm and its extension). This represents a 50 percent increase. Within the extension footprint, the number of acres that could be cultivated would increase from 27 acres to 835 acres. An additional 43 acres of mitigation land would also be irrigated and could provide other harvesting opportunities.

With the additional lands, the Farm, as a whole, would include 2,140 acres. The total number of allotments within the expanded farm footprint is 81. The farm extension area consists of 26 allotments while the existing farm has 55 allotments. Tribal land is also found in both the existing farm footprint and the extension area. The extension area has 36.6 acres of tribal land.

Access to the farm extension would be restricted to Campus Drive and Papago Road. Campus Drive currently connects the existing farm and its expansion area. It would continue to be used for farming operations with the completion of the farm extension. Papago Road would provide a secondary access point to the farm extension.

The proposed action would not impact adjacent land use. Since the District and Uam Komalik Livestock Association's Range Management Plan restricts grazing to tribal lands within the western portion of the District, the proposed project would not impact any managed rangeland. The additional farm land would be fenced and gated to discourage livestock access and trespass. Community access to the District's two riparian restoration sites would also be maintained.

3.2.2.3 Cumulative Effects

With the completion of CAP Link Pipeline along with the rehabilitation and expansion of the Farm, 2,140 acres within the District would be served by an irrigation system that can deliver up to 52 cfs of CAP water. In the near future, the Tucson Reliability Division of the CAP would develop facilities within the District to provide CAP water during system outages. It is anticipated that the future facilities would be located within the vicinity of the farm extension.

Land use in the area may also be affected by two proposed projects. One is a new transportation corridor proposed by the Federal Highway Administration (FHWA) and Arizona Department of Transportation (ADOT). The new transportation corridor, referred to as the Sonoran Corridor, would connect I-19 and Interstate 10 (I-10) south of the Tucson International Airport. The project is currently undergoing environmental review with a Tier 1 Environmental Impact Statement (EIS) projected to be completed in 2020. The Tier 1 EIS would provide a roadmap for advancing the project to the next phase – a Tier 2 environmental study. The Tier 1 EIS is programmatic in nature, looking at a corridor level, where the Tier 2 EIS would evaluate a specific alignment within the selected corridor. The Sonoran Corridor project area, under the Tier 1 EIS, entirely encompasses the lands under consideration for the farm extension. However, the project's proposed alternatives completely avoid the farm extension area. The second project that would affect the land use in the area entails the construction and operation of a water delivery pipeline from the CAP to an existing Groundwater Savings Facility owned by the Farmers Investment Company (FICO). A portion of the pipeline would cross District lands near Pima Mine Road. Both projects would require allottee, District, and Tribal approval before BIA can grant easements for these projects.

As the result of past, present, and foreseeable future actions, the eastern portion of the District may be substantially developed within the near future.

3.3 Water Resources

3.3.1 Affected Environment

Surface Water. The principal natural surface drainage feature within the project area is the Santa Cruz River, which borders the eastern portion of the farm extension. Prior to 1900, the Santa Cruz River was perennial from its headwaters in the San Rafael Valley to the Town of Tubac (Wood, House & Pearthree, 1999). After the Town of Tubac, the surface flow did not reappear until about 2 miles south of Martinez Hill, producing a perennial reach of river and a marshy cienega (wetland) within what is now the project area. The surface flow of the River provided a reliable source of water for irrigation and supported the agricultural village and mission of San Xavier del Bac (Kupel, 1987).

Initial changes to the Santa Cruz River within the District occurred as early as 1849, when the north end of the District began being dissected by gullies that terminated in deep vertical head cuts (Betancourt, 1987). By the 1890s, large segments of the river were entrenched, including the segment through the project area. The head cutting began as a result of poorly engineered waterworks and high flows in the Santa Cruz River (Gregory et al., 2016).

Groundwater use by Tucson settlers in the late 19th century, in conjunction with regional arroyo entrenchment during that time, quickly depleted the perennial surface water supply (Gregory et al., 2016). The combination of head cut initiation, dams, and excavated ditches in the riverbed precipitated an irreversible incision of the Santa Cruz Channel (Gregory et al., 2016). As a result of the entrenchment, the Santa Cruz River evolved from an ill-defined arroyo with a broad active floodplain and perennial surface flow in some areas to a deeply incised, ephemeral channel. Perennial flows ceased in the late 1930s as a result of many diversions and groundwater pumping (Wood, House, & Pearthree, 1999). Today, most of the Santa Cruz River and its tributaries are ephemeral and flow only in response to storm runoff.

Surface drainage in the project area flows south to north including within the Santa Cruz River and the West Branch of the Santa Cruz River. The reach of the Santa Cruz River that is within the project area has a wide channel (175-ft to 2,000-ft) and a high capacity (a 200 year flood of 42,300 cfs would not overtop the bank). Consequently, floodwaters do not generally threaten the lands within the project area. The river threat is primarily from bank erosion and the lateral migration of the active channel. In October 1983, an extreme flood flow of approximately 45,000 cfs promoted lateral migration of the channel that eroded large sections of the western bank of the Santa Cruz River. As a result of this flood and subsequent floods, approximately one mile of the western bank of the Santa Cruz River, opposite of Martinez Hill, has been stabilized with riprap or soil cement.

Ephemeral washes draining the piedmont of the Sierrita Mountains and Black Mountain carry substantial amounts of runoff to the project area by draining into the entrenched West Branch of the Santa Cruz River. The flood flows from the West Branch of the Santa Cruz River (that are east of I-19) are then directed through the ADOT flood channel and are discharged into the Santa Cruz River.

Groundwater. The District lies within the 3,866 square-mile Tucson Active Management Area (AMA). Designated under the Arizona Groundwater Management Code, the statutory goal of the AMA is to reduce overdraft and attain safe yield of groundwater supplies by 2025.

The Tucson AMA consists of two hydrogeologic sub basins: the northern part of the Upper Santa Cruz Valley Sub Basin and the Avra Valley Sub Basin. The Upper Santa Cruz Valley Sub Basin is the primary source of groundwater in the District and is designated a Sole Source Aquifer by the U.S. Environmental Protection Agency (EPA) under Section 1424(e) of the Safe Drinking Water Act.[3]

Sustained groundwater mining in the Upper Santa Cruz Valley Sub Basin has had adverse consequences for the District. Since 1940, maximum groundwater level declines in the Tucson AMA have ranged from 200-ft in the Tucson area to 150-ft in the vicinity of the ASARCO mine

[3] The Sole Source Aquifer program was created to protect drinking water supplies in the areas with few or no alternative sources to groundwater resources. EPA review is required for any federally funded proposal that could affect a designed sole-source aquifer.

well field near Sahuarita (Arizona Department of Water Resources [ADWR], 1999), reflecting severe overdraft of the regional aquifer from agricultural, mining, and urban pumpage (Kupel, 1987).

The regional groundwater flow pattern is from the margins of the Upper Santa Cruz Valley Sub Basin toward the San Cruz River and beneath the River from south to the north-northwest through basin-fill alluvial deposits. Local deviation from the general flow pattern occurs in the southeastern portion of the District where groundwater flows toward and into the ASARCO well field cone of depression. An additional deviation results from the Pima Mine Road (PMR) recharge facility's groundwater mound, which trends west and northwest below the Santa Cruz River. The permitted maximum recharge capacity for PMR is 30,000 af per year. Natural recharge in the project area is dominated primarily by percolation through the bed of the Santa Cruz River. The Farm as well as the riparian restoration sites along the Santa Cruz River also provide indirect recharge within the northeastern portion of the District.

Historically, groundwater depletion coupled with the poor casing condition of many older wells significantly reduced the production capacity of the wells found within the existing farm. With the importation of CAP water, the Farm's reliance on groundwater supplies substantially reduced. As a result, the Farm disconnected electrical service to their wells to reduce their operating costs. In the vicinity of the farm extension between the Santa Cruz River and I-19, there are 11 wells. None of these wells are currently capable of providing water.

Groundwater levels have been rising within the Tucson AMA at a rate of 4 to 5-ft per year; the rise is attributed to (1) entities using CAP water in lieu of groundwater, (2) entities recharging the aquifer with CAP water, and (3) agricultural return flows associated with the Farm (N. Lehman, pers. comm., August 20, 2018). As a result, the depth to groundwater within the project area, as of December 2016, is approximately 42 to 85-ft (N. Lehman, pers. comm., October 19, 2018).

CAP Water. The primary source of water for irrigation is imported through the CAP. CAP water is a mixture of water from the Colorado River, Bill Williams River, and Agua Fria River; however, the Colorado River is the principal source. Water supplied through the CAP is of adequate quality for irrigation and meets all primary nonmicrobial drinking water standards under the Safe Drinking Water Act.

Two standards are widely used to evaluate water quality for irrigation: salinity, and sodium adsorption ration (SAR). Salinity refers to the presence of soluble salts, such as calcium, magnesium, sodium, sulfate, chloride, and bicarbonate, within the water. It is commonly expressed as total dissolved solids (TDS). CAP water tested at the San Xavier Pumping Plant between January and August of 2018 had a TDS value that ranged between 610 to 660 milligrams per liter (mg/L; CAWCD, 2018). In comparison, the local groundwater tested by the District within the project area, between 2016 and 2017, had a TDS value that ranged

from 320 to 630 mg/L (District, 2016-2017).[4] Most crops can tolerate TDS levels in irrigation water around 1,000 mg/L without experiencing significant yield reduction, but increased management is required to ensure that any salt buildup in soils is leached below the root zone (Westland Resource, 2002).

Irrigation water containing large amounts of sodium is of special concern due to sodium's effects on the soil. SAR is a measure of the ratio of sodium to calcium and magnesium in solution. High SAR values will reduce the rate of infiltration of the irrigation water. If the infiltration rate is sufficiently reduced, it may become difficult to replace soil water for plant growth and surface runoff may become a problem (Reclamation, 2004). A SAR value of less than 6 indicates a slight to moderate degree of restriction on water use for irrigation. Using water quality data from a July 12, 2018 sampling, CAP water measured at the San Xavier Pumping Plant has a SAR of 2.1 (N. Lehman, pers. comm., September 20, 2018).

3.3.2 Environmental Consequences

3.3.2.1 No Action

No substantial changes in groundwater or surface water conditions are anticipated in the short-term. In the long-term, conservation and application of CAP water for irrigation and recharge, both on and off the District, will continue to reverse the groundwater declines within the District. The portion of the District's CAP water allocation that is in excess to the needs of the Farm would be available for other uses granted by the AWSA. Existing flood patterns and inundation frequencies would prevail into the foreseeable future.

3.3.2.2 Proposed Action

Surface Water. The main stem, West Branch of the Santa Cruz River and the ADOT flood channel are considered jurisdictional under the Clean Water Act. The proposed action, specifically the armoring of the western bank of the Santa Cruz River and the road crossings over the West Branch of the Santa Cruz River and the ADOT flood channel, would result in a discharge of dredge and fill material within the waters of the United States (WOTUS). Both activities are unavoidable, so they have been designed to minimize adverse effects on the WOTUS. Under the proposed action, Reclamation would protect three areas along the Santa Cruz River (Figure 3). If all three areas are armored with riprap, this would result in approximately 26,855 cubic yards (cy) of dredge and 59,412 cy of fill. The degree of impact to the River could change as the design progresses; however, it is anticipated that it would only decrease with the other approaches under consideration. Another aspect of the proposed project that would result in dredge and fill within the WOTUS is the installation of rock chutes. The rock chutes would result in approximately 710 cy of dredge and would require 90 cy of fill within the WOTUS. The road crossing over the ADOT flood channel would also result in 210 cy of dredge and 80 cy of fill, while the road crossing over the West Branch of the Santa Cruz River would produce 360 cy of dredge and require 215 cy of fill. The construction proposed within the WOTUS would require compliance with Section 404 and 401 of the Clean Water Act. Any unavoidable impacts to the WOTUS would require compensatory mitigation.

[4] The Safe Drinking Act sets a secondary standard of 500 mg/L. Secondary standards are nonenforceable guidelines that 0 mg/L of TDS is generally considered y comparison, ocean water carries an average TDS concentration of 35,000 mg/L.

Berms would be installed along portions of the West Branch of the Santa Cruz River and the main stem to protect the Farm's infrastructure and crops from flood damage. The perimeter berm along the Santa Cruz River would also prevent runoff from cascading over the eroded river bank and contributing to head cutting issues. Construction of the berm along the West Branch of the Santa Cruz River would prevent floodwaters, up to and including a 100-year event, from inundating fields and roads within the farm extension. With a 100-year flood, the berm would result in a minor expansion of the inundation zone to the west. However, the overall effect to this drainage from the berm would be a deepening of the channel. The berm would not impede the rain runoff from the farm extension to the West Branch of the Santa Cruz River. On-site drainage would be routed, using the natural slope of the land, through shallow overflow ditches. Overflow would empty into either the West Branch of the Santa Cruz River, the ADOT flood channel, or Santa Cruz River. Where possible, on-site drainage would also be routed through mitigation areas.

The bank protection areas would also reduce the risk of property loss. By armoring the bank, it would protect the farm's infrastructure from potential river encroachment.

CAP Water. The crops proposed for the farm extension can tolerate the TDS levels of the irrigation water. Based on the SAR value of the CAP water, the rate of infiltration of the irrigation water within the farm extension may be slightly restrictive. To ensure that any salt buildup in the soil is leached below the root zone, the Farm would implement a salt management plan for the area.

Groundwater. A portion of the irrigation application in excess of evapotranspiration[5] would percolate through the soil and provide recharge to the local groundwater aquifer. For agricultural land in the Tucson AMA, incidental recharge is estimated to be about 25 percent of the water applied (Mason & Hipke, 2013). Water quality in the deeper, regional aquifer from which drinking water is supplied would eventually be affected by localized increases in TDS and sulfate. However, substantial changes in groundwater quality would not be anticipated under the proposed action. No exceedance of Arizona Aquifer Water Quality Standards or Federal primary drinking water standards for groundwater is expected.

The percolation of irrigation water may create localized mounding of perched groundwater associated with impervious layers of clay beneath a small portion of the Farm. The groundwater quality of this perched water table would likely exceed that of CAP water (i.e. higher levels of TDS and sulfate as compared to water sampled from the regional aquifer). Additionally, the perching of shallow water above these restrictive layers of soil could result in localized waterlogging, requiring the installation of agricultural drains. Peizometers may be needed in the future to assess long-term water level trends, the potential for waterlogging, and the need for agricultural drains.

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[5] Evapotranspiration is the process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants. Transpiration is the process where plants absorb water through their roots and then give off water vapor through pores in their leaves.

Since the wells found within the farm extension footprint are not capable of producing water, five wells (SX-6, SX-10A, Core 1, Core 2A, and O1A-4) would be abandoned and capped. The remaining six wells would be used to monitor groundwater levels within the area. The application of CAP water for irrigation is expected to reverse groundwater declines within the immediate area.

3.3.2.3 Cumulative Effects

Higher groundwater levels in the northeastern portion of the District would result from deep percolation of CAP water used for irrigation and the indirect recharge associated with the District's riparian restoration sites. Incidental and direct recharge within the District would be incremental to other nearby recharge sources utilizing CAP water, such as the Pima Mine Road Recharge Facility operated by the City of Tucson. The proposed delivery of CAP water to FICO Pecan Orchard Groundwater Saving Facility would also provide indirect recharge. As a result of the recharge from these sources, a groundwater mound would likely develop beneath the eastern portion of the District.

The TDS concentration of groundwater underlying the District is generally less than 650 mg/L. Direct and incidental recharge with CAP water would result in slight to moderate increases in TDS concentrations locally.

