# APPENDIX D – INVESTIGATION AND ANALYSIS

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# SUBAPPENDIX D.1 ECONOMIC ANALYSIS

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Table 6 - Replacement and Contents Values by Structure Type (Exhibit D1)

| Structure Type | Replacement Value | Contents Value | Sources |
|---|---|---|---|
| Residential (Single Family) | $79 to $171 per sq. ft. | 50% of structure value | • NRCS Principles and Guidelines<br>• Marshall Valuation Service |
| Garage/Outbuilding | $17 per sq. ft. | | |
| Educational Facility | $187 per sq. ft. | | |
| Emergency Services | $234 per sq. ft. | | |
| Utilities | $97 per sq. ft. | | |
| Commercial Business | $57 to $169 per sq. ft. | 200% of structure value | |
| Agricultural | $5 to $40 per sq. ft. | 25% of structure value | |
| Stock Tank 15 ft. diameter | $51,504 | NA | |
| Solar Panels | $1.06-$3.16 per watt | NA | • National Renewable Energy Laboratory |

Table 7 – Roadway Mileage within the Existing Condition Floodplain (Exhibit D2)

| 10-Year Event under Existing Conditions | | 100-Year Event under Existing Conditions | |
|---|---|---|---|
| Roadway Type | Roadway Length (Miles) | Roadway Type | Roadway Length (Miles) |
| State Route | 0.04 | State Route | 0.25 |
| Major Local Road | 7.45 | Major Local Road | 11.67 |
| Minor Local Road | 58.9 | Minor Local Road | 81.70 |

Attachment 7 – Structure_USACEdepthDamagecurves.xls

**Source:** **US Army Corps of Engineers** https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/nwmc/partners/?&cid=nrcs143_009725

*Stage (feet in relation to first floor)

| | Depth* | S | Depth | C |
|---|---|---|---|---|
| 1 1-story without basement | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 10 | 0 | 0 |
| | 1 | 20.5 | 1 | 44 |
| | 2 | 27.5 | 2 | 74.5 |
| | 3 | 33 | 3 | 84.5 |
| | 4 | 38 | 4 | 87.5 |
| | 5 | 43 | 5 | 89 |
| | 8 | 63 | 8 | 92 |
| | 10 | 69 | 10 | 92 |
| 7 Moblie Home | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 5 | -2 | 0 |
| | 0 | 10 | 0 | 0 |
| | 1 | 20 | 1 | 51 |
| | 2 | 31 | 2 | 76 |
| | 3 | 44 | 3 | 85 |
| | 4 | 59.5 | 4 | 89 |
| | 5 | 73.5 | 5 | 91.5 |
| | 8 | 94 | 8 | 95 |
| | 10 | 96 | 10 | 96 |
| 42 Business General | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 1 | 1 | 2 |
| | 2 | 2 | 2 | 6 |
| | 3 | 3 | 3 | 10 |
| | 4 | 5 | 4 | 15 |
| | 5 | 8 | 5 | 19 |
| | 8 | 16 | 8 | 33 |
| | 10 | 21 | 10 | 44 |
| 61 Garage | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 3 | 1 | 11 |
| | 2 | 5 | 2 | 17 |
| | 3 | 6 | 3 | 20 |
| | 4 | 7 | 4 | 23 |
| | 5 | 8 | 5 | 25 |
| | 8 | 17 | 8 | 42 |
| | 10 | 25 | 10 | 63 |
| 85 Police Station | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 8 | 1 | 25 |
| | 2 | 15 | 2 | 43 |
| | 3 | 24 | 3 | 63 |
| | 4 | 25 | 4 | 70 |
| | 5 | 26 | 5 | 80 |
| | 8 | 32 | 8 | 100 |
| | 10 | 40 | 10 | 100 |
| 92 School | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 8 | 1 | 18 |
| | 2 | 12 | 2 | 26 |
| | 3 | 15 | 3 | 30 |
| | 4 | 15 | 4 | 33 |
| | 5 | 16 | 5 | 35 |
| | 8 | 22 | 8 | 50 |
| | 10 | 28 | 10 | 66 |

| | | | | |
|---|---|---|---|---|
| 102 Agricultural Structures | 0 | 0 | 0 | 0 |
| | 0.1 | 4 | 0.1 | 14 |
| | 1 | 20 | 1 | 24 |
| | 2 | 29 | 2 | 38 |
| | 3 | 35 | 3 | 53 |
| | 4 | 44 | 4 | 69 |
| | 5 | 51 | 5 | 81 |
| | 6 | 68 | 6 | 96 |
| | 7 | 87 | 7 | 100 |
| | 8 | 100 | 8 | 100 |
| 105 Utilities | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 0 | 1 | 0 |
| | 2 | 0 | 2 | 0 |
| | 3 | 10 | 3 | 0 |
| | 4 | 13 | 4 | 0 |
| | 5 | 16 | 5 | 0 |
| | 8 | 22 | 8 | 0 |
| | 10 | 30 | 10 | 0 |
| 106 Solar Panels/Farm | -8.1 | 0 | -8.1 | 0 |
| | -8 | 0 | -8 | 0 |
| | -2 | 0 | -2 | 0 |
| | 0 | 0 | 0 | 0 |
| | 1 | 0 | 1 | 0 |
| | 2 | 0 | 2 | 0 |
| | 3 | 10 | 3 | 0 |
| | 4 | 20 | 4 | 0 |
| | 5 | 35 | 5 | 0 |
| | 8 | 50 | 8 | 0 |
| | 10 | 70 | 10 | 0 |
| 107 Stock Tank | 0 | 4 | 0 | 14 |
| | 0.1 | 20 | 0.1 | 24 |
| | 1 | 29 | 1 | 38 |
| | 2 | 35 | 2 | 53 |
| | 3 | 44 | 3 | 69 |
| | 4 | 51 | 4 | 81 |
| | 5 | 68 | 5 | 96 |
| | 6 | 87 | 6 | 100 |
| | 7 | 100 | 7 | 100 |
| | 8 | 100 | 8 | 100 |

# Subappendix D.1.1 Brawley Wash Economics – Investigation and Analysis

## I. Introduction

The economic investigation and analysis summarizes the benefit-cost analysis methodology and results developed in support of the Brawley Wash Watershed Plan-Environmental Assessment (Plan-EA). The benefit-cost analysis follows the procedures outlined in:

- *Principles and Requirements for Federal Investments in Water Resources* and *Interagency Guidelines*
- Guidance for Conducting Analyses Under the Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments DM 9500-013
- *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*
- *National Watershed Program Manual* (2014).

Watershed conditions in Brawley Wash have been a concern for Pima County and the Natural Resources Conservation Service (NRCS) over several decades. A Natural Resource Restoration Plan for the Brawley Wash Watershed was first prepared in June 1992 and covered an area of approximately 2,355 square miles (506,880 acres). The objective of the Plan was to implement alternatives to reduce erosion adversely impacting the area's natural resources, land values, and structural features. At the time, over 70% of the land within the watershed was dominated by ranches with grazing livestock. As a result of overgrazing, the watershed had lost substantial natural protective grasslands and was left vulnerable to erosion (SCS 1992). Human activities had altered natural drainage patterns, adversely impacting the hydrologic function of the watershed, resulting in environmental and economic damage.

In 2008, NRCS completed the Brawley Wash – Los Robles Wash Watershed Rapid Watershed Assessment. The assessment identified similar natural resource conditions and concerns as the 1992 Plan: soil erosion, excessive runoff and other habitat and environmental concerns, and recommended conservation practices.

The Brawley Wash Watershed Plan-EA builds upon the goals of the 1992 Restoration Plan and 2008 Watershed Assessment. The purpose of the Plan-EA is to reduce flood damage to public and private infrastructure and agricultural land in the Brawley Wash Watershed by managing stormwater sheet flow and enhancing floodplain functions. The Plan-EA goals include providing watershed protection by reducing erosion, sediment damage and the presence of invasive plant species, enhancing native habitat restoration, and improving rangeland and soil health.

This economic analysis quantifies the flood damage reduction benefits of the Plan-EA's proposed action using the United States Army Corps of Engineers (USACE) Hydrologic Engineering Center Flood Impact Analysis software (HEC-FIA) to estimate structures and vehicle damages, and Geographic Information System (GIS) analysis to estimate damages to study area infrastructure. The analysis also measures the administrative cost savings to the National Flood Insurance Program (NFIP) from a reduction in the number of properties that must participate.

Ecosystem services benefits, while not monetized in this benefit-cost analysis, are included in the Plan-EA in compliance with PR&G evaluation procedures. The alternatives evaluation and tradeoff analysis within the Plan-EA includes consideration of environmental and other ecosystem services benefits.

The study area for the analysis was defined as the 100-year floodplain within the Brawley Wash Watershed. A subset of seven problem areas were identified within the 100-year floodplain, and alternatives were developed with a focus on these areas.

The alternatives considered are not mutually exclusive, and multiple alternative concepts could be combined. If alternatives were combined, the flood reduction benefits would be additive.

Problem Area 1, Alternative 2 (P1A2), Problem Area 5, Alternative 3 (P5A3) and Problem Area 6, Alternative 3 (P6A3) are the same as P1A1, P5A2 and P6A2, respectively, with one key difference. P1A2, P5A3 and P6A3 include the installation of Natural Infrastructure Dryland Systems (NIDS). Use of these natural or anthropogenically created structures has been shown to enhance/restore delivery of various ecosystem services. Because the benefits of NIDS are described qualitatively in the Plan-EA and not monetized, these three alternatives appear to have the same benefits as P1A1, P5A2 and P6A2, for a higher cost. Please refer to the Plan-EA for more information on how the non-monetized benefits of the NIDS, which consist of ground water quality improvements and recharge, erosion regulation, carbon sequestration and hydrologic changes have also been considered in the alternative selection process in the Plan-EA.

Unless otherwise noted, values in the analysis are in 2024 prices and annual values have been discounted using the Fiscal Year (FY) 2024 federal discount rate for water resources projects of 2.75 percent.

## II. Study Area Inventory

The study area is approximately 198,000 acres (309 square miles), beginning at the Pinal/Pima County border, continuing downstream along the Los Robles Wash, then branching out to the Blanco Wash and Brawley Wash, Pima County and extending to the West Ajo Highway to the south (see *Figure 1, Study Area Location*). The study area also encompasses a portion of Tohono O'odham National Reservation and the Ironwood Forest National Monument. Study area land use consists of rural residential properties, active agricultural fields, open space, commercial and institutional properties, and roadway infrastructure.

## II.A. Structures and Vehicles

Study area structures were identified and categorized by land use type using GIS tax parcel data obtained from the Pima County Tax Assessors Office. The accuracy of the parcels database was verified via examination of aerial photography. A total of 1,006 structures or structure groups are present within the study area floodplain (see *Figure 4, Economic Analysis Study Area Boundary* in Appendix C of the Plan-EA). A structure group was defined as multiple structures of the same type on the same property, such as several agricultural buildings on a property, or two buildings associated with a commercial business. Properties that contained both residential and agricultural structures were subdivided within the inventory to correctly assess damage to each structure type. A total of 766 structures or structure groups are affected by a 100-year flood event under existing conditions. A total of 335 structures or structure groups are affected by a 10-year flood event under existing conditions (see *Figure 20, Economic Analysis Study Area Boundary* in Appendix C of the Plan-EA.

Tax assessment data for structure values was either not available or not considered representative of replacement value. Therefore, the outline of each structure was delineated and included in a GIS polygon shapefile. Replacement values were determined on a square foot basis using Marshall Valuation Service data and were based on land use, class, and type of structure (Marshall Valuation Service 2023). Replacement values and contents values for structures are shown in Exhibit D1.

**Exhibit D1. Replacement and Contents Value by Structure Type**

| Structure Type | Replacement Value | Contents Value | Sources |
|---|---|---|---|
| Residential (Single Family) | $79 to $171 per sq. ft. | 50% of structure value | • NRCS Principles and Guidelines<br>• Marshall Valuation Service |
| Garage/Outbuilding | $17 per sq. ft. | | |
| Educational Facility | $187 per sq. ft. | | |
| Emergency Services | $234 per sq. ft. | | |
| Utilities | $97 per sq. ft. | | |
| Commercial Business | $57 to $169 per sq. ft. | 200% of structure value | |
| Agricultural | $5 to $40 per sq. ft. | 25% of structure value | |
| Stock Tank 15 ft. diameter | $51,504 | NA | |
| Solar Panels | $1.06-$3.16 per watt | NA | • National Renewable Energy Laboratory |

Study area communities are primarily rural with pockets of residential neighborhoods. No major development or redevelopment plans were identified for inclusion in the flood damage estimate. Replacement values for solar panels were estimated using the National Renewable Energy Laboratory. Based on data, large-scale solar farm panels cost $1.06 per watt while residential panels cost $3.16 per watt.
Future infrastructure development activities concentrate on maintaining existing roads and agricultural infrastructure. No major infrastructure projects were identified for inclusion in the flood damage estimate.
Vehicles were added to the inventory based on experience in prior flood events. The FEMA HAZUS-MH MR3 Technical Manual methodology was used to estimate personal vehicle value (FEMA, 2018). The FEMA methodology provides vehicle age distribution data by vehicle classification. Based on Kelley Blue Book transaction price data and the FEMA methodology, the average study area vehicle was assumed to be valued at $17,800. Residences were assumed to have one mid-size sedan left vulnerable to flood damage. For residential homes with agricultural operations one light truck was assumed per property. Using the FEMA HAZUS methodology, light truck values within the study area were estimated to average $24,600. No vehicles were assigned to commercial or institutional structures in the model, which is a conservative estimate to avoid over counting flooded vehicles.

## II.B. Critical Facilities

The study area includes power generation, water supply, community and federal facilities characterized as critical under 7 CFR 650.25, Floodplain Management. The CAVSARP facility, an underground storage project constructed in 2003 to recharge, store and recover groundwater and Colorado River water for Tucson Water customers is centrally located within the study area. The City of Tucson's SAVSARP facility is located south of CAVSARP within the study area.

In addition, the Central Arizona Project (CAP) canal runs along the eastern border of the study area, with portions located within the study area. The CAP, which is 336 miles in length and travels through Maricopa, Pima and Pinal counties, provides approximately 80% of the state's population with water (CAP 2023).

Avra Valley Solar Generating Station is a 34 MW photovoltaic power plant located in Avra Valley within the study area. Located about 20 miles west of Tucson, this solar farm uses approximately 300 acres of fallow agricultural land to generate power for Tucson Electric Power Company (Wichner 2012).

The Marana High School, Roadrunner Elementary School and Three Point Border Patrol facility are located within the study area and are characterized as critical under 7 CFR 650.25. Please refer to *Figure 4, Economic Analysis Study Area Boundary* in Appendix C of the Plan-EA, showing critical facilities.

## II.C. Agricultural Land

The USDA Cropland Data Layer for 2023 was reviewed to identify the crop mix for the study area, and the following were identified as the primary crops: grassland/pasture, cotton, alfalfa, and durum wheat, see *Figure 11, Study Area Agriculture* in Appendix C of the Plan-EA. There are approximately 3,233 acres of active cropland under the four primary crops within the 10-year flood extent and 4,807 acres of active cropland under the four primary crops within the 100-year flood extent. Grassland was approximately 62.8 percent of the agricultural land use in the study area, followed by cotton (18.5%), alfalfa (12.9%) and durum wheat (2%). Fallow cropland or cropland with a percentage below 2% of the agricultural land use in the study area was not considered in the analysis.

## II.D. Roadways and Roadway Bridges

Roadways were divided into three categories: state route, major local road, and minor local road. Total mileage for each roadway type in the study area was estimated using ArcGIS and shown in Exhibit D2. There were no railroad lines in the study area affected by flooding. Twenty-three bridges were identified within the study area. Please refer to *Figure 4, Economic Analysis Study Area Boundary* in Appendix C of the Plan-EA showing roadway and bridge locations.

Exhibit D2. Roadway Mileage within the Existing Condition Floodplain

| 10-Year Event under Existing Conditions | | 100-Year Event under Existing Conditions | |
|---|---|---|---|
| Roadway Type | Roadway Length (Miles) | Roadway Type | Roadway Length (Miles) |
| State Route | 0.04 | State Route | 0.25 |
| Major Local Road | 7.45 | Major Local Road | 11.67 |
| Minor Local Road | 58.9 | Minor Local Road | 81.70 |

## II.E. Recreation

Study area recreation opportunities include the federally owned Ironwood Forest National Monument and Robles Ranch Community Center. The Ironwood Forest National Monument has 129,000-acres of land with 1,360-acres (1%) of motorized roads and recreation trails. Two recreation trails would be impacted by the 100-year flood event (BLM 2024). There is no use data available or developed recreation amenities associated with the trails. Adverse effects to these trails would be minimal, with potential temporary access limitations following large flood events.

Robles Ranch Community Center, operated by Pima County, provides community services, child-care, senior programs, public meeting space, and recreation. The 100-year flood event does not impact the community center building, access to the facility or adjacent recreation facilities. Based on minimal expected flood damages, recreation impacts were not included in the analysis.

## I. Flood Damage under Existing Conditions

Within the Watershed Plan-EA, existing conditions are equivalent to the No Action, or Future Without Federal Investment (FWOFI) Alternative. The No Action/FWOFI consists of no flood prevention improvements in the study area. Flood risk, erosion and sediment damages on a regional scale would not be mitigated. This No Action/FWOFI Alternative, or existing conditions scenario, presents a baseline for comparison to estimate flood protection being provided by each alternative.

Below is a summary of flood impacts under existing conditions. Monetized flood damages are presented both as total damage per event and converted to expected annual damages (EAD). Calculation of EAD accounts for the probability of exceedance of each flood event magnitude, or the percent chance a hazard of that magnitude or lesser will occur in a given year. The expected annual damage is the area under the frequency-damage curve. EAD can be understood as the expense that would occur in any given year if monetary damages from all hazard probabilities and magnitudes were spread out equally over time (CWCB 2020).

## III.A. Structures and Vehicles

Flood damage to structures was estimated using HEC-FIA version 3.0. The HEC-FIA model uses the following parameters to estimate the flooding depth and cost of damages to structures and vehicles:

- Flood frequency and depth, duration, and arrival time gridded data from the output flood model
- Terrain elevation grid in combination with user defined parameters to determine first floor elevation
- Foundation heights, which were assumed to range from 0.5-feet to 2.0 feet from ground elevation
- Point locations of all structures
- Type and value of each structure and contents within the structure
- Damage coefficient data for each type of structure and contents

HEC-FIA uses gridded data to determine depth, arrival, and duration of water at each structure point. The model then analyzes the water depth and first floor elevation with the default or user defined depth damage curve to determine damages for each flood event.

Using the output hydraulic data, the 10-year and 100-year flood events were modeled in HEC-FIA. Depth-damage factors for the various structure types and contents were obtained from USACE data provided by NRCS (NRCS 2018). Model results for existing conditions are shown in Exhibit D3, including damages by structure type and number of structures inundated for the two flood events modeled. Please refer to *Figure 4, Economic Analysis Study Area*

*Boundary* in Appendix C for floodplain delineation mapping showing the inundation limits for the 100-year flood boundary.

Exhibit D3. HEC-FIA Model Results, No Action/FWOFI (Existing Conditions)

| Flood Event | No. of Structures Affected[1] | Structures by Type | | | | Total Structure Damage | Total Contents Damage | Total Vehicle Damage | Total Damage |
|---|---|---|---|---|---|---|---|---|---|
| | | Res. | Ag. | Comm. | Inst. | | | | |
| 100-yr | 766 | 639 | 116 | 5 | 6 | $13,622,882 | $5,173,498 | $1,100,025 | $ 19,896,405 |
| 10-yr | 335 | 265 | 65 | 3 | 2 | $4,734,988 | $1,261,050 | $122,158 | $6,118,196 |

[1] *A total of 1,006 structures are located in the 100-year floodplain, but flood depths were below levels that would result in damages for some structures.*

Expected annual damages to structures and vehicles under existing conditions was estimated at **$1,369,621** (Exhibit D4). Please see page D-19 for model output tables.

Exhibit D4. Expected Annual Flood Damages to Structures and Vehicles under Existing Conditions

| Flood Event | Exceedance Probability | Existing Conditions | |
|---|---|---|---|
| | | Damages | Contribution to EAD |
| 100-yr | 0.01 | $19,896,405 | $198,964 |
| 10-yr | 0.1 | $ 6,118,196 | $1,170,657 |
| | | TOTAL | $1,369,621 |

## III.B. Critical Facilities

The CAVSARP facility is bounded by berms, which protect the major components of the facility from flood damage through the 100-year flood event. Several groundwater extraction wells, located outside the berms, would experience flood depths of approximately two feet in the 100-year flood event. According to the City of Tucson Water Department, these flood depths would not be expected to damage the groundwater extraction wells. The wells have elevated motors and sanitary seals that would resist contamination of groundwater and floodwater (Pallanes 2024). Therefore, the CAVSARP facility was excluded from the HEC-FIA model. However, it should be noted that the CAVSARP facility access from Sandario Road and West Mile Wide Road would be flooded during the 100-year event, preventing emergency access to the facility.

The SAVSARP facility and CAP canal are not impacted by the 100-year flood event. However, it should be noted that access to the SAVSARP facility from West Snyder Hill Road, South Marstellar Road and South Sandario Road would be flooded during the 100-year event, limiting emergency access to the facility.

Although the Avra Valley Solar Generating Station is in the floodplain, the flood depths experienced under the 100-year existing conditions are below the level to cause damage to the solar modules and supporting infrastructure for the solar plant.

The Marana High School would experience flood depths ranging from a half a foot to eight feet in the 100-year flood event. Roadway access to the school would not be impacted during the 100-year flood event. Roadrunner Elementary School and playground would experience flood depths less than one foot in the 100-year flood event. In addition, access to the school from West Calle Carmela and North Anway Road would be impacted. The Three Point Border Patrol facility, parking lot, and driveway access would experience flood depths ranging from one foot to six feet in depth during the 100-year flood event.

## III.C. Agriculture

Average flood depths on agricultural fields across the flood events modeled range from 1.1 to 2.7 feet, with the duration of flooding averaging approximately one day and expected not to exceed 2.7 days. (Duration data was only

considered for flood depths greater than two feet due to data availability). Fields within Schuk Toak Farms, a commercial agricultural property owned by the Tohono O'odham Nation, would experience flooding in the flood events modeled.

Agricultural acreage was valued at the producer surplus per acre at the risk of flood loss for each crop. Based on the hydraulic model parameters for depth and duration, crop loss damage estimation used adaptations of the short duration damage curve available from the HEC-FIA/USACE LifeSim models, four flood depth classes, and an area specific crop production function.

Monthly flood probabilities were derived based on the percentage of historical annual peak discharges occurring in each month at nearest U.S. Geological Survey gauging station (09487000 Brawley Wash near Three Points, AZ). The HEC-FIA model results and associated depth grids provided flooded agricultural acreage per crop under the 10-year and 100-year flood extent.

To develop producer surplus at the risk of loss due to a flood event, enterprise budget data from the University of Arizona Cooperative Extension for cotton, durum wheat and alfalfa was collected (University of Arizona 2023). A timeline of operations was developed to spread variable cost over the year for each crop. To estimate producer surplus at the risk of loss, the difference between the per acre gross revenue and variable cost was taken which was then used to calculate the probability weighted per acre loss for each of the crops. Expected per acre producer surplus value at risk of flood loss for grassland/pasture was assumed to equal that of an acre of the alfalfa crop.
Exhibit D5 presents a sample calculation for cotton which follows the steps listed below:

Exhibit D5. Expected annual production value at risk of flood loss for Cotton

| | Oct. | Nov. | Dec. | Jan. | Feb. | March | April | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flood Probability[1] | 6% | 2% | 4% | 2% | 0% | 0% | 0% | 0% | 4% | 30% | 36% | 16% |
| Percent Damage[2] | 15% | 0% | 0% | 0% | 10% | 0% | 0% | 50% | 70% | 40% | 30% | 20% |
| Variable Cost /month[3] | $0 | $0 | $0 | $17 | $34 | $34 | $168 | $168 | $168 | $168 | $130 | $38 |
| Marketable Crop Value Per Acre[4] | $1,850 | $1,850 | $1,850 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,850 | $1,850 |
| Producer Surplus | $1,850 | $1,850 | $1,850 | -$17 | -$34 | -$34 | -$168 | -$168 | -$168 | -$168 | $1,720 | $1,812 |
| Weighted Monthly Loss | $17 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | -$5 | -$20 | $186 | $58 |
| | | | | | | | | | | **Total** | **$236** | |

[1] Based on Pima county specific flood probability curve.

[2] modeled after the short duration curve in Hec-FIA and production function of cotton in Arizona.

[3,4] University of Arizona Extension service ,2023.

Per acre damage for cotton factoring in flood probability and a short duration damage curve

1. For each crop annual variable cost was spread over the year.
2. The difference between per acre gross revenue and variable cost was calculated for each month to estimate producer surplus at the risk of loss due to flooding.
3. Producer surplus at risk of loss for a given month was then multiplied by the probability of flood occurrence in the given month and the percent yield loss based on the short duration damage curve, giving the

probability weighted expected damage/loss for each month. This loss was then summed to calculate annual expected producer surplus at risk of flood loss

4. per acre.
5. This annual expected loss of producer surplus is further multiplied by a damage factor assigned based on the depth of flooding experienced at the crop location to calculate the expected loss. For example, if 10 acres of cotton land experienced a flood depth of 2 to 4 feet, then using a depth damage factor of 50%, ($236*0.5) *10 = $1,180 would be the damage associated with those 10 acres.
6. These losses are summed to calculated total agricultural losses for each scenario.

Model results for No Action/FWOFI are shown in Exhibit D6 including damages by crop type and number of acres inundated for the two flood events modeled. Exhibit D7 presents EAD to agriculture.

**Exhibit D6. HEC-FIA Model Results, No Action/FWOFI (Existing Conditions)**

| Flood Event | Acres flooded | Total Agricultural Damage |
|---|---|---|
| 100-yr | 4,807 | $526,654 |
| 10-yr | 3,234 | $320,795 |

**Exhibit D7. Expected Annual Flood Damages to Agriculture**

| Flood Event | Exceedance Probability | Existing Conditions | |
|---|---|---|---|
| | | Damages | Contribution to EAD |
| 100-yr | 0.01 | $526,654 | $5,267 |
| 10-yr | 0.1 | $320,795 | $38,135 |
| | | TOTAL | $43,402 |

## III.C. Roadways and Roadway Bridges

Roadway damages from flooding depend on unique study area factors, such as the roadways' height, distance from and position relative to the flood water. Therefore, published damage factors for roadways were not readily available. To estimate roadway damages, project civil engineers used project data (mapping and hydraulic modeling) to develop a series of assumptions regarding flood impacts on study area roadways.

Cleaning and replacement costs per linear foot were estimated by project civil engineers for roadways in the study area. The cost assumptions for roadway cleaning and replacement are summarized in Exhibit D8. Detailed cost estimates are shown in Exhibit D9.

**Exhibit D8. Cleaning and Replacement Costs for Study Area Roadways**

| Roadway Type | % Cleaning | Cleaning cost $/LF | % Replacement | Repair cost $/LF |
|---|---|---|---|---|
| State Route | 90% | $84 | 10% | $573 |
| Major Local Road | 80% | $72 | 20% | $280 |
| Minor Local Road | 70% | $54 | 30% | $99 |

*Source: Gannett Fleming, 2023.*

Exhibit D9. Detailed Cost Estimates for Roadways

**Cleaning - Minor Local Road**

Assume cleaning is needed for roadway + area next to road

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volume of Debris | 44 | ft | x | 0.75 | ft | = | 33 | SF/LF | = | 1.22 | CY/LF |
| Excavation of Debris | $35.60 | /CY | x | 1.22 | CY/LF | = | $44 | /LF | | | |
| Pipe Cleaning | $41.60 | | x | 0.00 | ft pipe/ft road | = | $0 | /LF | | | |
| | | | | | Total | = | $44 | /LF | | | |
| | | | | | With 25% Contingency | = | $54 | /LF | | | |

**Cleaning - Major Local Road**

Assume cleaning is needed for roadway + area next to road + One 50-foot long cross pipe every 500'

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volume of Debris | 54 | ft | x | 0.75 | ft | = | 40.5 | SF/LF | = | 1.50 | CY/LF |
| Excavation of Debris | $35.60 | /CY | x | 1.50 | CY/LF | = | $53 | /LF | | | |
| Pipe Cleaning | $41.60 | | x | 0.10 | ft pipe/ft road | = | $4 | /LF | | | |
| | | | | | Total | = | $58 | /LF | | | |
| | | | | | With 25% Contingency | = | $72 | /LF | | | |

**Cleaning - State Route**

Assume cleaning is needed for roadway + area next to road + One 50-foot long cross pipe every 500'

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Volume of Debris | 64 | ft | x | 0.75 | ft | = | 48 | SF/LF | = | 1.78 | CY/LF |
| Excavation of Debris | $35.60 | /CY | x | 1.78 | CY/LF | = | $63 | /LF | | | |
| Pipe Cleaning | $41.60 | | x | 0.10 | ft pipe/ft road | = | $4 | /LF | | | |
| | | | | | Total | = | $67 | /LF | | | |
| | | | | | With 25% Contingency | = | $84 | /LF | | | |

**Replacement - Minor Local Road**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Select Mat. Surface - 6" | $13.50 | /SY | x | 24 | FT (width) | x | 200 | LF (per 200') | / | 9 | SF/SY | = | $7,200 |
| Catch Basin | $4,750 | EA | x | | | x | 0 | per 200' | | | | = | $0 |
| 18" pipe | $110.00 | /LF | | | | x | 0 | LF (per 200') | | | | = | $0 |
| | | | | | | | | | | | Subtotal | | $7,200 |

| | | | | |
|---|---|---|---|---|
| $7,200 | per 200 feet | = | $36 | per LF |
| + | cleaning | = | $44 | per LF |
| | Total | = | $80 | per LF |
| | With 25% Contingency | = | $99 | per LF |

**Replacement - Major Local Road**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Subbase & Paving | $37.30 | /SY | x | 34 | FT (width) | x | 200 | LF (per 200') | / | 9 | SF/SY | = | $28,182 |
| Catch Basin | $4,750 | EA | x | | | x | 0.8 | per 200' | | | | = | $3,800 |
| 18" pipe | $110.00 | /LF | | | | x | 20 | LF (per 200') | | | | = | $2,200 |
| | | | | | | | | | | | Subtotal | | $34,182 |

| | | | | |
|---|---|---|---|---|
| $34,182 | per 200 feet | = | $171 | per LF |
| + | cleaning | = | $53 | per LF |
| | Total | = | $224 | per LF |
| | With 25% Contingency | = | $280 | per LF |

**Replacement - State Route**

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roadway Subbase & Paving | $74.60 | /SY | x | 44.00 | FT (width) | x | 200 | LF (per 200') | / | 9 | SF/SY | = | $72,942 |
| Catch Basin | $4,750 | EA | x | | | x | 0.8 | per 200' | | | | = | $3,800 |
| 18" pipe | $110.00 | /LF | | | | x | 20 | LF (per 200') | | | | = | $2,200 |
| | | | | | | | | | | | Subtotal | | $78,942 |

| | | | | |
|---|---|---|---|---|
| $78,942 | per 200 feet | = | $395 | per LF |
| + | cleaning | = | $63 | per LF |
| | Total | = | $458 | per LF |
| | With 25% Contingency | = | $573 | per LF |

Using ArcGIS, the roadway mileage inundated under each flood event was calculated. Mileage inundated was multiplied by the percentage of flooded surface that would require repair. Damaged surface (feet) was multiplied by the repair costs (per foot) to obtain damages. Expected annual damage to roadways under existing conditions was estimated at **$3,143,247** (Exhibit D10).