The Tucson Reliability Division of the CAP would develop facilities to deliver CAP water to the District during annual CAP maintenance outages. Within the District, a recharge and recovery system is envisioned, but the specifics have yet to be determined. The recharge and recovery system would allow the District to use a portion of their CAP water supply for long-term groundwater recharge. The recharge with CAP water would have a localized, additive effect on groundwater quality and quantity. Additional NEPA compliance would be required to evaluate the potential impacts of the long-term recharge with CAP water once plans are formulated for this project. In the interim, the Farm would plan their agricultural activities around the annual CAP maintenance outage.

3.3.3 Conservation and Mitigation Measures

The following measures would be implemented to reduce impacts on water resources:

- Construction materials would not be stockpiled in areas where they can be washed away by high water or storm flows.
- The construction contractor's petroleum product storage would be located at least 20-ft from storm water channels, washes, and rivers. The petroleum storage areas would be lined and diked to permit safe containment of leaks and spills.
- To manage the salts within the crop's root zone, the Farm would implement a salt management plan for the farm extension.

3.4 Geology and Soils

3.4.1 Affected Environment

Geology and Topography. The farm extension lies within the historic floodplain of the Santa Cruz River. Channel cutting over the last 100 years has entrenched the Santa Cruz River in a deep arroyo with wall heights of 5 to 30-ft and channel widths of 175 to 2,000-ft. Within the project area, the floodplain is smooth and broad, gently sloping south to north with an overall slope of less than one percent. The change in elevation across the farm is about 81 ft, ranging from 2,605 feet above mean sea level at the southern end to 2,524 feet above mean sea level in the north.

Soils. The Soil Survey of Tucson-Avra Valley Area, Arizona (Soil Conservation Service, 1972) shows that the soils of the lowest terrace or floodplain are composed primarily of Grabe Loam, Pima Silty Clay Loam, and Comoro Loam series. These soil series have a Capability Class I ranking. Capability Class I soils have few restrictions that limit their use for irrigation. In general, these soil series are deep, well drained, nearly level soils with moderate to moderately slow permeability and high available water holding capacity.

Soils of the upper terrace are primarily Mohave Sandy Loam with inclusions of Brazito Sandy Loam and class 6 gullied lands. The Mohave sandy loam has a Capability Class II ranking. It is well drained, gently sloping soil with moderate permeability, good water holding capacity, and moderate water erosion hazard. Alfalfa yields on the Mohave series average 7 tons per acre. The Brazito series occurs on the steeper drainage way slopes. It has lower water holding capacity and alfalfa yields of 5 tons per acre.

Reclamation (2004) prepared a land classification report that characterized and delineated lands within the project area that are capable of sustained agricultural productivity under irrigation. Three major land characteristics (soil, topography, and drainage) were evaluated along with farm budgets for alfalfa and watermelon to determine if the lands are arable. Arable lands are those that when farmed, in adequate size units for the prevailing climatic and economic setting and provided with the necessary irrigation development, will (1) generate sufficient income under commercial irrigation to pay all farm production expenses, (2) provide a reasonable return to labor, management and capital, and (3) will at least pay the operation, maintenance and replacement costs of the associated project facilities. All the agricultural land within the farm extension was considered arable with either a Class 1 (well-suited for irrigation) or Class 2 (moderately well-suited for irrigation) rating (Reclamation, 2004). Of the land evaluated, 56.5 acres do not meet the specifications for arable lands (Reclamation, 2004). These lands are referred to as Class 6 and include gullied land and rough drainage ways subject to flooding.

As a part of the land classification process, trace element concentrations within the soils were evaluated to determine if elemental concentrations are higher than common levels found within the soils of the Western United States. This analysis is important because elements of higher concentrations, in the soluble form, may be toxic to plant growth or may result in concentrations in irrigation return flows that may be toxic or hazardous. Of the 40 elements studied, only copper had levels that exceeded the common range for soils in the Western United States.

A concentration of 106 milligram/kilogram (mg/kg) was found within one composite sample taken from within the project area (Reclamation, 2004). This concentration is slightly higher than the proposed tolerable amount of 100 mg/kg (Pais and Jones, 1997). The symptoms of excessive copper are iron chlorosis and root growth damage. The effect of copper toxicity generally applies to sensitive crops, such as cereal grains, legumes, and citrus seedlings.

Sinkholes form in alluvial deposits along the floodplain of the Santa Cruz River and were first described in the area during the turn of the century. Based on geological mapping of the sinkholes and depressions within the project area, there are 46 sinkholes or head cutting arroyos that would need to be addressed. Most of the sinkholes or head cutting arroyos to be mitigated are located along the perimeter of the Farm. Only eight sinkholes or head cutting arroyos are located within the farm extension boundary.

3.4.2 Environmental Consequences

3.4.2.1 No Action

No substantial change from existing conditions would be expected in the foreseeable future.

3.4.2.2 Proposed Action

Geology and Topography. Topographic elements of the Farm would be affected to a minor extent by construction of flood control structures and land leveling. No effect to geologic resources would occur.

Soils. Land leveling of flood irrigation fields and the construction of the irrigation conveyance system, roads, on-site drainage features and flood protection structures are integral features of the farm extension project. Most of the earthen material needed for road and berm construction would be taken from adjacent agricultural fields. Specifically, the soil displaced during the land leveling process for the fields would be used as borrow material. All material excavated from the bank protection sites would be used to construct their compacted fill slopes. Otherwise, earthen material would be imported from an approved borrow source.

Incorporation of level basin flood irrigation would require leveling approximately 115 acres.[6] The remaining (center pivot) fields would require minor cut and fill finishing. Land leveling would have a minor, short-term effect on the chemical and physical properties of the soil. Changes in soil fertility and microbial biomass are possible, particularly in locations where relatively deep cuts are made (Brye K.R., et al. 2003). Soil quality and productivity would improve with the addition of organic matter and soil amendments. The biological properties of the soil would likely continue to change and equilibrate within a few growing seasons to the new soil conditions created by the land leveling and to subsequent cropping systems and soil management practices. The erosion potential of soils would decrease as a result of slope control and greater uniformity of the land surface.

[6] Land leveling is the practice of creating a slight, but uniform slope across a field to provide more even distribution of water. Topsoil is mechanically removed from areas with relatively high elevation and deposited in spots with lower elevation.

The Class 1 and 2 soils have a moderate to high water-holding capacity, greater than 6 inches in the upper 4 ft of soil. This higher soil moisture capacity reduces the number of required irrigations and lowers the risk of moisture stress in crops. Water infiltration rates of farm soils are sufficient to permit high irrigation efficiency and limit the potential for waterlogged conditions within the root zone (Reclamation 2004).

With appropriate irrigation management, the TDS concentration of CAP water would not affect soil quality. Additionally, it is unlikely that the slightly higher copper concentration found within a limited portion of the project area would result in crop growth damage. This is because the concentration level is only slightly above the proposed tolerable level and because the other three composite samples taken were below 100 mg/kg.

Other ground disturbing activities associated with the extension include the construction of the irrigation conveyance system, roads, on-site drainage measures and flood protection features. The irrigation conveyance system, roads, on-site drainage measures, and flood protection features would directly affect approximately 186 acres within and outside of the farm extension boundary. Temporary disturbance associated with contractor use areas would impact 44.5 acres within the farm boundary.

The project would have a long-term beneficial effect on soil conservation within the area. The on-site drainage and flood protection features would facilitate improved drainage and reduce the overall flood threat.

Sinkholes within the project area can be detriment to farming activities and construction. Therefore, sinkhole remediation would be required for all lands that would be farmed, contain irrigation infrastructure or are subject to fencing, on-site drainage measures and flood protection. The remediation process is imperative for improving the land, preventing the waste of irrigation water and avoiding further erosion. The process for doing so involves excavation, water testing, backfilling, and compaction. Borrow material would be used where excavated earthen materials are not suitable for use or of insufficient quantity.

3.4.2.3 Cumulative Effects

As the result of past, present, and reasonably foreseeable future actions, the eastern portion of the District would be incrementally developed. This would result in considerable ground disturbance within this portion of the District.

3.4.3 Conservation and Mitigation Measures

The following measures would be implemented to reduce impacts to the soils:

- Best management practices (BMPs) would be employed during construction to control dust (see Section 3.7.3).
- Various BMPs would be employed by the Farm to reduce dust emissions associated with tillage, harvesting, and lands not cultivated (see Section 3.7.3).

3.5 Biological Resources

3.5.1 Affected Environment

Vegetation. The project area encompasses Sonoran Desertscrub and Sonoran Riparian Scrubland habitat (Brown, 1994). The lands that would be developed primarily occur within Sonoran Desertscrub habitat. The Arizona Upland subdivision of the Sonoran Desertscrub is the dominant vegetative community within the project area and the lands are characterized by the paloverde-cacti-mixed scrub series (Brown, ed. 1994). The primary plant species are velvet mesquite (*Prosopis velutina*), gray thorn (*Zizyphus obtusifolia*), wolfberry (*Lycium berlandieri*), triangle-leaf bursage (*Ambrosia deltoidea*), saltbush (*Atriplex* spp.), and the occasional ironwood (*Olneya tesota*), catclaw acacia (*Acacia greggii*), foothill palo verde (*Cercidium microphyllum*), barrel cactus (*Ferocactus* spp.), and various cholla species (*Cylindropuntia* spp.). The habitat has been highly disturbed within the farm extension footprint since the early 1800s due to wood harvesting, grazing, prior agricultural activity, and groundwater pumping. As a direct result, the plant diversity and density is low within the farm extension footprint, with the exception of two areas. The prior habitat disturbances have also contributed to a proliferation of tumbleweed (*Salsola* spp.), Palmer amaranth (*Amaranthus palmeri*), and many non-native grasses. More densely vegetated habitat exists just south of the ADOT flood channel where sheet flow currently pools and within an earthen lined gravity canal that once directed surface flows from the Santa Cruz River to the fields adjacent to the San Xavier Mission. Due to the entrenchment and ephemeral nature of the Santa Cruz River, the earthen lined gravity canal now only captures sheet flow. However, this has allowed for mesquite to flourish, and as a result a mature stand of mesquite exists within the confines of the canal. The vegetation to the east of the farm boundary along the high pressure line is mostly untouched.

Sonoran Riparian Scrubland is also found within the project area (Brown, 1994). Along the many desert washes, main stem, and West Branch of the Santa Cruz River, vegetation composition and structure overlap considerably with those of the surrounding desert uplands and consist primarily of small, xerophytic shrubs and trees. This drought tolerant community is commonly referred to as xeroriparian vegetation. Plants within the xeroriparian community include velvet mesquite, wolfberry, paloverde (*Cercidium* spp.), catclaw acacia, saltbush, and desert broom (*Baccharis sarathroides*). Overall, the drainages found within the project area are considered of moderate to low quality due to their lack of diversity and density.

The District's two riparian restoration sites fall immediately outside of the farm boundary, but one restoration site (Site 2) is within the construction boundary. These restoration sites are enhancing or restoring the riparian habitat found along the Santa Cruz River. The Sonoran Riparian Deciduous Forest/Woodland habitat (Brown, 1994) that characterizes the restoration sites consists primarily of Fremont cottonwood (*Populus fremontii*), velvet mesquite, screwbean mesquite (*Prosopis pubescens*), desert willow (*Chilopsis linearis*), netleaf hackberry (*Celtis reticulata*), and sacaton (*Sporobolus* spp.).

Wildlife. The project area supports a large variety of avian species and is home to numerous small and large mammal and herpetofaunal species (Appendix D). On occasion, horses and cattle are also known to graze within the project area.

The diversity of wildlife species is directly correlated to vegetation diversity and structure. Wildlife species diversity is greater in native and undisturbed vegetation than in disturbed habitats. Hence, the species diversity and density of the project area is lower than what is found within adjacent undisturbed habitat.

In October through December 2015, Reclamation surveyed the project area for burrowing owls (*Athene cunicularia*). Burrowing owls are a yearlong avian resident to the area that use holes dug by mammals or created by erosion, pipes, and spaces below concrete or other solid structures (AZGFD, 2009). They, as well as their nests, are protected under the Migratory Bird Treaty Act (MBTA). Though follow-up surveys are required prior to ground disturbance, the initial survey conducted provided insight into the extent of the species occupation within the area. The initial survey identified two adult burrowing owls, seven active burrows and 46 potentially active burrows.

3.5.2 Environmental Consequences

3.5.2.1 No Action

No substantial change from existing conditions would be expected in the foreseeable future. Only 27 acres (Fields 49, 50, and 51) would be actively cultivated while the remaining lands would not be disturbed, except by the occasional wood harvest or livestock grazing. Overall, the land would retain its vegetated cover and would continue to support its current wildlife population.

3.5.2.2 Proposed Action

Vegetation. In general, impacts to vegetation would be adverse. Approximately 1,039 acres of low to high quality Sonoran Desertscrub and Sonoran Riparian Scrubland habitat would be cleared for the farm fields, irrigation conveyance system, roads, on-site drainage measures, flood protection features associated with the farm extension. This figure does not include the 27 acres already in production. Of the 1,039 acres that would be cleared, approximately 10 acres of high quality habitat and 1,029 acres of low to moderate habitat would be cleared. High quality habitat has a high plant diversity and density, while low quality habitat has more open and scrubby vegetation. Overall, the number of acres being disturbed represents 0.01 percent of the total number of acres that are within the District; thus, the long-time effects to the vegetation within the project area would be minor.

As part of the overall disturbance to the vegetative cover, approximately 20 acres of Sonoran Riparian Scrubland and open channel habitat would be impacted for the installation of road crossings, rock chutes, bank protection, and O&M roads. Of the 1.4 acres being impacted for the road crossings, 0.9 acres of densely vegetated Sonoran Riparian Scrubland habitat would be removed along the West Branch of the Santa Cruz River and the ADOT flood channel. The western bank of the Santa Cruz River is sparsely vegetated; thus, the vegetation disturbance to the Santa Cruz River for the rock chutes, bank protection areas, and their associated O&M roads would be limited.

During a 100-year flood, the berm adjacent to the West Branch of the Santa Cruz River would result in a minor but westerly expansion of the inundation zone. The existing vegetation along the inundation zone would benefit from this temporary ponding of floodwaters. Another

overall effect to the West Branch of the Santa Cruz River from the berm would be a deepening of the channel. Channel deepening would reduce overbank flooding, potentially resulting in reduced vegetative vigor, reduction in ground cover, and a subsequent reduction in canopy density.

Any area not designated for construction would be left untouched. This includes the mesquite bosque associated with an old earthen lined canal that is located in the northeastern corner of the farm extension boundary. Excluding the 60 acres that are designated as archaeological exclusion areas, the total number of acres within the farm extension boundary that would not be disturbed is estimated to be 169 acres. Besides not being disturbed by construction, these areas would benefit from the increased water table associated with agricultural recharge. A shallower water table would allow for increased vegetation growth.

SXCA is interested in maintaining their historic connection to the land. Thus, an additional 43 acres within the farm extension footprint would be supplementally planted with mesquite (velvet and screwbean) and other native plants traditionally harvested, like devil's claw, wolfberry, saltbush, and graythorn. The supplemental planting areas are located close to the Santa Cruz River and currently contain low quality habitat (Figure 4). With the additional plantings and the option to irrigate, the habitat quality would increase on these lands. They would also provide a more contiguous string of vegetation along the Santa Cruz River between the Wa:k Hikdan and Site 2. The supplemental planting areas would provide the Farm with harvesting opportunities, but they would also offset a portion of the habitat loss to the project. As a secondary effect, they would provide erosion control along the western bank of the Santa Cruz River.

Though the District's riparian restoration Site 2 is within the proposed construction boundary for this project, it would not be immediately impacted by construction activities. The low pressure line leading to Site 2 and the Wa:k Hikdan would be maintained as part of this project. The only potential impacts to the vegetation within these restoration sites would occur when the low pressure line is upgraded and/or buried. During this timeframe, water would not be available to the sites so the trees may become stressed.