Exhibit D10. Expected Annual Flood Damages to Infrastructure

| Flood Event | Exceedance Probability | Existing Conditions | |
|---|---|---|---|
| | | Damages | Contribution to EAD |
| 100-yr | 0.01 | $36,296,580 | $362,966 |
| 10-yr | 0.1 | $25,487,457 | $2,780,282 |
| | | TOTAL | $3,143,247 |

GIS analysis was conducted to determine if roadway bridges located within the study area would be impacted by flooding. Eight bridges in the study area were affected by flooding and would be overtopped in the 100-year flood event.

While this analysis measures cleaning and replacement costs, other flood-related damages would occur for the traveling public when study area roadways and bridges are flooded. Flooded roads may produce traffic delays and require detours around flooded areas. Detouring results in additional travel time, vehicle operating costs, and air emissions due to the longer route required. If roadways are damaged, detours may continue for an extended period until repairs are completed. Within the study area, Route 86 (W Ajo Highway) is notable as a state route that would experience flooding during the 100-year event, and likely require detouring.

## IV. Alternatives

Alternatives were developed to address the purpose and needs of the watershed project. The alternatives were focused on the County and City-owned lands in the seven identified problem areas. The alternatives formulation and evaluation processes are summarized in the Plan-EA and the *Preliminary Alternatives Selection Memo* (December 2022). This analysis evaluates the No Action/FWOFI Alternative and the eleven action alternatives carried forward for detailed study. In this section, existing conditions (No Action) are compared against each alternative to identify the flood damage reduction benefits provided. The difference in damages between the No Action/FWOFI Alternative (existing conditions) and each action alternative represents the annual benefit of implementing the alternative.

This analysis is a key piece of information for the evaluation and comparison of alternatives in compliance with the PR&G, but it does not prescribe the selected plan. Under the PR&G, monetary and non-monetary benefits are considered in a trade-off analysis between economic, social, and environmental outputs of the alternatives within an ecosystem services framework. This trade-off analysis is presented in the Plan-EA.

## IV.A. Structures and Vehicles

Using the output hydraulic data, the 10-year and 100-year flood events were modeled in HEC-FIA for the eleven alternatives. Exhibit D11 presents the calculation of the expected annual damage for structures and vehicles under the No Action/FWOFI Alternative and the eleven action alternatives.

Exhibit D11. Expected Annual Flood Damages to Structures and Vehicles, Alternatives

| Alternatives | 10-yr 0.1 #Structures | 10-yr 0.1 Damages | Contrib. to EAD | 100-yr 0.01 #Structures | 100-yr 0.01 Damages | Contrib. to EAD | Total Expected Annual Damage |
|---|---|---|---|---|---|---|---|
| No Action/ FWOFI | 335 | $6,118,196 | $1,170,657 | 766 | $19,896,405 | $198,964 | $1,369,621 |
| P1A1 | 324 | $5,828,407 | $1,123,060 | 744 | $19,128,471 | $191,285 | $1,314,344 |
| P1A2[1] | 324 | $5,828,407 | $1,123,060 | 744 | $19,128,471 | $191,285 | $1,314,344 |
| P2A1 | 336 | $6,141,643 | $1,168,410 | 764 | $19,823,031 | $198,230 | $1,366,641 |
| P5A1 | 341 | $6,267,234 | $1,182,104 | 767 | $20,001,733 | $200,017 | $1,382,121 |
| P5A2 | 344 | $6,304,201 | $1,180,002 | 765 | $19,918,072 | $199,181 | $1,379,183 |
| P5A3[2] | 341 | $6,267,234 | $1,182,104 | 767 | $20,001,733 | $200,017 | $1,382,121 |
| P6A1 | 330 | $5,955,735 | $1,133,535 | 737 | $19,233,923 | $192,339 | $1,325,874 |
| P6A2 | 330 | $5,955,339 | $1,132,323 | 736 | $19,207,394 | $192,074 | $1,324,397 |
| P6A3[3] | 330 | $5,955,735 | $1,133,535 | 737 | $19,233,923 | $192,339 | $1,325,874 |
| P7A1 | 331 | $6,089,703 | $1,153,152 | 754 | $19,535,896 | $195,359 | $1,348,511 |
| P7A2 | 333 | $6,017,128 | $1,148,225 | 752 | $19,498,989 | $194,990 | $1,343,215 |

[1] *There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
[2] *There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
[3] *There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*

The annual flood reduction benefit to structures and vehicles is shown in Exhibit D12. Benefits are rounded to the nearest hundred dollars per NRCS guidance. Alternatives P1A1 and P1A2 provide the greatest flood reduction benefit for structures and vehicles. Alternatives P5A1. P5A2 and P5A3 slightly increase flood risk in the respective problem area.

Exhibit D12. Expected Annual Flood Damage Reduction for Structures and Vehicles

| Alternatives | Flood Event | 10-yr | 100-yr | Totals | Annual Flood Reduction Benefit |
|---|---|---|---|---|---|
| | Ex. Prob. | 0.1 | 0.01 | | |
| | | Contrib. to EAD | Contrib. to EAD | | |
| No Action/ FWOFI | | $1,170,657 | $198,964 | $1,369,621 | -- |
| P1A1 | | $1,123,060 | $191,285 | $1,314,344 | $55,300 |
| P1A2[1] | | $1,123,060 | $191,285 | $1,314,344 | $55,300 |
| P2A1 | | $1,168,410 | $198,230 | $1,366,641 | $3,000 |
| P5A1 | | $1,182,104 | $200,017 | $1,382,121 | **($12,500)** |
| P5A2 | | $1,180,002 | $199,181 | $1,379,183 | **($9,600)** |
| P5A3[2] | | $1,182,104 | $200,017 | $1,382,121 | **($12,500)** |
| P6A1 | | $1,133,535 | $192,339 | $1,325,874 | $43,700 |
| P6A2 | | $1,132,323 | $192,074 | $1,324,397 | $45,200 |
| P6A3[3] | | $1,133,535 | $192,339 | $1,325,874 | $43,700 |
| P7A1 | | $1,153,152 | $195,359 | $1,348,511 | $21,100 |
| P7A2 | | $1,148,225 | $194,990 | $1,343,215 | $26,400 |

*[2] There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
*[3] There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
*[4] There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*

## IV.B. Critical Facilities

As discussed in Section III.B, the CAVSARP and SAVSARP facilities are not impacted by the 100-year flood event. This remains true with each alternative. None of the alternatives substantially improves the access road flooding for these facilities. The Avra Valley Solar Generating Station and the CAP canal remain unaffected by 100-year flooding under each alternative.

Flood depths at Marana High School, Roadrunner Elementary School and Three Point Border Patrol facilities remain similar under each alternative in comparison to existing conditions as discussed in Section III.B. Therefore, the impacts discussed in Section III.B do not change as a result of implementing the action alternatives.

## IV.C. Agriculture

Exhibit D13 presents the calculation of the expected annual damage to agriculture under No Action/FWOFI Alternative and the action alternatives.

Exhibit D13. Expected Annual Flood Damages to Agriculture

| Alternatives | Flood Event | 10-yr | Contrib. to EAD | 100-yr | Contrib. to EAD | Total Expected Annual Damage |
|---|---|---|---|---|---|---|
| | Ex. Prob. | 0.1 | | 0.01 | | |
| | | Damages | | Damages | | |
| No Action/ FWOFI | | $320,795 | $38,135 | $526,654 | $5,267 | $43,402 |
| P1A1 | | $317,910 | $37,800 | $522,093 | $5,221 | $43,021 |
| P1A2[1] | | $317,910 | $37,800 | $522,093 | $5,221 | $43,021 |
| P2A1 | | $322,821 | $38,125 | $524,392 | $5,244 | $43,369 |
| P5A1 | | $325,268 | $38,336 | $526,645 | $5,266 | $43,603 |
| P5A2 | | $325,554 | $38,293 | $525,408 | $5,254 | $43,547 |
| P5A3[2] | | $325,268 | $38,336 | $526,645 | $5,266 | $43,603 |
| P6A1 | | $322,749 | $38,224 | $526,676 | $5,267 | $43,491 |
| P6A2 | | $322,865 | $38,294 | $528,119 | $5,281 | $43,575 |
| P6A3[3] | | $322,749 | $38,224 | $526,676 | $5,267 | $43,491 |
| P7A1 | | $320,656 | $38,081 | $525,577 | $5,256 | $43,336 |
| P7A2 | | $320,617 | $38,081 | $525,630 | $5,256 | $43,337 |

[1] *There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
[2] *There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
[3] *There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*

While expected annual damage to agriculture is limited under existing conditions, none of the alternatives materially change flood damage to agricultural land (Exhibit D14). This includes minimal changes to flood damage at Schuk Toak Farms. Given the relatively small magnitude of flood damage reduction benefits to Agriculture, they were not included in the calculation of total flood damage reduction benefits presented in Exhibit D18. Inclusion of these benefits does not change the benefit/cost ratios reported for project alternatives.

Exhibit D14. Expected Annual Flood Damages to Agriculture

| Alternatives | Flood Event | 10-yr | 100-yr | Totals | Annual Flood Reduction Benefit |
|---|---|---|---|---|---|
| | Ex. Prob. | 0.1 | 0.01 | | |
| | - | Contrib. to EAD | Contrib. to EAD | | |
| FWOFI/No Action | | $38,135 | $5,267 | $43,402 | -- |
| P1A1 | | $37,800 | $5,221 | $43,021 | $381 |
| P1A2[1] | | $37,800 | $5,221 | $43,021 | $381 |
| P2A1 | | $38,125 | $5,244 | $43,369 | $33 |
| P5A1 | | $38,336 | $5,266 | $43,603 | **($201)** |
| P5A2 | | $38,293 | $5,254 | $43,547 | **($146)** |
| P5A3[2] | | $38,336 | $5,266 | $43,603 | **($201)** |
| P6A1 | | $38,224 | $5,267 | $43,491 | **($89)** |
| P6A2 | | $38,294 | $5,281 | $43,575 | **($174)** |
| P6A3[3] | | $38,224 | $5,267 | $43,491 | **($89)**[4] |
| P7A1 | | $38,081 | $5,256 | $43,336 | $65 |
| P7A2 | | $38,081 | $5,256 | $43,337 | $64 |

[1] *There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
[2] *There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
[3] *There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*
[4] *Relatively small amount of induced flooding associated with PA63 is not indicative of any severe issues in the watershed.*
[4]

## IV.D. Roadways and Roadway Bridges

Total damage and expected annual damage to roadways under each alternative are shown in Exhibit D15.

Exhibit D15. Expected Annual Flood Damages to Roadway Infrastructure, Alternatives

| Alternatives | Flood Event | 10-yr | Contrib. to EAD | 100-yr | Contrib. to EAD | Total Expected Annual Damage |
|---|---|---|---|---|---|---|
| | Ex. Prob. | 0.1 | | 0.01 | | |
| | | Damages | | Damages | | |
| No Action/ FWOFI | | $25,487,457 | $2,780,282 | $36,296,580 | $362,966 | $3,143,247 |
| P1A1 | | $25,375,407 | $2,770,983 | $36,201,998 | $362,020 | $3,133,003 |
| P1A2[1] | | $25,375,407 | $2,770,983 | $36,201,998 | $362,020 | $3,133,003 |
| P2A1 | | $25,175,266 | $2,734,772 | $35,597,455 | $355,975 | $3,090,747 |
| P5A1 | | $25,233,605 | $2,747,777 | $35,828,116 | $358,281 | $3,106,059 |
| P5A2 | | $26,083,154 | $2,836,719 | $36,955,046 | $369,550 | $3,206,269 |
| P5A3[2] | | $25,233,605 | $2,747,777 | $35,828,116 | $358,281 | $3,106,059 |
| P6A1 | | $25,618,807 | $2,762,664 | $35,773,724 | $357,737 | $3,120,401 |
| P6A2 | | $25,561,465 | $2,760,101 | $35,774,103 | $357,741 | $3,117,842 |
| P6A3[3] | | $25,618,807 | $2,762,664 | $35,773,724 | $357,737 | $3,120,401 |
| P7A1 | | $25,082,891 | $2,729,760 | $35,578,451 | $355,785 | $3,085,545 |
| P7A2 | | $25,079,123 | $2,730,087 | $35,589,477 | $355,895 | $3,085,982 |

[1] *There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
[2] *There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
[3] *There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*

Expected annual damage to roadways under No Action/FWOFI Alternative is estimated at **$3,143,247** as shown above. The difference in damages between existing conditions and the alternatives, shown in Exhibit D16, represents the annual benefit of implementing each alternative. The alternatives do not change the overtopping condition of the eight bridges in the 100-year flood event.

Exhibit D16. Expected Annual Flood Damages to Roadway Infrastructure

| Alternatives | Flood Event | 10-yr | 100-yr | Totals | Annual Flood Reduction Benefit |
|---|---|---|---|---|---|
| | Ex. Prob. | 0.1 | 0.01 | | |
| | | Contrib. to EAD | Contrib. to EAD | | |
| FWOFI/No Action | | $2,780,282 | $362,966 | $3,143,247 | -- |
| P1A1 | | $2,770,983 | $362,020 | $3,133,003 | $10,244 |
| P1A2[1] | | $2,770,983 | $362,020 | $3,133,003 | $10,244 |
| P2A1 | | $2,734,772 | $355,975 | $3,090,747 | $52,500 |
| P5A1 | | $2,747,777 | $358,281 | $3,106,059 | $37,189 |
| P5A2 | | $2,836,719 | $369,550 | $3,206,269 | **($63,022)** |
| P5A3[2] | | $2,747,777 | $358,281 | $3,106,059 | $37,189 |
| P6A1 | | $2,762,664 | $357,737 | $3,120,401 | $22,846 |
| P6A2 | | $2,760,101 | $357,741 | $3,117,842 | $25,406 |
| P6A3[3] | | $2,762,664 | $357,737 | $3,120,401 | $22,846 |
| P7A1 | | $2,729,760 | $355,785 | $3,085,545 | $57,703 |
| P7A2 | | $2,730,087 | $355,895 | $3,085,982 | $57,266 |

[1] *There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
[2] *There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
[3] *There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*

## IV.E. Administrative Cost Savings to the National Flood Insurance Program (NFIP)

By reducing the size of the 100-year floodplain, eight of the eleven alternatives reduce the number of properties that must participate in the NFIP, which enables savings in the administrative costs of the program. According to NRCS technical guidance based on a FEMA actuarial rate review, each policy is estimated to incur an administrative cost of $385.32 per year (updated from the original 2015 NRCS estimate using the Bureau of Economic Analysis (BEA) Gross Domestic Product Implicit Price Deflator) (Townley, 2016, FEMA 2011, BEA 2023).

The 100-year floodplain under the FWOFI/No Action and the alternatives were compared using ArcGIS. Savings in administrative cost and number of residential properties removed from the 100-year floodplain are shown in Exhibit D17.

Exhibit D17. Administrative Cost Savings to the NFIP per Alternative

| Alternatives | No. Res. Structures | Structures removed from the 100-year Inundation Boundary | Administrative Cost Savings/Benefit of Implementing Alternative |
|---|---|---|---|
| FWOFI/No Action | 639 | -- | -- |
| P1A1 | 618 | 21 | $8,100 |
| P1A2 | 618 | 21 | $8,100 |
| P2A1 | 637 | 2 | $800 |
| P5A1 | 639 | 0 | $0 |
| P5A2 | 639 | 0 | $0 |
| P5A3 | 639 | 0 | $0 |
| P6A1 | 612 | 27 | $10,400 |
| P6A2 | 611 | 28 | $10,800 |
| P6A3 | 612 | 27 | $10,400 |
| P7A1 | 627 | 12 | $4,600 |
| P7A2 | 626 | 13 | $5,000 |

## IV.F. Total Benefits

Exhibit D18 summarizes the total flood reduction and flood insurance administrative cost savings benefits for each alternative. Alternatives P7A2, P7A1 and P6A2 provide the greatest total benefits, but all the alternatives with the exception of P5A2 provide positive benefits.

Exhibit D18. Total Annual Benefits per Alternative

| Alternatives | Annual Flood Damage Reduction[4] | | Administrative Cost Savings to NFIP | Total Annual Benefits |
|---|---|---|---|---|
| | Structures | Roadways | | |
| P1A1 | $55,277 | $10,244 | $8,100 | $73,621 |
| P1A2[1] | $55,277 | $10,244 | $8,100 | $73,621 |
| P2A1 | $2,980 | $52,500 | $800 | $56,281 |
| P5A1 | ($12,500) | $37,189 | $0 | $24,689 |
| P5A2 | ($9,562) | ($63,022) | $0 | ($72,584) |
| P5A3[2] | ($12,500) | $37,189 | $0 | $24,689 |
| P6A1 | $43,747 | $22,846 | $10,400 | $76,994 |
| P6A2 | $45,224 | $25,406 | $10,800 | $81,430 |
| P6A3[3] | $43,747 | $22,846 | $10,400 | $76,994 |
| P7A1 | $21,110 | $57,703 | $4,600 | $83,413 |
| P7A2 | $26,406 | $57,266 | $5,000 | $88,672 |

*[1] There was no change in flood reduction between P1A1 and P1A2, therefore, flood damages are the same under both alternatives.*
*[3] There was no change in flood reduction between P5A1 and P5A3, therefore, flood damages are the same under both alternatives.*
*[3] There was no change in flood reduction between P6A1 and P6A3, therefore, flood damages are the same under both alternatives.*
*[4] Because substantive agricultural benefits are not present, agriculture as a benefit category was not included in the exhibit.*

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## Subappendix D.1.1 Table 1. HEC-FIA Results, 10-Year Flood Event under Existing Conditions