Wildlife. The proposed project would result in adverse effects to wildlife resources. In general, wildlife resources would be adversely effected by the loss of 1,039 acres of habitat. Though the majority of these acres are of low to moderate quality, the land provides habitat for herpetofauna, small and large mammals, passerine birds, and raptors; all of which would be impacted to varying degrees. The primary effect of the project on wildlife resources would be the loss of small mammals and herpetofauna due to construction activities. Most avian species and medium sized to large mammals would be capable of avoiding the construction area. These species would likely be displaced into the surrounding habitat until the mitigation lands are established and/or the construction completes. Temporary noise-related disturbances associated with construction would also have a minor effect on wildlife. Direct and indirect effects to migratory birds and their habitats would be substantially reduced or avoided through the conservation practices described in Section 3.5.3 (under the first two bullets). For any direct effects to migratory bird species that cannot be avoided, a MBTA permit would be acquired.

The supplemental planting of native plants within the 43 acres set aside for mitigation would offset some of the impacts to wildlife habitat within the project area. The remaining farm fields (835 acres) would have a wildlife value since they would provide vegetated cover and/or foraging opportunities for wildlife. An additional 169 acres within the farm extension footprint would not be impacted; thus, this land would continue to support its associated wildlife.

3.5.2.3 Cumulative Effects

Past, present, and foreseeable future projects would result in the development of the eastern portion of the District. This would have an adverse cumulative effect on the vegetation and wildlife resources within the District. However, since the proposed action occupies approximately half of the area that would be impacted by development, the effects to vegetation and wildlife would not be significant. Though the proposed action would result in long-term adverse effects to biological resources, the mitigation measures identified for the project would offset a majority of those effects. It is also expected the other foreseeable future projects would implement mitigations measures to reduce their overall effect on biological resources.

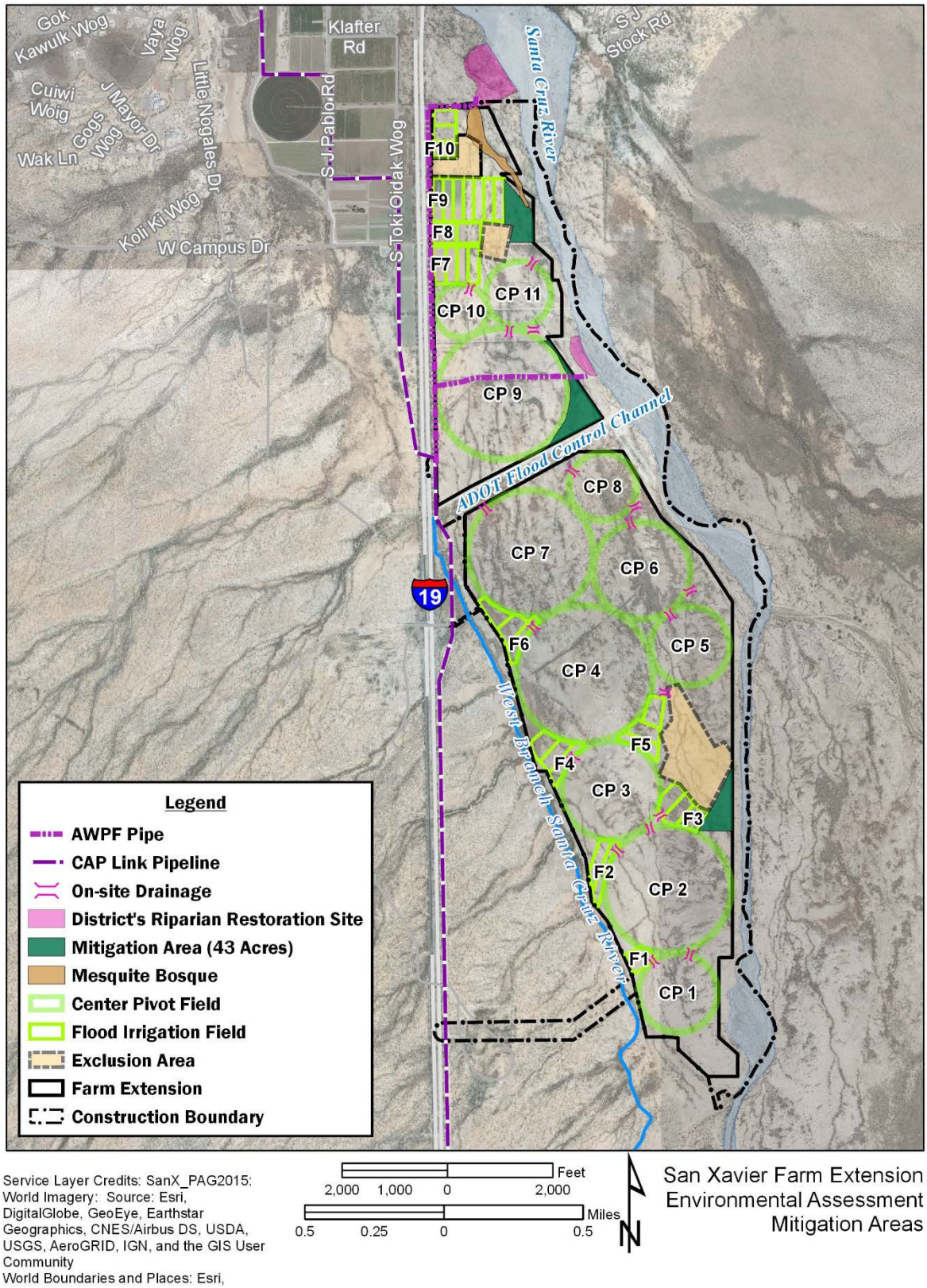
3.5.3 Conservation and Mitigation Measures

The following measures would be implemented to reduce impacts to biological resources:

- To ensure compliance with the MBTA, all vegetation scheduled to be disturbed between the dates of March 15 and August 31 that may contain active bird nests would be surveyed by a trained biologist immediately prior (within 24 hours) to being disturbed. If an active nest is discovered, vegetation clearing activities would not be allowed to proceed in the vicinity of the nest(s). No activities shall occur within an appropriate buffered distance from active nests until after the young birds have fledged from the nest. If an active nest is discovered, Reclamation would determine the appropriate buffered distance.
- A burrowing owl survey would be conducted at least 120 days before ground disturbing activities. If surveys are conducted in the fall or winter and occupied burrows or owls are found, Reclamation would implement the conservation measures identified in the burrowing owl clearance protocol (AZGFD, 2009) and would then resurvey the area 30 days prior to the ground disturbing activities. The same protocol would need to occur if surveys are conducted in the spring or summer and unoccupied burrows are discovered. However, if surveys are conducted in the spring or summer and occupied burrows or owls are found, a 35-meter (100-ft) radius buffer that excludes all heavy machinery and foot traffic would be set up around the active burrow entrances until the appropriate conservation action can be determined.
- Avoidance of impacts is a recognized form of mitigation. Several features of the project have been designed or located to avoid impacts to existing vegetation.
- Forty-three acres of mesquite and other native plants traditionally harvested by the Nation would be planted in three identified areas along the Santa Cruz River. No less than 70 percent of the total area planted would be in velvet and screwbean mesquite.
- Vegetation salvaged from the project area during subjugation would be available to tribal members of the District.

- All work in the immediate area would cease if any federally listed species are observed in the construction area. Reclamation and USFWS personnel would be notified immediately.
- Construction personnel would be instructed not to collect, disturb, or molest wildlife species.
- The contractor would be instructed to exercise care to preserve the natural landscape and conduct operations so as to prevent unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work.
- The Farm would employ Integrated Pest Management during the operation of the farm extension.

Figure 4. Supplemental Planting Areas Utilized As Mitigation



3.6 Cultural Resources

The cultural history and previous research of the area can be found in Gregory et al. (2016); Jones, Gregory, and Aguila (2018); and Schilling (2012).

3.6.1 Affected Environment

Reclamation has completed a Class III cultural resource inventory of the entire project area. In December of 2011 and January of 2012, Reclamation directed Archaeological Resources Consulting (ACS) to conduct pedestrian survey, magnetometer sampling, shovel testing, and limited non-site trenching of 1,150 acres of proposed new farm fields (Schilling 2012). In March and April of 2015, Reclamation directed ACS to complete a pedestrian survey of an additional 194 acres for pipelines that would link the proposed new farm fields to the CAP distribution line, as well as areas along the Santa Cruz River that might require bank protection (Gregory et al. 2016). In June and July of 2018, Reclamation directed ACS to complete a pedestrian survey for an additional 58 acres associated with a new access point for the proposed extension.

These investigations have identified 49 cultural resources within the project area. Table 3 lists these sites, their eligibility for inclusion in the National Register of Historic Places (NRHP), and mitigation measures should the proposed action be taken.

Table 3. Cultural Resources within the Project Area

Site Number	Site Type	Eligibility	Mitigation Measure
ACS 1	Prehistoric artifact scatter	Determined eligible (D)	Avoidance
ACS 2	Multi-component artifact scatter	Unknown	Avoidance
AZ BB:13:16(G)(ASM)	Prehistoric artifact scatter	Determined eligible (D)	Avoidance and fence site boundary prior to construction
AZ BB:13:16(H)(ASM)	Prehistoric artifact scatter with features(s)	Determined eligible (D)	Avoidance and fence site boundary prior to construction
AZ BB:13:165(ASM)	Prehistoric artifact scatter	Not eligible	No further work
AZ BB:13:167(ASM)	Prehistoric artifact scatter	Not eligible	No further work
AZ BB:13:169(ASM)	Prehistoric artifact scatter	Determined eligible (D)	Data recovery
AZ BB:13:170(ASM)	Historic period field house/homestead	Determined eligible (A, B, and/or D)	Avoidance and fence site boundary prior to construction
AZ BB:13:172(ASM)	Prehistoric artifact scatter	Determined eligible (D)	Data recovery
AZ BB:13:173(ASM)	Historic period homestead	Determined eligible (D)	Avoidance and fence site boundary prior to construction

Site Number	Site Type	Eligibility	Mitigation Measure
AZ BB:13:196(ASM)	Prehistoric artifact scatter	Determined eligible (D)	Avoidance and permanent site fencing
AZ BB:13:196(A)(ASM)	Prehistoric artifact scatter	Determined eligible (D)	Avoidance
AZ BB:13:199(ASM)	Multi-component artifact scatter	Determined eligible (D)	Data recovery
AZ BB:13:211(ASM)	Historic period artifact scatter with feature(s)	Determined eligible (A and D)	Avoidance
AZ BB:13:215(ASM)	Multi-component artifact scatter	Determined eligible (D); segment within project area noncontributing	No further work
AZ BB:13:716(ASM)	Multi-component artifact scatter	Determined eligible (D)	Data recovery
TO:SX:1(TON)	Multi-component artifact scatter	Not eligible	No further work
TO:SX:2(TON)	Multi-component artifact scatter	Unknown	Eligibility testing
TO:SX:3(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:4(TON)	Indeterminate lateral canal	Determined eligible (D)	Data recovery
TO:SX:5(TON)	Multi-component artifact scatter	Unknown	Eligibility testing
TO:SX:6(TON)	Historic period trash dump	Not eligible	No further work
TO:SX:7(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:8(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:9(TON)	Historic period trash dump	Not eligible	No further work
TO:SX:10(TON)	Historic period well with feature(s)	Not eligible	No further work
TO:SX:11(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:12(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:13(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:14(TON)	Prehistoric artifact scatter	Unknown	Data recovery
TO:SX:15(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:16(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:17(TON)	Prehistoric artifact scatter	Unknown	Assessment by a protohistoric specialist/consultant and hand stripping units to identify possible protohistoric features and/or deposits
TO:SX:18(TON)	Multi-component artifact scatter	Determined eligible (D)	Data recovery
TO:SX:19(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:20(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:21(TON)	Prehistoric rock feature	Determined eligible (D)	Data recovery
TO:SX:22(TON)	Historic period well with feature(s)	Not eligible	No further work
TO:SX:23(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing
TO:SX:24(TON)	Prehistoric artifact scatter	Unknown	Eligibility testing

Site Number	Site Type	Eligibility	Mitigation Measure
TO:SX:25(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:26(TON)	Prehistoric artifact scatter	Not eligible	No further work
TO:SX:27(TON)	Historic period utility line	Not eligible	No further work
TO:SX:28(TON)	Historic period utility line	Not eligible	No further work
TO:SX:29(TON)	Historic period lateral with feature(s)	Not eligible	No further work
TO:SX:30(TON)	Historic period trash dump	Not eligible	No further work
TO:SX:31(TON)	Multi-component artifact scatter	Unknown	Monitoring
TO:SX:32(TON)	Prehistoric artifact scatter	Determined eligible (D)	Avoidance
TO:SX:33(TON)	Prehistoric artifact scatter	Unknown	Avoidance

3.6.2 Environmental Consequences

3.6.2.1 No Action

Erosion, grazing, and unauthorized dumping of trash would continue in the proposed farm extension if no action is taken. These activities do affect cultural resources, especially erosion, but the effects are mostly limited to sites near sinkholes and the bank of the Santa Cruz River. Overall, effects to cultural resources would be minimal if no action is taken.

3.6.2.2 Proposed Action

The proposed action would have an adverse effect on 31 historic properties and sites for which NRHP eligibility is undetermined. In order to mitigate adverse effects resulting from the proposed action, Reclamation directed ACS to develop a historic properties treatment plan that provides specific recommendations for avoidance measures and monitoring, as well as eligibility testing and data recovery as mitigation for those archaeological sites where avoidance is not feasible (see Table 3). The proposed action would avoid 11 sites, one site would be monitored to ensure no significant cultural resource deposits are disturbed, 11 sites would require eligibility testing, and 8 sites would require data recovery.

Three of the historic properties within the project area (AZ BB:13:170[ASM], AZ BB:13:173[ASM], and AZ BB:13:196[ASM]) have been identified as Traditional Cultural Properties (TCP) and one isolated occurrence, a modern memorial, has been identified as a sacred site by the Nation. Additionally, the Hopi Tribe considers all prehistoric archaeological sites of their ancestors to be TCPs. While it is not possible to avoid all sites within the project area, Reclamation would avoid the three TCPs and memorial identified by the Nation.

Following consultation with the Tohono O'odham Tribal Historic Preservation Officer, BIA, the District, and the Hopi Tribe, Reclamation will develop a Memorandum of Agreement that addresses mitigation for the affected sites. Pursuant to 36 C.F.R. § 800.6(a)(1), Reclamation notified the Advisory Council on Historic Preservation (ACHP) of its determinations and the ACHP declined to participate in accordance with 36 C.F.R. § 800(a)(1)(iii).

3.6.2.3 Cumulative Effects

Cultural resources could be affected in the foreseeable future by grazing and the construction and operation of the Sonoran Corridor. Should these projects move forward, historic properties in the project areas would require mitigation (avoidance, archaeological testing, or data recovery).

3.6.3 Conservation and Mitigation Measures

The following measures would be implemented to reduce impacts to cultural resources:

- A Memorandum of Agreement that addresses mitigation for the affected cultural sites will be entered into prior to completing NEPA.
- A tribal monitor must be present during all field activities.
- If improvements to the main access road are required along Campus Drive, the portion of the road that bisects the exclusion area may not be excavated. Only fill material would be allowed in this instance in order to protect the TCP.
- Imported earthen material must come from an approved borrow source.

3.7 Air Quality

3.7.1 Affected Environment

Air quality is determined by the ambient concentrations of pollutants that are known to have detrimental effects on human health. Pursuant to the Clean Air Act (CAA), the EPA has established National Ambient Air Quality Standards (NAAQS) for six air pollutants: ozone, airborne particulate matter (PM_{10} and $PM_{2.5}$),[7] carbon monoxide (CO), sulfur dioxide, nitrogen dioxide, and lead. Areas of the country with air quality that does not meet the standards are designated "nonattainment areas" by the EPA. The nonattainment designation subjects an area to regulatory control of pollutant emissions so that attainment of the NAAQS can be achieved within a specified period. Areas that were in nonattainment, but are currently in compliance with NAAQS, are called maintenance areas.

Air quality planning within eastern Pima County, including the Tucson Air Planning Area (TAPA), is the responsibility of the Pima Association of Governments (PAG). The PAG coordinates with local agencies and the Arizona Department of Environmental Quality to address regional air quality issues. As the designated air quality planning body for eastern Pima County, the PAG develops regional air quality plans, conducts air quality conformity analysis as a function of transportation planning, and ensures air quality programs are in compliance with Federal, state, and local requirements. Local members of the PAG include but are not limited to the City of Tucson, Pima County, and the Nation. Pima County Department of Environmental Quality (PDEQ) monitors the levels of pollutants in the air throughout the region. The nearest air quality monitoring site to the project area is Rose Elementary, which is approximately 5.5 miles north of the farm extension. Despite that the District falls within Pima County, the EPA has CAA regulatory authority on the Nation's lands.

Currently, Pima County is in attainment for all six NAAQS (Pima County, 2018). However, the TAPA is within a Limited Maintenance Plan area for CO (EPA, 2018). As a maintenance area, the TAPA has (1) attained the NAAQS for CO, (2) demonstrated that the improvement is due to permanent and enforceable control measures, (3) implemented an approved maintenance plan,

[7] PM_{10} and $PM_{2.5}$ refers to airborne particulates less than 10 microns and 2.5 microns in diameter, respectively.

and (4) met other relevant requirements in the CAA (EPA, 2018). There has been no exceedances of the CO standard in TAPA from 1993 to the present, and a second 10-year CO Limited Maintenance Plan was approved by the EPA in 2009.

Carbon monoxide is a localized pollutant that disperses rapidly (PAG, n.d.). In Pima County, greater than 50 percent of CO emissions come from a combination of on-road and off-road motor vehicles (PAG, n.d.). Other sources of CO include aircrafts, trains and vegetation burning. Technological advances and the implementation of the following measures have helped maintain the average 8-hour concentration of CO well below the NAAQS in the TAPA (PAG, n.d.):

- Federal motor vehicle control program (tailpipe emission standards for new cars)
- State inspection and maintenance programs
- Since 1990, use of oxygenated fuels from September 30 to March 31 in Pima County

The quality of air in the TAPA is primarily affected by mobile (i.e. car and truck traffic), industrial, and construction-related sources. Despite regional improvements to air quality, CO, ozone, and particulate matter are of continuing concern. Urban growth and increases in traffic could result in higher concentrations of CO, O precursors (reactive organic gases [ROG]), $PM_{10,}$ and $PM_{2.5}$. The levels for nitrogen dioxide, sulfur dioxide, and lead,[8] as measured by the PDEQ, have remained consistently low for the last 20 years (PDEQ, 2018b). Agriculture is not a major source for most of these pollutants, the only exception being particulate matter.

According to PDEQ (2018b), "Particulate matter concentrations are often higher near unpaved roads, during localized activities such as construction, during extended dry periods, and when strong winds are present." Other sources for dust in the Tucson area include agricultural and vacant fields, smokestacks, and fires. In 1999, Pima County violated the PM_{10} standard set by the EPA as the result of wind-blown dust (PDEQ, 2018b). PDEQ has since developed a Natural Events Action Plan (NEAP) and relevant control measures in an effort to remain in attainment status and to protect the public's health and welfare when ambient levels of PM_{10} are high (PDEQ 2018b). Pima County also follows the Exceptional Events Rule instituted by EPA on November 21, 2008 for exceedances of the standard.

Most agricultural PM_{10} is in the form of fugitive dust[9] emitted from wind erosion and, to a lesser extent, on-field operations such as tilling and harvesting. Travel on unpaved farm roads is an additional source of PM_{10}. These activities can also result in $PM_{2.5}$ emissions. However, fugitive dust is a relatively small component of $PM_{2.5}$ emissions.

The EPA General Conformity Rule (GCR) will be applied to the project since it involves a Federal action in a designated maintenance area. Under the GCR, established under the CAA [Section 176(c)(4)], Federal actions must conform to the initiatives established in the applicable

[8] Pima County has no sources of lead of one ton or more. Thus, in accordance with the 2005 National Air Emissions Inventory from EPA, PDEQ only needed to monitor one location (Children's Park). The monitoring began in January 2012, and was discontinued May 2016, per approval from EPA, due to negligible levels of lead detected.

[9] Fugitive dust is a type of nonpoint source air pollution that generally arises from mechanical disturbance of soil, or other granular material, and entrainment of dust particles by the action of turbulent air currents, such as wind erosion.

State Implementation Plan. The GCR ensures that the actions taken by Federal agencies in nonattainment and maintenance areas meet national standards for air quality. Under the rule, any new project using Federal funds or requiring Federal approval must not cause or contribute to a worsening of air quality in areas that are designated nonattainment or maintenance areas. The GCR specifies certain emission levels, called de minimis levels, for each pollutant. The de minimis level is the minimum threshold at which conformity determinations must be made for pollutants in nonattainment and maintenance areas. For CO, the threshold at which a conformity determination must be performed (the de minimis level) is 100 tons per year (tpy; EPA, 2010).

3.7.2 Environmental Consequences

3.7.2.1 No Action

Without the additional lands, only 27 acres within the existing farm extension boundary would be actively cultivated or periodically disked to discourage weed growth into the foreseeable future. These activities would expose soils to agricultural wind, tillage, and harvest dust emissions. Vehicular traffic associated with the operation of these fields would also emit CO and fugitive dust. However, neither pollutant would exceed the de minimis level.

Without construction, the remaining acres of fallowed or undisturbed lands would continue to contribute to the windborne dust in the area. The empirical evidence from wind tunnel tests indicate that wind-derived fugitive dust emissions are more prevalent where desert soils have been destabilized by human activity or livestock. Under natural conditions, desert soils tend to form a mineral and organic crust that is somewhat resistant to wind erosion. Undisturbed soil that has formed a crust has a limited supply of available dust. When these areas are exposed to high winds, dust is sporadically released (Macpherson, Nickling, Gillies, and Etyemezian, 2008). On most soils, relatively high threshold wind speeds are required to cause particles to become suspended in measurable airborne concentrations (Macdougall and Uhl, 2002). PDEQ uses 15 miles per hour (mph) as the minimum threshold wind speed for calculating PM_{10} emission associated with wind events within the NEAP action area (PDEQ, 2001).

3.7.2.2 Proposed Action

The proposed action would result in CO and fugitive dust emissions. Activities that would contribute to these emissions include land preparation, construction activities, farming operations, and emissions from vehicles and equipment. Appendix E provides the air emission calculations and assumptions for both the construction of the farm extension and its subsequent operation. A summary of the emissions can be found in Table 4.

Table 4. Annual Emissions Estimate for the Farm Extension

	Pollutant Emissions (tons per year)*		
Activity	**CO**	**PM_{10}**	**$PM_{2.5}$**
Construction[1]	14.3	346.2	71.4
Farm Operations[2]	18.8	255.3	5.2

[1] Emissions associated with equipment/vehicular use, archaeological testing and recovery, grubbing and clearing of the land, unpaved road travel, and the construction of facilities.

[2] Emissions associated with tilling, harvesting, weeding, burning and wind erosion.

* Calculations account for incorporated BMPs

General construction activities, including archaeological testing and recovery, grubbing and clearing of the land, unpaved road travel, and the construction of facilities, would be phased over a 3-year period. The CO emissions associated with construction activities (14.3 tpy) are estimated to be far below the conformity threshold of 100 tpy. Therefore, a conformity determination for CO is not required. The annual PM_{10} emissions from the general construction activities are estimated to be at 346.2 tpy, while $PM_{2.5}$ emissions represent 71.4 tpy. These figures take into account construction BMPs that would be employed to reduce the emissions associated with the project (see Section 3.7.3). With the implementation of BMPs, temporary construction activities would result in short-term, elevated levels of CO, PM_{10} and $PM_{2.5}$. However, no air quality permits are required for the construction of the Farm, because a farm is not considered a stationary source under the CAA.

The farm operations associated within the extension area for travel on unpaved roads, wind erosion, tilling, harvesting, and burning would contribute to the CO and fugitive dust emissions of the area. Approximately 835 acres of the 1,094 acre farm extension would be subject to recurrent cultivation practices. An additional 43 acres would be supplementally planted with native vegetation within the first year but would not be subject to repeat mechanical tilling. Twenty-five miles of unpaved roads that are restricted to local traffic at reduced speeds would be utilized. The remainder of the farm extension area would consist of field borders and vacant land, most of which is partly vegetated.

The CO emissions associated with the operation of the farm extension would be approximately 18.8 tpy, well below the de minimis threshold. The total annual PM_{10} emissions from tillage, harvesting, burning, vehicle/equipment travel, and wind are estimated to be 503.6 tpy while $PM_{2.5}$ emissions would be 7.7 tpy. As a result, farming operations within the extension area would have a long-term, adverse effect on the local air quality. No air quality permits are required for farm operations but the Farm has committed to implementing BMPs to help reduce or contain agriculturally related dust emissions (see Section 3.7.3). With the implementation of BMPs, the fugitive dust emissions for the farm extension would substantially reduce (255.3 tpy for PM_{10} and 5.2 tpy for $PM_{2.5}$). The particulate emissions associated with the farm extension would directly affect Pima County's emission levels.

3.7.2.3 Cumulative Effects

Emissions from the proposed action would be incremental and additive to the CO and fugitive dust emissions associate with the current Farm and any future land use development near the project area. Air quality impacts from future foreseeable projects would occur during construction and in some cases the operation of the project.

Tailpipe emissions and fugitive dust from the construction of these projects are anticipated to have a short-term, minor adverse impact to the local air quality. Each new project would be responsible for implementing dust control measures during construction, pursuant to EPA requirements and agency BMPs.

Only two future foreseeable projects have the potential to effect air quality during their operation – the Sonoran Corridor and the Farm. The Sonoran Corridor, a transportation project currently in the Tier 1 Planning Phase, could contribute to a reduction in CO emissions by

shifting traffic away from the currently congested sections of I-19 and I-10. However, if the freight truck volume increases, the project could increase the CO emissions within the area. To comply with the CAA, the FHWA and ADOT will ensure that the proposed transportation corridor conforms to the State Implementation Plan and is consistent with ADOT's Long Range Transportation Plan and applicable Metropolitan Transportation Improvement Programs and the 2045 Regional Mobility and Accessibility Plan. The Farm would contribute to elevated fugitive dust emissions within the District and Pima County; however, it would continue to employ BMPs to reduce those emissions.

3.7.3 Conservation and Mitigation Measures

During construction for the farm extension, the following BMPs would be implemented:

- All active construction areas, including on-site haul roads, contractor use areas, and open stockpiles, would be effectively stabilized against dust emissions by applying water, chemical suppressants, and/or other reasonable measures.
- Land disturbances would be limited to areas needed for construction.
- Speeds of less than 25 mph would be maintained within the construction footprint.
- Trucks hauling soil or sediment would be covered.
- The contractor would not be permitted to dispose of construction materials by burning.
- The contractor would not operate equipment and vehicles that show excessive exhaust emissions until corrective repairs or adjustments are made to reduce such emissions to acceptable levels. Unnecessary idling of diesel-powered construction equipment would be minimized.

The Farm proposes the following wide range of BMPs for controlling or reducing the dust emissions associated with farm operations:

- During stagnant air conditions, tilling would not occur on high pollution advisory days.
- Tractor operations, such as tillage, cultivation, planting, or harvesting, would be combined whenever possible.
- No tillage or soil preparation would occur when the wind speed exceeds 25 mph.
- Use of cover or multi-year crops would be maximized. Otherwise, a sequential cropping method would be employed.
- Public access would be restricted within the extension area.
- The speed limit on farm roads would not exceed 25 mph.
- The vegetative cover on non-cropland would be maintained to the maximize extent practicable.
- Plant residues would be left on the soil surface between crop rotations.
- Adequate soil moisture would be maintained during tillage and following planting.

3.8 Socioeconomic Resources

3.8.1 Affected Environment

The primary components of the District's economy is government, business, and agriculture. The government (District and Nation) is a major employer providing opportunities in management, public administration, and education. Business enterprises include Desert Diamond Casino and the San Xavier Industrial Park. Indian arts and crafts shops located in the San Xavier Plaza next to the San Xavier Mission Del Bac contribute to the economic health of the District. Livestock production and farming provide other economic opportunities within the District. Many community members also work for businesses in Tucson.

The District labor force is estimated to be 1,615 people based on the 2012-2016 American Community Survey. Table 5 shows the estimated median household, family, and per capita income in the District for 2012-2016. Overall, the District's household, family and per capita income is substantially lower than that of Pima County and Arizona. The percentage of individuals and families living below the poverty level in the District is double that of the Pima County and the State of Arizona.

Table 5. Economic Characteristics of the District

Attribute	San Xavier District	Pima County	Arizona
Population	2,181	1,003,338	6,728,577
Median Household Income	$36,250	$46,764	$51,340
Median Family Income	$38,482	$58,613	$61,001
Per Capita Income	$12,567	$26,204	$26,686
Families Below Poverty Level	28.8%	13.2%	12.9%
Individuals below Poverty Line	32.5%	19.1%	17.7%

Source: 2012-2016 American Community Survey 5 Year Estimates (U.S. Census Bureau, 2018)

The Farm's current revenue from the sale of crops does not cover annual operating costs, requiring supplemental funds provided by Reclamation and the Nation under SAWRSA to sustain the Farm. The absence of a net profit has precluded association members from receiving annual payments and has resulted in the Farm's debt obligations increasing.

3.8.2 Environmental Consequences

3.8.2.1 No Action

Existing conditions would prevail into the foreseeable future. However, as a result of the GCE (2016) assessment, the Farm has refined it operational practices. With a shift in operational practices, the Farm's revenues are projected to improve.

3.8.2.2 Proposed Action

As indicated in GCE (2016), "the expansion is anticipated to provide the Farm with opportunities for improved operational efficiencies, greater profit and an improved and strengthened business presence in southeastern Arizona." This outcome is anticipated due to recent shifts in operational practices on the Farm that have resulted from the GCE (2016) assessment.

With the additional lands, the Farm's active commercial crop production would increase from approximately 820 acres to 1,655 acres (this figure does not include mitigation lands associated with the extension or the tree plantation within the existing Farm). Another 43 acres would be supplementally planted with native vegetation from which additional income could be generated from the sale of mesquite flour or the collection of native plant material.

Of the 861 acres currently being cultivated on the existing farm, approximately 750 acres are being used for alfalfa and grass production. SXCA anticipates that 720 acres within the extension area would be dedicated to alfalfa. Thus, "development of the expansion lands will [nearly] double the alfalfa acreage in production, which increases the opportunities of the Farm to improve profitability by bringing in additional products for sale" (GCE, 2016). Utilizing the improved all-natural production method described in GCE (2016), the Farm could produce an alfalfa yield of 6.75 tons per acre. This is about 18 percent higher than the Farm's average alfalfa yield between 2010 and 2014. During this timeframe, the average alfalfa yield was about 5.7 to 5.8 tons per acre (GCE, 2016).

The traditional crop enterprise is an expensive but culturally important element of the Farm. Should the enterprise not be able to sustain itself, the larger alfalfa enterprise could subsidize the costs associated with it.