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 55 | 1 | 1-Story without basement | Residential | -0.37 | $43,353 | $0 | $0 | $43,353 |
| 79 | 1 | 1-Story without basement | Residential | -0.36 | $37,165 | $0 | $0 | $37,165 |
| 268 | 1 | 1-Story without basement | Residential | -0.25 | $32,223 | $0 | $0 | $32,223 |
| 269 | 1 | 1-Story without basement | Residential | -0.36 | $28,812 | $0 | $0 | $28,812 |
| 324 | 1 | 1-Story without basement | Residential | 0.34 | $76,841 | $42,543 | $0 | $119,384 |
| 325 | 1 | 1-Story without basement | Residential | 0.48 | $52,736 | $37,233 | $0 | $89,969 |
| 326 | 1 | 1-Story without basement | Residential | 0.48 | $75,694 | $53,513 | $0 | $129,207 |
| 328 | 1 | 1-Story without basement | Residential | -0.49 | $31,973 | $0 | $0 | $31,973 |
| 330 | 1 | 1-Story without basement | Residential | -0.22 | $31,023 | $0 | $0 | $31,023 |
| 331 | 1 | 1-Story without basement | Residential | -0.21 | $40,818 | $0 | $0 | $40,818 |
| 333 | 1 | 1-Story without basement | Residential | -0.18 | $60,511 | $0 | $0 | $60,511 |
| 336 | 1 | 1-Story without basement | Residential | -0.33 | $44,665 | $0 | $0 | $44,665 |
| 337 | 1 | 1-Story without basement | Residential | 0.04 | $59,223 | $4,521 | $0 | $63,744 |
| 354 | 1 | 1-Story without basement | Residential | -0.42 | $68,746 | $0 | $0 | $68,746 |
| 1 | 102 | Agricultural Structures | Agriculture | 0.00 | $0 | $0 | $0 | $0 |
| 9 | 102 | Agricultural Structures | Agriculture | 3.38 | $1,915 | $736 | $0 | $2,652 |
| 12 | 102 | Agricultural Structures | Agriculture | 1.49 | $184 | $58 | $6,711 | $6,953 |
| 22 | 102 | Agricultural Structures | Agriculture | 0.16 | $986 | $708 | $0 | $1,694 |
| 26 | 102 | Agricultural Structures | Agriculture | 1.20 | $4,034 | $1,240 | $5,691 | $10,965 |
| 29 | 102 | Agricultural Structures | Agriculture | 0.86 | $1,446 | $463 | $0 | $1,909 |
| 38 | 102 | Agricultural Structures | Agriculture | 0.42 | $17,698 | $8,037 | $0 | $25,735 |
| 87 | 102 | Agricultural Structures | Agriculture | 0.29 | $276 | $150 | $0 | $426 |
| 130 | 102 | Agricultural Structures | Agriculture | 0.17 | $288 | $201 | $0 | $489 |
| 155 | 102 | Agricultural Structures | Agriculture | 0.63 | $235 | $87 | $0 | $322 |
| 161 | 102 | Agricultural Structures | Agriculture | 0.04 | $741 | $648 | $0 | $1,389 |
| 180 | 102 | Agricultural Structures | Agriculture | 0.26 | $11,435 | $6,578 | $0 | $18,013 |
| 186 | 102 | Agricultural Structures | Agriculture | 0.81 | $1,181 | $388 | $0 | $1,570 |
| 193 | 102 | Agricultural Structures | Agriculture | 0.45 | $1,593 | $700 | $0 | $2,294 |
| 249 | 102 | Agricultural Structures | Agriculture | 0.05 | $426 | $372 | $0 | $798 |
| 252 | 102 | Agricultural Structures | Agriculture | 0.13 | $141 | $112 | $0 | $253 |
| 253 | 102 | Agricultural Structures | Agriculture | 0.02 | $678 | $594 | $0 | $1,272 |
| 271 | 102 | Agricultural Structures | Agriculture | 0.58 | $992 | $383 | $1,873 | $3,248 |
| 274 | 102 | Agricultural Structures | Agriculture | 0.53 | $335 | $135 | $0 | $470 |
| 276 | 102 | Agricultural Structures | Agriculture | 0.04 | $1,014 | $888 | $0 | $1,902 |
| 277 | 102 | Agricultural Structures | Agriculture | 0.07 | $2,458 | $2,151 | $0 | $4,609 |
| 278 | 102 | Agricultural Structures | Agriculture | 0.02 | $63 | $55 | $0 | $117 |
| 280 | 102 | Agricultural Structures | Agriculture | 0.09 | $189 | $166 | $0 | $355 |
| 284 | 102 | Agricultural Structures | Agriculture | 0.10 | $392 | $343 | $0 | $735 |
| 285 | 102 | Agricultural Structures | Agriculture | 0.11 | $273 | $228 | $0 | $501 |
| 286 | 102 | Agricultural Structures | Agriculture | 0.20 | $21,613 | $14,069 | $0 | $35,682 |
| 289 | 102 | Agricultural Structures | Agriculture | 0.07 | $258 | $226 | $0 | $484 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 290 | 102 | Agricultural Structures | Agriculture | 0.39 | $3,252 | $1,530 | $0 | $4,782 |
| 303 | 102 | Agricultural Structures | Agriculture | 0.31 | $1,215 | $646 | $0 | $1,860 |
| 313 | 102 | Agricultural Structures | Agriculture | 0.00 | $2 | $2 | $0 | $4 |
| 318 | 102 | Agricultural Structures | Agriculture | 0.27 | $729 | $410 | $0 | $1,140 |
| 323 | 102 | Agricultural Structures | Agriculture | 0.00 | $4 | $4 | $0 | $8 |
| 351 | 102 | Agricultural Structures | Agriculture | 0.01 | $16 | $14 | $0 | $30 |
| 393 | 102 | Agricultural Structures | Agriculture | 0.00 | $4 | $4 | $0 | $8 |
| 407 | 102 | Agricultural Structures | Agriculture | 0.49 | $710 | $297 | $0 | $1,007 |
| 414 | 102 | Agricultural Structures | Agriculture | 0.39 | $20,464 | $9,649 | $0 | $30,113 |
| 437 | 102 | Agricultural Structures | Agriculture | 0.27 | $537 | $305 | $0 | $842 |
| 439 | 102 | Agricultural Structures | Agriculture | 0.07 | $253 | $222 | $0 | $475 |
| 457 | 102 | Agricultural Structures | Agriculture | 0.11 | $84 | $71 | $0 | $155 |
| 459 | 102 | Agricultural Structures | Agriculture | 0.04 | $59 | $52 | $0 | $111 |
| 468 | 102 | Agricultural Structures | Agriculture | 0.70 | $8,062 | $2,838 | $2,772 | $13,673 |
| 469 | 102 | Agricultural Structures | Agriculture | 1.11 | $5,657 | $1,720 | $5,361 | $12,738 |
| 472 | 102 | Agricultural Structures | Agriculture | 0.66 | $577 | $209 | $2,491 | $3,276 |
| 474 | 102 | Agricultural Structures | Agriculture | 1.30 | $1,335 | $414 | $6,031 | $7,780 |
| 546 | 102 | Agricultural Structures | Agriculture | 0.54 | $5,520 | $2,209 | $0 | $7,728 |
| 554 | 102 | Agricultural Structures | Agriculture | 0.14 | $582 | $452 | $0 | $1,033 |
| 592 | 102 | Agricultural Structures | Agriculture | 0.10 | $79 | $69 | $0 | $147 |
| 637 | 102 | Agricultural Structures | Agriculture | 0.00 | $60 | $53 | $0 | $113 |
| 715 | 102 | Agricultural Structures | Agriculture | 0.15 | $932 | $700 | $0 | $1,632 |
| 720 | 102 | Agricultural Structures | Agriculture | 0.02 | $25 | $22 | $0 | $46 |
| 726 | 102 | Agricultural Structures | Agriculture | 0.01 | $314 | $274 | $0 | $588 |
| 817 | 102 | Agricultural Structures | Agriculture | 0.12 | $1,172 | $964 | $0 | $2,136 |
| 832 | 102 | Agricultural Structures | Agriculture | 0.67 | $315 | $113 | $0 | $428 |
| 857 | 102 | Agricultural Structures | Agriculture | 0.25 | $212 | $124 | $0 | $336 |
| 889 | 102 | Agricultural Structures | Agriculture | 0.19 | $1,332 | $894 | $0 | $2,226 |
| 902 | 102 | Agricultural Structures | Agriculture | 0.04 | $330 | $289 | $0 | $619 |
| 905 | 102 | Agricultural Structures | Agriculture | 0.02 | $32 | $28 | $0 | $60 |
| 960 | 102 | Agricultural Structures | Agriculture | 0.13 | $153 | $123 | $0 | $276 |
| 961 | 102 | Agricultural Structures | Agriculture | 0.02 | $68 | $59 | $0 | $127 |
| 1003 | 102 | Agricultural Structures | Agriculture | 0.06 | $786 | $688 | $0 | $1,473 |
| 1004 | 102 | Agricultural Structures | Agriculture | 0.02 | $1,076 | $942 | $0 | $2,018 |
| 1027 | 102 | Agricultural Structures | Agriculture | 0.01 | $122 | $107 | $0 | $229 |
| 1051 | 102 | Agricultural Structures | Agriculture | 0.75 | $3,824 | $1,304 | $3,144 | $8,272 |
| 265 | 42 | Business - general | Commercial | -0.47 | $0 | $0 | $0 | $0 |
| 427 | 42 | Business - general | Commercial | -0.50 | $0 | $0 | $0 | $0 |
| 31 | 61 | Garage | Residential | -0.13 | $0 | $0 | $0 | $0 |
| 117 | 61 | Garage | Residential | -0.32 | $0 | $0 | $0 | $0 |
| 159 | 61 | Garage | Residential | 0.30 | $64 | $59 | $0 | $123 |
| 165 | 61 | Garage | Residential | 7.08 | $826 | $534 | $0 | $1,360 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 183 | 61 | Garage | Residential | -0.36 | $0 | $0 | $0 | $0 |
| 218 | 61 | Garage | Residential | 0.41 | $107 | $99 | $0 | $206 |
| 357 | 61 | Garage | Residential | -0.50 | $0 | $0 | $0 | $0 |
| 398 | 61 | Garage | Residential | -0.45 | $0 | $0 | $0 | $0 |
| 446 | 61 | Garage | Residential | -0.15 | $0 | $0 | $0 | $0 |
| 463 | 61 | Garage | Residential | -0.48 | $0 | $0 | $0 | $0 |
| 466 | 61 | Garage | Residential | -0.45 | $0 | $0 | $0 | $0 |
| 768 | 61 | Garage | Residential | 0.04 | $11 | $10 | $0 | $21 |
| 2 | 7 | Mobile Home | Residential | 0.32 | $45,113 | $27,820 | $0 | $72,933 |
| 3 | 7 | Mobile Home | Residential | 0.24 | $16,072 | $7,958 | $0 | $24,029 |
| 4 | 7 | Mobile Home | Residential | 0.01 | $6,524 | $115 | $0 | $6,639 |
| 6 | 7 | Mobile Home | Residential | 0.12 | $36,035 | $10,139 | $0 | $46,174 |
| 7 | 7 | Mobile Home | Residential | 0.21 | $17,491 | $7,891 | $0 | $25,382 |
| 10 | 7 | Mobile Home | Residential | 0.22 | $11,593 | $5,429 | $0 | $17,022 |
| 11 | 7 | Mobile Home | Residential | 1.58 | $37,059 | $45,999 | $6,879 | $89,937 |
| 13 | 7 | Mobile Home | Residential | 0.29 | $16,130 | $9,247 | $0 | $25,377 |
| 14 | 7 | Mobile Home | Residential | 0.88 | $23,039 | $27,566 | $4,142 | $54,746 |
| 15 | 7 | Mobile Home | Residential | -0.30 | $27,926 | $0 | $0 | $27,926 |
| 18 | 7 | Mobile Home | Residential | 0.02 | $33,160 | $1,986 | $0 | $35,145 |
| 19 | 7 | Mobile Home | Residential | 0.04 | $19,477 | $1,862 | $0 | $21,338 |
| 20 | 7 | Mobile Home | Residential | -0.15 | $24,360 | $0 | $0 | $24,360 |
| 21 | 7 | Mobile Home | Residential | 2.04 | $120,631 | $146,291 | $8,326 | $275,248 |
| 23 | 7 | Mobile Home | Residential | 2.39 | $94,746 | $104,350 | $9,343 | $208,438 |
| 34 | 7 | Mobile Home | Residential | -0.42 | $20,686 | $0 | $0 | $20,686 |
| 35 | 7 | Mobile Home | Residential | -0.32 | $13,735 | $0 | $0 | $13,735 |
| 39 | 7 | Mobile Home | Residential | -0.30 | $5,255 | $0 | $0 | $5,255 |
| 40 | 7 | Mobile Home | Residential | -0.33 | $24,334 | $0 | $0 | $24,334 |
| 41 | 7 | Mobile Home | Residential | -0.38 | $22,802 | $0 | $0 | $22,802 |
| 42 | 7 | Mobile Home | Residential | -0.25 | $13,036 | $0 | $0 | $13,036 |
| 43 | 7 | Mobile Home | Residential | -0.34 | $18,264 | $0 | $0 | $18,264 |
| 45 | 7 | Mobile Home | Residential | -0.36 | $20,371 | $0 | $0 | $20,371 |
| 46 | 7 | Mobile Home | Residential | -0.29 | $6,809 | $0 | $0 | $6,809 |
| 47 | 7 | Mobile Home | Residential | -0.26 | $18,375 | $0 | $0 | $18,375 |
| 48 | 7 | Mobile Home | Residential | -0.35 | $9,243 | $0 | $0 | $9,243 |
| 49 | 7 | Mobile Home | Residential | -0.03 | $2,615 | $0 | $0 | $2,615 |
| 51 | 7 | Mobile Home | Residential | 0.23 | $57,865 | $27,875 | $0 | $85,741 |
| 53 | 7 | Mobile Home | Residential | -0.04 | $14,330 | $0 | $0 | $14,330 |
| 54 | 7 | Mobile Home | Residential | -0.45 | $19,102 | $0 | $0 | $19,102 |
| 56 | 7 | Mobile Home | Residential | -0.20 | $8,883 | $0 | $0 | $8,883 |
| 57 | 7 | Mobile Home | Residential | 0.17 | $29,698 | $10,782 | $0 | $40,480 |
| 58 | 7 | Mobile Home | Residential | 0.31 | $26,895 | $16,070 | $0 | $42,964 |
| 59 | 7 | Mobile Home | Residential | 0.57 | $18,557 | $17,121 | $1,839 | $37,517 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 60 | 7 | Mobile Home | Residential | -0.26 | $3,125 | $0 | $0 | $3,125 |
| 61 | 7 | Mobile Home | Residential | -0.27 | $23,160 | $0 | $0 | $23,160 |
| 62 | 7 | Mobile Home | Residential | -0.05 | $11,319 | $0 | $0 | $11,319 |
| 63 | 7 | Mobile Home | Residential | -0.01 | $3,760 | $0 | $0 | $3,760 |
| 64 | 7 | Mobile Home | Residential | 0.21 | $14,615 | $6,467 | $0 | $21,082 |
| 66 | 7 | Mobile Home | Residential | -0.29 | $14,084 | $0 | $0 | $14,084 |
| 67 | 7 | Mobile Home | Residential | -0.13 | $8,580 | $0 | $0 | $8,580 |
| 68 | 7 | Mobile Home | Residential | -0.36 | $27,079 | $0 | $0 | $27,079 |
| 70 | 7 | Mobile Home | Residential | -0.17 | $5,154 | $0 | $0 | $5,154 |
| 71 | 7 | Mobile Home | Residential | -0.12 | $8,343 | $0 | $0 | $8,343 |
| 72 | 7 | Mobile Home | Residential | 0.01 | $5,780 | $160 | $0 | $5,941 |
| 73 | 7 | Mobile Home | Residential | -0.02 | $7,049 | $0 | $0 | $7,049 |
| 75 | 7 | Mobile Home | Residential | -0.14 | $18,531 | $0 | $0 | $18,531 |
| 76 | 7 | Mobile Home | Residential | 0.79 | $2,633 | $2,970 | $3,480 | $9,083 |
| 77 | 7 | Mobile Home | Residential | 0.25 | $12,891 | $6,677 | $0 | $19,568 |
| 78 | 7 | Mobile Home | Residential | -0.36 | $10,696 | $0 | $0 | $10,696 |
| 82 | 7 | Mobile Home | Residential | 0.81 | $4,665 | $5,328 | $3,612 | $13,605 |
| 83 | 7 | Mobile Home | Residential | 0.39 | $10,083 | $7,187 | $0 | $17,270 |
| 84 | 7 | Mobile Home | Residential | -0.16 | $31,648 | $0 | $0 | $31,648 |
| 85 | 7 | Mobile Home | Residential | 0.12 | $8,893 | $2,410 | $0 | $11,303 |
| 88 | 7 | Mobile Home | Residential | -0.40 | $9,597 | $0 | $0 | $9,597 |
| 89 | 7 | Mobile Home | Residential | 0.39 | $26,150 | $18,536 | $0 | $44,686 |
| 90 | 7 | Mobile Home | Residential | -0.21 | $9,823 | $0 | $0 | $9,823 |
| 91 | 7 | Mobile Home | Residential | 0.40 | $10,522 | $7,664 | $0 | $18,186 |
| 97 | 7 | Mobile Home | Residential | -0.13 | $11,624 | $0 | $0 | $11,624 |
| 98 | 7 | Mobile Home | Residential | -0.34 | $5,688 | $0 | $0 | $5,688 |
| 101 | 7 | Mobile Home | Residential | -0.25 | $8,842 | $0 | $0 | $8,842 |
| 102 | 7 | Mobile Home | Residential | 0.25 | $37,424 | $18,967 | $0 | $56,390 |
| 106 | 7 | Mobile Home | Residential | 0.10 | $17,185 | $3,987 | $0 | $21,172 |
| 109 | 7 | Mobile Home | Residential | -0.41 | $15,770 | $0 | $0 | $15,770 |
| 110 | 7 | Mobile Home | Residential | 0.51 | $10,133 | $8,716 | $1,418 | $20,268 |
| 111 | 7 | Mobile Home | Residential | 0.02 | $11,026 | $499 | $0 | $11,525 |
| 112 | 7 | Mobile Home | Residential | -0.50 | $15,376 | $0 | $0 | $15,376 |
| 113 | 7 | Mobile Home | Residential | -0.17 | $9,372 | $0 | $0 | $9,372 |
| 116 | 7 | Mobile Home | Residential | -0.42 | $18,753 | $0 | $0 | $18,753 |
| 118 | 7 | Mobile Home | Residential | -0.22 | $16,056 | $0 | $0 | $16,056 |
| 119 | 7 | Mobile Home | Residential | -0.40 | $30,536 | $0 | $0 | $30,536 |
| 126 | 7 | Mobile Home | Residential | -0.13 | $11,653 | $0 | $0 | $11,653 |
| 129 | 7 | Mobile Home | Residential | 0.54 | $19,026 | $17,013 | $1,644 | $37,682 |
| 131 | 7 | Mobile Home | Residential | -0.14 | $10,937 | $0 | $0 | $10,937 |
| 132 | 7 | Mobile Home | Residential | -0.27 | $28,744 | $0 | $0 | $28,744 |
| 133 | 7 | Mobile Home | Residential | -0.50 | $18,068 | $0 | $0 | $18,068 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 134 | 7 | Mobile Home | Residential | 1.25 | $4,000 | $5,034 | $5,791 | $14,825 |
| 135 | 7 | Mobile Home | Residential | 0.88 | $18,859 | $22,455 | $4,083 | $45,398 |
| 136 | 7 | Mobile Home | Residential | 0.73 | $11,374 | $12,200 | $0 | $23,574 |
| 137 | 7 | Mobile Home | Residential | 0.73 | $31,423 | $33,706 | $2,995 | $68,124 |
| 139 | 7 | Mobile Home | Residential | 0.02 | $5,277 | $239 | $0 | $5,516 |
| 140 | 7 | Mobile Home | Residential | -0.27 | $20,475 | $0 | $0 | $20,475 |
| 142 | 7 | Mobile Home | Residential | 0.55 | $10,764 | $9,785 | $0 | $20,549 |
| 143 | 7 | Mobile Home | Residential | -0.42 | $16,277 | $0 | $0 | $16,277 |
| 144 | 7 | Mobile Home | Residential | -0.14 | $2,700 | $0 | $0 | $2,700 |
| 145 | 7 | Mobile Home | Residential | -0.40 | $5,453 | $0 | $0 | $5,453 |
| 146 | 7 | Mobile Home | Residential | -0.08 | $2,564 | $0 | $0 | $2,564 |
| 147 | 7 | Mobile Home | Residential | 0.53 | $9,325 | $8,277 | $1,599 | $19,200 |
| 148 | 7 | Mobile Home | Residential | 0.29 | $20,653 | $11,709 | $0 | $32,361 |
| 149 | 7 | Mobile Home | Residential | 0.57 | $9,606 | $8,875 | $1,847 | $20,328 |
| 150 | 7 | Mobile Home | Residential | 0.24 | $11,310 | $5,490 | $0 | $16,801 |
| 151 | 7 | Mobile Home | Residential | 0.16 | $18,337 | $6,344 | $0 | $24,681 |
| 152 | 7 | Mobile Home | Residential | 0.47 | $18,181 | $14,760 | $0 | $32,941 |
| 154 | 7 | Mobile Home | Residential | -0.24 | $23,958 | $0 | $0 | $23,958 |
| 158 | 7 | Mobile Home | Residential | -0.25 | $16,508 | $0 | $0 | $16,508 |
| 164 | 7 | Mobile Home | Residential | -0.22 | $9,114 | $0 | $0 | $9,114 |
| 167 | 7 | Mobile Home | Residential | -0.17 | $10,955 | $0 | $0 | $10,955 |
| 169 | 7 | Mobile Home | Residential | -0.50 | $10,444 | $0 | $0 | $10,444 |
| 171 | 7 | Mobile Home | Residential | -0.29 | $9,707 | $0 | $0 | $9,707 |
| 173 | 7 | Mobile Home | Residential | -0.50 | $23,495 | $0 | $0 | $23,495 |
| 181 | 7 | Mobile Home | Residential | -0.49 | $40,746 | $0 | $0 | $40,746 |
| 187 | 7 | Mobile Home | Residential | 0.03 | $8,114 | $584 | $0 | $8,698 |
| 189 | 7 | Mobile Home | Residential | 0.06 | $17,767 | $2,488 | $0 | $20,255 |
| 190 | 7 | Mobile Home | Residential | -0.22 | $1,670 | $0 | $0 | $1,670 |
| 191 | 7 | Mobile Home | Residential | 0.45 | $17,777 | $14,109 | $0 | $31,887 |
| 192 | 7 | Mobile Home | Residential | -0.28 | $15,829 | $0 | $0 | $15,829 |
| 194 | 7 | Mobile Home | Residential | 0.32 | $32,789 | $20,366 | $0 | $53,155 |
| 195 | 7 | Mobile Home | Residential | 0.41 | $26,831 | $20,035 | $0 | $46,866 |
| 198 | 7 | Mobile Home | Residential | 1.29 | $32,741 | $41,117 | $5,930 | $79,788 |
| 199 | 7 | Mobile Home | Residential | 0.50 | $10,746 | $9,099 | $0 | $19,845 |
| 200 | 7 | Mobile Home | Residential | 1.01 | $13,197 | $16,817 | $5,013 | $35,027 |
| 201 | 7 | Mobile Home | Residential | 0.73 | $13,125 | $14,122 | $3,023 | $30,270 |
| 202 | 7 | Mobile Home | Residential | -0.12 | $4,277 | $0 | $0 | $4,277 |
| 204 | 7 | Mobile Home | Residential | 0.06 | $23,574 | $3,458 | $0 | $27,032 |
| 206 | 7 | Mobile Home | Residential | 0.46 | $15,742 | $12,725 | $0 | $28,466 |
| 207 | 7 | Mobile Home | Residential | 0.56 | $23,279 | $21,429 | $1,824 | $46,532 |
| 208 | 7 | Mobile Home | Residential | 0.93 | $20,488 | $25,187 | $4,482 | $50,157 |
| 209 | 7 | Mobile Home | Residential | 0.25 | $8,662 | $4,445 | $0 | $13,108 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 211 | 7 | Mobile Home | Residential | 0.81 | $23,108 | $26,441 | $3,633 | $53,181 |
| 212 | 7 | Mobile Home | Residential | -0.21 | $17,208 | $0 | $0 | $17,208 |
| 214 | 7 | Mobile Home | Residential | 0.61 | $4,249 | $4,105 | $2,152 | $10,507 |
| 215 | 7 | Mobile Home | Residential | 0.11 | $20,942 | $5,297 | $0 | $26,239 |
| 220 | 7 | Mobile Home | Residential | -0.12 | $1,347 | $0 | $0 | $1,347 |
| 221 | 7 | Mobile Home | Residential | -0.38 | $18,104 | $0 | $0 | $18,104 |
| 222 | 7 | Mobile Home | Residential | -0.31 | $10,804 | $0 | $0 | $10,804 |
| 223 | 7 | Mobile Home | Residential | -0.50 | $12,356 | $0 | $0 | $12,356 |
| 225 | 7 | Mobile Home | Residential | -0.43 | $15,711 | $0 | $0 | $15,711 |
| 227 | 7 | Mobile Home | Residential | -0.41 | $2,427 | $0 | $0 | $2,427 |
| 231 | 7 | Mobile Home | Residential | -0.29 | $18,097 | $0 | $0 | $18,097 |
| 232 | 7 | Mobile Home | Residential | -0.23 | $2,285 | $0 | $0 | $2,285 |
| 233 | 7 | Mobile Home | Residential | -0.30 | $19,340 | $0 | $0 | $19,340 |
| 234 | 7 | Mobile Home | Residential | 0.13 | $15,201 | $4,456 | $0 | $19,657 |
| 235 | 7 | Mobile Home | Residential | -0.20 | $3,176 | $0 | $0 | $3,176 |
| 236 | 7 | Mobile Home | Residential | -0.49 | $8,743 | $0 | $0 | $8,743 |
| 238 | 7 | Mobile Home | Residential | -0.22 | $24,052 | $0 | $0 | $24,052 |
| 239 | 7 | Mobile Home | Residential | 0.48 | $5,373 | $4,467 | $0 | $9,840 |
| 240 | 7 | Mobile Home | Residential | 0.16 | $13,453 | $4,704 | $0 | $18,157 |
| 241 | 7 | Mobile Home | Residential | -0.18 | $3,138 | $0 | $0 | $3,138 |
| 243 | 7 | Mobile Home | Residential | 0.09 | $9,529 | $2,008 | $0 | $11,537 |
| 244 | 7 | Mobile Home | Residential | -0.27 | $5,960 | $0 | $0 | $5,960 |
| 248 | 7 | Mobile Home | Residential | -0.48 | $2,103 | $0 | $0 | $2,103 |
| 251 | 7 | Mobile Home | Residential | -0.34 | $27,185 | $0 | $0 | $27,185 |
| 255 | 7 | Mobile Home | Residential | -0.40 | $5,280 | $0 | $0 | $5,280 |
| 257 | 7 | Mobile Home | Residential | -0.43 | $8,379 | $0 | $0 | $8,379 |
| 259 | 7 | Mobile Home | Residential | 0.75 | $16,736 | $18,345 | $3,197 | $38,278 |
| 261 | 7 | Mobile Home | Residential | -0.45 | $14,646 | $0 | $0 | $14,646 |
| 270 | 7 | Mobile Home | Residential | -0.32 | $28,998 | $0 | $0 | $28,998 |
| 272 | 7 | Mobile Home | Residential | 0.02 | $15,350 | $690 | $0 | $16,040 |
| 279 | 7 | Mobile Home | Residential | -0.32 | $13,035 | $0 | $0 | $13,035 |
| 287 | 7 | Mobile Home | Residential | -0.44 | $18,610 | $0 | $0 | $18,610 |
| 288 | 7 | Mobile Home | Residential | -0.40 | $18,731 | $0 | $0 | $18,731 |
| 291 | 7 | Mobile Home | Residential | -0.46 | $9,411 | $0 | $0 | $9,411 |
| 292 | 7 | Mobile Home | Residential | -0.39 | $13,010 | $0 | $0 | $13,010 |
| 293 | 7 | Mobile Home | Residential | -0.49 | $9,692 | $0 | $0 | $9,692 |
| 294 | 7 | Mobile Home | Residential | -0.32 | $10,421 | $0 | $0 | $10,421 |
| 295 | 7 | Mobile Home | Residential | -0.44 | $13,381 | $0 | $0 | $13,381 |
| 296 | 7 | Mobile Home | Residential | -0.13 | $14,555 | $0 | $0 | $14,555 |
| 297 | 7 | Mobile Home | Residential | -0.50 | $23,096 | $0 | $0 | $23,096 |
| 300 | 7 | Mobile Home | Residential | -0.34 | $22,122 | $0 | $0 | $22,122 |
| 305 | 7 | Mobile Home | Residential | -0.26 | $24,192 | $0 | $0 | $24,192 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 306 | 7 | Mobile Home | Residential | -0.38 | $18,399 | $0 | $0 | $18,399 |
| 307 | 7 | Mobile Home | Residential | -0.20 | $10,008 | $0 | $0 | $10,008 |
| 308 | 7 | Mobile Home | Residential | -0.21 | $9,597 | $0 | $0 | $9,597 |
| 309 | 7 | Mobile Home | Residential | -0.42 | $10,327 | $0 | $0 | $10,327 |
| 310 | 7 | Mobile Home | Residential | -0.36 | $5,555 | $0 | $0 | $5,555 |
| 311 | 7 | Mobile Home | Residential | -0.50 | $15,391 | $0 | $0 | $15,391 |
| 312 | 7 | Mobile Home | Residential | -0.32 | $19,685 | $0 | $0 | $19,685 |
| 315 | 7 | Mobile Home | Residential | -0.49 | $17,372 | $0 | $0 | $17,372 |
| 316 | 7 | Mobile Home | Residential | -0.45 | $9,103 | $0 | $0 | $9,103 |
| 319 | 7 | Mobile Home | Residential | -0.41 | $9,789 | $0 | $0 | $9,789 |
| 320 | 7 | Mobile Home | Residential | -0.47 | $16,404 | $0 | $0 | $16,404 |
| 321 | 7 | Mobile Home | Residential | -0.25 | $18,530 | $0 | $0 | $18,530 |
| 339 | 7 | Mobile Home | Residential | -0.21 | $9,203 | $0 | $0 | $9,203 |
| 344 | 7 | Mobile Home | Residential | -0.35 | $6,143 | $0 | $0 | $6,143 |
| 346 | 7 | Mobile Home | Residential | -0.46 | $12,028 | $0 | $0 | $12,028 |
| 352 | 7 | Mobile Home | Residential | -0.49 | $23,880 | $0 | $0 | $23,880 |
| 353 | 7 | Mobile Home | Residential | -0.27 | $34,364 | $0 | $0 | $34,364 |
| 358 | 7 | Mobile Home | Residential | 0.12 | $13,027 | $3,640 | $0 | $16,667 |
| 359 | 7 | Mobile Home | Residential | -0.29 | $25,648 | $0 | $0 | $25,648 |
| 360 | 7 | Mobile Home | Residential | -0.16 | $9,987 | $0 | $0 | $9,987 |
| 366 | 7 | Mobile Home | Residential | -0.29 | $9,261 | $0 | $0 | $9,261 |
| 368 | 7 | Mobile Home | Residential | -0.44 | $10,754 | $0 | $0 | $10,754 |
| 374 | 7 | Mobile Home | Residential | -0.44 | $24,772 | $0 | $0 | $24,772 |
| 375 | 7 | Mobile Home | Residential | -0.44 | $8,723 | $0 | $0 | $8,723 |
| 376 | 7 | Mobile Home | Residential | -0.43 | $6,445 | $0 | $0 | $6,445 |
| 379 | 7 | Mobile Home | Residential | -0.47 | $16,059 | $0 | $0 | $16,059 |
| 382 | 7 | Mobile Home | Residential | -0.33 | $26,438 | $0 | $0 | $26,438 |
| 383 | 7 | Mobile Home | Residential | -0.41 | $30,762 | $0 | $0 | $30,762 |
| 385 | 7 | Mobile Home | Residential | -0.39 | $11,476 | $0 | $0 | $11,476 |
| 387 | 7 | Mobile Home | Residential | -0.36 | $16,695 | $0 | $0 | $16,695 |
| 388 | 7 | Mobile Home | Residential | -0.49 | $11,654 | $0 | $0 | $11,654 |
| 389 | 7 | Mobile Home | Residential | -0.24 | $4,335 | $0 | $0 | $4,335 |
| 395 | 7 | Mobile Home | Residential | -0.49 | $26,803 | $0 | $0 | $26,803 |
| 396 | 7 | Mobile Home | Residential | -0.45 | $15,230 | $0 | $0 | $15,230 |
| 399 | 7 | Mobile Home | Residential | -0.43 | $14,434 | $0 | $0 | $14,434 |
| 401 | 7 | Mobile Home | Residential | -0.29 | $2,318 | $0 | $0 | $2,318 |
| 405 | 7 | Mobile Home | Residential | -0.37 | $12,993 | $0 | $0 | $12,993 |
| 406 | 7 | Mobile Home | Residential | -0.30 | $11,048 | $0 | $0 | $11,048 |
| 408 | 7 | Mobile Home | Residential | -0.48 | $12,423 | $0 | $0 | $12,423 |
| 411 | 7 | Mobile Home | Residential | -0.50 | $8,845 | $0 | $0 | $8,845 |
| 425 | 7 | Mobile Home | Residential | -0.28 | $5,570 | $0 | $0 | $5,570 |
| 426 | 7 | Mobile Home | Residential | -0.48 | $10,657 | $0 | $0 | $10,657 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 429 | 7 | Mobile Home | Residential | -0.44 | $13,647 | $0 | $0 | $13,647 |
| 431 | 7 | Mobile Home | Residential | -0.14 | $23,892 | $0 | $0 | $23,892 |
| 436 | 7 | Mobile Home | Residential | -0.48 | $25,738 | $0 | $0 | $25,738 |
| 441 | 7 | Mobile Home | Residential | -0.47 | $11,575 | $0 | $0 | $11,575 |
| 453 | 7 | Mobile Home | Residential | -0.22 | $8,324 | $0 | $0 | $8,324 |
| 473 | 7 | Mobile Home | Residential | 0.17 | $31,299 | $11,720 | $0 | $43,019 |
| 550 | 7 | Mobile Home | Residential | -0.44 | $10,527 | $0 | $0 | $10,527 |
| 582 | 7 | Mobile Home | Residential | -0.30 | $8,101 | $0 | $0 | $8,101 |
| 587 | 7 | Mobile Home | Residential | -0.35 | $20,213 | $0 | $0 | $20,213 |
| 593 | 7 | Mobile Home | Residential | -0.49 | $8,210 | $0 | $0 | $8,210 |
| 617 | 7 | Mobile Home | Residential | -0.26 | $15,042 | $0 | $0 | $15,042 |
| 651 | 7 | Mobile Home | Residential | -0.43 | $21,654 | $0 | $0 | $21,654 |
| 654 | 7 | Mobile Home | Residential | -0.43 | $19,871 | $0 | $0 | $19,871 |
| 663 | 7 | Mobile Home | Residential | -0.28 | $12,137 | $0 | $0 | $12,137 |
| 666 | 7 | Mobile Home | Residential | -0.44 | $14,198 | $0 | $0 | $14,198 |
| 673 | 7 | Mobile Home | Residential | -0.40 | $14,838 | $0 | $0 | $14,838 |
| 683 | 7 | Mobile Home | Residential | -0.43 | $29,003 | $0 | $0 | $29,003 |
| 716 | 7 | Mobile Home | Residential | -0.34 | $15,581 | $0 | $0 | $15,581 |
| 767 | 7 | Mobile Home | Residential | 0.41 | $16,796 | $12,389 | $0 | $29,185 |
| 769 | 7 | Mobile Home | Residential | -0.40 | $13,855 | $0 | $0 | $13,855 |
| 818 | 7 | Mobile Home | Residential | -0.34 | $9,246 | $0 | $0 | $9,246 |
| 819 | 7 | Mobile Home | Residential | 0.37 | $9,254 | $6,375 | $0 | $15,629 |
| 826 | 7 | Mobile Home | Residential | -0.50 | $17,375 | $0 | $0 | $17,375 |
| 852 | 7 | Mobile Home | Residential | -0.46 | $13,786 | $0 | $0 | $13,786 |
| 863 | 7 | Mobile Home | Residential | -0.39 | $14,217 | $0 | $0 | $14,217 |
| 864 | 7 | Mobile Home | Residential | -0.43 | $6,072 | $0 | $0 | $6,072 |
| 886 | 7 | Mobile Home | Residential | -0.48 | $23,283 | $0 | $0 | $23,283 |
| 891 | 7 | Mobile Home | Residential | -0.09 | $21,889 | $0 | $0 | $21,889 |
| 894 | 7 | Mobile Home | Residential | 0.57 | $13,221 | $12,184 | $1,832 | $27,236 |
| 895 | 7 | Mobile Home | Residential | 0.08 | $11,647 | $2,202 | $0 | $13,849 |
| 915 | 7 | Mobile Home | Residential | -0.29 | $47,067 | $0 | $0 | $47,067 |
| 966 | 7 | Mobile Home | Residential | -0.50 | $27,873 | $0 | $0 | $27,873 |
| 987 | 7 | Mobile Home | Residential | -0.48 | $9,697 | $0 | $0 | $9,697 |
| 998 | 7 | Mobile Home | Residential | -0.43 | $6,568 | $0 | $0 | $6,568 |
| 1005 | 7 | Mobile Home | Residential | -0.43 | $12,449 | $0 | $0 | $12,449 |
| 1023 | 7 | Mobile Home | Residential | 0.27 | $29,980 | $16,068 | $0 | $46,049 |
| 1038 | 7 | Mobile Home | Residential | -0.19 | $16,838 | $0 | $0 | $16,838 |
| 842 | 85 | Police station | Institutional | -0.41 | $0 | $0 | $0 | $0 |
| 443 | 92 | School | Institutional | -0.02 | $0 | $0 | $0 | $0 |
| 275 | 106 | Solar Panels | Commercial | 0.04 | $0 | $0 | $0 | $0 |
| 471 | 107 | Stock Tank | Agriculture | 0.76 | $13,710 | $0 | $0 | $13,710 |
| 745 | 107 | Stock Tank | Agriculture | 0.51 | $12,392 | $0 | $0 | $12,392 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| | | | | **TOTAL** | **$4,734,988** | **$1,261,050** | **$122,158** | **$6,118,196** |

Subappendix D.1.1 Table 2. HEC-FIA Results, 100-Year Flood Event under Existing Conditions