Since the Farm would primarily be focused on a single crop for over 84 percent of the land in production, a revised business plan has been established that addresses the production and marketing of the alfalfa crop. The business strategy for the traditional/vegetable farm would utilize existing market arrangements.

An anticipated income from the alfalfa production would be projected by the Farm each year. The income would be estimated based on a commercial crop budget. Below is an example crop budget established by GCE (2016). The information used to develop the crop budget was provided by the University of Arizona, specialists on GCE study team, research studies, and the Farm Manager. A number of factors were used to determine the crop budget, including estimated product prices and yields, operating costs, machinery costs, management services, and rental payments (see Appendix F). The budget takes into account all production costs to produce an acre of alfalfa except for the cost of water. The prices expressed are at the 2014-2015 price level. Per the crop budget, it would cost $331.24 to establish one acre of alfalfa. Once the stand is established, it would cost $784.47 to produce one acre of alfalfa. One acre of alfalfa has a gross revenue of $1,424.25, so the net return on that one acre would be $639.78. The total net revenue would then need to be further reduced to account for the annual operation, maintenance and replacement costs for the irrigation system and any production expenses that may be over that of the industry. Factors such as changes in crop yield, crop mix, market conditions, and operating costs (including wages) would influence actual profit margins.

The farm extension would stimulate economic growth and may provide additional employment opportunities within the District. Under the new proposed lease agreement, allottees who have leased their interest in land to the SXCA are entitled to annual rent payments and a proportionate share in the net profits; therefore, the Farm would generate income for cooperative members.

3.8.2.3 Cumulative Effects

Rental payments, profit sharing and job opportunities would be additional to other income streams within the District.

3.9 Indian Trust Assets

3.9.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in assets held in trust by the United States for the benefit of federally recognized Indian Tribes or individual tribal members. The United States, as trustee protects and maintains the specific rights reserved by, or granted to, Indian tribes or individuals by treaties, statutes, and executive orders.

The tribal and allotted land within the Nation is considered a trust asset. Approximately 59 percent of land within the District is allotted, and 41 percent is considered a resource of the Nation controlled by the District (Franzoy Corey, 1988). The farm extension footprint consists almost entirely of allotted land, except for 36.64 acres of lands held by the Nation.

In consideration of the Department of Interior's trust responsibility, two public scoping meetings were held in 2010. Since 2010, BIA, Reclamation, the District's SAWRSA Office, and the SXCA have continued to reach out and solicit feedback from the community through SXCA quarterly and annual meetings, SXCA newsletters, and San Xavier Allottees Association meetings. Reclamation also meets quarterly with the Nation, District, and the Schuk Toak District regarding implementation of SAWRSA. The progress of the farm extension is regularly discussed at these meetings.

3.9.2 Environmental Consequences

3.9.2.1 No Action

Existing conditions would prevail into the foreseeable future. The District's CAP water allocation that is in excess to the needs of the Farm would be available for other uses granted by the AWSA.

3.9.2.2 Proposed Action

The farm extension project is part of an overall plan to revitalize agriculture within the District and apply the District's water right under SAWRSA to further benefit community members. In order to encourage allottee input under the planning process, BIA, Reclamation, the District's SAWRSA Office, and the SXCA have reached out to the community through various means, including SXCA and San Xavier Allottees Association meetings and SXCA newsletters. Under the proposed action, BIA would not approve the land appraisals, lease agreements, and granting of temporary or permanent right-of-way for the farm extension unless they get consent from the majority of the allottees, the District, and Nation. The Nation, as well as the allottees effected by

the proposed project, would be adequately compensated for the use of their land. Therefore, ITAs would not be adversely impacted by the proposed action. Project implementation would enhance the value of the land and community's water resources.

3.9.2.3 Cumulative Effects

The cumulative, long-term effect from past, present, and foreseeable future projects would be the development of the majority of the District's eastern border. Through the development process, the Nation and effected allottees would be financially compensated for the use of the land. In addition, the projects would benefit community members by providing additional employment opportunities within the District.

3.10 Environmental Justice

3.10.1 Affected Environment

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was issued by the President of the United States on February 11, 1994. This order established requirements to address Environmental Justice concerns within the context of agency operations. As part of the NEPA process, agencies are required to identify and address disproportionately high and adverse human health or environmental effects on minority or low-income communities. Federal agencies are directed to ensure that Federal programs or activities do not result, either directly or indirectly, in discrimination on the basis of race, color, or national origin. The order also requires that "the responsibilities set forth [in the EO] shall apply equally to Native American programs." Within the project area, allottee land owners and the Nation represent the only EO 12898 population that would be affected by implementation activities.

3.10.2 Environmental Consequences

3.10.2.1 No Action

Existing conditions would prevail into the foreseeable future.

3.10.2.2 Proposed Action

The farm extension project would facilitate effective and efficient use of land and water resources within the District to enhance economic growth and development. In addition, the project would benefit community members by providing additional employment opportunities and other means of income. Economic opportunities provided by the project are consistent with cultural and historic land uses.

The project would also allow the District to apply its CAP allocation to the farm extension and would enhance the adequacy and dependability of their agricultural enterprise. No residents would be relocated. In addition, no Native American or minority populations would be exposed to disproportionately high-adverse health or environmental effects resulting from the extension.

3.10.2.3 Cumulative Effects

Implementation of past, present and foreseeable future projects would facilitate effective and efficient use of the District's land and water resources within the District. No Native American or minority populations would be exposed to disproportionately high-adverse health or environmental effects resulting from these projects.

Chapter 4. Consultation and Coordination

Permits to be acquired

- A MBTA permit may be required for any direct effects to migratory bird species that cannot be avoided. If required, Reclamation, in coordination with the District's Natural Resource Department, will obtain the MBTA permit for the project.
- Reclamation will acquire all applicable permits (Section 401, 402, and 404) under the Clean Water Act prior to construction.

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List of Agencies Consulted

Arizona Department of Environmental Quality
Arizona Department of Transportation
Arizona Department of Water Resources
Arizona Game and Fish Department
Bureau of Indian Affairs
Bureau of Land Management
Hopi Tribe
Natural Resources Conservation Service
Pima County Department of Environmental Quality
Pima County Flood Control District
San Xavier Cooperative Farm Board

San Xavier Cooperative Association
San Xavier Allottee Association
San Xavier District Natural Resource Department
San Xavier District Planning Office
Tohono O'odham Cultural Affairs Office (Tribal Historic Preservation Office)
Tohono O'odham Water Resource Department
Tohono O'odham Legislative Agricultural Resource Committee
Tohono O'odham Legislative Cultural Preservation Committee
Tohono O'odham Legislative Natural Resources Committee
Uam Komalik Livestock Association
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Federal Highway Administration
U.S. Environmental Protection Agency
U.S. Geological Survey

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Appendix A. NEPA Scoping Newsletter

RECLAMATION

Managing Water in the West

San Xavier Cooperative Farm Extension

San Xavier District, Tohono O'odham Nation

Project Information and Opportunity to Comment

August 2016

Introduction

The Bureau of Reclamation (Reclamation), in cooperation with the San Xavier District (SXD) of the Tohono O'odham Nation and the Bureau of Indian Affairs (BIA), is preparing an Environmental Assessment (EA) for the proposed extension of the existing San Xavier Cooperative Farm (Co-Op or farm) to incorporate approximately 1,094 acres of land proposed for agricultural use. The project area is located south and east of the existing Co-Op within the northeastern portion of SXD, in Pima County, Arizona, on undeveloped and uninhabited Indian trust allotted land. (Figure 1).

The purpose of this scoping notice is to inform interested and affected parties of the proposed action and to solicit comments on the potential impacts of the proposal.

Background

The Southern Arizona Water Rights Settlement Act (SAWRSA, P.L. 97-293) of 1982 provided Federal funds to rehabilitate the original Co-Op and build a pipeline to deliver Central Arizona Project (CAP) water to agricultural fields within the farm. In 2000, a 5.6-mile-long pipeline (CAP Link Pipeline) linking the CAP Canal and the Co-Op's original water distribution system was completed. That same year, the Tohono O'odham Legislative Council approved a request by the SXD and San Xavier Cooperative Association (SXCA) that asked for Reclamation to proceed with the design and construction of the farm rehabilitation and extension. At that time a planning group, consisting of the SXD, SXCA and its Board of Directors, the Co-Op and Reclamation, began developing a strategy that would best suit the needs of the community, conserve water, and provide efficient delivery of CAP water to existing agricultural fields for irrigation. Rehabilitation of the Co-Op was completed in 2007.

The Arizona Water Settlement Act of 2004 (AWSA, P.L. No. 108-451) directed the Secretary of Interior (Secretary), through Reclamation, to design and construct an extension of the irrigation system to deliver CAP water to additional lands for the Co-Op, resulting in a system that will serve up to 2,300 net irrigable acres on the San Xavier Reservation. Following the completion of the farm rehabilitation, the SXCA and the Co-Op held two community planning meetings with existing and proposed allottees in 2010 for the lease renewal on the existing Co-Op and to introduce a proposal for the extension.[1] A farm planning and economic analysis report was also prepared to evaluate the current practices of the existing Co-Op and to analyze the potential agricultural production associated with the proposed farm extension.[2] In September 2015, SXCA asked Reclamation to proceed with plans to extend the Co-Op.

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[1] In accordance with BIA's leasing and permitting procedures, scoping meetings were conducted by SXCA Board of Directors and the Farm Manager on June 19, 2010 and July 17, 2010 to introduce the proposed extension to the affected allottees and the community. In 2010, the SXCA envisioned that the farm extension would occur in phases. Thus, the scoping meetings only included 350 acres out of the 1,094 acres currently proposed.

[2] Reclamation contracted with George Cairo Engineering, Inc. to produce the San Xavier Cooperative Farm, Farm Planning & Economic Analysis Report – January 8, 2016.

Proposed Action

Reclamation would construct a water delivery system to the additional 1,094 acres of land proposed for agricultural use. The additional land is adjacent to the existing, 900 acre farm that was rehabilitated in 2007. SXCA and Reclamation have agreed that 1,994 acres (a combined total of 1,094 acres for the farm extension and the existing 900 acre farm) will constitute the final acreage for the Co-Op farm authorized by AWSA.

Purpose and Need

The purpose and need for the proposed action is to meet the Secretary's legal requirement under Section 304(c)(2) of AWSA to design and construct an extension to the irrigation system for the Co-Op to serve 1,094 acres of additional land proposed for agricultural use. The additional land will be considered in the land lease and the granting of right-of-way for the Co-Op.

In order to design and construct the irrigation system, Reclamation must consider the overall farming strategy of the SXCA. The SXCA's farming strategy is to "provide a reasonable financial return to the land owners (lessees) through the sustainable, efficient, and profitable use of its resources."

Project Location

The project area is located within the northeastern portion of the SXD of the Tohono O'odham Nation, south and east of the existing Co-Op (Figure 1). The project area includes two parcels of land that will be irrigated; the northern parcel is 298 acres, and the southern parcel is 796 acres. Additionally, there are six potential locations for pipelines that will connect the CAP Link Pipeline to the farm extension lands. The southern-most distribution alignment is 3,892 feet (ft) long and has a 100-ft wide construction right-of-way (8.9 acres). The alignment to the north of the last described alignment is 1,298-ft long and has a 100-ft wide construction right-of-way (3 acres). The next alignment is 407-ft long and has a 100-ft wide construction right-of-way (0.9 acres). The alignment north of the last one is 340-ft long and has a 100-ft wide construction right-of-way (0.8 acres). Finally, the two northern-most alignments have the same dimensions (123-ft long with a 100-ft construction right-of-way or 0.3 acres each). The pipeline that will occupy the chosen right-of-ways will be 36 inches in diameter.

Alternative Actions

A no action alternative must be considered in addition to the proposed action in the National Environmental Policy Act (NEPA) review process. The no action alternative also provides the baseline for comparison for environmental effects as they relate to the proposed project. Other action alternatives that meet the purpose and need will also be considered during the NEPA process. Different farm methods under consideration include 1) all-natural production, 2) all-conventional production, 3) a combination of natural and conventional production, 4) organic farming practices/certification, and 5) a combination of crop production and raising livestock. Irrigation practices that will be considered include level basin and center pivot irrigation systems. Crops under consideration include a composition of both alfalfa, as the primary cash crop, and traditional/vegetable crops. The preferred alternative is an all-natural/organic production using a center pivot irrigation system.

Preliminary Issues

The first step in determining the scope of the EA is identifying the key issues related to the effect of the proposed action on the existing natural, social, and economic environment. Public input during this initial scoping process will help us focus the EA on important issues. The following issues will be addressed in the EA: 1) biological resources (including threatened and endangered species), 2) cultural resources, 3) water resources (including ground water and surface water), 4) land use, 5) soils, 6) air quality, 7) Indian Trust Assets, and 8) socioeconomic factors.

Cooperating Agencies

Reclamation is the lead Federal agency responsible for preparing the EA. The cooperating agencies are SXD, as the project proponent, and BIA, which has responsibility for Indian Trust Assets and issuing permits. BIA will be the approving party to the land appraisals, lease agreements and granting of temporary or permanent easements for right-of-way associated with the Co-Op. The proposed EA will serve as the NEPA review for BIA's actions as well.

Decision Process

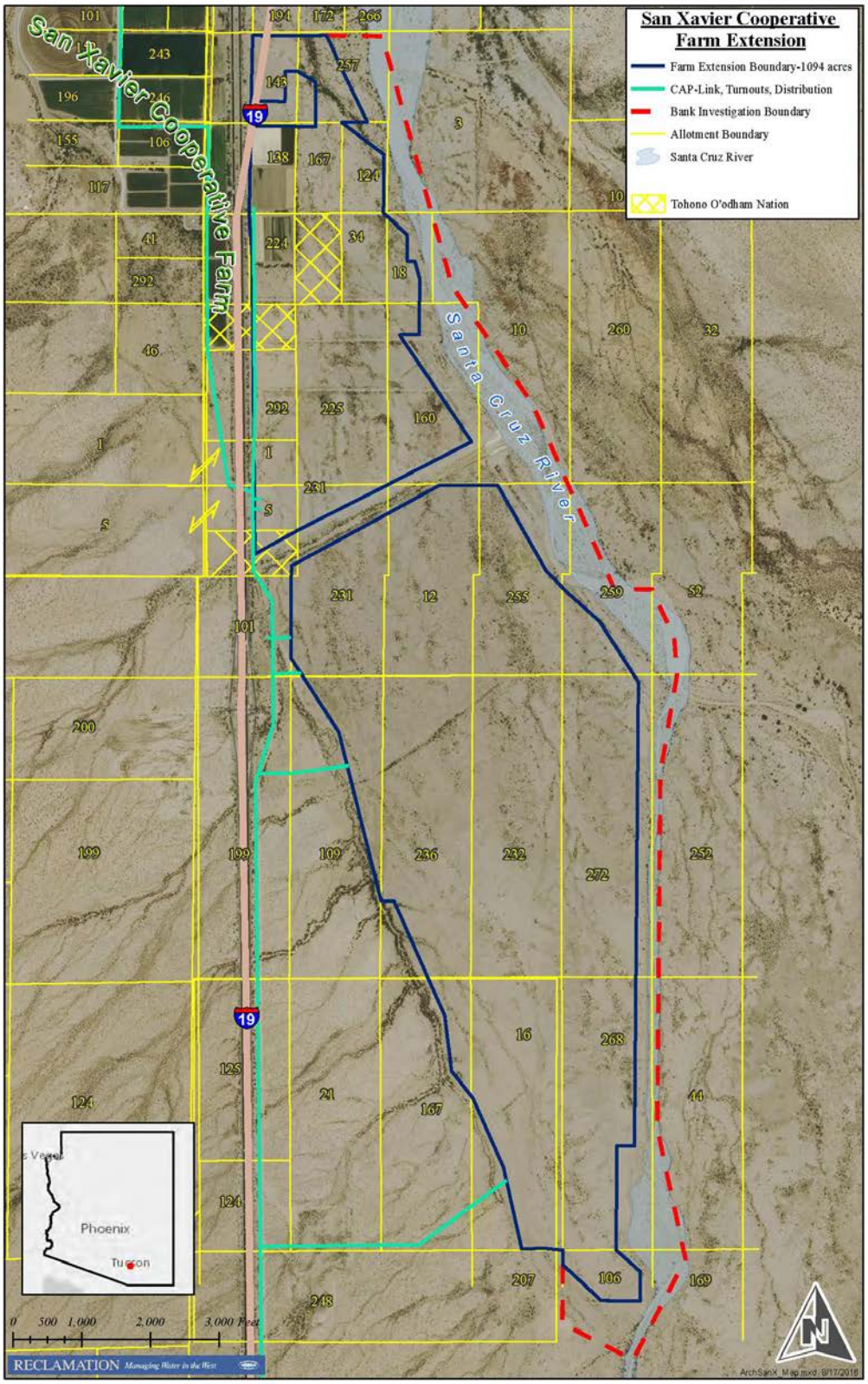
The responsible official for Reclamation (Area Manager of the Phoenix Area Office) must make a determination regarding the environmental effects associated with each alternative, including the no action alternative. If the EA demonstrates that there are no significant environmental effects, the Area Manager would record this determination in a Finding of No Significant Impact (FONSI). BIA would follow the same decision making process.

How to Comment

You are encouraged to offer comments on the scope of the upcoming EA, including potential issues, concerns, and alternatives to the proposed project. Reclamation will accept comments up to September 29, 2016. Please include your full name and address and the project title (San Xavier Cooperative Farm Extension) with your comments. Comments should be submitted to Ms. Nichole Olsker, Bureau of Reclamation, 6150 West Thunderbird Road, Glendale, Arizona 85306. Hand-delivered written comments may be submitted to the above address, Monday through Friday, between 7:30 a.m. and 4:00 p.m. Facsimiles may be sent to Ms. Nichole Olsker at 623-773-6486. Electronic (e-mail) comments may be submitted to nolsker@usbr.gov. Please include your full name and address with your e-mail.

By law, the names and addresses of those providing comments are available for public review through Reclamation. However, individuals may request that their name and/or address be withheld from the record. These requests will be honored to the extent allowable by law. If you wish to have your name and/or address withheld, you must state this prominently at the beginning of your comment letter. All comments from organizations or businesses will be available in their entirety for inspection. For additional information concerning the proposed project, please contact Ms. Nichole Olsker at the above referenced address, telephone number, or e-mail.

Figure 1. Project Location Map.



Appendix B. Scoping Comments

SHPO - 2016-1036(132858)
ARIZONA STATE HISTORIC PRESERVATION OFFICE

United States Department of the Interior

BUREAU OF RECLAMATION
Lower Colorado Region
Phoenix Area Office
6150 West Thunderbird Road
Glendale, AZ 85306-4001

AUG 2 3 2016

IN REPLY REFER TO:
PXAO-1500
ENV-6.00

OFFICIAL FILE COPY
PHOENIX AREA OFFICE
ACTION BY:
RECEIVED
SEP 12 '16
DATE | SURNAME | ROUTE TO

RECEIVED
SEP 02 2016
ARIZONA STATE HISTORIC PRESERVATION OFFICE

MEMORANDUM

To: Area Manager
Attention: PXAO-1000

From: Sean Heath
Chief, Environmental Resource Management Division

Subject: Scoping Newsletter for the San Xavier Cooperative Farm Extension Environmental Assessment (EA) – San Xavier District, Tohono O'odham Nation

The Bureau of Reclamation, in cooperation with the San Xavier District of the Tohono O'odham Nation and the Bureau of Indian Affairs, is preparing an EA for the proposed extension of the existing San Xavier Cooperative Farm (Co-Op or farm) to incorporate approximately 1,094 acres of land proposed for agricultural use. In designing and constructing an extension to the irrigation system, Reclamation will meet the Secretary's legal requirement under Section 304(c)(2) of the Arizona Water Settlement Act of 2004.

Before preparing the draft EA, Reclamation is seeking to inform interested and affected parties of the proposed action and to solicit comments on the potential impacts of the proposal. The subject scoping newsletter is attached for your approval. Upon receiving approval, the scoping document will be posted on our Internet and mailed to interested parties.

If you have any questions, please contact Ms. Nichole Olsker at 623-773-6258.

Attachment

cc: LC-2624 (Env. Library) (w/att)

Thank you for the information, our office will participate through the NHPA/Section 106 consultation process.
Amber Cogswell 9/9/16
Arizona State Historic Preservation Office

Clarified that we won't send report for tribal land, per phone call. 09/29/16 -L. Jelinek, archaeologist

THE HOPI TRIBE

Herman G. Honanie
CHAIRMAN
Alfred Lomahquahu Jr.
VICE-CHAIRMAN

September 12, 2016

Sean M. Heath, Chief, Environmental Resource Management Division
Attention: Nichole Olsker
Bureau of Reclamation, Phoenix Area Office, Environmental Resource Management Division
6150 West Thunderbird Road
Glendale, Arizona 85306-4001

Dear Mr. Heath,

This letter is in response to your scoping newsletter dated August 23, 2016, regarding the San Xavier Cooperative 1,094 acre Farm Extension on the Tohono O'odham Nation. The Hopi Tribe claims cultural affiliation to prehistoric cultural groups in Arizona, including the Hohokam cultural group in southern Arizona. The Hopi Cultural Preservation Office supports the identification and avoidance of prehistoric archaeological sites, and we consider the prehistoric archaeological sites of our ancestors to be Traditional Cultural Properties. Therefore, we appreciate the Bureau of Reclamation, Phoenix Area Office's continuing solicitation of our input and your efforts to address our concerns.

The Hopi Cultural Preservation Office requests consultation on any proposal in Arizona that may adversely affect prehistoric cultural sites. Therefore, to enable us to determine if this proposal may affect cultural resources significant to the Hopi Tribe, please provide us with a copy of the cultural resources inventory report of the area of potential effect and the draft environmental assessment for review and comment.

If prehistoric cultural resources are identified that will be adversely affected by project activities, we request continuing consultation including being provided with a copy of any proposed treatment plans for review and comment. If you have any questions or need additional information, please contact Terry Morgart at the Hopi Cultural Preservation Office at 928-734-3619 or tmorgart@hopi.nsn.us. Thank you for your consideration.

Respectfully,

Leigh J. Kuwanwisiwma, Director
Hopi Cultural Preservation Office

xc: Arizona State Historic Preservation Office

Peter Steere, To THPO, said ok to send Hopi a report in email dated 9/29/2016.
Report printed w/ cover letter to be mailed by 10/3/2016. L. Jelinek, archaeologist
9/29/2016

PIMA COUNTY
FLOOD CONTROL

September 26, 2016

Ms. Nichole Olsker, Area Manager
Phoenix Area Office, Bureau of Land Management
6150 West Thunderbird Road
Glendale, AZ 85306

nolsker@usbr.gov

Re: San Xavier Cooperative Farm Extension

Dear Ms. Nichole Olsker:

The Regional Flood Control District (District) has received the Scoping Newsletter for the San Xavier Cooperative Farm Extension Environmental Assessment. We understand that the proposed action involves extending the irrigation system.

Pima County Regional Flood Control District (District) met with representatives from the San Xavier Cooperative Farm last October to discuss potential improvements at the existing farm in order to reduce the amount of irrigation drainage entering the channel of the West Branch of Santa Cruz River from the fields- see the attached map. As a result of this runoff and, to a lesser extent, storm runoff, this channel becomes inundated with water for long periods of time. The earthen bottom becomes saturated making mower access virtually impossible. The District receives numerous complaints throughout the year about the overgrown vegetation and mosquitoes in this channel. During the wet times, the District is helpless to respond and nearby residents remain frustrated and angry with the District and the Farm.

Understanding that the scoping notice is for a farm extension project, the District is hopeful that project scope be expanded to encourage the existing Farm to implement more efficient irrigation strategies, such as the center pivot system proposed in the report, to reduce the amount of runoff from both the new expansion and the existing farm fields. Other alternatives to consider include tail-water reuse systems (such as proposed last year) and/or increased management of the irrigation to reduce tail-water on the fields. The District appreciates the Farm's attention to this matter and recommends addressing these off-site flows in the water resource impacts to be considered in the Environmental Assessment.

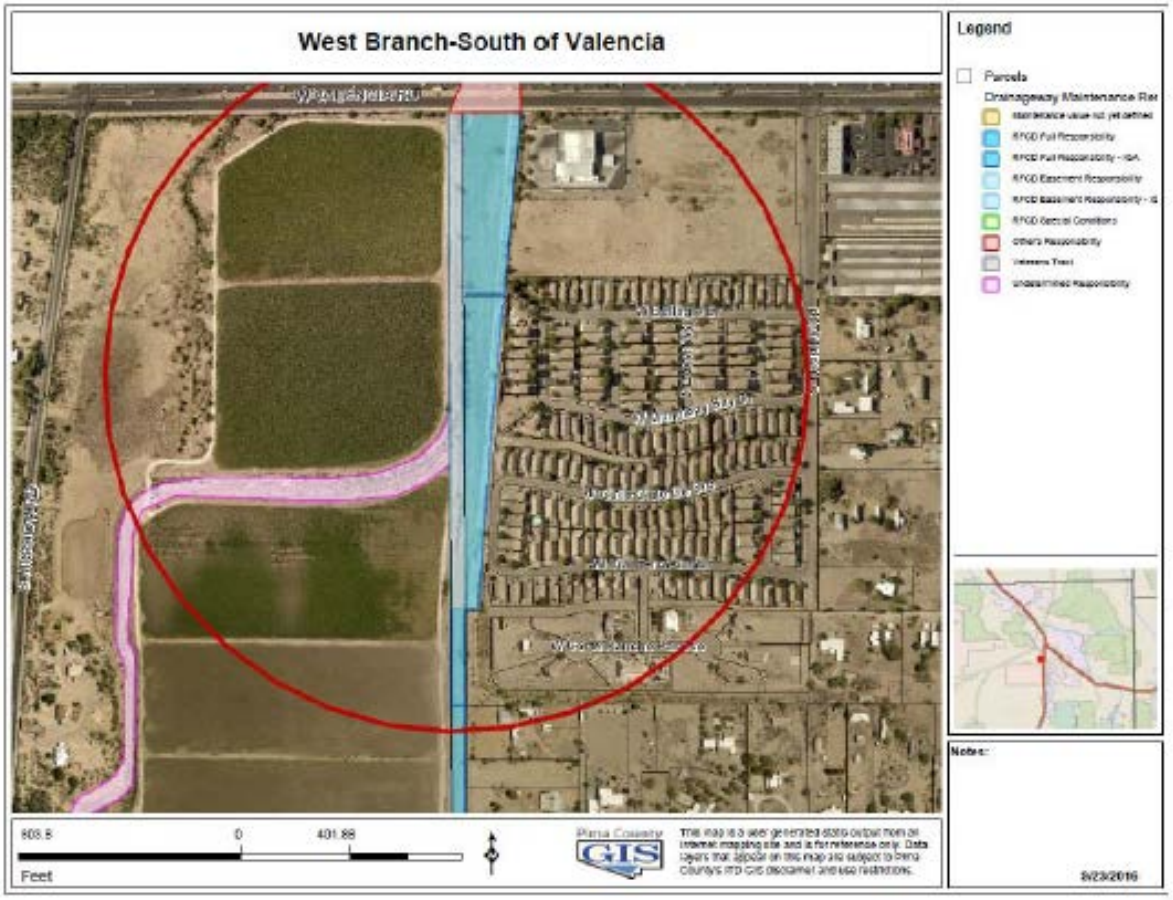
Sincerely,

Greg Saxe, Environmental Planning Manager
Floodplain Management Division

Enclosure(s): West Branch Channel Map

cc: Colby Fryar, Civil Engineering Manager, Infrastructure Management Division

Suzanne Shields, P.E., Director
97 E. Congress, 3rd Floor, Tucson, Arizona 85701-1797 • Phone: 520-724-4600 • Fax: 520-724-4621


West Branch-South of Valencia
Legend
Parcels
Drainageway Maintenance Re
Notes:
9/23/2016
Feet
Pima County
GIS

Olsker, Nichole <nolsker@usbr.gov>

Comments & Questions on San Xavier Cooperative Farm Extension Scoping Newsletter

3 messages

Mark Pugh <mpugh@waknet.org> Fri, Sep 23, 2016 at 5:00 PM
To: "nolsker@usbr.gov" <nolsker@usbr.gov>
Cc: Peter Steere <Peter.Steere@tonation-nsn.gov>, "Holly.Barton@tonation-nsn.gov" <Holly.Barton@tonation-nsn.gov>, Michael Bends <mbends@waknet.org>

September 23, 2016

Dear Ms. Olsker,

The San Xavier District of the Tohono O'odham Nation has the following comments & questions on the **San Xavier Cooperative Farm Extension Scoping Newsletter**:

1. Who will actually be doing the work on the actual EA? Will it be the BOR or a hired Consultant, and if so who?

2. On **Page One**, in the Background section, 2nd paragraph, it mentions two community Scoping meetings were held for the lease renewal, what are the dates of the two meetings?

3. On **Page One**, Footnote #1 mentions the two Scoping meetings only included 350 acres out of the 1,094 currently proposed. How and when were the Allottee made aware of remaining 744 acres that would be impacted?

4. On **Page One**, in the Background section, 2nd paragraph section, and in Footnote #2, it mentions the San Xavier Cooperative Farm, Farm Planning & Economic Analysis Report from Jan. 8., 2016. If possible, the SXD Planning Department would be interested in copy of this report to review.

5. On **Page Two**, in the Project Location Section, the SXD Planning Department would like to request a MAP showing where all 6 potential CAP Link locations would be.

6. Has the Bureau of Reclamation received any response back from TON SHPO Officer Peter Steere concerning this Farm Extension Scoping Newsletter?

7. Has the Bureau of Reclamation received any response back from TON Biological Officer concerning this Farm Extension Scoping Newsletter?

8. On the bottom of **Page 2**, under Alternative Actions, it mentions different Farm methods under consideration including #5 – raising livestock. Has the San Xavier (Uam Komelik) Livestock Association been made aware of this proposal?

9. On your **Page 5 Map**, it is not clear what is the existing CAP Link Line, and what is proposed.

10. On your **Page 5 Map**, what is the purpose of your Bank Investigation Boundary (Red dashed line)/

That is what we have at this time. Thank you for the opportunity to comment and ask questions on the San Xavier Cooperative Farm Extension Scoping Newsletter.

Sincerely,

Mark C. Pugh
Principal Planner

San Xavier District

mpugh@waknet.org

(520) 573-4076

San Xavier Cooperative Farm Extension Scoping Newsletter, 8-23-16.pdf
896K

Comments on the San Xavier Cooperative Farm Extension

September 28, 2016

To All It May Concern:

I am writing to express my deep worries about the farm extension. I think it is ill advised for many reasons. They are large and simple reasons.

First, water. It is clear that a water shortage is reality. This project will not have its CAP water needs met, as planned. Fact is, Coop will doubtless have to manage with less water and use other sources before long, too, on its established acres.

Second, profitability. The current Coop Farm is not ready to expand. Its existing fields, crops and organization are struggling. Quantity and quality of production are not up to a successful level. Making it bigger will not solve these problems but will just make the problems bigger and the losses larger.