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 153 | 107 | Stock Tank | Agriculture | 0.39 | $11,779 | $0 | $0 | $11,779 |
| 188 | 107 | Stock Tank | Agriculture | 0.15 | $10,533 | $0 | $0 | $10,533 |
| 470 | 107 | Stock Tank | Agriculture | 0.40 | $11,850 | $0 | $0 | $11,850 |
| 471 | 107 | Stock Tank | Agriculture | 1.53 | $16,589 | $0 | $0 | $16,589 |
| 745 | 107 | Stock Tank | Agriculture | 0.94 | $14,602 | $0 | $0 | $14,602 |
| 1 | 102 | Agricultural Structures | Agriculture | 0.69 | $32,041 | $11,403 | $0 | $43,444 |
| 9 | 102 | Agricultural Structures | Agriculture | 4.97 | $2,534 | $1,006 | $0 | $3,540 |
| 12 | 102 | Agricultural Structures | Agriculture | 2.84 | $256 | $95 | $11,163 | $11,514 |
| 22 | 102 | Agricultural Structures | Agriculture | 1.93 | $5,467 | $1,784 | $0 | $7,251 |
| 26 | 102 | Agricultural Structures | Agriculture | 1.94 | $5,272 | $1,722 | $8,271 | $15,265 |
| 27 | 102 | Agricultural Structures | Agriculture | 0.03 | $118 | $103 | $0 | $220 |
| 29 | 102 | Agricultural Structures | Agriculture | 1.55 | $2,054 | $652 | $0 | $2,707 |
| 33 | 102 | Agricultural Structures | Agriculture | 0.31 | $15,910 | $8,347 | $0 | $24,257 |
| 38 | 102 | Agricultural Structures | Agriculture | 1.04 | $37,264 | $11,232 | $0 | $48,496 |
| 52 | 102 | Agricultural Structures | Agriculture | 0.26 | $1,464 | $836 | $0 | $2,299 |
| 80 | 102 | Agricultural Structures | Agriculture | 0.28 | $415 | $230 | $0 | $646 |
| 87 | 102 | Agricultural Structures | Agriculture | 0.63 | $501 | $185 | $0 | $686 |
| 103 | 102 | Agricultural Structures | Agriculture | 0.00 | $2 | $2 | $0 | $4 |
| 130 | 102 | Agricultural Structures | Agriculture | 0.84 | $928 | $301 | $3,775 | $5,004 |
| 155 | 102 | Agricultural Structures | Agriculture | 1.14 | $370 | $113 | $0 | $483 |
| 161 | 102 | Agricultural Structures | Agriculture | 0.39 | $3,753 | $1,772 | $0 | $5,525 |
| 180 | 102 | Agricultural Structures | Agriculture | 0.41 | $15,819 | $7,263 | $0 | $23,082 |
| 186 | 102 | Agricultural Structures | Agriculture | 1.33 | $1,627 | $507 | $0 | $2,134 |
| 193 | 102 | Agricultural Structures | Agriculture | 1.08 | $3,256 | $987 | $0 | $4,244 |
| 217 | 102 | Agricultural Structures | Agriculture | 0.24 | $1,159 | $693 | $0 | $1,852 |
| 219 | 102 | Agricultural Structures | Agriculture | 0.37 | $1,022 | $496 | $0 | $1,518 |
| 249 | 102 | Agricultural Structures | Agriculture | 0.24 | $1,263 | $764 | $0 | $2,027 |
| 252 | 102 | Agricultural Structures | Agriculture | 0.33 | $253 | $130 | $0 | $383 |
| 253 | 102 | Agricultural Structures | Agriculture | 0.18 | $3,830 | $2,637 | $0 | $6,467 |
| 264 | 102 | Agricultural Structures | Agriculture | 0.47 | $1,503 | $642 | $0 | $2,145 |
| 271 | 102 | Agricultural Structures | Agriculture | 1.54 | $1,971 | $626 | $6,877 | $9,473 |
| 274 | 102 | Agricultural Structures | Agriculture | 1.96 | $828 | $270 | $0 | $1,098 |
| 276 | 102 | Agricultural Structures | Agriculture | 0.22 | $4,357 | $2,705 | $0 | $7,062 |
| 277 | 102 | Agricultural Structures | Agriculture | 0.33 | $6,887 | $3,529 | $0 | $10,416 |
| 278 | 102 | Agricultural Structures | Agriculture | 0.18 | $420 | $290 | $0 | $710 |
| 280 | 102 | Agricultural Structures | Agriculture | 0.33 | $437 | $224 | $0 | $661 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 284 | 102 | Agricultural Structures | Agriculture | 0.26 | $676 | $387 | $0 | $1,063 |
| 285 | 102 | Agricultural Structures | Agriculture | 0.66 | $900 | $326 | $0 | $1,226 |
| 286 | 102 | Agricultural Structures | Agriculture | 0.57 | $46,213 | $17,913 | $0 | $64,125 |
| 289 | 102 | Agricultural Structures | Agriculture | 0.34 | $799 | $402 | $0 | $1,201 |
| 290 | 102 | Agricultural Structures | Agriculture | 0.70 | $5,237 | $1,840 | $2,796 | $9,872 |
| 303 | 102 | Agricultural Structures | Agriculture | 0.57 | $1,957 | $762 | $0 | $2,718 |
| 313 | 102 | Agricultural Structures | Agriculture | 0.78 | $967 | $323 | $0 | $1,290 |
| 318 | 102 | Agricultural Structures | Agriculture | 0.97 | $2,002 | $609 | $0 | $2,611 |
| 323 | 102 | Agricultural Structures | Agriculture | 0.34 | $226 | $114 | $0 | $340 |
| 351 | 102 | Agricultural Structures | Agriculture | 0.21 | $268 | $170 | $0 | $437 |
| 393 | 102 | Agricultural Structures | Agriculture | 0.16 | $558 | $400 | $0 | $958 |
| 407 | 102 | Agricultural Structures | Agriculture | 0.58 | $809 | $312 | $0 | $1,121 |
| 414 | 102 | Agricultural Structures | Agriculture | 0.61 | $29,283 | $11,027 | $0 | $40,310 |
| 437 | 102 | Agricultural Structures | Agriculture | 0.67 | $1,091 | $392 | $0 | $1,483 |
| 439 | 102 | Agricultural Structures | Agriculture | 0.50 | $1,065 | $442 | $0 | $1,508 |
| 449 | 102 | Agricultural Structures | Agriculture | 0.26 | $198 | $114 | $0 | $312 |
| 450 | 102 | Agricultural Structures | Agriculture | 0.19 | $65 | $44 | $0 | $109 |
| 457 | 102 | Agricultural Structures | Agriculture | 0.42 | $192 | $88 | $0 | $280 |
| 459 | 102 | Agricultural Structures | Agriculture | 0.33 | $271 | $139 | $0 | $410 |
| 468 | 102 | Agricultural Structures | Agriculture | 1.45 | $13,220 | $4,165 | $6,565 | $23,949 |
| 469 | 102 | Agricultural Structures | Agriculture | 1.88 | $7,543 | $2,453 | $8,053 | $18,049 |
| 472 | 102 | Agricultural Structures | Agriculture | 1.34 | $949 | $296 | $6,162 | $7,407 |
| 474 | 102 | Agricultural Structures | Agriculture | 2.02 | $1,713 | $563 | $8,527 | $10,803 |
| 476 | 102 | Agricultural Structures | Agriculture | 0.61 | $9,362 | $3,520 | $2,104 | $14,986 |
| 478 | 102 | Agricultural Structures | Agriculture | 0.15 | $802 | $606 | $0 | $1,408 |
| 485 | 102 | Agricultural Structures | Agriculture | 0.15 | $47 | $35 | $0 | $83 |
| 511 | 102 | Agricultural Structures | Agriculture | 0.26 | $246 | $140 | $0 | $386 |
| 522 | 102 | Agricultural Structures | Agriculture | 0.25 | $3,360 | $1,981 | $0 | $5,341 |
| 528 | 102 | Agricultural Structures | Agriculture | 0.43 | $528 | $236 | $0 | $764 |
| 529 | 102 | Agricultural Structures | Agriculture | 0.59 | $9,274 | $3,547 | $0 | $12,821 |
| 546 | 102 | Agricultural Structures | Agriculture | 0.67 | $6,652 | $2,386 | $0 | $9,038 |
| 551 | 102 | Agricultural Structures | Agriculture | 1.24 | $802 | $248 | $5,840 | $6,890 |
| 554 | 102 | Agricultural Structures | Agriculture | 1.71 | $3,311 | $1,065 | $7,460 | $11,836 |
| 561 | 102 | Agricultural Structures | Agriculture | 1.32 | $186 | $58 | $6,100 | $6,344 |
| 563 | 102 | Agricultural Structures | Agriculture | 1.00 | $688 | $207 | $4,987 | $5,881 |
| 565 | 102 | Agricultural Structures | Agriculture | 0.04 | $138 | $121 | $0 | $258 |
| 568 | 102 | Agricultural Structures | Agriculture | 0.54 | $408 | $164 | $0 | $572 |
| 570 | 102 | Agricultural Structures | Agriculture | 0.44 | $766 | $340 | $0 | $1,106 |
| 592 | 102 | Agricultural Structures | Agriculture | 0.19 | $108 | $73 | $0 | $181 |
| 637 | 102 | Agricultural Structures | Agriculture | 0.28 | $2,662 | $1,492 | $0 | $4,154 |
| 667 | 102 | Agricultural Structures | Agriculture | 0.25 | $301 | $178 | $0 | $479 |
| 668 | 102 | Agricultural Structures | Agriculture | 0.23 | $639 | $393 | $0 | $1,032 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 669 | 102 | Agricultural Structures | Agriculture | 0.02 | $14 | $12 | $0 | $26 |
| 712 | 102 | Agricultural Structures | Agriculture | 0.65 | $5,503 | $2,015 | $0 | $7,518 |
| 713 | 102 | Agricultural Structures | Agriculture | 0.15 | $168 | $125 | $0 | $293 |
| 715 | 102 | Agricultural Structures | Agriculture | 0.71 | $2,855 | $1,000 | $0 | $3,856 |
| 720 | 102 | Agricultural Structures | Agriculture | 0.61 | $503 | $189 | $2,096 | $2,789 |
| 721 | 102 | Agricultural Structures | Agriculture | 0.13 | $400 | $318 | $0 | $718 |
| 722 | 102 | Agricultural Structures | Agriculture | 0.07 | $226 | $198 | $0 | $425 |
| 726 | 102 | Agricultural Structures | Agriculture | 0.16 | $4,980 | $3,575 | $0 | $8,555 |
| 772 | 102 | Agricultural Structures | Agriculture | 0.00 | $0 | $0 | $0 | $0 |
| 775 | 102 | Agricultural Structures | Agriculture | 0.11 | $260 | $216 | $0 | $476 |
| 817 | 102 | Agricultural Structures | Agriculture | 0.68 | $3,875 | $1,386 | $2,601 | $7,863 |
| 825 | 102 | Agricultural Structures | Agriculture | 0.04 | $43 | $38 | $0 | $81 |
| 828 | 102 | Agricultural Structures | Agriculture | 0.41 | $554 | $253 | $0 | $806 |
| 832 | 102 | Agricultural Structures | Agriculture | 1.02 | $449 | $135 | $0 | $584 |
| 851 | 102 | Agricultural Structures | Agriculture | 0.04 | $31 | $27 | $0 | $57 |
| 856 | 102 | Agricultural Structures | Agriculture | 0.29 | $239 | $131 | $0 | $371 |
| 857 | 102 | Agricultural Structures | Agriculture | 1.13 | $668 | $204 | $5,431 | $6,302 |
| 876 | 102 | Agricultural Structures | Agriculture | 0.33 | $11,244 | $5,718 | $0 | $16,962 |
| 889 | 102 | Agricultural Structures | Agriculture | 0.34 | $1,977 | $995 | $0 | $2,972 |
| 902 | 102 | Agricultural Structures | Agriculture | 0.25 | $1,209 | $717 | $0 | $1,927 |
| 905 | 102 | Agricultural Structures | Agriculture | 0.15 | $187 | $138 | $0 | $326 |
| 922 | 102 | Agricultural Structures | Agriculture | 0.04 | $56 | $49 | $0 | $104 |
| 925 | 102 | Agricultural Structures | Agriculture | 0.14 | $391 | $301 | $0 | $692 |
| 960 | 102 | Agricultural Structures | Agriculture | 0.25 | $227 | $135 | $0 | $362 |
| 961 | 102 | Agricultural Structures | Agriculture | 0.20 | $542 | $354 | $0 | $896 |
| 964 | 102 | Agricultural Structures | Agriculture | 0.03 | $19 | $16 | $0 | $35 |
| 965 | 102 | Agricultural Structures | Agriculture | 0.06 | $83 | $73 | $0 | $156 |
| 968 | 102 | Agricultural Structures | Agriculture | 0.11 | $165 | $138 | $0 | $303 |
| 991 | 102 | Agricultural Structures | Agriculture | 0.08 | $279 | $245 | $0 | $524 |
| 1003 | 102 | Agricultural Structures | Agriculture | 0.23 | $1,994 | $1,222 | $0 | $3,216 |
| 1004 | 102 | Agricultural Structures | Agriculture | 0.11 | $4,572 | $3,820 | $0 | $8,392 |
| 1010 | 102 | Agricultural Structures | Agriculture | 0.08 | $47 | $41 | $0 | $88 |
| 1020 | 102 | Agricultural Structures | Agriculture | 0.10 | $1,108 | $963 | $0 | $2,071 |
| 1027 | 102 | Agricultural Structures | Agriculture | 0.02 | $204 | $179 | $0 | $383 |
| 1036 | 102 | Agricultural Structures | Agriculture | 0.00 | $4 | $3 | $0 | $7 |
| 1050 | 102 | Agricultural Structures | Agriculture | 0.06 | $144 | $126 | $0 | $269 |
| 1051 | 102 | Agricultural Structures | Agriculture | 1.54 | $6,103 | $1,937 | $6,863 | $14,903 |
| 1053 | 102 | Agricultural Structures | Agriculture | 0.68 | $7,410 | $2,646 | $2,617 | $12,674 |
| 275 | 106 | Solar Panels | Commercial | 1.87 | $0 | $0 | $0 | $0 |
| 24 | 42 | Business - general | Commercial | -0.22 | $0 | $0 | $0 | $0 |
| 265 | 42 | Business - general | Commercial | 0.27 | $801 | $3,205 | $0 | $4,007 |
| 427 | 42 | Business - general | Commercial | -0.36 | $0 | $0 | $0 | $0 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 943 | 42 | Business - general | Commercial | -0.43 | $0 | $0 | $0 | $0 |
| 505 | 105 | Utilities | Institutional | 0.40 | $0 | $0 | $0 | $0 |
| 687 | 105 | Utilities | Institutional | 0.18 | $0 | $0 | $0 | $0 |
| 942 | 105 | Utilities | Institutional | 0.00 | $0 | $0 | $0 | $0 |
| 443 | 92 | School | Institutional | 0.41 | $458,007 | $515,257 | $0 | $973,264 |
| 682 | 92 | School | Institutional | -0.42 | $0 | $0 | $0 | $0 |
| 842 | 85 | Police station | Institutional | 1.98 | $106,164 | $152,309 | $563,997 | $822,470 |
| 2 | 7 | Mobile Home | Residential | 1.10 | $72,356 | $91,706 | $5,324 | $169,386 |
| 3 | 7 | Mobile Home | Residential | 1.23 | $29,164 | $36,732 | $5,726 | $71,622 |
| 4 | 7 | Mobile Home | Residential | 0.77 | $11,481 | $12,755 | $3,328 | $27,564 |
| 5 | 7 | Mobile Home | Residential | 0.14 | $13,995 | $4,245 | $0 | $18,240 |
| 6 | 7 | Mobile Home | Residential | 0.86 | $59,567 | $70,145 | $0 | $129,711 |
| 7 | 7 | Mobile Home | Residential | 0.97 | $28,317 | $35,500 | $4,745 | $68,562 |
| 8 | 7 | Mobile Home | Residential | 1.20 | $33,754 | $42,568 | $5,638 | $81,960 |
| 10 | 7 | Mobile Home | Residential | 2.15 | $31,195 | $36,605 | $8,654 | $76,455 |
| 11 | 7 | Mobile Home | Residential | 3.70 | $76,917 | $61,546 | $12,794 | $151,257 |
| 13 | 7 | Mobile Home | Residential | 2.09 | $40,288 | $48,041 | $8,491 | $96,820 |
| 14 | 7 | Mobile Home | Residential | 2.70 | $49,019 | $50,314 | $10,214 | $109,547 |
| 15 | 7 | Mobile Home | Residential | 0.59 | $48,005 | $45,470 | $2,013 | $95,488 |
| 18 | 7 | Mobile Home | Residential | 0.96 | $63,533 | $79,437 | $4,708 | $147,678 |
| 19 | 7 | Mobile Home | Residential | 0.95 | $36,631 | $45,605 | $4,650 | $86,886 |
| 20 | 7 | Mobile Home | Residential | 0.75 | $44,256 | $48,365 | $3,168 | $95,790 |
| 21 | 7 | Mobile Home | Residential | 3.89 | $221,669 | $169,759 | $13,263 | $404,691 |
| 23 | 7 | Mobile Home | Residential | 3.98 | $155,474 | $116,681 | $13,489 | $285,644 |
| 32 | 7 | Mobile Home | Residential | -0.20 | $9,480 | $0 | $0 | $9,480 |
| 34 | 7 | Mobile Home | Residential | 0.09 | $25,162 | $5,243 | $0 | $30,405 |
| 35 | 7 | Mobile Home | Residential | 0.13 | $16,805 | $4,761 | $0 | $21,567 |
| 36 | 7 | Mobile Home | Residential | -0.34 | $11,792 | $0 | $0 | $11,792 |
| 37 | 7 | Mobile Home | Residential | -0.18 | $10,953 | $0 | $0 | $10,953 |
| 39 | 7 | Mobile Home | Residential | 0.33 | $7,540 | $4,728 | $0 | $12,268 |
| 40 | 7 | Mobile Home | Residential | 0.28 | $33,904 | $18,804 | $0 | $52,708 |
| 41 | 7 | Mobile Home | Residential | -0.08 | $24,680 | $0 | $0 | $24,680 |
| 42 | 7 | Mobile Home | Residential | 0.05 | $14,563 | $1,667 | $0 | $16,230 |
| 43 | 7 | Mobile Home | Residential | 0.09 | $21,786 | $4,585 | $0 | $26,372 |
| 44 | 7 | Mobile Home | Residential | -0.34 | $9,882 | $0 | $0 | $9,882 |
| 45 | 7 | Mobile Home | Residential | 0.04 | $23,350 | $2,507 | $0 | $25,857 |
| 46 | 7 | Mobile Home | Residential | 0.07 | $7,865 | $1,330 | $0 | $9,195 |
| 47 | 7 | Mobile Home | Residential | 0.28 | $25,024 | $13,764 | $0 | $38,789 |
| 48 | 7 | Mobile Home | Residential | 0.32 | $13,343 | $8,209 | $0 | $21,552 |
| 49 | 7 | Mobile Home | Residential | 0.37 | $3,596 | $2,462 | $0 | $6,058 |
| 50 | 7 | Mobile Home | Residential | -0.50 | $2,296 | $0 | $0 | $2,296 |
| 51 | 7 | Mobile Home | Residential | 1.38 | $113,594 | $142,098 | $6,222 | $261,913 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 53 | 7 | Mobile Home | Residential | 0.61 | $23,334 | $22,591 | $2,167 | $48,091 |
| 54 | 7 | Mobile Home | Residential | -0.04 | $21,301 | $0 | $0 | $21,301 |
| 56 | 7 | Mobile Home | Residential | 0.32 | $12,336 | $7,645 | $0 | $19,981 |
| 57 | 7 | Mobile Home | Residential | 0.78 | $45,412 | $50,852 | $3,408 | $99,671 |
| 58 | 7 | Mobile Home | Residential | 0.87 | $38,609 | $45,941 | $4,075 | $88,625 |
| 59 | 7 | Mobile Home | Residential | 1.19 | $26,216 | $33,074 | $5,613 | $64,903 |
| 60 | 7 | Mobile Home | Residential | 0.26 | $4,225 | $2,243 | $0 | $6,469 |
| 61 | 7 | Mobile Home | Residential | 0.37 | $34,071 | $23,515 | $0 | $57,585 |
| 62 | 7 | Mobile Home | Residential | 0.65 | $18,870 | $18,920 | $2,427 | $40,217 |
| 63 | 7 | Mobile Home | Residential | 0.51 | $5,685 | $4,884 | $1,411 | $11,980 |
| 64 | 7 | Mobile Home | Residential | 0.70 | $20,534 | $21,560 | $2,805 | $44,898 |
| 65 | 7 | Mobile Home | Residential | 0.00 | $11,003 | $0 | $0 | $11,003 |
| 66 | 7 | Mobile Home | Residential | 0.11 | $16,921 | $4,416 | $0 | $21,337 |
| 67 | 7 | Mobile Home | Residential | 0.36 | $12,088 | $8,194 | $0 | $20,282 |
| 68 | 7 | Mobile Home | Residential | 0.39 | $41,324 | $29,453 | $0 | $70,777 |
| 69 | 7 | Mobile Home | Residential | -0.08 | $22,347 | $0 | $0 | $22,347 |
| 70 | 7 | Mobile Home | Residential | 0.51 | $8,134 | $7,023 | $1,440 | $16,597 |
| 71 | 7 | Mobile Home | Residential | 0.60 | $13,790 | $13,215 | $2,094 | $29,099 |
| 72 | 7 | Mobile Home | Residential | 0.79 | $10,263 | $11,590 | $3,495 | $25,347 |
| 73 | 7 | Mobile Home | Residential | 0.65 | $11,717 | $11,815 | $2,472 | $26,004 |
| 75 | 7 | Mobile Home | Residential | 0.60 | $30,807 | $29,552 | $2,101 | $62,460 |
| 76 | 7 | Mobile Home | Residential | 1.54 | $3,803 | $4,729 | $6,720 | $15,252 |
| 77 | 7 | Mobile Home | Residential | 0.64 | $16,816 | $16,686 | $2,347 | $35,849 |
| 78 | 7 | Mobile Home | Residential | -0.01 | $11,731 | $0 | $0 | $11,731 |
| 82 | 7 | Mobile Home | Residential | 1.88 | $7,643 | $9,399 | $7,831 | $24,873 |
| 83 | 7 | Mobile Home | Residential | 1.44 | $18,022 | $22,494 | $6,400 | $46,915 |
| 84 | 7 | Mobile Home | Residential | 0.73 | $56,995 | $61,184 | $3,002 | $121,181 |
| 85 | 7 | Mobile Home | Residential | 0.99 | $15,778 | $19,966 | $4,876 | $40,619 |
| 86 | 7 | Mobile Home | Residential | 0.81 | $14,600 | $16,661 | $3,605 | $34,865 |
| 88 | 7 | Mobile Home | Residential | -0.29 | $9,880 | $0 | $0 | $9,880 |
| 89 | 7 | Mobile Home | Residential | 0.53 | $28,869 | $25,471 | $1,564 | $55,904 |
| 90 | 7 | Mobile Home | Residential | 0.48 | $15,304 | $12,569 | $0 | $27,873 |
| 91 | 7 | Mobile Home | Residential | 1.21 | $16,792 | $21,166 | $5,674 | $43,632 |
| 96 | 7 | Mobile Home | Residential | -0.47 | $9,032 | $0 | $0 | $9,032 |
| 97 | 7 | Mobile Home | Residential | -0.03 | $11,904 | $0 | $0 | $11,904 |
| 98 | 7 | Mobile Home | Residential | -0.01 | $6,202 | $0 | $0 | $6,202 |
| 99 | 7 | Mobile Home | Residential | -0.48 | $12,050 | $0 | $0 | $12,050 |
| 100 | 7 | Mobile Home | Residential | -0.47 | $6,851 | $0 | $0 | $6,851 |
| 101 | 7 | Mobile Home | Residential | -0.14 | $9,087 | $0 | $0 | $9,087 |
| 102 | 7 | Mobile Home | Residential | 1.19 | $66,172 | $83,510 | $5,593 | $155,275 |
| 104 | 7 | Mobile Home | Residential | -0.37 | $10,276 | $0 | $0 | $10,276 |
| 106 | 7 | Mobile Home | Residential | 0.28 | $19,950 | $11,038 | $0 | $30,988 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 107 | 7 | Mobile Home | Residential | -0.28 | $12,101 | $0 | $0 | $12,101 |
| 109 | 7 | Mobile Home | Residential | -0.32 | $16,147 | $0 | $0 | $16,147 |
| 110 | 7 | Mobile Home | Residential | 1.80 | $19,368 | $23,871 | $7,588 | $50,828 |
| 111 | 7 | Mobile Home | Residential | 1.07 | $22,542 | $28,619 | $5,224 | $56,384 |
| 112 | 7 | Mobile Home | Residential | -0.32 | $16,167 | $0 | $0 | $16,167 |
| 113 | 7 | Mobile Home | Residential | 0.17 | $11,479 | $4,298 | $0 | $15,778 |
| 116 | 7 | Mobile Home | Residential | -0.30 | $19,414 | $0 | $0 | $19,414 |
| 118 | 7 | Mobile Home | Residential | 0.20 | $20,474 | $8,850 | $0 | $29,323 |
| 119 | 7 | Mobile Home | Residential | -0.32 | $31,197 | $0 | $0 | $31,197 |
| 121 | 7 | Mobile Home | Residential | -0.45 | $6,678 | $0 | $0 | $6,678 |
| 122 | 7 | Mobile Home | Residential | -0.50 | $11,912 | $0 | $0 | $11,912 |
| 126 | 7 | Mobile Home | Residential | -0.01 | $12,018 | $0 | $0 | $12,018 |
| 127 | 7 | Mobile Home | Residential | -0.48 | $25,716 | $0 | $0 | $25,716 |
| 128 | 7 | Mobile Home | Residential | -0.42 | $19,369 | $0 | $0 | $19,369 |
| 129 | 7 | Mobile Home | Residential | 1.16 | $26,841 | $33,927 | $5,493 | $66,261 |
| 131 | 7 | Mobile Home | Residential | 0.50 | $16,932 | $14,299 | $0 | $31,231 |
| 132 | 7 | Mobile Home | Residential | 0.43 | $44,184 | $33,983 | $0 | $78,168 |
| 133 | 7 | Mobile Home | Residential | 0.32 | $27,170 | $16,672 | $0 | $43,842 |
| 134 | 7 | Mobile Home | Residential | 2.02 | $5,508 | $6,704 | $8,292 | $20,504 |
| 135 | 7 | Mobile Home | Residential | 1.66 | $27,392 | $33,915 | $7,119 | $68,426 |
| 136 | 7 | Mobile Home | Residential | 1.51 | $16,904 | $21,036 | $0 | $37,939 |
| 137 | 7 | Mobile Home | Residential | 1.51 | $46,701 | $58,118 | $6,649 | $111,468 |
| 139 | 7 | Mobile Home | Residential | 0.51 | $7,807 | $6,690 | $1,397 | $15,894 |
| 140 | 7 | Mobile Home | Residential | 0.25 | $27,332 | $13,721 | $0 | $41,052 |
| 141 | 7 | Mobile Home | Residential | -0.14 | $18,078 | $0 | $0 | $18,078 |
| 142 | 7 | Mobile Home | Residential | 1.22 | $15,545 | $19,585 | $0 | $35,131 |
| 143 | 7 | Mobile Home | Residential | 0.17 | $21,329 | $8,025 | $0 | $29,354 |
| 144 | 7 | Mobile Home | Residential | 0.40 | $3,923 | $2,874 | $0 | $6,797 |
| 145 | 7 | Mobile Home | Residential | 0.06 | $6,443 | $988 | $0 | $7,430 |
| 146 | 7 | Mobile Home | Residential | 0.52 | $3,983 | $3,488 | $1,519 | $8,990 |
| 147 | 7 | Mobile Home | Residential | 1.26 | $13,916 | $17,499 | $5,836 | $37,251 |
| 148 | 7 | Mobile Home | Residential | 0.80 | $28,989 | $32,966 | $3,567 | $65,523 |
| 149 | 7 | Mobile Home | Residential | 1.11 | $13,007 | $16,479 | $5,347 | $34,833 |
| 150 | 7 | Mobile Home | Residential | 0.87 | $17,135 | $20,341 | $4,048 | $41,524 |
| 151 | 7 | Mobile Home | Residential | 0.79 | $28,386 | $31,969 | $3,466 | $63,821 |
| 152 | 7 | Mobile Home | Residential | 1.07 | $25,685 | $32,624 | $5,198 | $63,507 |
| 154 | 7 | Mobile Home | Residential | 0.39 | $35,408 | $25,283 | $0 | $60,691 |
| 156 | 7 | Mobile Home | Residential | -0.48 | $13,428 | $0 | $0 | $13,428 |
| 157 | 7 | Mobile Home | Residential | -0.23 | $16,991 | $0 | $0 | $16,991 |
| 158 | 7 | Mobile Home | Residential | 0.94 | $34,073 | $41,985 | $4,512 | $80,570 |
| 162 | 7 | Mobile Home | Residential | -0.50 | $15,014 | $0 | $0 | $15,014 |
| 163 | 7 | Mobile Home | Residential | -0.28 | $14,140 | $0 | $0 | $14,140 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 164 | 7 | Mobile Home | Residential | 0.11 | $10,685 | $2,654 | $0 | $13,339 |
| 166 | 7 | Mobile Home | Residential | -0.48 | $68,293 | $0 | $0 | $68,293 |
| 167 | 7 | Mobile Home | Residential | 0.11 | $12,734 | $3,272 | $0 | $16,006 |
| 168 | 7 | Mobile Home | Residential | -0.49 | $18,103 | $0 | $0 | $18,103 |
| 169 | 7 | Mobile Home | Residential | -0.41 | $10,713 | $0 | $0 | $10,713 |
| 170 | 7 | Mobile Home | Residential | -0.45 | $6,709 | $0 | $0 | $6,709 |
| 171 | 7 | Mobile Home | Residential | -0.14 | $10,102 | $0 | $0 | $10,102 |
| 173 | 7 | Mobile Home | Residential | -0.44 | $23,870 | $0 | $0 | $23,870 |
| 176 | 7 | Mobile Home | Residential | -0.43 | $22,851 | $0 | $0 | $22,851 |
| 181 | 7 | Mobile Home | Residential | -0.39 | $41,883 | $0 | $0 | $41,883 |
| 184 | 7 | Mobile Home | Residential | -0.49 | $17,299 | $0 | $0 | $17,299 |
| 185 | 7 | Mobile Home | Residential | -0.47 | $10,827 | $0 | $0 | $10,827 |
| 187 | 7 | Mobile Home | Residential | 0.53 | $12,032 | $10,574 | $1,541 | $24,147 |
| 189 | 7 | Mobile Home | Residential | 0.53 | $25,740 | $22,820 | $1,592 | $50,153 |
| 190 | 7 | Mobile Home | Residential | 0.30 | $2,297 | $1,352 | $0 | $3,649 |
| 191 | 7 | Mobile Home | Residential | 1.11 | $25,971 | $32,907 | $5,341 | $64,219 |
| 192 | 7 | Mobile Home | Residential | 0.39 | $23,638 | $16,817 | $0 | $40,454 |
| 194 | 7 | Mobile Home | Residential | 0.95 | $48,387 | $60,142 | $4,628 | $113,157 |
| 195 | 7 | Mobile Home | Residential | 1.12 | $40,456 | $51,234 | $5,373 | $97,064 |
| 196 | 7 | Mobile Home | Residential | 0.14 | $12,876 | $3,955 | $0 | $16,832 |
| 198 | 7 | Mobile Home | Residential | 1.97 | $43,306 | $53,123 | $8,136 | $104,564 |
| 199 | 7 | Mobile Home | Residential | 1.23 | $16,134 | $20,325 | $0 | $36,459 |
| 200 | 7 | Mobile Home | Residential | 1.70 | $18,180 | $22,479 | $7,248 | $47,907 |
| 201 | 7 | Mobile Home | Residential | 1.44 | $18,861 | $23,537 | $6,416 | $48,814 |
| 202 | 7 | Mobile Home | Residential | 0.36 | $5,998 | $4,039 | $0 | $10,037 |
| 203 | 7 | Mobile Home | Residential | -0.27 | $12,314 | $0 | $0 | $12,314 |
| 204 | 7 | Mobile Home | Residential | 0.58 | $35,150 | $32,976 | $1,949 | $70,074 |
| 205 | 7 | Mobile Home | Residential | -0.43 | $7,933 | $0 | $0 | $7,933 |
| 206 | 7 | Mobile Home | Residential | 0.92 | $20,622 | $25,168 | $4,388 | $50,178 |
| 207 | 7 | Mobile Home | Residential | 1.04 | $30,373 | $38,639 | $5,107 | $74,120 |
| 208 | 7 | Mobile Home | Residential | 1.45 | $26,415 | $32,960 | $6,426 | $65,801 |
| 209 | 7 | Mobile Home | Residential | 0.90 | $13,125 | $15,826 | $4,236 | $33,187 |
| 211 | 7 | Mobile Home | Residential | 1.25 | $28,926 | $36,403 | $5,781 | $71,110 |
| 212 | 7 | Mobile Home | Residential | 0.21 | $21,909 | $9,545 | $0 | $31,454 |
| 213 | 7 | Mobile Home | Residential | -0.30 | $11,132 | $0 | $0 | $11,132 |
| 214 | 7 | Mobile Home | Residential | 1.04 | $5,397 | $6,864 | $5,117 | $17,378 |
| 215 | 7 | Mobile Home | Residential | 0.62 | $30,485 | $29,631 | $2,195 | $62,311 |
| 216 | 7 | Mobile Home | Residential | -0.16 | $11,898 | $0 | $0 | $11,898 |
| 220 | 7 | Mobile Home | Residential | 0.19 | $1,660 | $688 | $0 | $2,348 |
| 221 | 7 | Mobile Home | Residential | -0.03 | $19,891 | $0 | $0 | $19,891 |
| 222 | 7 | Mobile Home | Residential | 0.05 | $12,316 | $1,525 | $0 | $13,840 |
| 223 | 7 | Mobile Home | Residential | -0.23 | $13,323 | $0 | $0 | $13,323 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 225 | 7 | Mobile Home | Residential | -0.08 | $17,267 | $0 | $0 | $17,267 |
| 226 | 7 | Mobile Home | Residential | -0.22 | $21,395 | $0 | $0 | $21,395 |
| 227 | 7 | Mobile Home | Residential | -0.10 | $2,636 | $0 | $0 | $2,636 |
| 228 | 7 | Mobile Home | Residential | -0.42 | $36,067 | $0 | $0 | $36,067 |
| 229 | 7 | Mobile Home | Residential | -0.40 | $28,727 | $0 | $0 | $28,727 |
| 230 | 7 | Mobile Home | Residential | -0.44 | $18,349 | $0 | $0 | $18,349 |
| 231 | 7 | Mobile Home | Residential | 0.38 | $26,873 | $18,760 | $0 | $45,633 |
| 232 | 7 | Mobile Home | Residential | 0.37 | $3,320 | $2,277 | $0 | $5,597 |
| 233 | 7 | Mobile Home | Residential | 0.35 | $28,258 | $18,685 | $0 | $46,943 |
| 234 | 7 | Mobile Home | Residential | 0.93 | $25,938 | $31,836 | $4,461 | $62,235 |
| 235 | 7 | Mobile Home | Residential | 0.60 | $5,350 | $5,111 | $2,073 | $12,534 |
| 236 | 7 | Mobile Home | Residential | 0.30 | $12,976 | $7,675 | $0 | $20,651 |
| 237 | 7 | Mobile Home | Residential | 0.12 | $29,110 | $7,960 | $0 | $37,070 |
| 238 | 7 | Mobile Home | Residential | 0.55 | $39,530 | $35,934 | $1,745 | $77,208 |
| 239 | 7 | Mobile Home | Residential | 1.34 | $8,587 | $10,762 | $6,079 | $25,427 |
| 240 | 7 | Mobile Home | Residential | 0.86 | $21,626 | $25,546 | $3,989 | $51,161 |
| 241 | 7 | Mobile Home | Residential | 0.65 | $5,410 | $5,424 | $2,427 | $13,261 |
| 243 | 7 | Mobile Home | Residential | 0.93 | $16,879 | $20,750 | $4,482 | $42,111 |
| 244 | 7 | Mobile Home | Residential | -0.08 | $6,253 | $0 | $0 | $6,253 |
| 246 | 7 | Mobile Home | Residential | -0.47 | $27,779 | $0 | $0 | $27,779 |
| 247 | 7 | Mobile Home | Residential | 0.11 | $19,782 | $5,083 | $0 | $24,865 |
| 248 | 7 | Mobile Home | Residential | -0.23 | $2,247 | $0 | $0 | $2,247 |
| 250 | 7 | Mobile Home | Residential | -0.46 | $2,918 | $0 | $0 | $2,918 |
| 251 | 7 | Mobile Home | Residential | -0.23 | $28,031 | $0 | $0 | $28,031 |
| 255 | 7 | Mobile Home | Residential | 0.11 | $6,513 | $1,647 | $0 | $8,160 |
| 257 | 7 | Mobile Home | Residential | -0.08 | $9,190 | $0 | $0 | $9,190 |
| 258 | 7 | Mobile Home | Residential | -0.43 | $9,267 | $0 | $0 | $9,267 |
| 259 | 7 | Mobile Home | Residential | 1.83 | $27,839 | $34,281 | $7,686 | $69,805 |
| 261 | 7 | Mobile Home | Residential | -0.24 | $15,538 | $0 | $0 | $15,538 |
| 266 | 7 | Mobile Home | Residential | -0.20 | $13,505 | $0 | $0 | $13,505 |
| 270 | 7 | Mobile Home | Residential | 0.67 | $52,596 | $53,810 | $0 | $106,406 |
| 272 | 7 | Mobile Home | Residential | 1.01 | $30,341 | $38,659 | $5,020 | $74,019 |
| 273 | 7 | Mobile Home | Residential | -0.46 | $17,730 | $0 | $0 | $17,730 |
| 279 | 7 | Mobile Home | Residential | -0.19 | $13,488 | $0 | $0 | $13,488 |
| 281 | 7 | Mobile Home | Residential | -0.43 | $32,867 | $0 | $0 | $32,867 |
| 282 | 7 | Mobile Home | Residential | -0.37 | $17,588 | $0 | $0 | $17,588 |
| 287 | 7 | Mobile Home | Residential | -0.24 | $19,630 | $0 | $0 | $19,630 |
| 288 | 7 | Mobile Home | Residential | -0.25 | $19,554 | $0 | $0 | $19,554 |
| 291 | 7 | Mobile Home | Residential | -0.22 | $10,052 | $0 | $0 | $10,052 |
| 292 | 7 | Mobile Home | Residential | -0.13 | $13,959 | $0 | $0 | $13,959 |
| 293 | 7 | Mobile Home | Residential | 0.02 | $11,231 | $481 | $0 | $11,712 |
| 294 | 7 | Mobile Home | Residential | 0.33 | $15,053 | $9,526 | $0 | $24,579 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 295 | 7 | Mobile Home | Residential | 0.41 | $21,172 | $15,617 | $0 | $36,789 |
| 296 | 7 | Mobile Home | Residential | 0.90 | $28,589 | $34,550 | $4,264 | $67,404 |
| 297 | 7 | Mobile Home | Residential | -0.25 | $24,772 | $0 | $0 | $24,772 |
| 298 | 7 | Mobile Home | Residential | -0.39 | $9,762 | $0 | $0 | $9,762 |
| 300 | 7 | Mobile Home | Residential | -0.13 | $23,341 | $0 | $0 | $23,341 |
| 305 | 7 | Mobile Home | Residential | 0.06 | $27,500 | $4,216 | $0 | $31,716 |
| 306 | 7 | Mobile Home | Residential | 0.02 | $20,689 | $986 | $0 | $21,674 |
| 307 | 7 | Mobile Home | Residential | 0.06 | $11,206 | $1,718 | $0 | $12,923 |
| 308 | 7 | Mobile Home | Residential | 0.32 | $13,364 | $8,244 | $0 | $21,608 |
| 309 | 7 | Mobile Home | Residential | 0.00 | $11,539 | $0 | $0 | $11,539 |
| 310 | 7 | Mobile Home | Residential | -0.02 | $6,073 | $0 | $0 | $6,073 |
| 311 | 7 | Mobile Home | Residential | -0.25 | $16,507 | $0 | $0 | $16,507 |
| 312 | 7 | Mobile Home | Residential | 0.46 | $31,175 | $24,863 | $0 | $56,038 |
| 314 | 7 | Mobile Home | Residential | 0.03 | $7,248 | $539 | $0 | $7,787 |
| 315 | 7 | Mobile Home | Residential | -0.22 | $18,722 | $0 | $0 | $18,722 |
| 316 | 7 | Mobile Home | Residential | 0.15 | $11,794 | $3,898 | $0 | $15,692 |
| 317 | 7 | Mobile Home | Residential | -0.26 | $18,439 | $0 | $0 | $18,439 |
| 319 | 7 | Mobile Home | Residential | -0.09 | $10,674 | $0 | $0 | $10,674 |
| 320 | 7 | Mobile Home | Residential | -0.31 | $17,133 | $0 | $0 | $17,133 |
| 321 | 7 | Mobile Home | Residential | -0.18 | $18,877 | $0 | $0 | $18,877 |
| 322 | 7 | Mobile Home | Residential | -0.27 | $12,407 | $0 | $0 | $12,407 |
| 339 | 7 | Mobile Home | Residential | 0.09 | $10,598 | $2,231 | $0 | $12,828 |
| 341 | 7 | Mobile Home | Residential | -0.31 | $8,568 | $0 | $0 | $8,568 |
| 343 | 7 | Mobile Home | Residential | -0.40 | $17,091 | $0 | $0 | $17,091 |
| 344 | 7 | Mobile Home | Residential | -0.05 | $6,650 | $0 | $0 | $6,650 |
| 345 | 7 | Mobile Home | Residential | -0.17 | $18,657 | $0 | $0 | $18,657 |
| 346 | 7 | Mobile Home | Residential | -0.19 | $12,945 | $0 | $0 | $12,945 |
| 347 | 7 | Mobile Home | Residential | -0.42 | $14,945 | $0 | $0 | $14,945 |
| 348 | 7 | Mobile Home | Residential | -0.36 | $7,584 | $0 | $0 | $7,584 |
| 349 | 7 | Mobile Home | Residential | -0.29 | $14,919 | $0 | $0 | $14,919 |
| 350 | 7 | Mobile Home | Residential | -0.46 | $12,949 | $0 | $0 | $12,949 |
| 352 | 7 | Mobile Home | Residential | -0.29 | $25,235 | $0 | $0 | $25,235 |
| 353 | 7 | Mobile Home | Residential | -0.06 | $36,335 | $0 | $0 | $36,335 |
| 355 | 7 | Mobile Home | Residential | -0.42 | $13,264 | $0 | $0 | $13,264 |
| 358 | 7 | Mobile Home | Residential | 0.29 | $14,998 | $8,666 | $0 | $23,664 |
| 359 | 7 | Mobile Home | Residential | -0.14 | $26,677 | $0 | $0 | $26,677 |
| 360 | 7 | Mobile Home | Residential | 0.12 | $11,632 | $3,106 | $0 | $14,737 |
| 362 | 7 | Mobile Home | Residential | -0.24 | $13,425 | $0 | $0 | $13,425 |
| 363 | 7 | Mobile Home | Residential | -0.44 | $21,337 | $0 | $0 | $21,337 |
| 364 | 7 | Mobile Home | Residential | -0.32 | $21,101 | $0 | $0 | $21,101 |
| 365 | 7 | Mobile Home | Residential | -0.28 | $11,760 | $0 | $0 | $11,760 |
| 366 | 7 | Mobile Home | Residential | 0.04 | $10,374 | $1,018 | $0 | $11,392 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 368 | 7 | Mobile Home | Residential | -0.19 | $11,522 | $0 | $0 | $11,522 |
| 369 | 7 | Mobile Home | Residential | -0.39 | $45,100 | $0 | $0 | $45,100 |
| 371 | 7 | Mobile Home | Residential | -0.41 | $6,178 | $0 | $0 | $6,178 |
| 372 | 7 | Mobile Home | Residential | -0.24 | $21,233 | $0 | $0 | $21,233 |
| 373 | 7 | Mobile Home | Residential | -0.20 | $5,841 | $0 | $0 | $5,841 |
| 374 | 7 | Mobile Home | Residential | -0.14 | $26,890 | $0 | $0 | $26,890 |
| 375 | 7 | Mobile Home | Residential | -0.18 | $9,368 | $0 | $0 | $9,368 |
| 376 | 7 | Mobile Home | Residential | -0.21 | $6,837 | $0 | $0 | $6,837 |
| 378 | 7 | Mobile Home | Residential | -0.40 | $35,143 | $0 | $0 | $35,143 |
| 379 | 7 | Mobile Home | Residential | -0.26 | $16,995 | $0 | $0 | $16,995 |
| 382 | 7 | Mobile Home | Residential | -0.11 | $28,030 | $0 | $0 | $28,030 |
| 383 | 7 | Mobile Home | Residential | -0.13 | $33,163 | $0 | $0 | $33,163 |
| 384 | 7 | Mobile Home | Residential | -0.48 | $7,352 | $0 | $0 | $7,352 |
| 385 | 7 | Mobile Home | Residential | -0.41 | $11,429 | $0 | $0 | $11,429 |
| 386 | 7 | Mobile Home | Residential | -0.17 | $24,526 | $0 | $0 | $24,526 |
| 387 | 7 | Mobile Home | Residential | -0.40 | $16,530 | $0 | $0 | $16,530 |
| 388 | 7 | Mobile Home | Residential | -0.27 | $12,394 | $0 | $0 | $12,394 |
| 389 | 7 | Mobile Home | Residential | 0.02 | $4,693 | $212 | $0 | $4,906 |
| 390 | 7 | Mobile Home | Residential | -0.48 | $13,911 | $0 | $0 | $13,911 |
| 395 | 7 | Mobile Home | Residential | -0.29 | $28,329 | $0 | $0 | $28,329 |
| 396 | 7 | Mobile Home | Residential | -0.32 | $15,771 | $0 | $0 | $15,771 |
| 397 | 7 | Mobile Home | Residential | -0.45 | $4,977 | $0 | $0 | $4,977 |
| 399 | 7 | Mobile Home | Residential | -0.32 | $14,891 | $0 | $0 | $14,891 |
| 401 | 7 | Mobile Home | Residential | 0.06 | $2,650 | $389 | $0 | $3,039 |
| 403 | 7 | Mobile Home | Residential | -0.38 | $22,161 | $0 | $0 | $22,161 |
| 405 | 7 | Mobile Home | Residential | -0.11 | $13,928 | $0 | $0 | $13,928 |
| 406 | 7 | Mobile Home | Residential | -0.14 | $11,520 | $0 | $0 | $11,520 |
| 408 | 7 | Mobile Home | Residential | -0.36 | $12,858 | $0 | $0 | $12,858 |
| 411 | 7 | Mobile Home | Residential | -0.09 | $9,863 | $0 | $0 | $9,863 |
| 413 | 7 | Mobile Home | Residential | -0.42 | $21,215 | $0 | $0 | $21,215 |
| 419 | 7 | Mobile Home | Residential | -0.48 | $11,846 | $0 | $0 | $11,846 |
| 421 | 7 | Mobile Home | Residential | -0.50 | $7,646 | $0 | $0 | $7,646 |
| 422 | 7 | Mobile Home | Residential | -0.46 | $12,974 | $0 | $0 | $12,974 |
| 425 | 7 | Mobile Home | Residential | -0.32 | $5,503 | $0 | $0 | $5,503 |
| 426 | 7 | Mobile Home | Residential | -0.39 | $10,923 | $0 | $0 | $10,923 |
| 429 | 7 | Mobile Home | Residential | -0.31 | $14,134 | $0 | $0 | $14,134 |
| 431 | 7 | Mobile Home | Residential | 0.06 | $26,198 | $3,720 | $0 | $29,917 |
| 433 | 7 | Mobile Home | Residential | -0.44 | $48,207 | $0 | $0 | $48,207 |
| 436 | 7 | Mobile Home | Residential | -0.19 | $27,865 | $0 | $0 | $27,865 |
| 441 | 7 | Mobile Home | Residential | -0.22 | $12,402 | $0 | $0 | $12,402 |
| 444 | 7 | Mobile Home | Residential | -0.22 | $8,281 | $0 | $0 | $8,281 |
| 445 | 7 | Mobile Home | Residential | -0.44 | $10,818 | $0 | $0 | $10,818 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 453 | 7 | Mobile Home | Residential | -0.07 | $8,672 | $0 | $0 | $8,672 |
| 467 | 7 | Mobile Home | Residential | -0.39 | $5,238 | $0 | $0 | $5,238 |
| 473 | 7 | Mobile Home | Residential | 0.40 | $37,355 | $27,164 | $0 | $64,519 |
| 475 | 7 | Mobile Home | Residential | -0.41 | $9,319 | $0 | $0 | $9,319 |
| 477 | 7 | Mobile Home | Residential | -0.20 | $12,353 | $0 | $0 | $12,353 |
| 481 | 7 | Mobile Home | Residential | -0.17 | $12,293 | $0 | $0 | $12,293 |
| 482 | 7 | Mobile Home | Residential | -0.27 | $8,642 | $0 | $0 | $8,642 |
| 483 | 7 | Mobile Home | Residential | -0.23 | $11,448 | $0 | $0 | $11,448 |
| 484 | 7 | Mobile Home | Residential | -0.49 | $11,734 | $0 | $0 | $11,734 |
| 487 | 4 | Mobile Home | Residential | -0.08 | $15,728 | $0 | $0 | $15,728 |
| 489 | 7 | Mobile Home | Residential | -0.35 | $9,385 | $0 | $0 | $9,385 |
| 490 | 7 | Mobile Home | Residential | -0.40 | $7,547 | $0 | $0 | $7,547 |
| 497 | 7 | Mobile Home | Residential | -0.02 | $17,565 | $0 | $0 | $17,565 |
| 500 | 7 | Mobile Home | Residential | -0.48 | $33,642 | $0 | $0 | $33,642 |
| 501 | 7 | Mobile Home | Residential | -0.44 | $12,075 | $0 | $0 | $12,075 |
| 502 | 7 | Mobile Home | Residential | -0.31 | $16,319 | $0 | $0 | $16,319 |
| 503 | 7 | Mobile Home | Residential | -0.13 | $10,056 | $0 | $0 | $10,056 |
| 506 | 7 | Mobile Home | Residential | -0.28 | $13,772 | $0 | $0 | $13,772 |
| 507 | 7 | Mobile Home | Residential | -0.47 | $18,185 | $0 | $0 | $18,185 |
| 509 | 7 | Mobile Home | Residential | -0.50 | $8,579 | $0 | $0 | $8,579 |
| 510 | 7 | Mobile Home | Residential | -0.49 | $18,271 | $0 | $0 | $18,271 |
| 512 | 7 | Mobile Home | Residential | 0.19 | $18,838 | $7,501 | $0 | $26,339 |
| 513 | 7 | Mobile Home | Residential | -0.20 | $26,963 | $0 | $0 | $26,963 |
| 514 | 7 | Mobile Home | Residential | -0.04 | $10,478 | $0 | $0 | $10,478 |
| 515 | 7 | Mobile Home | Residential | -0.46 | $11,250 | $0 | $0 | $11,250 |
| 516 | 7 | Mobile Home | Residential | -0.17 | $20,362 | $0 | $0 | $20,362 |
| 517 | 7 | Mobile Home | Residential | 0.08 | $14,177 | $2,585 | $0 | $16,762 |
| 519 | 7 | Mobile Home | Residential | 0.04 | $16,069 | $1,461 | $0 | $17,530 |
| 520 | 7 | Mobile Home | Residential | -0.23 | $11,040 | $0 | $0 | $11,040 |
| 521 | 7 | Mobile Home | Residential | 0.09 | $18,945 | $4,190 | $0 | $23,135 |
| 524 | 7 | Mobile Home | Residential | -0.42 | $18,842 | $0 | $0 | $18,842 |
| 525 | 7 | Mobile Home | Residential | 0.41 | $24,341 | $18,111 | $0 | $42,452 |
| 526 | 7 | Mobile Home | Residential | 0.03 | $12,345 | $798 | $0 | $13,143 |
| 533 | 7 | Mobile Home | Residential | -0.38 | $11,744 | $0 | $0 | $11,744 |
| 537 | 7 | Mobile Home | Residential | -0.48 | $15,079 | $0 | $0 | $15,079 |
| 538 | 7 | Mobile Home | Residential | -0.44 | $10,189 | $0 | $0 | $10,189 |
| 540 | 7 | Mobile Home | Residential | -0.01 | $24,556 | $0 | $0 | $24,556 |
| 541 | 7 | Mobile Home | Residential | -0.24 | $22,853 | $0 | $0 | $22,853 |
| 544 | 7 | Mobile Home | Residential | 0.47 | $56,620 | $46,429 | $0 | $103,050 |
| 545 | 7 | Mobile Home | Residential | 1.13 | $23,305 | $29,497 | $5,408 | $58,211 |
| 547 | 7 | Mobile Home | Residential | 0.02 | $21,731 | $820 | $0 | $22,551 |
| 548 | 7 | Mobile Home | Residential | 0.07 | $16,125 | $2,547 | $0 | $18,673 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 549 | 7 | Mobile Home | Residential | 0.41 | $26,417 | $19,519 | $0 | $45,936 |
| 550 | 7 | Mobile Home | Residential | 1.26 | $27,077 | $34,048 | $0 | $61,125 |
| 552 | 7 | Mobile Home | Residential | 0.72 | $20,987 | $22,474 | $2,980 | $46,441 |
| 553 | 7 | Mobile Home | Residential | 0.07 | $35,867 | $5,666 | $0 | $41,533 |
| 556 | 7 | Mobile Home | Residential | 0.22 | $25,340 | $11,566 | $0 | $36,907 |
| 557 | 7 | Mobile Home | Residential | 0.05 | $13,211 | $1,725 | $0 | $14,935 |
| 560 | 7 | Mobile Home | Residential | -0.46 | $17,538 | $0 | $0 | $17,538 |
| 562 | 7 | Mobile Home | Residential | -0.32 | $20,398 | $0 | $0 | $20,398 |
| 566 | 7 | Mobile Home | Residential | -0.49 | $9,993 | $0 | $0 | $9,993 |
| 567 | 7 | Mobile Home | Residential | -0.16 | $13,434 | $0 | $0 | $13,434 |
| 571 | 7 | Mobile Home | Residential | 0.19 | $11,178 | $4,510 | $0 | $15,688 |
| 574 | 7 | Mobile Home | Residential | -0.36 | $9,363 | $0 | $0 | $9,363 |
| 576 | 7 | Mobile Home | Residential | -0.31 | $13,871 | $0 | $0 | $13,871 |
| 582 | 7 | Mobile Home | Residential | -0.34 | $8,026 | $0 | $0 | $8,026 |
| 583 | 7 | Mobile Home | Residential | -0.46 | $14,849 | $0 | $0 | $14,849 |
| 584 | 7 | Mobile Home | Residential | -0.47 | $23,259 | $0 | $0 | $23,259 |
| 586 | 7 | Mobile Home | Residential | -0.49 | $23,410 | $0 | $0 | $23,410 |
| 587 | 7 | Mobile Home | Residential | -0.36 | $20,158 | $0 | $0 | $20,158 |
| 593 | 7 | Mobile Home | Residential | -0.42 | $8,388 | $0 | $0 | $8,388 |
| 594 | 7 | Mobile Home | Residential | 0.13 | $10,954 | $3,280 | $0 | $14,235 |
| 596 | 7 | Mobile Home | Residential | -0.27 | $10,414 | $0 | $0 | $10,414 |
| 597 | 7 | Mobile Home | Residential | -0.50 | $15,466 | $0 | $0 | $15,466 |
| 599 | 7 | Mobile Home | Residential | -0.47 | $19,115 | $0 | $0 | $19,115 |
| 603 | 7 | Mobile Home | Residential | -0.49 | $18,490 | $0 | $0 | $18,490 |
| 608 | 7 | Mobile Home | Residential | -0.48 | $19,066 | $0 | $0 | $19,066 |
| 610 | 7 | Mobile Home | Residential | -0.38 | $18,285 | $0 | $0 | $18,285 |
| 615 | 7 | Mobile Home | Residential | -0.49 | $13,171 | $0 | $0 | $13,171 |
| 616 | 7 | Mobile Home | Residential | -0.41 | $8,621 | $0 | $0 | $8,621 |
| 617 | 7 | Mobile Home | Residential | -0.12 | $15,617 | $0 | $0 | $15,617 |
| 618 | 7 | Mobile Home | Residential | -0.43 | $17,555 | $0 | $0 | $17,555 |
| 619 | 7 | Mobile Home | Residential | -0.33 | $26,452 | $0 | $0 | $26,452 |
| 621 | 7 | Mobile Home | Residential | -0.50 | $14,965 | $0 | $0 | $14,965 |
| 622 | 7 | Mobile Home | Residential | -0.35 | $10,936 | $0 | $0 | $10,936 |
| 628 | 7 | Mobile Home | Residential | -0.38 | $16,935 | $0 | $0 | $16,935 |
| 630 | 7 | Mobile Home | Residential | -0.44 | $22,140 | $0 | $0 | $22,140 |
| 631 | 7 | Mobile Home | Residential | -0.41 | $20,778 | $0 | $0 | $20,778 |
| 634 | 7 | Mobile Home | Residential | -0.30 | $20,252 | $0 | $0 | $20,252 |
| 639 | 7 | Mobile Home | Residential | -0.41 | $11,923 | $0 | $0 | $11,923 |
| 640 | 7 | Mobile Home | Residential | -0.43 | $10,504 | $0 | $0 | $10,504 |
| 641 | 7 | Mobile Home | Residential | -0.50 | $20,910 | $0 | $0 | $20,910 |
| 642 | 7 | Mobile Home | Residential | -0.48 | $14,443 | $0 | $0 | $14,443 |
| 643 | 7 | Mobile Home | Residential | -0.39 | $18,150 | $0 | $0 | $18,150 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 644 | 7 | Mobile Home | Residential | -0.27 | $16,836 | $0 | $0 | $16,836 |
| 651 | 7 | Mobile Home | Residential | -0.27 | $22,587 | $0 | $0 | $22,587 |
| 652 | 7 | Mobile Home | Residential | -0.43 | $17,881 | $0 | $0 | $17,881 |
| 653 | 7 | Mobile Home | Residential | -0.42 | $11,988 | $0 | $0 | $11,988 |
| 654 | 7 | Mobile Home | Residential | -0.25 | $20,849 | $0 | $0 | $20,849 |
| 655 | 7 | Mobile Home | Residential | -0.39 | $20,722 | $0 | $0 | $20,722 |
| 656 | 7 | Mobile Home | Residential | -0.50 | $8,620 | $0 | $0 | $8,620 |
| 657 | 7 | Mobile Home | Residential | -0.50 | $18,099 | $0 | $0 | $18,099 |
| 659 | 7 | Mobile Home | Residential | -0.50 | $25,495 | $0 | $0 | $25,495 |
| 660 | 7 | Mobile Home | Residential | -0.49 | $38,348 | $0 | $0 | $38,348 |
| 661 | 7 | Mobile Home | Residential | -0.48 | $23,084 | $0 | $0 | $23,084 |
| 662 | 7 | Mobile Home | Residential | -0.50 | $29,569 | $0 | $0 | $29,569 |
| 663 | 7 | Mobile Home | Residential | 0.06 | $13,793 | $1,866 | $0 | $15,659 |
| 664 | 7 | Mobile Home | Residential | -0.35 | $17,981 | $0 | $0 | $17,981 |
| 665 | 7 | Mobile Home | Residential | -0.42 | $10,537 | $0 | $0 | $10,537 |
| 666 | 7 | Mobile Home | Residential | -0.20 | $15,168 | $0 | $0 | $15,168 |
| 672 | 7 | Mobile Home | Residential | -0.39 | $22,454 | $0 | $0 | $22,454 |
| 673 | 7 | Mobile Home | Residential | 0.27 | $20,956 | $11,362 | $0 | $32,318 |
| 674 | 7 | Mobile Home | Residential | -0.50 | $15,060 | $0 | $0 | $15,060 |
| 675 | 7 | Mobile Home | Residential | -0.37 | $13,413 | $0 | $0 | $13,413 |
| 676 | 7 | Mobile Home | Residential | -0.50 | $22,581 | $0 | $0 | $22,581 |
| 677 | 7 | Mobile Home | Residential | -0.44 | $28,151 | $0 | $0 | $28,151 |
| 679 | 7 | Mobile Home | Residential | -0.44 | $12,057 | $0 | $0 | $12,057 |
| 680 | 7 | Mobile Home | Residential | -0.44 | $19,831 | $0 | $0 | $19,831 |
| 683 | 7 | Mobile Home | Residential | -0.01 | $32,355 | $0 | $0 | $32,355 |
| 686 | 7 | Mobile Home | Residential | -0.30 | $20,060 | $0 | $0 | $20,060 |
| 691 | 7 | Mobile Home | Residential | -0.50 | $10,341 | $0 | $0 | $10,341 |
| 693 | 7 | Mobile Home | Residential | -0.49 | $9,960 | $0 | $0 | $9,960 |
| 694 | 7 | Mobile Home | Residential | -0.34 | $18,786 | $0 | $0 | $18,786 |
| 696 | 7 | Mobile Home | Residential | -0.47 | $19,059 | $0 | $0 | $19,059 |
| 698 | 7 | Mobile Home | Residential | -0.41 | $16,793 | $0 | $0 | $16,793 |
| 699 | 7 | Mobile Home | Residential | -0.46 | $7,765 | $0 | $0 | $7,765 |
| 704 | 7 | Mobile Home | Residential | -0.49 | $15,223 | $0 | $0 | $15,223 |
| 705 | 7 | Mobile Home | Residential | -0.47 | $21,483 | $0 | $0 | $21,483 |
| 706 | 7 | Mobile Home | Residential | -0.24 | $16,116 | $0 | $0 | $16,116 |
| 708 | 7 | Mobile Home | Residential | -0.44 | $12,152 | $0 | $0 | $12,152 |
| 716 | 7 | Mobile Home | Residential | 0.17 | $19,922 | $7,342 | $0 | $27,264 |
| 717 | 7 | Mobile Home | Residential | -0.03 | $22,895 | $0 | $0 | $22,895 |
| 723 | 7 | Mobile Home | Residential | -0.35 | $15,202 | $0 | $0 | $15,202 |
| 724 | 7 | Mobile Home | Residential | -0.37 | $12,258 | $0 | $0 | $12,258 |
| 725 | 7 | Mobile Home | Residential | -0.35 | $10,091 | $0 | $0 | $10,091 |
| 728 | 7 | Mobile Home | Residential | -0.46 | $8,341 | $0 | $0 | $8,341 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 729 | 7 | Mobile Home | Residential | -0.38 | $3,594 | $0 | $0 | $3,594 |
| 730 | 7 | Mobile Home | Residential | -0.39 | $6,961 | $0 | $0 | $6,961 |
| 731 | 7 | Mobile Home | Residential | -0.37 | $17,504 | $0 | $0 | $17,504 |
| 732 | 7 | Mobile Home | Residential | -0.50 | $16,809 | $0 | $0 | $16,809 |
| 733 | 7 | Mobile Home | Residential | -0.39 | $22,554 | $0 | $0 | $22,554 |
| 734 | 7 | Mobile Home | Residential | -0.50 | $10,605 | $0 | $0 | $10,605 |
| 739 | 7 | Mobile Home | Residential | -0.33 | $21,956 | $0 | $0 | $21,956 |
| 742 | 7 | Mobile Home | Residential | -0.49 | $8,240 | $0 | $0 | $8,240 |
| 747 | 7 | Mobile Home | Residential | -0.49 | $10,949 | $0 | $0 | $10,949 |
| 748 | 7 | Mobile Home | Residential | -0.10 | $16,245 | $0 | $0 | $16,245 |
| 751 | 7 | Mobile Home | Residential | -0.29 | $18,858 | $0 | $0 | $18,858 |
| 762 | 7 | Mobile Home | Residential | -0.39 | $15,194 | $0 | $0 | $15,194 |
| 767 | 7 | Mobile Home | Residential | 0.55 | $18,504 | $16,744 | $1,716 | $36,964 |
| 769 | 7 | Mobile Home | Residential | -0.24 | $14,463 | $0 | $0 | $14,463 |
| 771 | 7 | Mobile Home | Residential | -0.49 | $26,660 | $0 | $0 | $26,660 |
| 782 | 7 | Mobile Home | Residential | -0.50 | $21,244 | $0 | $0 | $21,244 |
| 784 | 7 | Mobile Home | Residential | -0.49 | $15,819 | $0 | $0 | $15,819 |
| 786 | 7 | Mobile Home | Residential | -0.35 | $16,803 | $0 | $0 | $16,803 |
| 787 | 7 | Mobile Home | Residential | -0.45 | $16,169 | $0 | $0 | $16,169 |
| 788 | 7 | Mobile Home | Residential | -0.41 | $42,756 | $0 | $0 | $42,756 |
| 789 | 7 | Mobile Home | Residential | -0.44 | $14,284 | $0 | $0 | $14,284 |
| 791 | 7 | Mobile Home | Residential | -0.43 | $23,235 | $0 | $0 | $23,235 |
| 792 | 7 | Mobile Home | Residential | -0.35 | $18,336 | $0 | $0 | $18,336 |
| 794 | 7 | Mobile Home | Residential | -0.32 | $13,241 | $0 | $0 | $13,241 |
| 795 | 7 | Mobile Home | Residential | -0.47 | $28,491 | $0 | $0 | $28,491 |
| 796 | 7 | Mobile Home | Residential | -0.48 | $20,510 | $0 | $0 | $20,510 |
| 797 | 7 | Mobile Home | Residential | -0.34 | $12,342 | $0 | $0 | $12,342 |
| 798 | 7 | Mobile Home | Residential | -0.37 | $28,836 | $0 | $0 | $28,836 |
| 799 | 7 | Mobile Home | Residential | -0.47 | $10,838 | $0 | $0 | $10,838 |
| 800 | 7 | Mobile Home | Residential | -0.49 | $9,202 | $0 | $0 | $9,202 |
| 803 | 7 | Mobile Home | Residential | -0.48 | $12,368 | $0 | $0 | $12,368 |
| 806 | 7 | Mobile Home | Residential | -0.34 | $33,543 | $0 | $0 | $33,543 |
| 818 | 7 | Mobile Home | Residential | 0.22 | $12,331 | $5,649 | $0 | $17,980 |
| 819 | 7 | Mobile Home | Residential | 0.98 | $13,340 | $16,794 | $4,803 | $34,938 |
| 820 | 7 | Mobile Home | Residential | -0.37 | $10,608 | $0 | $0 | $10,608 |
| 821 | 7 | Mobile Home | Residential | 0.10 | $14,296 | $3,251 | $0 | $17,547 |
| 824 | 7 | Mobile Home | Residential | 0.18 | $23,390 | $9,137 | $0 | $32,528 |
| 826 | 7 | Mobile Home | Residential | -0.36 | $18,050 | $0 | $0 | $18,050 |
| 829 | 7 | Mobile Home | Residential | 0.04 | $10,623 | $994 | $0 | $11,617 |
| 830 | 7 | Mobile Home | Residential | -0.37 | $11,728 | $0 | $0 | $11,728 |
| 831 | 7 | Mobile Home | Residential | -0.23 | $14,434 | $0 | $0 | $14,434 |
| 833 | 7 | Mobile Home | Residential | 0.11 | $15,314 | $3,904 | $0 | $19,219 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 835 | 7 | Mobile Home | Residential | -0.41 | $4,493 | $0 | $0 | $4,493 |
| 836 | 7 | Mobile Home | Residential | -0.26 | $4,302 | $0 | $0 | $4,302 |
| 838 | 7 | Mobile Home | Residential | 0.85 | $14,685 | $17,260 | $3,931 | $35,876 |
| 839 | 7 | Mobile Home | Residential | 0.21 | $20,033 | $8,728 | $0 | $28,761 |
| 847 | 7 | Mobile Home | Residential | -0.45 | $15,059 | $0 | $0 | $15,059 |
| 848 | 7 | Mobile Home | Residential | -0.50 | $11,638 | $0 | $0 | $11,638 |
| 849 | 7 | Mobile Home | Residential | -0.36 | $14,624 | $0 | $0 | $14,624 |
| 850 | 7 | Mobile Home | Residential | -0.47 | $8,974 | $0 | $0 | $8,974 |
| 852 | 7 | Mobile Home | Residential | -0.35 | $14,221 | $0 | $0 | $14,221 |
| 855 | 7 | Mobile Home | Residential | -0.04 | $14,776 | $0 | $0 | $14,776 |
| 858 | 7 | Mobile Home | Residential | -0.49 | $18,216 | $0 | $0 | $18,216 |
| 859 | 7 | Mobile Home | Residential | -0.48 | $22,206 | $0 | $0 | $22,206 |
| 860 | 7 | Mobile Home | Residential | -0.43 | $7,146 | $0 | $0 | $7,146 |
| 862 | 7 | Mobile Home | Residential | -0.47 | $7,156 | $0 | $0 | $7,156 |
| 863 | 7 | Mobile Home | Residential | -0.23 | $14,867 | $0 | $0 | $14,867 |
| 864 | 7 | Mobile Home | Residential | -0.03 | $6,752 | $0 | $0 | $6,752 |
| 865 | 7 | Mobile Home | Residential | -0.45 | $12,049 | $0 | $0 | $12,049 |
| 866 | 7 | Mobile Home | Residential | -0.46 | $19,024 | $0 | $0 | $19,024 |
| 869 | 7 | Mobile Home | Residential | -0.41 | $9,406 | $0 | $0 | $9,406 |
| 870 | 7 | Mobile Home | Residential | -0.46 | $11,677 | $0 | $0 | $11,677 |
| 871 | 7 | Mobile Home | Residential | -0.50 | $33,843 | $0 | $0 | $33,843 |
| 874 | 7 | Mobile Home | Residential | -0.45 | $10,436 | $0 | $0 | $10,436 |
| 875 | 7 | Mobile Home | Residential | -0.40 | $12,133 | $0 | $0 | $12,133 |
| 880 | 7 | Mobile Home | Residential | -0.50 | $14,175 | $0 | $0 | $14,175 |
| 886 | 7 | Mobile Home | Residential | -0.34 | $24,216 | $0 | $0 | $24,216 |
| 887 | 7 | Mobile Home | Residential | -0.49 | $21,583 | $0 | $0 | $21,583 |
| 888 | 7 | Mobile Home | Residential | -0.50 | $12,982 | $0 | $0 | $12,982 |
| 890 | 7 | Mobile Home | Residential | -0.45 | $25,847 | $0 | $0 | $25,847 |
| 891 | 7 | Mobile Home | Residential | 0.03 | $23,047 | $1,713 | $0 | $24,761 |
| 893 | 7 | Mobile Home | Residential | -0.26 | $10,952 | $0 | $0 | $10,952 |
| 894 | 7 | Mobile Home | Residential | 0.88 | $15,838 | $18,859 | $4,083 | $38,781 |
| 895 | 7 | Mobile Home | Residential | 0.47 | $15,809 | $12,815 | $0 | $28,624 |
| 896 | 7 | Mobile Home | Residential | -0.38 | $9,924 | $0 | $0 | $9,924 |
| 898 | 7 | Mobile Home | Residential | -0.40 | $14,607 | $0 | $0 | $14,607 |
| 900 | 7 | Mobile Home | Residential | -0.34 | $4,570 | $0 | $0 | $4,570 |
| 903 | 7 | Mobile Home | Residential | -0.42 | $27,867 | $0 | $0 | $27,867 |
| 906 | 7 | Mobile Home | Residential | -0.44 | $13,756 | $0 | $0 | $13,756 |
| 907 | 7 | Mobile Home | Residential | -0.26 | $29,151 | $0 | $0 | $29,151 |
| 909 | 7 | Mobile Home | Residential | 0.24 | $9,001 | $4,428 | $0 | $13,429 |
| 911 | 7 | Mobile Home | Residential | -0.46 | $15,291 | $0 | $0 | $15,291 |
| 913 | 7 | Mobile Home | Residential | -0.49 | $6,664 | $0 | $0 | $6,664 |
| 914 | 7 | Mobile Home | Residential | -0.42 | $16,314 | $0 | $0 | $16,314 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 915 | 7 | Mobile Home | Residential | -0.03 | $50,470 | $0 | $0 | $50,470 |
| 917 | 7 | Mobile Home | Residential | -0.40 | $24,896 | $0 | $0 | $24,896 |
| 919 | 7 | Mobile Home | Residential | -0.37 | $23,983 | $0 | $0 | $23,983 |
| 920 | 7 | Mobile Home | Residential | -0.47 | $20,520 | $0 | $0 | $20,520 |
| 926 | 7 | Mobile Home | Residential | -0.43 | $21,563 | $0 | $0 | $21,563 |
| 927 | 7 | Mobile Home | Residential | -0.46 | $22,055 | $0 | $0 | $22,055 |
| 929 | 7 | Mobile Home | Residential | -0.47 | $15,661 | $0 | $0 | $15,661 |
| 930 | 7 | Mobile Home | Residential | -0.48 | $26,014 | $0 | $0 | $26,014 |
| 932 | 7 | Mobile Home | Residential | -0.32 | $15,492 | $0 | $0 | $15,492 |
| 938 | 7 | Mobile Home | Residential | -0.50 | $4,949 | $0 | $0 | $4,949 |
| 944 | 7 | Mobile Home | Residential | -0.39 | $10,068 | $0 | $0 | $10,068 |
| 948 | 7 | Mobile Home | Residential | -0.43 | $21,788 | $0 | $0 | $21,788 |
| 950 | 7 | Mobile Home | Residential | -0.43 | $17,117 | $0 | $0 | $17,117 |
| 951 | 7 | Mobile Home | Residential | -0.48 | $13,713 | $0 | $0 | $13,713 |
| 952 | 7 | Mobile Home | Residential | -0.46 | $14,456 | $0 | $0 | $14,456 |
| 953 | 7 | Mobile Home | Residential | -0.16 | $7,675 | $0 | $0 | $7,675 |
| 955 | 7 | Mobile Home | Residential | -0.42 | $6,961 | $0 | $0 | $6,961 |
| 956 | 7 | Mobile Home | Residential | -0.35 | $6,136 | $0 | $0 | $6,136 |
| 958 | 7 | Mobile Home | Residential | -0.50 | $7,306 | $0 | $0 | $7,306 |
| 963 | 7 | Mobile Home | Residential | -0.45 | $19,897 | $0 | $0 | $19,897 |
| 966 | 7 | Mobile Home | Residential | -0.39 | $28,789 | $0 | $0 | $28,789 |
| 971 | 7 | Mobile Home | Residential | -0.41 | $13,837 | $0 | $0 | $13,837 |
| 972 | 7 | Mobile Home | Residential | -0.47 | $15,369 | $0 | $0 | $15,369 |
| 973 | 7 | Mobile Home | Residential | -0.45 | $11,884 | $0 | $0 | $11,884 |
| 974 | 7 | Mobile Home | Residential | -0.48 | $11,984 | $0 | $0 | $11,984 |
| 975 | 7 | Mobile Home | Residential | -0.45 | $18,606 | $0 | $0 | $18,606 |
| 977 | 7 | Mobile Home | Residential | -0.31 | $29,551 | $0 | $0 | $29,551 |
| 982 | 7 | Mobile Home | Residential | -0.45 | $12,752 | $0 | $0 | $12,752 |
| 983 | 7 | Mobile Home | Residential | -0.44 | $19,156 | $0 | $0 | $19,156 |
| 984 | 7 | Mobile Home | Residential | -0.42 | $6,365 | $0 | $0 | $6,365 |
| 987 | 7 | Mobile Home | Residential | -0.15 | $10,609 | $0 | $0 | $10,609 |
| 988 | 7 | Mobile Home | Residential | -0.48 | $10,535 | $0 | $0 | $10,535 |
| 993 | 7 | Mobile Home | Residential | -0.32 | $14,782 | $0 | $0 | $14,782 |
| 994 | 7 | Mobile Home | Residential | -0.31 | $18,016 | $0 | $0 | $18,016 |
| 997 | 7 | Mobile Home | Residential | -0.19 | $22,665 | $0 | $0 | $22,665 |
| 998 | 7 | Mobile Home | Residential | -0.12 | $7,146 | $0 | $0 | $7,146 |
| 1001 | 7 | Mobile Home | Residential | -0.42 | $20,279 | $0 | $0 | $20,279 |
| 1005 | 7 | Mobile Home | Residential | -0.27 | $13,002 | $0 | $0 | $13,002 |
| 1008 | 7 | Mobile Home | Residential | -0.44 | $24,269 | $0 | $0 | $24,269 |
| 1009 | 7 | Mobile Home | Residential | 0.23 | $25,308 | $12,025 | $0 | $37,334 |
| 1012 | 7 | Mobile Home | Residential | 0.31 | $21,908 | $13,349 | $0 | $35,257 |
| 1013 | 7 | Mobile Home | Residential | -0.49 | $14,971 | $0 | $0 | $14,971 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 1014 | 7 | Mobile Home | Residential | -0.39 | $8,734 | $0 | $0 | $8,734 |
| 1016 | 7 | Mobile Home | Residential | -0.48 | $12,212 | $0 | $0 | $12,212 |
| 1017 | 7 | Mobile Home | Residential | -0.34 | $14,039 | $0 | $0 | $14,039 |
| 1019 | 7 | Mobile Home | Residential | -0.40 | $18,926 | $0 | $0 | $18,926 |
| 1021 | 7 | Mobile Home | Residential | -0.32 | $28,301 | $0 | $0 | $28,301 |
| 1023 | 7 | Mobile Home | Residential | 0.81 | $42,953 | $49,149 | $3,633 | $95,735 |
| 1029 | 7 | Mobile Home | Residential | -0.37 | $23,511 | $0 | $0 | $23,511 |
| 1030 | 7 | Mobile Home | Residential | -0.47 | $10,487 | $0 | $0 | $10,487 |
| 1034 | 7 | Mobile Home | Residential | -0.50 | $12,579 | $0 | $0 | $12,579 |
| 1035 | 7 | Mobile Home | Residential | -0.06 | $11,760 | $0 | $0 | $11,760 |
| 1038 | 7 | Mobile Home | Residential | 0.05 | $18,624 | $2,389 | $0 | $21,013 |
| 1040 | 7 | Mobile Home | Residential | -0.46 | $14,587 | $0 | $0 | $14,587 |
| 1041 | 7 | Mobile Home | Residential | -0.47 | $23,199 | $0 | $0 | $23,199 |
| 1043 | 7 | Mobile Home | Residential | -0.34 | $33,509 | $0 | $0 | $33,509 |
| 1044 | 7 | Mobile Home | Residential | -0.49 | $19,867 | $0 | $0 | $19,867 |
| 1045 | 7 | Mobile Home | Residential | -0.40 | $12,758 | $0 | $0 | $12,758 |
| 1046 | 7 | Mobile Home | Residential | -0.49 | $31,347 | $0 | $0 | $31,347 |
| 1049 | 7 | Mobile Home | Residential | -0.44 | $19,171 | $0 | $0 | $19,171 |
| 31 | 61 | Garage | Residential | 0.51 | $382 | $350 | $0 | $732 |
| 105 | 61 | Garage | Residential | 0.24 | $313 | $287 | $0 | $601 |
| 117 | 61 | Garage | Residential | -0.19 | $0 | $0 | $0 | $0 |
| 159 | 61 | Garage | Residential | 1.30 | $258 | $229 | $0 | $487 |
| 165 | 61 | Garage | Residential | 13.36 | $1,451 | $914 | $0 | $2,365 |
| 183 | 61 | Garage | Residential | -0.24 | $0 | $0 | $0 | $0 |
| 218 | 61 | Garage | Residential | 0.84 | $223 | $205 | $0 | $428 |
| 357 | 61 | Garage | Residential | -0.21 | $0 | $0 | $0 | $0 |
| 398 | 61 | Garage | Residential | -0.34 | $0 | $0 | $0 | $0 |
| 417 | 61 | Garage | Residential | -0.37 | $0 | $0 | $0 | $0 |
| 446 | 61 | Garage | Residential | 0.04 | $17 | $16 | $0 | $33 |
| 463 | 61 | Garage | Residential | -0.29 | $0 | $0 | $0 | $0 |
| 466 | 61 | Garage | Residential | 1.39 | $572 | $505 | $0 | $1,077 |
| 535 | 61 | Garage | Residential | 0.23 | $81 | $74 | $0 | $154 |
| 559 | 61 | Garage | Residential | -0.24 | $0 | $0 | $0 | $0 |
| 581 | 61 | Garage | Residential | -0.41 | $0 | $0 | $0 | $0 |
| 598 | 61 | Garage | Residential | -0.34 | $0 | $0 | $0 | $0 |
| 681 | 61 | Garage | Residential | -0.47 | $0 | $0 | $0 | $0 |
| 714 | 61 | Garage | Residential | -0.28 | $0 | $0 | $0 | $0 |
| 765 | 61 | Garage | Residential | -0.40 | $0 | $0 | $0 | $0 |
| 768 | 61 | Garage | Residential | 0.18 | $54 | $49 | $0 | $103 |
| 773 | 61 | Garage | Residential | -0.48 | $0 | $0 | $0 | $0 |
| 774 | 61 | Garage | Residential | -0.49 | $0 | $0 | $0 | $0 |
| 804 | 61 | Garage | Residential | -0.48 | $0 | $0 | $0 | $0 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 809 | 61 | Garage | Residential | -0.50 | $0 | $0 | $0 | $0 |
| 867 | 61 | Garage | Residential | -0.34 | $0 | $0 | $0 | $0 |
| 879 | 61 | Garage | Residential | -0.39 | $0 | $0 | $0 | $0 |
| 882 | 61 | Garage | Residential | -0.43 | $0 | $0 | $0 | $0 |
| 883 | 61 | Garage | Residential | -0.40 | $0 | $0 | $0 | $0 |
| 940 | 61 | Garage | Residential | -0.50 | $0 | $0 | $0 | $0 |
| 941 | 61 | Garage | Residential | -0.48 | $0 | $0 | $0 | $0 |
| 945 | 61 | Garage | Residential | -0.44 | $0 | $0 | $0 | $0 |
| 969 | 61 | Garage | Residential | -0.45 | $0 | $0 | $0 | $0 |
| 986 | 61 | Garage | Residential | -0.50 | $0 | $0 | $0 | $0 |
| 992 | 61 | Garage | Residential | -0.40 | $0 | $0 | $0 | $0 |
| 1000 | 61 | Garage | Residential | -0.01 | $0 | $0 | $0 | $0 |
| 1002 | 61 | Garage | Residential | -0.49 | $0 | $0 | $0 | $0 |
| 1007 | 61 | Garage | Residential | -0.30 | $0 | $0 | $0 | $0 |
| 1033 | 61 | Garage | Residential | -0.46 | $0 | $0 | $0 | $0 |
| 1037 | 61 | Garage | Residential | -0.42 | $0 | $0 | $0 | $0 |
| 55 | 1 | 1-Story without basement | Residential | 0.04 | $55,480 | $4,580 | $0 | $60,060 |
| 79 | 1 | 1-Story without basement | Residential | -0.14 | $42,326 | $0 | $0 | $42,326 |
| 182 | 1 | 1-Story without basement | Residential | -0.35 | $51,705 | $0 | $0 | $51,705 |
| 268 | 1 | 1-Story without basement | Residential | 0.56 | $58,807 | $45,876 | $1,824 | $106,508 |
| 269 | 1 | 1-Story without basement | Residential | 0.48 | $52,845 | $37,103 | $0 | $89,948 |
| 324 | 1 | 1-Story without basement | Residential | 0.62 | $93,341 | $77,115 | $2,224 | $172,680 |
| 325 | 1 | 1-Story without basement | Residential | 0.77 | $63,309 | $59,384 | $3,328 | $126,021 |
| 326 | 1 | 1-Story without basement | Residential | 0.78 | $91,122 | $85,838 | $3,371 | $180,332 |
| 327 | 1 | 1-Story without basement | Residential | -0.26 | $53,749 | $0 | $0 | $53,749 |
| 328 | 1 | 1-Story without basement | Residential | -0.09 | $40,398 | $0 | $0 | $40,398 |
| 329 | 1 | 1-Story without basement | Residential | -0.41 | $37,520 | $0 | $0 | $37,520 |
| 330 | 1 | 1-Story without basement | Residential | 0.12 | $39,232 | $9,331 | $0 | $48,562 |
| 331 | 1 | 1-Story without basement | Residential | -0.01 | $45,375 | $0 | $0 | $45,375 |
| 333 | 1 | 1-Story without basement | Residential | 0.11 | $74,228 | $15,973 | $0 | $90,201 |
| 334 | 1 | 1-Story without basement | Residential | -0.38 | $29,838 | $0 | $0 | $29,838 |
| 335 | 1 | 1-Story without basement | Residential | -0.17 | $36,120 | $0 | $0 | $36,120 |
| 336 | 1 | 1-Story without basement | Residential | 0.14 | $61,192 | $16,333 | $0 | $77,525 |
| 337 | 1 | 1-Story without basement | Residential | 0.86 | $108,353 | $107,460 | $3,938 | $219,751 |
| 354 | 1 | 1-Story without basement | Residential | -0.21 | $78,160 | $0 | $0 | $78,160 |
| 380 | 1 | 1-Story without basement | Residential | -0.48 | $62,111 | $0 | $0 | $62,111 |
| 492 | 1 | 1-Story without basement | Residential | -0.41 | $34,884 | $0 | $0 | $34,884 |
| 493 | 1 | 1-Story without basement | Residential | -0.42 | $58,607 | $0 | $0 | $58,607 |
| 495 | 1 | 1-Story without basement | Residential | -0.45 | $50,568 | $0 | $0 | $50,568 |
| 496 | 1 | 1-Story without basement | Residential | -0.15 | $39,168 | $0 | $0 | $39,168 |
| 518 | 1 | 1-Story without basement | Residential | -0.25 | $34,183 | $0 | $0 | $34,183 |
| 543 | 1 | 1-Story without basement | Residential | -0.48 | $16,843 | $0 | $0 | $16,843 |