I believe expansion is potentially a good thing for Coop, the SX District and the people: but not this. There needs to be innovative, sustainable thinking and planning. Not a standard farm plan but something new with respect and attention to the environment, the water realities, and the longterm needs of the community.

I hope all will stop and consider. I hope the desert will not be destroyed for a plan doomed to failure. What will become of the land when there's no money or water to operate? Squared off and leveled acres will degrade and erode, no longer suitable for native vegetation or wildlife: or it could be ready for housing and parking lots? Do we want to "prepare the land" for that kind of future?

Clifford Pablo
2551 West Quail Road
Tucson, Az 85746

FREEPORT-McMoRan

Phoenix Corporate Office
333 N. Central Ave
Phoenix, AZ 85004

Sandy Fabritz.
Director, Water Resources
Land and Water Department
Telephone: 602-366-7129
Fax: 602-366-7305
Email: sfabritz@FMI.com

September 28, 2016

Ms. Nichole Olsker
United States Bureau of Reclamation
Phoenix Area Office
6150 West Thunderbird Rd.
Glendale, AZ 85306

Re: San Xavier Cooperative Farm Extension

Dear Ms. Olsker:

Freeport Minerals Corporation has reviewed the project information related to the proposed expansion of the San Xavier District's Cooperative Farm and believes the proposed action is consistent with the terms of the Arizona Water Settlement Act of 2004 and would be beneficial to the regional economy of southern Arizona.

We support the Tohono O'odham Nation's efforts and are pleased to see the planned introduction of additional Central Arizona Project (CAP) water, which has already been designated for use in this manner, into this region in support of local economic growth and cultural activity within the San Xavier District.

We do not envision any negative consequences from the development of the additional 1,094 acres of farmland or the delivery of CAP water for this previously intended and authorized purpose.

If you have any questions regarding this correspondence, please contact me at (602) 366-7129 or by e-mail at sfabritz@fmi.com.

Sincerely,

Sandy Fabritz
Director, Water Resources
Freeport Minerals Corporation

cc: The Honorable Edward Manuel, Chairman, Tohono O'odham Nation
Laura Berglan, Acting Attorney General, Tohono O'odham Nation
Nina Siquieros, Superintendent, Bureau of Indian Affairs Papago Agency
Francis McAllister, Vice President, Freeport Land & Water
David Rhoades, General Manager, Freeport Sierrita Mine

Appendix C. List of Crops Grown at the Farm

Traditional and Vegetable Produce

Melons
Canary Melon
Cantaloupe
Charantais melon
Crenshaw Melon
Galia Melon
Honey Orange Melon
Honey Yellow Melon
Sun Jewel Melon
Black Diamond Watermelon
Crimson Sweet Watermelon
Red Watermelon
Sugar Baby Watermelon
Yellow Watermelon

Squash
Butternut Squash
Crookneck Squash
Grey Squash
Ha:l Mamath (Squash)
Ha:l Traditional
Patty Pan Squash
Red Kuri Squash
Round Squash
Spaghetti Squash
Yellow Squash
Zucchini Squash
Asian Eggplant
Rosa Bianca Eggplant
Purple Eggplant
Pumpkin

Peppers/Onions
Anaheim Peppers
Jalapenos
Green Chile
Red Chile
Serrano Chile
Green Onions
Itoi Onions
Onions
Red Onions
White Onions

Tomatoes
Cherry Tomatoes
(Lrg) Tomatoes
Nichol Tomatoes
Yellow Pear Tomatoes

Brocolli/Cauliflower
Brocolli
Romanesco Brocolli
Cauliflower
Cabbage

Herbs
Cilantro
Garlic
Basil

Greens/Chard, etc.
Chard
Leeks
Lettuce

Misc.
Armenian Cucumbers
Pickling Cucumbers
Beets
Okra
Sugar Cane
Short stable cotton
Wheat
Barley
Sorghum
Sudan grass
Oat hay

Cash crop
Alfalfa

Appendix D. Common Animal and Plant Species of the Area

Reptiles and Amphibians

Sonoran Desert Toad	*Incilius alvarius*
Couch's Spadefoot Toad	*Scaphiopus couchi*
Great Plains Toad	*Anaxyrus cognatus*
Red-spotted Toad	*Anaxyrus punctatus*
Green Toad	*Anaxyrus debilis*
Arizona Striped Whiptail	*Aspidoscelis arizonae*
Tiger Whiptail	*Aspidoscelis tigris*
Desert Grassland Whiptail	*Cnemidophorus uniparens*
Side-blotched Lizard	*Uta stansburiana*
Zebra-tailed Lizard	*Callisaurus draconoides*
Southwestern Fence Lizard	*Sceloporus cowlesi*
Regal Horned Lizard	*Phrynosoma solare*
Desert Spiny Lizard	*Sceloporus magister*
Desert Banded Gecko	*Coleonyx variegatus*
Desert Iguana	*Dipsosaurus dorsalis*
Gila Monster	*Heloderma suspectum*
Patch-nosed Snake	*Salvadora* spp.
Western Diamondback Rattlesnake	*Crotalus atrox*
Mojave Rattlesnake	*Crotalus scutulatus*
Desert Kingsnake	*Lampropeltis splendida*
Gopher Snake	*Pituophis catenifer*
Coachwhip	*Masticophis flagellum*

Avian (Birds)

Red-tailed Hawk	*Buteo jamaicensis*
American kestrel	*Falco sparverius*
Northern Harrier	*Circus cyaneus*
Harris Hawk	*Parabuteo unicinctus*
Burrowing Owl	*Athene cunicularia*
Poor-will	Antrostomus arizonae
Mourning Dove	*Zenaida macroura*
Inca Dove	*Columbina inca*
Curve-billed Thrasher	*Toxostoma curvirostre*
Say's Phoebe	*Sayornis saya*
Abert's towhee	*Pipilo aberti*
Black-tailed Gnatcatcher	*Polioptila melanura*
Ladder-backed Woodpecker	*Dryobates scalaris*
Gila woodpecker	*Melanerpes uropygialis*
Northern Flicker	*Colaptes auratus*
Gambel's Quail	*Callipepla gambelii*
Common Raven	*Corvus corax*
Verdin	*Auriparus flaviceps*
Cactus Wren	*Campylorhynchus brunneicapillus*

Greater Roadrunner	Geococcyx californianus
Northern Mockingbird	*Mimus polyglottos*
Loggerhead Shrike	*Lanius ludovicianus*
Phainopepla	*Phainopepla nitens*
Brown-headed Cowbird	*Molothrus ater*
House Finch	*Haemorhous mexicanus*
Lark Sparrow	*Chondestes grammacus*
White-crowned Sparrow	*Zonotrichia leucophris*
Brewer's Sparrow	*Spizella breweri*
Black-throated Sparrow	*Aimophila bilineata*
Starling	*Sturnus vulgaris*
Red-winged blackbird	*Agelaius phoeniceus*

Mammals

Coyote	*Canis latrans*
Mule Deer	*Odocoileus hemionus*
Javelina	*Tayassu tajaca*
Striped Skunk	*Mephitis mephitis*
Desert Cottontail	*Sylilagus audubonii*
Black-tailed Jackrabbit	*Lepus californicus*
Antelope Jackrabbit	*Lepus alleni*
Harris' Antelope Squirrel	*Ammospermophilus harrissi*
Round-tailed Ground Squirrel	*Spermophilus tereticaudus*
White-footed Mouse	*Peromyscus leucopus*
Cactus Mouse	*Peromyscus eremicus*
Deer Mouse	*Peromyscus maniculatus*
Merriam's Kangaroo Rat	*Dipodomy merriami*
Ord's Kangaroo Rat	*Dipodomys ordi*
White-throated Woodrat	*Neotoma albigula*
Desert Woodrat	*Neotoma lepida*
Cottonrat	*Sigmodon arizonae*
Desert Pocket Mouse	*Chaetodipus penicillatus*
Bailey Pocket Mouse	*Chaetodipus baileyi*
Arizona Pocket Mouse	*Perognathus amplus*
Southern Grasshopper Mouse	*Onychomys torridus*

Appendix E. Air Quality Assumptions and Calculations

The emissions associated with construction and farm operations on the San Xavier Farm Extension are based on the following assumptions:

Construction

- The farm extension is expected to require 3 years to complete; archaeological testing and recovery was estimated to take 2 years, while construction would last 1 year.
- The farm extension schedule was used as a starting point to determine the type of construction activities required for the project. The number of days assigned to each construction activity was used to estimate the time each specific piece of equipment would be used to complete the activity.
- Construction equipment, typically required for a specific construction activity, was determined by referring to RS Means, engineering professional opinion and looking at equipment used in similar completed projects.
- Vehicle commuting to the construction site was assumed to be 20 miles each way. There are closer hotels within the Tucson area, but during certain times of the year, hotel availability is limited. The same mileage was applied to delivery supply trucks.
- Emission factors for all pieces of agricultural equipment could not be located. Generic "other agricultural equipment" emission factors of 2.22 grams/hp-hour (hr) for CO and 0.4166 grams/hp-hr for particulate were applied to the rustler and bale shredder (EPA, 2008).
- Emission factors for the 175-hp balewagon, 300-hp windrower, and 50-hp grinder were not located but known emission factors were substituted from the 175-hp multi-crop harvester, 300-hp water truck, and 50-hp skid loader.
- The emission factor for a 100-hp engine tractor was applied to all tractors.
- Fugitive dust emissions from non-engine construction sources include general construction activities, new road construction and staging areas. A general construction activities Level 1 emission factor was used for these activities since only the area and duration of construction is known (Countess Environmental, 2006). Fugitive dust emission factor assumptions came directly from FEMA's (n.d.) Calculation Sheet for Combustible Emissions (see construction fugitive dust emission factors below).
- Activities associated with archeological testing and recovery is assumed to have the same emission factors as general construction. Excavation associated with the archaeological testing and recovery would disturb 79 acres within the construction footprint.
- Road width for new road construction varies from 12-ft to 24-ft. An average width of 18-ft was used in the calculation for fugitive dust associated with road construction.
- Two staging areas, totaling 44.5 acres, were identified within the proposed boundary.

Farming Operations

- Farming operations activities were detailed in the George Cairo Engineering Farm Planning and Economic Analysis report (2016) and a collateral inventory of existing farm equipment was provided.

- Given that farming operations change with growing and harvesting cycles, it was assumed that each piece of equipment would be used approximately 122 days of the year.
- Durations of farming operations activities contributing to fugitive dust emissions were assumed based on conversations with the Farm Manager about the alfalfa growing/cutting schedule. The duration of weeding was unknown and was loosely based on research involving alfalfa operations.
- Based on input from the Farm Manager, weeds within ditches or along the perimeter of each field will be burned once or twice a year. With a 5-ft buffer around the perimeter of each field, 14 acres will be impacted.
- Vehicle commuting for farming operations was assumed to be 20 miles per day. The proposed farm roads total approximately 25 miles. Farm workers will not be driving the entirety of the farm each day so 20 miles per day was assumed for roundtrip activity.
- Wind erosion was calculated using the Countess Environmental (2006) study.

References:

Countess Environmental. 2006. *WRAP Fugitive Dust Handbook*. Prepared for Western Governors' Association.

Environmental Protection Agency (EPA). 1995. *AP 42, Fifth Edition Compilation of Air Pollutant Emissions Factors, Volume 1: Stationary Point and Area Sources*.

_. 2008. Non-Road Mobile emission factors.

FEMA. n.d. *Calculation Sheet for Combustible Emissions*. Retrieved from https://www.fema.gov/media-library-data/20130726-1711-25045-6430/appendix_d.pdf

George Cairo Engineering, Inc (GCE). 2016. *San Xavier Cooperative Farm, Farm Planning & Economic Analysis Final Report*.

Tucson Arizona Meteorological Network Station. 2018. Tucson station data and reports. Retrieved from https://cals.arizona.edu/AZMET/01.htm

Construction Fugitive Dust Emission Factors from FEMA (n.d.)

General Construction Activities Emission Factor: 0.19 ton PM_{10}/acre-month

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), dated 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 PM_{10}/acre-month for sites without large-scale cut/fill operations. A worst-case emission factor of 0.42 ton PM_{10}/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 PM_{10}/acre-month emission factor by applying 25 percent of the large-scale earthmoving emission factor (0.42 ton PM_{10}/acre-month) and 75 percent of the average emission factor (0.11 ton PM_{10}/acre-month).

The 0.19 ton PM_{10}/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 PM_{10}/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 Governors 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 percent for PM_{10} and $PM_{2.5}$ in PM nonattainment areas.

New Road Construction Emission Factor 0.42 ton PM_{10}/acre-month

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 PM_{10}/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 PM_{10}/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

$PM_{2.5}$ emissions are estimated by applying a particle size multiplier of 0.10 to PM_{10} 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 percent for PM_{10} and $PM_{2.5}$ in PM nonattainment areas. Wetting controls will be applied during project construction (EPA, 2006).

References:

FEMA. n.d. *Calculation Sheet for Combustible Emissions*. Retrieved from https://www.fema.gov/media-library-data/20130726-1711-25045-6430/appendix_d.pdf

Environmental Protection Agency (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.

_. 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.

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

Construction Equipment							Emission Factor CO			Results by Pollutant					
Type of Equipment	Engine type	# of Units	Engine HP	Hours/day	Days/yr	Total HP hours in a year	CO	PM-10	PM 2.5	CO	CO	PM-10	PM-10	PM 2.5	PM 2.5
							grams/hp-hr	grams/hp-hr	grams/hp-hr	Tons/year	lb/24 hr	Tons/year	lb/24 hr	Tons/year	lb/24 hr
Non-Road Construction Equipment															
Water Truck	Diesel	1	300	4	314	376800	2.07	0.41	0.4	0.86	4.71	0.17	0.93	0.17	0.91
Excavator	Diesel	1	200	10	200	400000	1.3	0.32	0.31	0.54	2.96	0.14	0.77	0.14	0.75
Dump Truck	Diesel	2	400	10	290	2320000	2.07	0.41	0.4	0.86	4.71	1.05	5.75	1.02	5.61
Front End Loader	Diesel	1	300	10	110	330000	1.55	0.35	0.34	0.64	3.53	0.13	0.70	0.12	0.68
Brush Chipper	Diesel	1	400	10	110	440000	2.6	0.15	0.15	1.08	5.94	0.07	0.40	0.07	0.40
Dozers	Diesel	1	300	10	290	870000	1.38	0.33	0.32	0.57	3.14	0.32	1.73	0.31	1.68
Dozer-Ripper	Diesel	1	300	10	90	270000	2.61	0.082	0.082	1.08	5.94	0.02	0.13	0.02	0.13
Tractor-Disker	Diesel	1	100	10	90	90000	3.73	0.12	0.12	1.55	8.49	0.01	0.07	0.01	0.07
Tractor-Tiller	Diesel	1	100	10	130	130000	3.73	1.37	1.33	1.55	8.49	0.20	1.08	0.19	1.04
Graders	Diesel	1	300	10	150	450000	1.36	0.33	0.32	0.56	3.10	0.16	0.90	0.16	0.87
Scraper	Diesel	1	175	10	200	350000	0.75	0.15	0.15	0.31	1.71	0.06	0.32	0.06	0.32
Roller	Diesel	1	150	10	90	135000	1.8	0.5	0.4	0.75	4.12	0.07	0.38	0.06	0.33
Generator Set		6	40	10	314	753600	3.76	0.73	0.71	1.56	8.56	0.61	3.32	0.59	3.23
TOTAL (Nonroad Construction)										11.93	65.39	3.01	16.47	2.92	16.02