| STRUCTURE ID | USACE CODE | USACE DESCRIPTION | STRUCTURE TYPE | DEPTH | STRUCTURE DAMAGE | CONTENT DAMAGE | CAR DAMAGE | TOTAL DAMAGE |
|---|---|---|---|---|---|---|---|---|
| 573 | 1 | 1-Story without basement | Residential | -0.34 | $24,021 | $0 | $0 | $24,021 |
| 591 | 1 | 1-Story without basement | Residential | -0.48 | $16,350 | $0 | $0 | $16,350 |
| 600 | 1 | 1-Story without basement | Residential | -0.50 | $28,388 | $0 | $0 | $28,388 |
| 601 | 1 | 1-Story without basement | Residential | -0.44 | $35,276 | $0 | $0 | $35,276 |
| 605 | 1 | 1-Story without basement | Residential | -0.36 | $36,389 | $0 | $0 | $36,389 |
| 606 | 1 | 1-Story without basement | Residential | -0.49 | $36,554 | $0 | $0 | $36,554 |
| 624 | 1 | 1-Story without basement | Residential | -0.42 | $38,208 | $0 | $0 | $38,208 |
| 626 | 1 | 1-Story without basement | Residential | -0.42 | $25,600 | $0 | $0 | $25,600 |
| 636 | 1 | 1-Story without basement | Residential | -0.36 | $33,634 | $0 | $0 | $33,634 |
| 689 | 1 | 1-Story without basement | Residential | -0.44 | $51,937 | $0 | $0 | $51,937 |
| 749 | 1 | 1-Story without basement | Residential | -0.45 | $71,014 | $0 | $0 | $71,014 |
| 750 | 1 | 1-Story without basement | Residential | -0.23 | $57,158 | $0 | $0 | $57,158 |
| 753 | 1 | 1-Story without basement | Residential | -0.43 | $48,948 | $0 | $0 | $48,948 |
| 755 | 1 | 1-Story without basement | Residential | -0.40 | $20,140 | $0 | $0 | $20,140 |
| 756 | 1 | 1-Story without basement | Residential | -0.23 | $49,470 | $0 | $0 | $49,470 |
| 840 | 1 | 1-Story without basement | Residential | 0.06 | $41,066 | $4,771 | $0 | $45,837 |
| | | | | **TOTAL** | **$13,622,882** | **$5,173,498** | **$1,100,025** | **$19,896,405** |

# SUBAPPENDIX D.2 HYDROLOGY AND HYDRAULIC (H&H) ANALYSIS

CONTENTS:

- Table 8 - Summary of Study Area Watersheds and Surface Water Features
- Table 9 - NWI Feature Characterizations within the Study Area

- D.2.1 - Hydrology and Hydraulic Alternatives Analysis Report

Table 8 - Summary of Study Area Watersheds and Surface Water Features

| Watershed Name (HUC 10) | Subwatershed Name (HUC 12) | Area of Subwatershed (acres) | Number and Type of NWI stream features (acres) | Number and Type of NWI Pond or Lake features (acres) | Total Number of NWI Features | Total Area of NWI Features (acres) |
|---|---|---|---|---|---|---|
| Upper Brawley Wash (1505030404) | South Mendoza Wash (150503040403) | 11,632.3 | 16-R4SBC 9-R5UBH (200.06) | 19-PUBF (23.11) | 44 | 223.17 |
| | Soto-Wash-Brawley Wash (150503040405) | 26,037.7 | 57-R4SBC 14-R5UBH 1-R5UBFx (518.94) | 22-PUBF (27.25) | 94 | 546.19 |
| **Subtotal** | | **37,670.0** | **719.0** | **50.36** | **138** | **769.36** |
| Lower Brawley Wash (1505030405) | Town of Three Points (150503040504) | 25,730.4 | 29-R4SBC 9-R5UBH (268.16) | 12-PUBF 1-PUSC (24.56) | 51 | 292.73 |
| | Black Tank-Brawley Wash (150503040506) | 15,439.5 | 16-R4SBC 5-R5UBH 3-R5UBFx (175.49) | 9-PUBF (16.67) | 33 | 192.16 |
| | White Tank-Brawley Wash (150503040508) | 51,169.7 | 51-R4SBC 21-R5UBH 11-R5UBFx (593.76) | 41-PUBF 2-PUSC 1-L2UBH (89.63) | 127 | 683.38 |
| **Subtotal** | | **167,679.6** | **1,037.41** | **130.86** | **211** | **2706.99** |
| Los Robles Wash (1505030406) | Lower Blanco Wash (150503040604) | 35,233.5 | 10-R4SBC 1-R5UBH 8-R5UBFx (456.36) | 22-PUBF (40.06) | 41 | 496.42 |
| | Los Robles Wash (150503040605) | 33,134.5 | 1-R2UBH 26-R4SBC 10-R5UBH 3-R5UBFx (372.83) | 19-PUBF 1-PFOC (27.82) | 57 | 400.65 |
| **Subtotal** | | **68,368.0** | **829.19** | **67.88** | **98** | **897.07** |
| **Total** | | **198,377.6** | **2,585.60** | **249.1** | **447** | **2834.70** |

Table 9 - NWI Feature Characterizations within the Study Area

| NWI Feature Code | Code Translation | Quantity within Analysis Area* | Associated Feature(s) |
|---|---|---|---|
| R4SBC | Riverine, intermittent, streambed, seasonally flooded | 185 | Unnamed and named natural drainages, including Los Robles Wash |
| R5UBH | Riverine, unknown perennial, unconsolidated bottom, permanently flooded | 67 | Unnamed and named natural drainages, including Brawley Wash |
| R5UBFx | Riverine, unknown perennial, unconsolidated bottom, semi permanently flooded, excavated | 23 | Unnamed and named natural or human-excavated drainages; ex. excavated channel on west side of Blanco Estates for flood protection |
| R2UBH | Riverine, lower perennial, unconsolidated bottom, permanently flooded | 1 | Santa Cruz River north of the Pinal/Pima County line |
| L2UBH | Lacustrine, littoral, unconsolidated bottom, permanently flooded | 1 | Tucson Water Recharge Basin |
| PFOC | Palustrine, forested, seasonally flooded | 1 | Adjacent to the Santa Cruz River, north of the Pinal/Pima County line |
| PUBF | Palustrine, unconsolidated bottom, semi permanently flooded | 140 | Named and unnamed pond features |
| PUSC | Palustrine, unconsolidated shore, seasonally flooded | 3 | Named and unnamed pond features |

*Source: USFWS (2021)*

**Features may be mapped within more than 1 subwatershed.*

Subappendix D.2.1 Hydrology and Hydraulic Alternatives Analysis Report

# ALTERNATIVES ANALYSIS REPORT

## Brawley Wash Watershed Plan and Environmental Assessment

Pima County, Arizona
NAVD88 Vertical Datum

*Prepared for:*

PIMA COUNTY
FLOOD CONTROL
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October 18, 2024

CMG Project No. 21-002

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# SECTION 1 INTRODUCTION

CMG Drainage Engineering, Inc. (CMG) was a sub consultant to Stantec Consulting Services Inc. (Stantec) under contract (Contract # CT-FC-290) to the Pima County Regional Flood Control District (District) for the Brawley Wash Watershed Plan and Environmental Assessment. CMG's major role is to perform hydraulic analyses of recommended alternatives.