Farming Operations							Emission Factor CO			Results by Pollutant					
Type of Equipment	Engine type	# of Units	Engine HP	Hours/day	Days/yr	Total HP hours in a year	CO	PM-10	PM 2.5	CO	CO	PM-10	PM-10	PM 2.5	PM 2.5
							grams/hp-hr	grams/hp-hr	grams/hp-hr	Tons/year	lb/24 hr	Tons/year	lb/24 hr	Tons/year	lb/24 hr
Farming Operations															
Tractor-Farming (Planting, Disking, Raking, Borders)		5	120	10	100	600000	8.2	1.37	1.33	5.42	29.72	0.91	4.96	0.88	4.82
Tractor-Tillage (Plowing, Disking, Ripping)		1	180	10	100	180000	8.2	1.37	1.33	1.63	8.92	0.27	1.49	0.26	1.45
Tractor-Alfalfa (Rake, Bale)		1	145	10	100	145000	8.2	1.37	1.33	1.31	7.18	0.22	1.20	0.21	1.16
Tractor-Harvest Eq.: (swather, rake, baler, squeeze, retriever)	These jobs performed by one of the included inventoried tractors									----	----	----	----	----	----
Tractor		1	85	10	100	85000	8.2	1.37	1.33	0.77	4.21	0.13	0.70	0.12	0.68
Bale Wagon		1	175	10	100	175000	2.17	0.4167	0.4167	0.42	2.29	0.08	0.44	0.08	0.44
Windrower		1	300	10	110	330000	2.07	0.41	0.40	0.75	4.13	0.15	0.82	0.15	0.80
Windrower		1	110	10	110	121000	4.91	2.276	2.276	0.66	3.59	0.30	1.66	0.30	1.66
4000 gal Water Truck		1	300	10	300	900000	2.07	0.41	0.40	2.05	11.25	0.41	2.23	0.40	2.17
Forklift		1	270	10	100	270000	2.61	0.1491	0.1491	0.78	4.26	0.04	0.24	0.04	0.24
Combine		1	180	10	100	180000	2.17	0.4167	0.4167	0.43	2.36	0.08	0.45	0.08	0.45
Sprayer/Highboy		1	95	10	100	95000	5.87	0.5845	0.5845	0.61	3.37	0.06	0.34	0.06	0.34
Multi-Crop Harvester		1	175	10	100	175000	2.17	0.4167	0.4167	0.42	2.29	0.08	0.44	0.08	0.44
Rustler		7	20	10	100	140000	2.2204	0.4166	0.4166	0.34	1.88	0.06	0.35	0.06	0.35
Bale Shredder		1	10	10	100	10000	2.2204	0.4166	0.4166	0.02	0.13	0.00	0.03	0.00	0.03
Skid Loader		1	50	10	100	50000	1.53	0.202	0.202	0.08	0.46	0.01	0.06	0.01	0.06
Grinder		1	50	10	100	50000	1.53	0.202	0.202	0.08	0.46	0.01	0.06	0.01	0.06
TOTAL (Farming Operations)										15.79	86.50	2.82	15.48	2.77	15.16

Same EF used for all tractors
"Other Agricultural Equipment" EF Factors applied
Emissions factors for similar engine horsepower used

Vehicle Commuting - Construction Site				Emission Factor			Results by Pollutant		
Type of Vehicle	Mile/Day	Days/Yr	Number of Vehicles	CO	PM-10	PM 2.5	CO	PM-10	PM 2.5
				g/mile	g/mile	g/mile	Tons/year	Tons/year	Tons/year
Personal Vehicle Commuting to Site									
Passanger Cars	20	314	15	12.40	0.0052	0.0049	1.29	0.0005	0.0005
Pick-up Trucks	20	314	10	15.70	0.0065	0.006	1.09	0.0004	0.0004
Type of Vehicle	Mile/Day	Days/Yr	Number of Vehicles	CO	PM-10	PM 2.5	CO	PM-10	PM 2.5
							Tons/year	Tons/year	Tons/year
Heavy-Duty Trucks Delivery Supply Trucks									
10,000-19,500 lb Delivery Truck	20	100	1	1.32	0.1200	0.13	0.0029	0.0003	0.0003
33,000-60,000 lb Semi Trailer Rig	20	30	1	3.21	0.3300	0.36	0.0021	0.0002	0.0002
TOTAL (ROAD VEHICLES)							2.38	0.0015	0.0014

Vehicle Commuting - Farming Operations				Emission Factor			Results by Pollutant		
Type of Vehicle	Mile/Day	Days/Yr	Number of Vehicles	CO	PM-10	PM 2.5	CO	PM-10	PM 2.5
				g/mile	g/mile	g/mile	Tons/year	Tons/year	Tons/year
Pick-up Trucks	20	314	10	15.7	0.0065	0.0060	1.09	0.0004	0.0004
TOTAL (ROAD VEHICLES)							1.09	0.0004	0.0004

Construction Fugitive Dust Emissions (FEMA EA, 2009)						Emission Factor		Results by Pollutant							
Construction	Duration of Construction Project (months)	Length (miles)	Length (feet)	Width (feet)	Area (acres)	PM-10 ton/acre-month	PM 2.5 ton/acre-month	PM-10 Tons (duration) Controlled	PM-10 Tons/year Controlled	PM-10 Tons (duration) Uncontrolled	PM-10 Tons/year Uncontrolled	PM 2.5 Tons (duration) Controlled	PM 2.5 Tons/year Controlled	PM 2.5 Tons (duration) Uncontrolled	PM 2.5 Tons/year Uncontrolled
General Construction Activities - Clearing and Grubbing	2.67				1087	0.19	0.019	275.37	61.19	550.75	122.39	27.54	6.12	55.07	12.24
General Construction Activities - Grading (Center Pivot Fields + Flood Fields)	2				835	0.19	0.19	158.65	26.44	317.30	52.88	158.65	26.44	317.30	52.88
General Construction Activities - Excavation/Fill (Flood Fields, Bank Protection, Rock Chutes, Berms)	3.33				131.6	0.19	0.19	41.67	11.58	83.35	23.15	41.67	11.58	83.35	23.15
TOTAL (GENERAL CONSTRUCTION ACTIVITIES)								475.70	99.21	951.39	198.42	227.86	44.14	455.72	88.27
Archeology	24				78.69	0.19	0.019	179.41	89.71	358.83	179.41	17.94	8.97	35.88	17.941
New Road Construction	10	25.2	134246	18	68	0.42	0.042	142.80	119.00	285.6	238.00	14.28	11.90	28.56	23.80
Staging Areas	10				44.5	0.19	0.019	42.28	35.23	84.6	70.46	4.23	3.52	8.46	7.05
TOTAL (ALL CONSTRUCTION ACTIVITIES)									343.15		686.29		68.53		137.06

Farming Operations Land Preparation Fugitive Dust Emissions (WRAP, 2006; p. 2-2)				Emission Factor	Results by Pollutant	
Land Preparation	Duration of Activity (days)	Area (acres)	Number of Passes	PM-10 lbs/acre-pass	PM-10 Tons/Year Controlled	PM-10 Tons/Year Uncontrolled
Discing, Tilling	10	835	3	1.2	27.43	54.86
Ripping, Subsoiling	10	835	3	4.6	105.15	210.29
Land Planting	10	835	1	12.5	95.24	190.48
Weeding	60	835	1	0.8	1.02	2.03
TOTAL (FARMING)					228.84	457.67

Farming - Open Burning Fugitive Dust Emissions		Emission Factor		Fuel Loading Factors	Results by Pollutant			
Possible Burning Activities	Area (acres)	CO lb/ton	Particulate lb/ton	(Waste Production) Ton/Acre	CO Pounds/Year	CO Tons/Year	Particulate Pounds/Year	Particulate Tons/Year
Weeds - Unspecified - Center Pivot Fields (Ditches) - burned yearly	7.26	85	15	3.2	1974.72	1.0	348.48	0.17
Weeds - Unspecified - Flood Irrigated Fields (Ditches) - burned yearly	6.8	85	15	3.2	1849.6	0.9	326.4	0.16
TOTAL (BURNING)					3824	1.91	675	0.34

Agricultural Wind Erosion (WRAP, 2006; Chap. 7)	Agricultural Wind Erosion Emission Factor Estimation Inputs									Emission Factor	Results by Pollutant	
	A = portion of total wind erosion losses that would be measured as total suspended particulate	I = soil erodibility	K = surface roughness factor	V = mean annual wind speed	PE = Thornthwaite's precipitation-evaporation index (ratio of precipitation to evapotranspiration)	C = climatic factor	L' = unsheltered field width factor	V' = vegetative cover factor	Field Size	PM10 Emissions Factor E	PM-10	PM-10
	Dimensionless	Tons/Acre/Year	Dimensionless	MPH	Dimensionless	Dimensionless	Dimensionless	Dimensionless	Acres	Tons/Acre/Year	Tons/Year Controlled	Tons/Year Uncontrolled
Alfalfa Fields	0.025	38	1	6.25	1.521	0.36	0.95	0.25	835	0.041	16.96	33.91

Open Area Wind Erosion (WRAP, 2006; Chap. 8, and Farm Rehab EA)	PM10 Emission Factor: E		
	EF (Tons/Acre/Hour) by Wind Speed (MPH)		
	15-19.9	20-24.9	25-29.9
Stabilized Disturbed Land	0.004	0.00034	0.00019
Undisturbed Native Desert	0.000	0	0.00257

Open Area Wind Erosion Inputs					Results by Pollutant				
Month	Land Type (acres)		Wind Event (hours)*		PM-10				Total Pm10 Emissions (Tons)
	Stable	Undisturbed Native Desert	15-19.9 mph (EFU = 0) (EFS = 0.00042)	20-24.9 (EFU = 0) (EFS = 0.00034)	Stable @ 15-19.9 mph (Tons)	Stable @ 20-24.9 mph (Tons)	Undisturbed @ 15-19.9 mph (Tons)	Undisturbed @ 20-24.9 mph (Tons)	
January	44.5	217	1	0	0.1869	0	0	0	0.1869
February	44.5	217	0	0	0	0	0	0	0
March	44.5	217	0	0	0	0	0	0	0
April	44.5	217	8	0	1.4952	0	0	0	1.4952
May	44.5	217	0	0	0	0	0	0	0
June	44.5	217	0	0	0	0	0	0	0
July	44.5	217	10	0	1.869	0	0	0	1.869
August	44.5	217	0	0	0	0	0	0	0
September	44.5	217	0	0	0	0	0	0	0
October	44.5	217	0	0	0	0	0	0	0
November	44.5	217	0	0	0	0	0	0	0
December	44.5	217	2	0	0.3738	0	0	0	0.3738
TOTAL (tons/year)									3.92

*Average hourly wind speed was determined using data from the Tucson Arizona Meterological Network (AZMET) Station. No hourly wind speed in excess of 19.9 mph was recorded by the AZMET station during the 2018/2017(Oct-Dec) period.

Unpaved Road Wind Erosion (WRAP, 2006; Chap. 6)	Unpaved Road Emission Factor Estimation Inputs								Emission Factor		Results by Pollutant			
	s = surface material silt content	M = surface material moisture content	S = mean vehicle speed	C = emission factor for 1980's vehicle fleet exhaust, brake wear & tire wear (PM-10)	C = emission factor for 1980's vehicle fleet exhaust, brake wear & tire wear (PM-2.5)	No. of Vehicles per Day	Road Length	Emission (activity) Days per Year	PM10 Emissions Factor E	PM 2.5 Emissions Factor E	PM-10	PM-10	PM 2.5	PM 2.5
	(%)	(%)	MPH	(lb/VMT)	(lb/VMT)	Vehicles/Day	Miles	Days/Year	lb/VMT	lb/VMT	Tons/Year Uncontrolled	Tons/Year Controlled	Tons/Year Uncontrolled	Tons/Year Controlled
Unpaved Roads - Gravel/crushed limestone	6.4	1	35	0.00036	0.00047	10	20	314	0.16	0.16	4.91	2.46	4.91	2.45
Unpaved Roads - Dirt (local material compacted, bladed, and crowned)	11	1	35	0.00036	0.00047	10	20	314	0.42	0.42	13.04	6.52	13.03	6.52

Appendix F. Crop Budget

San Xavier Cooperative Farm crop budget as presented in Appendix 9 of the GCE (2016) report.

Table 2 Enterprise Crop Budget
Natural Alfalfa Hay Production
(2014 Prices)

Operation	Times	Labor			Machinery			Materials Services					TOTAL
		Hours	$/Hour	Subtotal	Hours	$/Hour	Subtotal	Item	Quantity	Unit	$/Unit	Subtotal	COST
Irrigate	14.0	0.375	$13.00	$68.25				Water	6.00	AI	$0.00	$0.00	$68.25
Fertilizer (water run)	1.0	0.900	$14.30	$12.87				Green Phos Acid	14.00	Gal	$5.0000	$70.00	$82.87
Swathing	7.0	0.230	$14.30	$23.02	0.210	$63.35	$93.12						$116.15
Raking	7.0	0.100	$14.30	$10.01	0.090	$51.17	$32.24						$42.25
Baling	7.0	0.230	$14.30	$23.02	0.210	$47.39	$69.66	Baling Twine (1)	0.52	Box	$41.85	$21.93	$114.62
Roadsiding	7.0	0.071	$14.30	$7.11	0.064	$22.54	$10.10						$17.21
Retriever	7.0	0.071	$13.00	$6.46	0.064	$22.54	$10.10						$16.56
Pickup Use					1.330	$11.76	$15.64						$15.64
Interest on Operating Capital @3% for 6 mo. (2)													$6.87
Subtotal Variable Costs				$150.74			$230.86					$91.93	$480.41
Fixed Costs:													
Land									$150.00				
General Overhead/Marketing		5.00% of Variable Costs							$24.02				
Management Services (3)		3.00% of Total Costs							$19.63				
1/3 Stand Estab. Cost									$110.41				
Subtotal Fixed Costs													$304.07
Total Costs													$784.47
		Yield:		3.375 tons	Alfalfa			$250.00 per ton					
				1.350 tons	Grass Mix			$220.00 per ton					
Gross Revenue				2.025 tons	Grass			$140.00 per ton					$1,424.25
		Total		6.750 tons									
Net Returns													$639.78

NOTES: (1) Assumes 20 bales/ton, 33 linear feet/bale and 8,500 linear feet/box.
(2) Interest on operating capital excludes pickup use.
(3) Considered as returns to management.
(4) $47.77 harvest costs per ton at 6.75 T/acre

Enterprise Crop Budget
Natural Alfalfa Stand Establishment
(2014 Prices)

Operation	Times	Labor			Machinery			Materials Services					TOTAL
		Hours	$/Hour	Subtotal	Hours	$/Hour	Subtotal	Item	Quantity	Unit	$/Unit	Subtotal	COST
Plow	1.0	0.250	$14.30	$3.58	0.225	$124.60	$28.04						$31.61
Disk	1.0	0.150	$14.30	$2.15	0.130	$120.39	$15.65						$17.80
Disk	1.0	0.150	$14.30	$2.15	0.130	$120.39	$15.65						$17.80
Laser Level	1.0							Custom	1.00	Acre	$85.00	$85.00	$85.00
Plant	1.0	0.250	$14.30	$3.58	0.225	$113.32	$25.50	Seed	30.00	Lb	$3.50	$105.00	$134.07
Irrigate	2.0	0.375	$13.00	$9.75				Water	4.00	AI	$0.00	$0.00	$9.75
Pickup Use					1.000	$11.76	$11.76						$11.76
Interest on Operating Capital @3% for 6 mo. (1)													$4.44
Subtotal Variable Costs				$21.19			$96.59					$190.00	$312.22
Fixed Costs:													
General Overhead		3.00% of Variable Costs							$9.37				
Management Services (2)		3.00% of Total Costs							$9.65				
Subtotal Fixed Costs													**$19.01**
Total Costs													$331.24

NOTES: (1) Interest on operating capital excludes pickup use.
(2) Considered as returns to management.