In Stantec's Preliminary Alternatives Selection Memo (dated December 20, 2022), provided in Appendix D, it includes: (1) identified problem areas; (2) formulation of alternative components; (3) feasibility evaluation of identified components; and (4) recommended alternatives for further evaluation. Seven problem areas have been identified. Problem areas No. 3 & 4 were removed from further evaluation as requested by a cooperating agency (Tucson Water). For the remaining five problem areas, each problem area has two or three recommended structural improvements. This alternative analysis report documents hydraulic analyses and results for the recommended alternatives. The problem areas are shown on the Study Location Map (Figure 1).

# SECTION 2 OVERVIEW OF EXISTING SURFACE DRAINAGE CONDITIONS

In the Brawley Wash Watershed project area, major drainage features include incised earthen channels +, widespread sheetflow areas, roadways, and constructed earthen berms. The watershed is subject to erosion of natural channels and sedimentation issues throughout the watershed. Erosion and sedimentation could change the topography within the watershed and alter the flow path and floodplain.

The existing conditions floodplain data for the project area were obtained from the District's ongoing Brawley-Black Wash Floodplain Mapping Project. FLO-2D models were utilized to perform hydrologic and hydraulic analyses. The District provided the FLO-2D models (dated December 2, 2022, prepared by JE Fuller), which were utilized as the basis of alternative analyses for this project. The existing conditions 10- and 100-year flow depths and discharges are shown on Exhibit 1A and 1B, respectively (in Appendix B). As shown on the existing conditions flow depth exhibits, the constructed berms alter the natural flow patterns and natural floodplain. In addition, erosions and sedimentation could also have significant impact on the flow patterns.

# SECTION 3 OVERVIEW OF RECOMMENDED STRUCTURAL IMPROVEMENT ALTERNATIVES

The main goal of the recommended structural improvement alternatives is to restore natural drainage flow patterns. As shown in Stantec's Preliminary Alternatives Selection Memo (dated December 20, 2022), the recommended alternatives could be summarized into four major categories below:

1. Earthen berm openings: The constructed earthen berms typically function to block upstream runoff from draining to its natural flow directions and to divert the flow to somewhere else. Therefore, the berms changed the natural drainage patterns. The openings along the berms would allow runoff to pass through the berms and therefore restore the natural drainage patterns.
   The earthen berms were modeled in the existing conditions FLO-2D model as LEVEE.DAT or grid elevations (TOPO.DAT). The berm openings are modeled in FLO-2D by modifying these two files.
2. Natural Infrastructure for Dryland Streams (NIDS): The NIDS retains stormwater in shallow depths. They could function to mitigate flooding risks. The NIDS is modeled by adjusting grid elevations (TOPO.DAT).
3. Earthen diversion channels: the purpose of the diversion channels is to convey stormwater in the channel to desired areas. The channels are modeled by adjusting grid elevations (TOPO.DAT) and channel Manning's coefficient (MANNINGS_N.DAT).
4. Berm extension: Due to severe erosion and channel head cutting issues caused by exiting manmade structures, new berms might be needed to restore the natural drainage patterns. The extended berm is modeled by modifying the LEVEE.DAT file.

Each of the alternatives is described in further detail below in Section 4.

# SECTION 4 DESCRIPTION AND PRELIMINARY EVALUATION OF ALTERNATIVES

Sections 4.1 through 4.9 below describe nine possible alternatives that address the identified problem areas of the watershed. The District provided existing conditions FLO-2D models, which have seven FLO-2D domains (domain A1 ~ A7) in total in the study area. For each alternative (except for alternative Problem Area No. 1 Alternative 2 - P1A2), the FLO-2D analyses were performed on following FLO-2D domains including: (1) the FLO-2D domain where the proposed improvements are located; and (2) all downstream FLO-2D domains. Both 10- and 100-year rainfall events were evaluated. To provide a clear description of many FLO-2D analysis related files, a file name summary table for the FLO-2D analysis is provided in Appendix A. The recommended alternatives are summarized in the Table below:

Table 1 – Summary of Alternatives Evaluated by FLO-2D Modeling

| Alternatives* | FLO-2D Domain of Proposed Improvements | FLO-2D Domains Evaluated | Proposed Improvements |
|---|---|---|---|
| P1A1 | A7 | A1 ~ A7 | • ±30’ wide opening @ a 250’ interval along berm |
| P1A2 | A7 | A1 ~ A7 | • Proposed improvements in P1A1<br>• 60’x60’x1.5’ (WxLxD) Water Harvesting Basin |
| P2A1 | A6 | A1 ~ A6 | • ±30’ wide opening @ a 250’ interval along berm |
| P5A1 | A4 | A1 ~ A4 | • ±30’ wide opening @ a 250’ interval along berm |
| P5A2 | A4 | A1 ~ A4 | • Proposed improvements in P5A1<br>• Three shallow diversion channels with size of 30’x1’ (WxD) |
| P6A1 | A3 | A1 ~ A3 | • ±30’ wide opening @ a 250’ interval along berm |
| P6A2 | A3 | A1 ~ A3 | • Proposed improvements in P6A1<br>• Six shallow diversion channels with size of 30’x1’ (WxD) |
| P7A1 | A3 | A1 ~ A3 | • ±250’ long berm opening<br>• Approximate 500’ berm extension to south (upstream) |
| P7A2** | A3 | A1 ~ A3 | • Proposed improvements in P7A1<br>• One shallow diversion channel with size of 30’x1’ (WxD) |

*P1A1 represents Problem Area No. 1 Alternative 1. Other alternatives are named in similar approach.
**P7A2 was replaced with a diversion channel based on initial modeling results. The Preliminary Alternative Selection Memo (dated December 20, 2022) called for culverts, but the inverts could not work here.

## 4.1 Problem Area 1 Alternative 1 (P1A1) – Buckelew West

Problem Area 1 (Buckelew West) is an abandoned agricultural field, surrounded by a perimeter berm. This berm impedes flow entering the abandoned agricultural field and thus causes higher flow depths and flow velocities in the surrounding areas. The purpose of the proposed improvements in this alternative is to restore natural drainage patterns by allowing flows to enter and to leave the abandoned agricultural field.
Problem Area 1 Alternative 1 (P1A1) evaluates changes to drainage in Buckelew West resulting from the proposed ±30-ft wide openings at a 250-ft interval along the perimeter berm. The existing conditions 10-year FLO-2D flow depths are shown on Figure 2. The proposed improvements for P1A1 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 2A & 2B.

Comparison (Exhibits 2C & 2D) of Alternative P1A1 FLO-2D model results (Exhibits 2A & 2B) with existing conditions modeling (Exhibit 1A & 1B) shows:

- Flows could enter and exit the agricultural field via the proposed openings along the berm. As a result, the flow depths on the agricultural field increase significantly. For the 10-year rainfall event, the agricultural field changes from roughly 50% dry land in existing conditions to almost 100% inundated in proposed conditions. At FLO-2D cross section #17 (domain A7), the 10-year discharge changes from 11 cfs (existing conditions) to 7821 cfs (proposed conditions).
- As shown on Exhibit 2C & 2D, flow depths in the surrounding areas (east & west) are mostly reduced. The Brawley Wash main channel and right overbank areas, to the east of the agricultural field, have less runoff and flow depths. As shown on Cross Section #5 (domain A7), at the Brawley Wash right overbank, the 10-year discharge is reduced from 4,839 cfs (existing) to 2,818 cfs (proposed).
- Higher flow depths and discharges are observed in the Brawley Wash main channel north of the agricultural field. This is mainly due to the flow entering the agricultural field and then leaving along the east and north perimeter via the proposed berm openings.
- The flow depth changes are mainly shown on FLO-2D domain A7, where the proposed improvements are located. Minor flow depths changes are also observed on FLO-2D domains A1 through A6.

## 4.2 Problem Area 1 Alternative 2 (P1A2) – Buckelew West

The proposed improvements in P1A2 include: (1) the proposed improvements in P1A1; and (2) multiple 60'x60'x1.5' (WxLxD) water harvesting basins (NIDS). The existing conditions 10-year FLO-2D flow depths are shown on Figure 2. The proposed improvements for P1A2 and the proposed 10-year FLO-2D flow depths are shown on Exhibits 10A.

The purpose of analyzing the multiple water harvesting basins (NIDS) is to determine their impact on the drainage patterns. As shown on Exhibit 10B (the 10-year flow depth differences between P1A2 and P1A1), the flow depth differences between these two alternatives are negligible. Therefore, the proposed multiple water harvesting basins have insignificant drainage impacts for the 10-year rainfall event. With much larger runoff volume in the 100-year rainfall event, the drainage impacts due to the water harvesting basins are less, compared to the 10-year rainfall event. Based on the findings, the consulting team recommended, with District's approval, that there is no need to perform additional drainage analysis for the 100-year rainfall event and downstream FLO-2D domains. As a result, water harvesting basins (NIDS) are removed from further drainage analysis on all other alternatives due to their negligible drainage impacts.

## 4.3 Problem Area 2 Alternative 1 (P2A1) – Tortuga Ranch

Problem Area 2 (Tortuga Ranch) is a diversion berm near the SAVSARP facility. This berm has an estimated maximum height of 6 feet. Upstream runoff is diverted northwesterly towards the ranch, resulting in higher flow depths and discharges in the Tortuga Ranch area. In addition, in our May 2022 field visit, a Tortuga Ranch staff indicated that floods from previous years could last up to couple of days with sheetflow depth about 1 ~ 2 feet. This caused difficulties in Tortuga Ranch's operation. The purpose of the proposed improvements in this alternative is to restore natural drainage patterns by allowing flow to pass along the natural path.

Problem Area 2 Alternative 1 (P2A1) proposes to include ±30-ft wide openings at a 250-ft interval along the berm. The intent is to allow upstream runoff to pass through the berm via the proposed openings. The existing conditions 10-year FLO-2D flow depths are shown on Figure 3. The proposed improvements for P2A1 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 3A & 3B.

Comparison (Exhibits 3C & 3D) of Alternative P2A1 FLO-2D model results (Exhibits 3A & 3B) with existing conditions modeling (Exhibit 1A & 1B) shows:

- Flows could pass through the berm via proposed openings to downstream, maintaining the natural flow path. As a result, the flow depths and discharges on Tortuga Ranch are reduced. As shown on Cross Section #23 (domain A6), the 10-year discharge at Tortuga Ranch is reduced from 6,999 cfs (existing) to 5,560 cfs (proposed), which is 1,439 cfs reduction.
- Along the natural flow path downstream of the berm, flow depths and discharges increase due to additional flows to pass through the berm via the proposed openings. However, the berms surrounding the SAVSARP facility are not overtopped in both 10- and 100-year rainfall events. At FLO-2D cross section

#27 (domain A6), the 10-year discharge changes from 6,928 cfs (existing conditions) to 8,060 cfs (proposed conditions).
- As shown on Exhibit 3C & 3D, the flow depth changes are mainly shown on FLO-2D domain A5 & A6, while domain A6 is where the proposed improvements are located. Negligible flow depths changes are observed on FLO-2D domains A1 through A4.

## 4.4 Problem Area 5 Alternative 1 (P5A1) – Cactus Avra

Problem Area 5 (Cactus Avra) is terraced fields surrounded with combination of constructed earthen berms and irrigation channels. These earthen berms have estimated heights of 3 ~ 4 feet and the irrigation channels have estimated depth of 2 ~ 3 feet. Some areas could have deep flow depths (> 6 feet). The purpose of the proposed improvements in this alternative is to restore natural drainage patterns by allowing flow to enter the abandoned agricultural field.

Problem Area 5 Alternative 1 (P5A1) proposes to include ±30-ft wide openings at a 250-ft interval along the berms. These openings are located along three major berm segments. The intent is to allow the runoff in the irrigation channels to enter the agricultural field via the proposed openings. The existing conditions 10-year FLO-2D flow depths are shown on Figure 4. The proposed improvements for P5A1 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 4A & 4B.

Comparison (Exhibits 4C & 4D) of Alternative P5A1 FLO-2D model results (Exhibits 4A & 4B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- Flows could enter the agricultural field to the west via the proposed openings along the berm. The proposed conditions flow depths increase on the agricultural field, but are limited to the areas adjacent to the berm. This is because the elevation relief on the agricultural field is mainly in the south/north direction, while the east/west direction is relatively flat. Flows entering the agricultural field via the proposed openings will largely drain to the north, instead of draining to the west. Therefore, this alternative's drainage impact on the agricultural field is limited.
- In the areas to the east of the proposed berm openings, the flow depths and discharges are reduced in the proposed conditions. This is because the berm openings allow runoff to leave the irrigation channels and enter the agricultural field to the west, resulting less flows to the east. As shown on Cross Section #26 (domain A4), the 10-year discharge is reduced from 11,777 cfs (existing) to 9,020 cfs (proposed), a 2,757 cfs reduction.
- The flow depth changes are mainly shown on FLO-2D domain A3 and A4, while domain A4 is where the proposed improvements are located. Minor flow depth changes are also observed on FLO-2D domain A2.

## 4.5 Problem Area 5 Alternative 2 (P5A2) – Cactus Avra

As discussed in Section 4.4 (P5A1), flow increases, with the proposed improvements in P5A1, are limited to the areas adjacent to the berm openings due to only minor elevation relief in the east/west direction. Therefore, additional improvements are necessary to facilitate directing runoff to the west in the agricultural field. The proposed improvements in P5A2 include: (1) the proposed improvements in P5A1; and (2) three segments of shallow diversion channels with a size of 30'x1' (WxD). The diversion channels drain northwesterly and function to direct the runoff from the berm openings to the west of the agricultural field. The existing conditions 10-year FLO-2D flow depths are shown on Figure 4. The proposed improvements for P5A2 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 5A & 5B.

Comparison (Exhibits 5C & 5D) of Alternative P5A2 FLO-2D model results (Exhibits 5A & 5B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- Flows could be directed to the west of the agricultural field via the three proposed diversion channels. As shown on Cross Section #53 (domain A4), the 10-year discharge is increased from 1cfs (existing) to 99 cfs (proposed), a 98 cfs increases.

- To the east of the berm openings, the changes to the drainage, compared to that in P5A1, are insignificant. That's because the diversion channels do not have drainage impact to the east.

## 4.6 Problem Area 6 Alternative 1 (P6A1) – Prickle Desert

Problem Area 6 (Prickle Desert) is terraced fields surrounded with constructed earthen berms. These earthen berms have estimated heights of 1 ~ 4 feet. Upstream runoff ponds against the berms and then is directed toward the west, resulting in increased flow depths. The purpose of the proposed improvements in this alternative is to restore natural drainage patterns by allowing flow to enter the abandoned agricultural field.

Problem Area 6 Alternative 1 (P6A1) proposes to include ±30-ft wide openings at a 250-ft interval along three berm segments. These openings would allow the upstream runoff to pass through and onto the agricultural fields. The existing conditions 10-year FLO-2D flow depths are shown on Figure 5. The proposed improvements for P6A1 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 6A & 6B.

Comparison (Exhibits 6C & 6D) of Alternative P6A1 FLO-2D model results (Exhibits 6A & 6B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- Flows could pass through the berm via proposed openings to the abandoned agricultural fields downstream, restoring to its natural drainage patterns. As a result, the flows could drain to the agricultural fields. The flow depths and discharges on the agricultural fields are increased. In addition, the ponding depths against the berms are significantly reduced. As shown on Cross Section #64 (domain A3), the 10-year discharge at the agricultural fields is increased from 2 cfs (existing) to 948 cfs (proposed), which is 946 cfs increase. Further downstream of the agricultural fields, the flow depth and discharges are also increased significantly. For example, at Cross Section #76 (domain A2), the 10-year discharge at the agricultural fields is increased from 33 cfs (existing) to 694 cfs (proposed), which is 661 cfs increase.
- With reduced ponding depths against the berms, the flow diverted to the west (Brawley Wash main channel) is reduced significantly. As a result, the discharges in the Brawley Wash main channel are reduced. This could lessen potential flooding and erosion issues downstream. At FLO-2D cross section #31 (domain A2), the 10-year discharge changes from 9,008 cfs (existing conditions) to 8,015 cfs (proposed conditions).
- As shown on Exhibit 6C & 6D, the flow depth changes are mainly shown on FLO-2D domain A3 & A2, while domain A3 is where the proposed improvements are located. Negligible flow depths changes are observed on FLO-2D domains A1.

## 4.7 Problem Area 6 Alternative 2 (P6A2) – Prickle Desert

As discussed in Section 4.6 (P6A1), with the proposed improvements in P6A1, flow could enter the agricultural fields via the proposed berm openings. The runoff will then be conveyed on the agricultural fields as widespread sheetflow. The relatively slow moving sheetflow drainage pattern on the field could limit the amount of flow reaching the north portion of the fields, especially for more frequent storms such as a 1-year storm event. Therefore, additional improvements are necessary to facilitate directing runoff to the north of the agricultural fields. The proposed improvements in P6A2 include: (1) the proposed improvements in P6A1; and (2) six segments of shallow diversion channels with a size of 30'x1' (WxD). The diversion channels drain northerly and function to direct the runoff from the berm openings to the north of the agricultural fields. The channel flow, as it drains to the north, will weir out to adjacent sheetflow areas if the channel capacity is exceeded. The existing conditions 10-year FLO-2D flow depths are shown on Figure 5. The proposed improvements for P6A2 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 7A & 7B.

Comparison (Exhibits 7C & 7D) of Alternative P6A2 FLO-2D model results (Exhibits 7A & 7B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- The proposed diversion channels could facilitate runoff draining to the north of the fields, as supported by slight flow discharge increases on the fields in 10-year rainfall events. However, it is anticipated that the

diversion channel could be of more importance in conveying runoff in the fields during more frequent storms. For example, during the 1-year rainfall event (not being evaluated by this project), the amount of runoff entering the fields could be much less than that in the 10-year rainfall event. With limited amount of runoff, the slow-moving widespread sheetflow conditions do not allow the runoff draining to the north of the fields efficiently. However, with the proposed diversion channels, the runoff could enter the channel and then be directed to the north within the channel. The runoff in channels could weir over to adjacent overland as the channels go north. This would help the drainage to the north of the fields, especially for more frequent storm events.

## 4.8 Problem Area 7 Alternative 1 (P7A1) – Tucker Road

Problem Area 7 (Tucker Road) is terraced fields surrounded with constructed earthen berms and drainage channels. These earthen berms have estimated heights of 3 ~ 4 feet and the channels have estimated depth of 2 ~ 3 feet. Blanco Wash main channel has head cutting (up to 20 ~ 25 feet) starting from the southwest corner of the abandoned agricultural field and continuous northernly along the agricultural field's west berm. The berms and drainage channels around the agricultural field likely contributed to the severe head cutting in the Brawley Wash main channel. Upstream runoff could not enter the abandoned agricultural field due to: (1) limited amount of runoff in the right overbank areas of Blanco Wash; (2) an earthen drainage channel to the south of the agricultural field functions to direct the runoff in the right overbank areas to the Brawley Wash main channel; and (3) the berms along the south of the agricultural field function to prevent runoff in the right overbank areas from entering the property. The purpose of the proposed improvements in this alternative is to restore natural drainage patterns by allowing flow to enter the abandoned agricultural field.

Problem Area 7 Alternative 1 (P7A1) proposes to include: (1) an approximately 500-ft long earthen berm extension to the south (upstream) from the existing earthen berm starting from the southwest corner of the agricultural field; and (2) a 250-ft wide berm opening at the southwest corner of the agricultural field. The dirt removed from the berm openings could be utilized to fill the drainage channel just south of the berm. This would help facilitate the right overbank runoff to enter the field. The existing conditions 10-year FLO-2D flow depths are shown on Figure 6. The proposed improvements for P7A1 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 8A & 8B.

Comparison (Exhibits 8C & 8D) of Alternative P7A1 FLO-2D model results (Exhibits 8A & 8B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- An increased amount of runoff could enter the agricultural field with the proposed improvements. The extended earthen berm to the south could help direct the right overbank runoff to the agricultural field. The berm opening and the filled channel would allow the approaching runoff to enter the field. As shown on Cross Section #96 (domain A3), the 10-year discharge at the agricultural field is increased from 1 cfs (existing) to 306 cfs (proposed), which is 305 cfs increase. However, due to the agricultural field ground surface sloping to the northwest direction, the flows entered the agricultural field would drain northwesterly against the existing berm to the west of the agricultural field. Therefore, only limited areas to the west of the agricultural field could benefit from the increased runoff on the field.
- The amount of runoff in the Blanco Wash main channel is reduced slightly. As shown on Cross Section #6 (domain A3), the 10-year discharge at the agricultural field reduces from 3,771cfs (existing) to 3,559 cfs (proposed), which is 212 cfs reduction.
- As shown on Exhibit 8C & 8D, the flow depth changes are mainly shown on FLO-2D domain A3, where the proposed improvements are located. Negligible flow depths changes are observed on FLO-2D domains A1 and A2.

## 4.9 Problem Area 7 Alternative 2 (P7A2) – Tucker Road

As discussed in Section 4.8 (P7A1), with the proposed improvements in P7A1, flow could enter the agricultural fields via the proposed berm extension and berm opening. However, the runoff could not drain to the east portion off the agricultural field due to its ground surface sloping northwesterly. Therefore, additional improvements are necessary

to facilitate directing runoff to the east of the agricultural field. The proposed improvements in P7A2 include: (1) the proposed improvements in P7A1; and (2) one segment of shallow diversion channels with a size of 30'x1' (WxD). The diversion channel drains northeasterly and functions to direct the runoff from the berm openings to the east of the agricultural fields. The existing conditions 10-year FLO-2D flow depths are shown on Figure 6. The proposed improvements for P7A2 and the proposed 10- or 100-year FLO-2D flow depths are shown on Exhibits 9A & 9B.

Comparison (Exhibits 9C & 9D) of Alternative P7A2 FLO-2D model results (Exhibits 9A & 9B) with existing conditions modeling (Exhibits 1A & 1B) shows:

- The proposed diversion channel could help to direct the runoff to the east, as supported by flow depth increases on the agricultural field in the 10-year rainfall event. The diversion channel conveys runoff from the berm opening to the northeast of the agricultural field. The channel runoff will weir out to the field along the left channel bank, if the channel capacity is exceeded.

Hydraulic Computations (proposed conditions FLO-2D models) for the Alternative Analyses are provided in Appendix E.

# SECTION 5 SUMMARY OF RESULTS

The results of this study have determined that recommended alternatives such as berm openings / diversion channels / berm extension are effective in restoring natural drainage flow patterns. However, the water harvesting basins have negligible drainage impact on restoring natural drainage patterns and potential flooding mitigation.

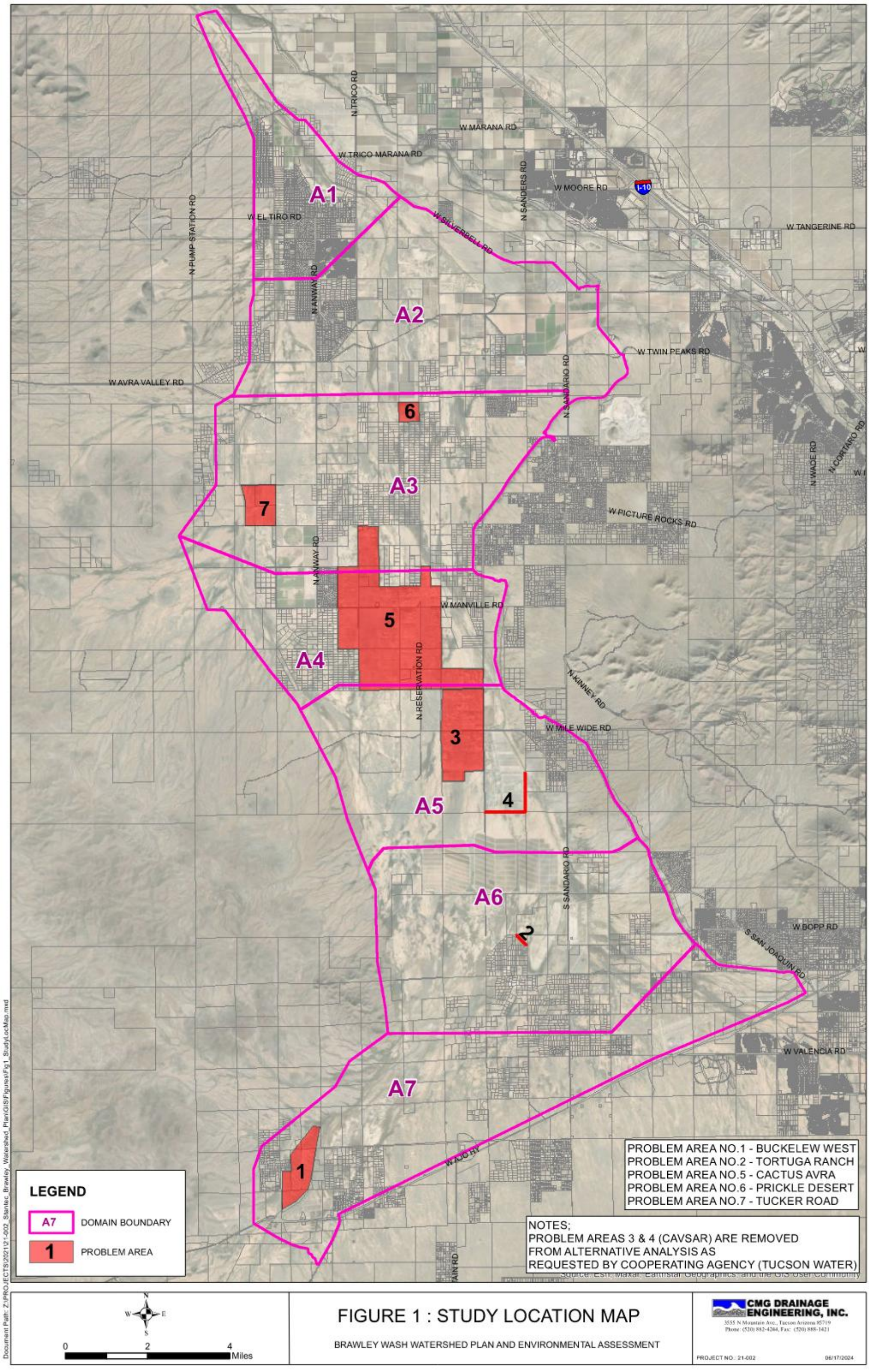
# SECTION 6 REFERENCES

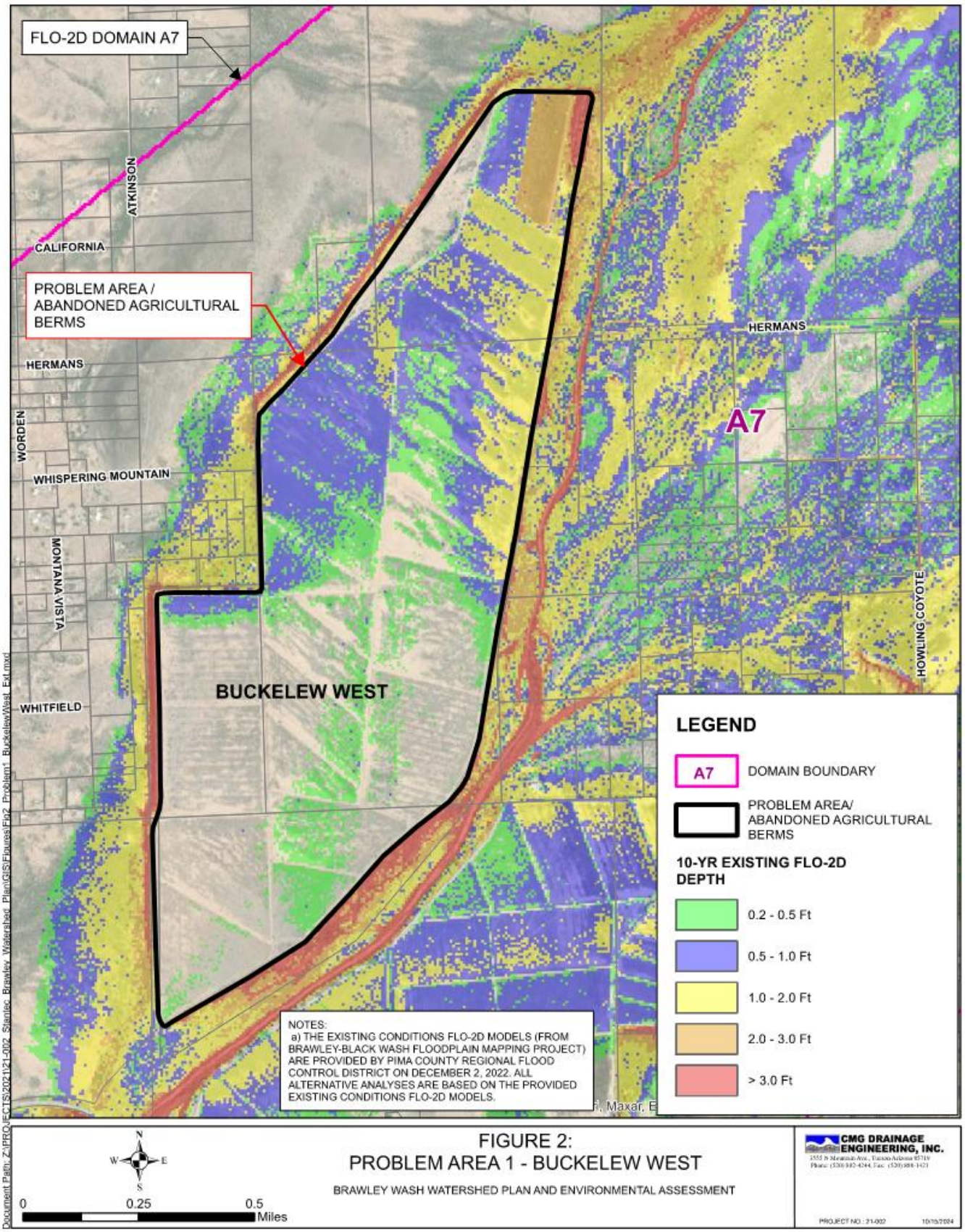
1. Stantec, *Preliminary Alternatives Selection Memo,* December 2022.
2. JE Fuller, *FLO-2D Models for ongoing Brawley-Black Wash Floodplain Mapping*, December 2, 2022.
3. Pima County Regional Flood Control District, *Design Standards for Stormwater Detention and Retention*, November 2015.
4. National Oceanic and Atmospheric Administration (NOAA) *Atlas 14, Precipitation Frequency Atlas for the Unites States: Volume 1 – Version 4.0 The semiarid Southwest. National Weather Service, Hydrometeorological Design Studies Center*, 2006.
5. O'Brien, Jim, *FLO-2D Pro Reference Manual*, 2013.
6. United States Army Corps of Engineers Hydrologic Engineering Center, *HEC-RAS River Analysis System User's Manual*, Version 4.1.0, January 2010.

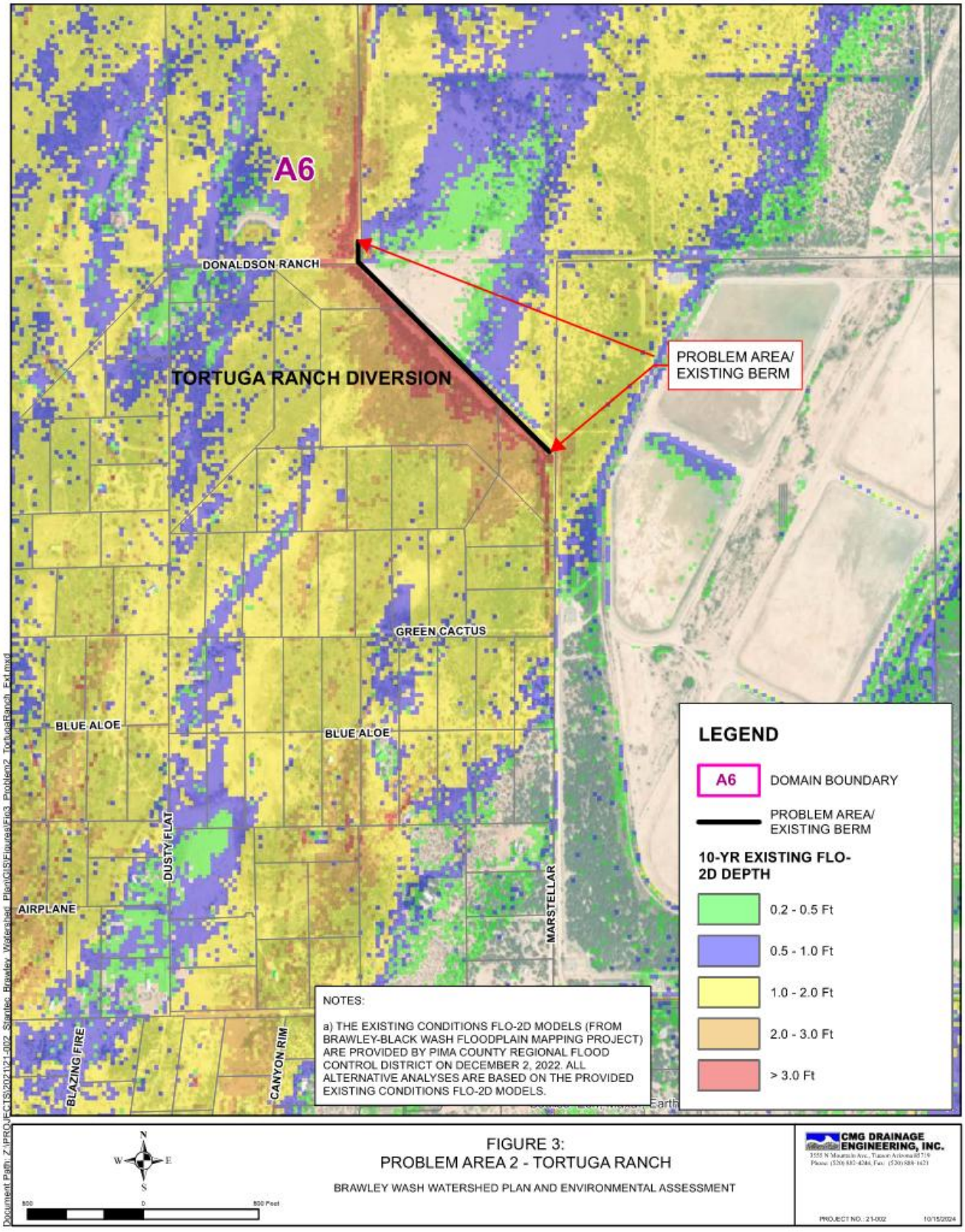
# FIGURES

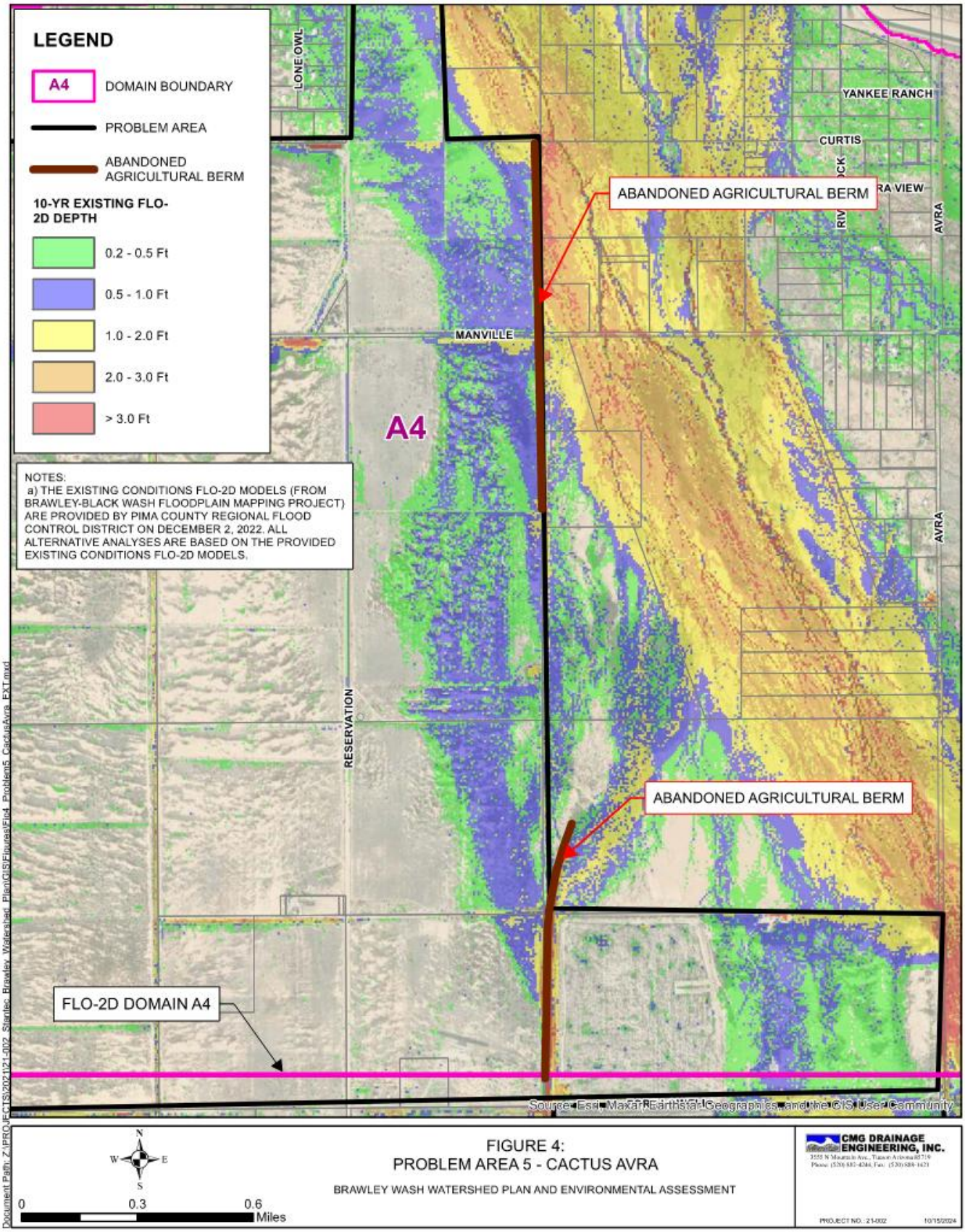
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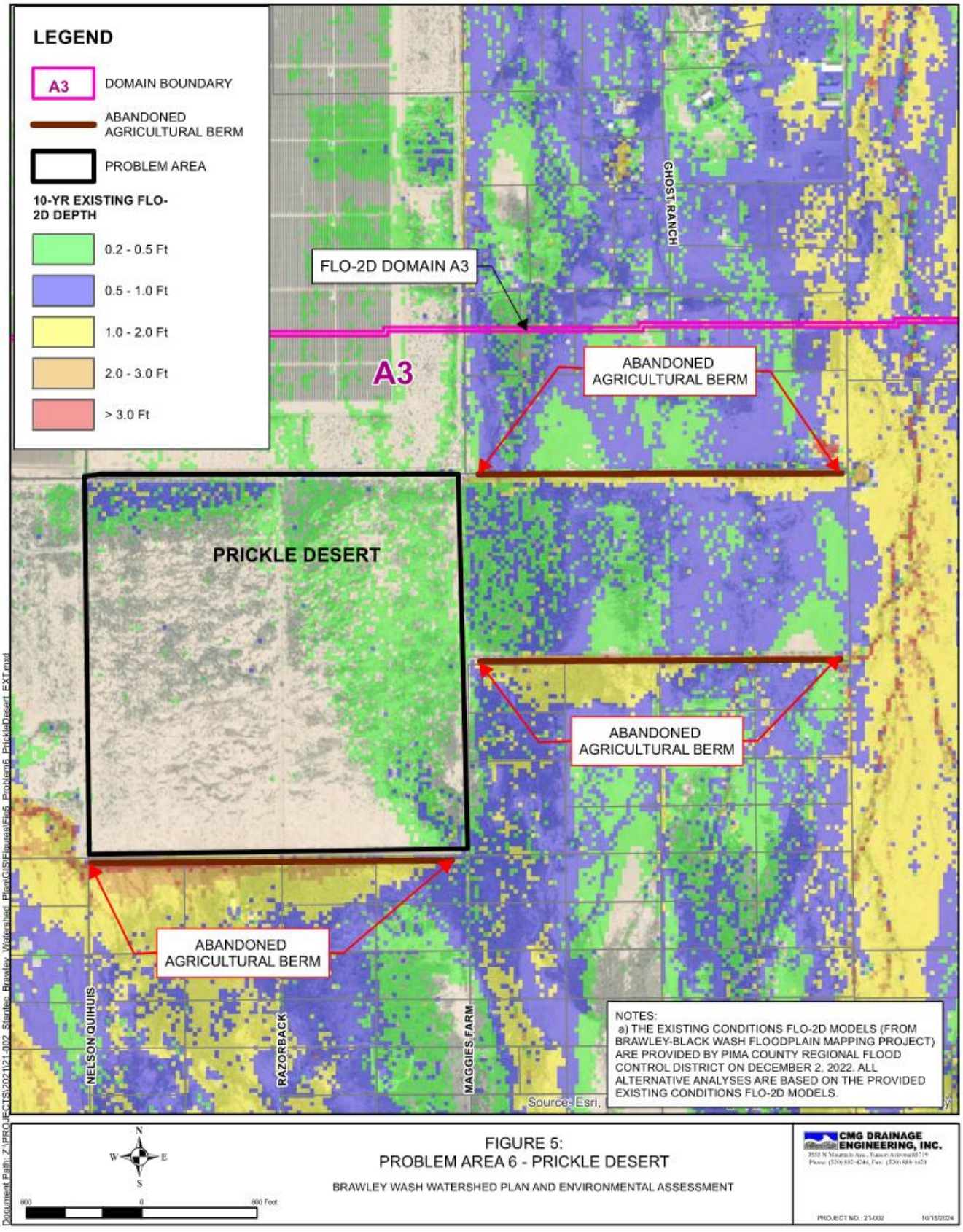
- Figure 1 ~ 6 (total 6 Figures)

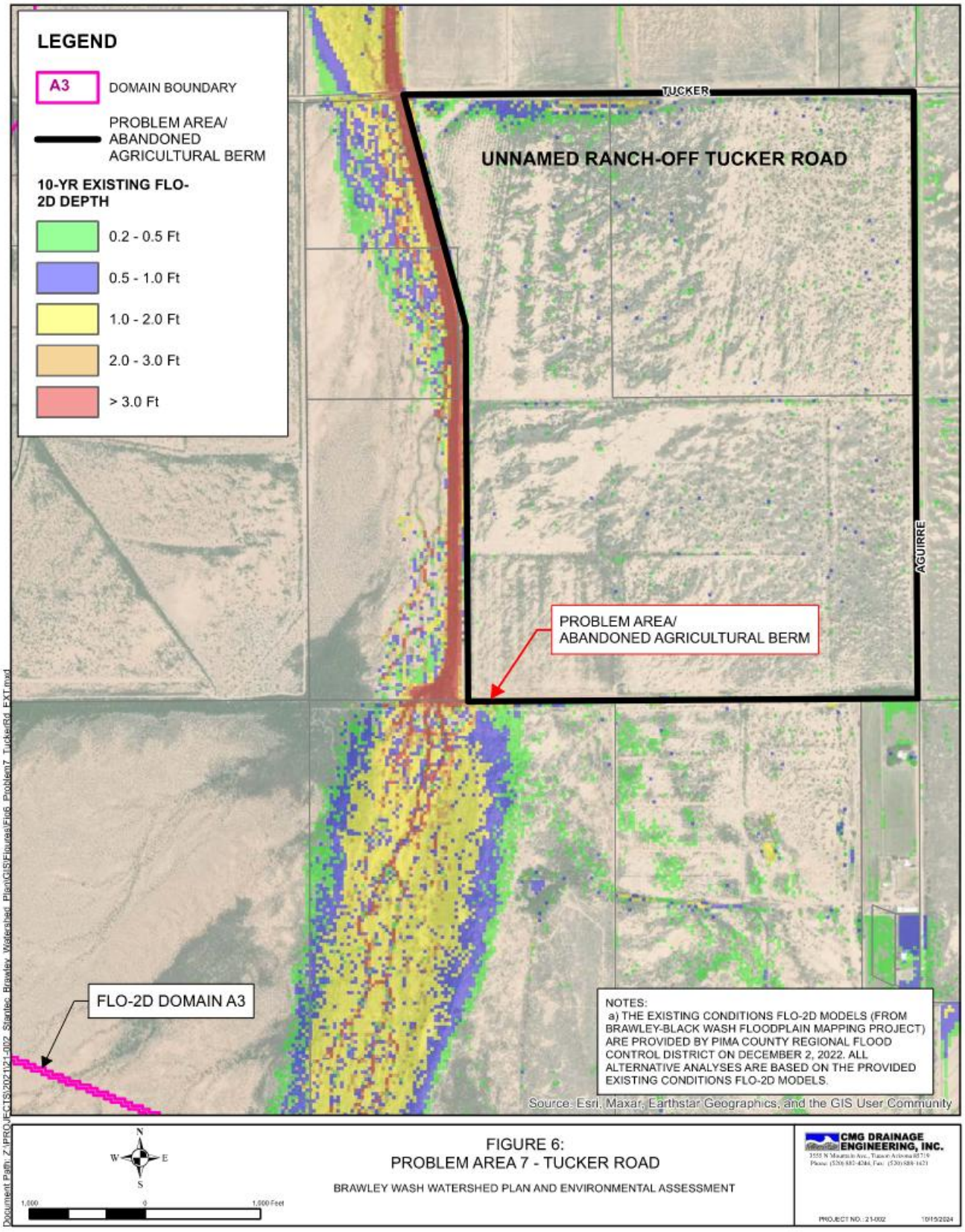

N TRICO RD
W MARANA RD
W TRICO MARANA RD
N SANDERS RD
W MOORE RD
I-10
W TANGERINE RD
A1
W EL TIRO RD
N PUMP STATION RD
W SILVERBELL RD
N ANWAY RD
A2
W TWIN PEAKS RD
W AVRA VALLEY RD
N SANDARIO RD
6
A3
7
W PICTURE ROCKS RD
N WADE RD
N CORTARO RD
N ANWAY RD
5
W MANVILLE RD
A4
N RESERVATION RD
N KINNEY RD
W MILE WIDE RD
3
A5
4
S SANDARIO RD
A6
2
W BOPP RD
S SAN JOAQUIN RD
W VALENCIA RD
A7
W AJO RY
1
LEGEND
A7 DOMAIN BOUNDARY
1 PROBLEM AREA
PROBLEM AREA NO.1 - BUCKELEW WEST
PROBLEM AREA NO.2 - TORTUGA RANCH
PROBLEM AREA NO.5 - CACTUS AVRA
PROBLEM AREA NO.6 - PRICKLE DESERT
PROBLEM AREA NO.7 - TUCKER ROAD
NOTES;
PROBLEM AREAS 3 & 4 (CAVSAR) ARE REMOVED
FROM ALTERNATIVE ANALYSIS AS
REQUESTED BY COOPERATING AGENCY (TUCSON WATER)
N
W
E
S
0
2
4
Miles
FIGURE 1 : STUDY LOCATION MAP
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
3555 N Mountain Ave., Tucson Arizona 85719
Phone: (520) 882-4264, Fax: (520) 888-1421
PROJECT NO.: 21-002
06/17/2024
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig1_StudyLocMap.mxd


FLO-2D DOMAIN A7
PROBLEM AREA / ABANDONED AGRICULTURAL BERMS
ATKINSON
CALIFORNIA
HERMANS
WORDEN
WHISPERING MOUNTAIN
MONTANA VISTA
WHITFIELD
BUCKELEW WEST
HERMANS
A7
HOWLING COYOTE
LEGEND
A7
DOMAIN BOUNDARY
PROBLEM AREA/ ABANDONED AGRICULTURAL BERMS
10-YR EXISTING FLO-2D DEPTH
0.2 - 0.5 Ft
0.5 - 1.0 Ft
1.0 - 2.0 Ft
2.0 - 3.0 Ft
> 3.0 Ft
NOTES:
a) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
N
W
E
S
0
0.25
0.5
Miles
FIGURE 2:
PROBLEM AREA 1 - BUCKELEW WEST
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
PROJECT NO.: 21-002
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig2_Problem1_BuckelewWest_Ext.mxd


A6
DONALDSON RANCH
TORTUGA RANCH DIVERSION
PROBLEM AREA/
EXISTING BERM
GREEN CACTUS
BLUE ALOE
BLUE ALOE
DUSTY FLAT
AIRPLANE
MARSTELLAR
BLAZING FIRE
CANYON RIM
LEGEND
A6
DOMAIN BOUNDARY
PROBLEM AREA/
EXISTING BERM
10-YR EXISTING FLO-
2D DEPTH
0.2 - 0.5 Ft
0.5 - 1.0 Ft
1.0 - 2.0 Ft
2.0 - 3.0 Ft
> 3.0 Ft
NOTES:
a) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
N
W
E
S
800
0
800 Feet
FIGURE 3:
PROBLEM AREA 2 - TORTUGA RANCH
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
PROJECT NO.: 21-002
10/15/2024
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig3_Problem2_TortugaRanch_Ex1.mxd


LEGEND
A4
DOMAIN BOUNDARY
PROBLEM AREA
ABANDONED AGRICULTURAL BERM
10-YR EXISTING FLO-2D DEPTH
0.2 - 0.5 Ft
0.5 - 1.0 Ft
1.0 - 2.0 Ft
2.0 - 3.0 Ft
> 3.0 Ft
NOTES:
a) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
LONE OWL
YANKEE RANCH
CURTIS
ABANDONED AGRICULTURAL BERM
AVRA
MANVILLE
A4
RESERVATION
ABANDONED AGRICULTURAL BERM
FLO-2D DOMAIN A4
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
N
W
E
S
0
0.3
0.6
Miles
FIGURE 4:
PROBLEM AREA 5 - CACTUS AVRA
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
PROJECT NO.: 21-002
10/15/2024
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig4_Problem5_CactusAvra_EXT.mxd


LEGEND
A3
DOMAIN BOUNDARY
ABANDONED AGRICULTURAL BERM
PROBLEM AREA
10-YR EXISTING FLO-2D DEPTH
0.2 - 0.5 Ft
0.5 - 1.0 Ft
1.0 - 2.0 Ft
2.0 - 3.0 Ft
> 3.0 Ft
FLO-2D DOMAIN A3
A3
ABANDONED AGRICULTURAL BERM
PRICKLE DESERT
ABANDONED AGRICULTURAL BERM
ABANDONED AGRICULTURAL BERM
GHOST RANCH
NELSON QUIHUIS
RAZORBACK
MAGGIES FARM
NOTES:
a) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
Source: Esri,
N
W
E
S
800
0
800 Feet
FIGURE 5:
PROBLEM AREA 6 - PRICKLE DESERT
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
PROJECT NO.: 21-002
10/15/2024
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig5_ProbArea6_PrickleDesert_EXT.mxd


LEGEND
A3
DOMAIN BOUNDARY
PROBLEM AREA/ ABANDONED AGRICULTURAL BERM
10-YR EXISTING FLO-2D DEPTH
0.2 - 0.5 Ft
0.5 - 1.0 Ft
1.0 - 2.0 Ft
2.0 - 3.0 Ft
> 3.0 Ft
TUCKER
UNNAMED RANCH-OFF TUCKER ROAD
AGUIRRE
PROBLEM AREA/ ABANDONED AGRICULTURAL BERM
FLO-2D DOMAIN A3
NOTES:
a) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
N
W
E
S
1,000
0
1,000 Feet
FIGURE 6:
PROBLEM AREA 7 - TUCKER ROAD
BRAWLEY WASH WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT
CMG DRAINAGE ENGINEERING, INC.
PROJECT NO.: 21-002
10/15/2024
Document Path: Z:\PROJECTS\2021\21-002_Stantec_Brawley_Watershed_Plan\GIS\Figures\Fig6_Problem7_TuckerRd_EXT.mxd

# APPENDIX A

# FILE NAME SUMMARY

Include:

- File Name Summary

| **Table 1: Brawley Wash Watershed File Name Summary (CMG Job 21-002)** | | |
|---|---|---|
| **Name** | **Description** | **Comments** |
| **Raster*** | | |
| 10YR_Depth_P1A2_A7.tif | 10YR: **Storm event –** (i) 10YR or (ii) 100YR | |
| | Depth: **Data description**- (i) Depth, (ii) Depth_Diff; (iii) …. | |
| | P1A2: **Problem 1 Alternative 2**- (i) P1A2; (ii) EXT; or (iii) P1A2_P1A1 | (iii) P1A2_P1A1: means P1A2 minus P1A1 |
| | A7: **Domain A7** | |
| **Alternative Shapefile** | | |
| P1_Prop_Improvements.shp | P1: Problem area 1 proposed improvements | |
| **FLO-2D Cross Section Shapefile** | | |
| A1_Xsect_Q10.shp | A1: **FLO-2D Domain –** Domain A1 through A7 | • Include Qs and Qdiff for each Alternative<br>• Field "P1A1PrQ100" – Proposed Q100 for Alternative P1A1.<br>• Field "P21_ExQ100" – 100YR Q difference between Alternative P2A1 and Existing Conditions. |
| | Xsect: **FLO-2D Cross Section** | |
| | Q10: **Discharge with Storm event –** (i) Q10 or (ii) Q100 | |
| **Exhibits:** Exhibits for Existing Conditions and all Proposed Alternatives. | | |

*****Raster for each alternative include depth, velocity, water surface elevation, and their differences.

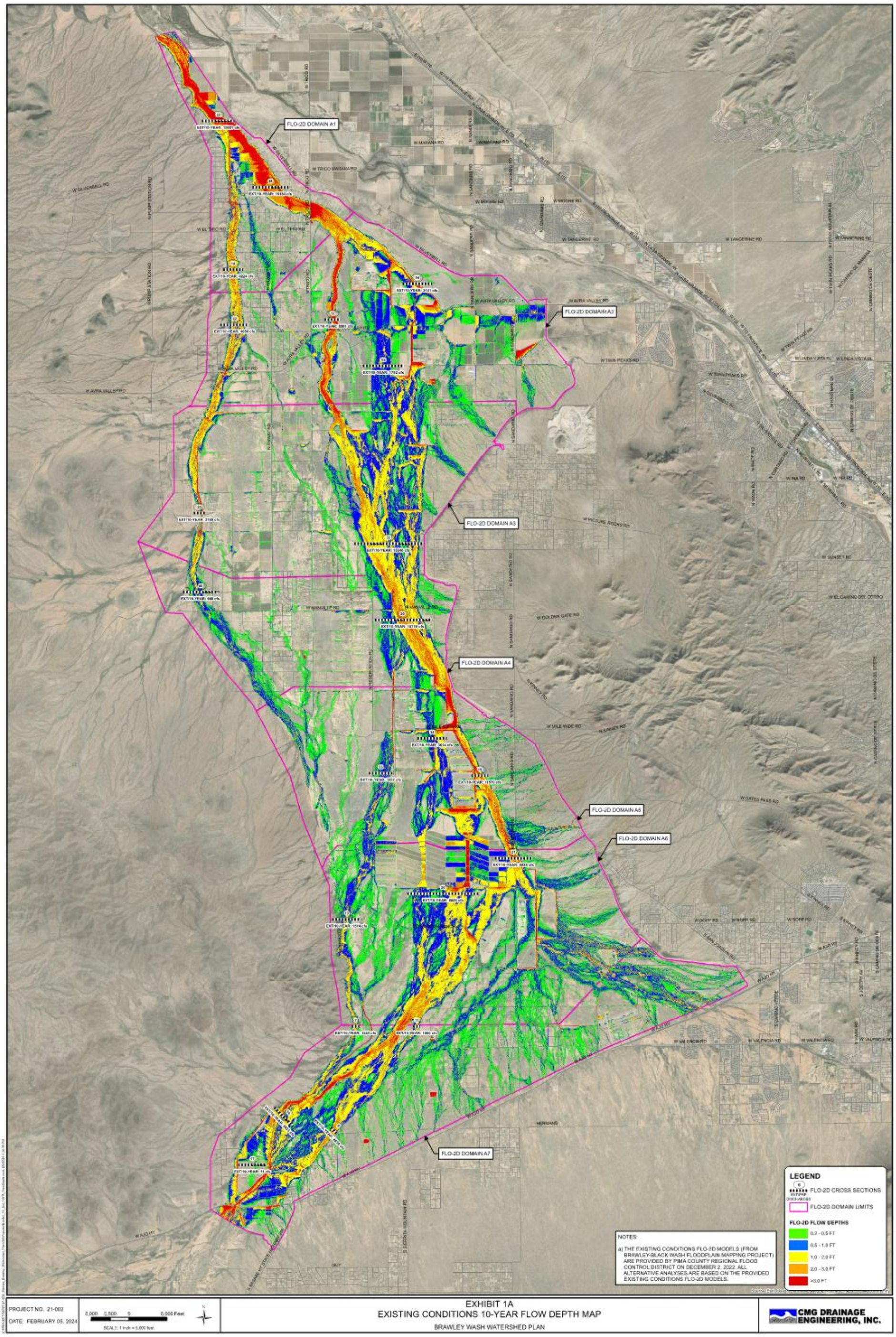
## APPENDIX B

## EXHIBITS

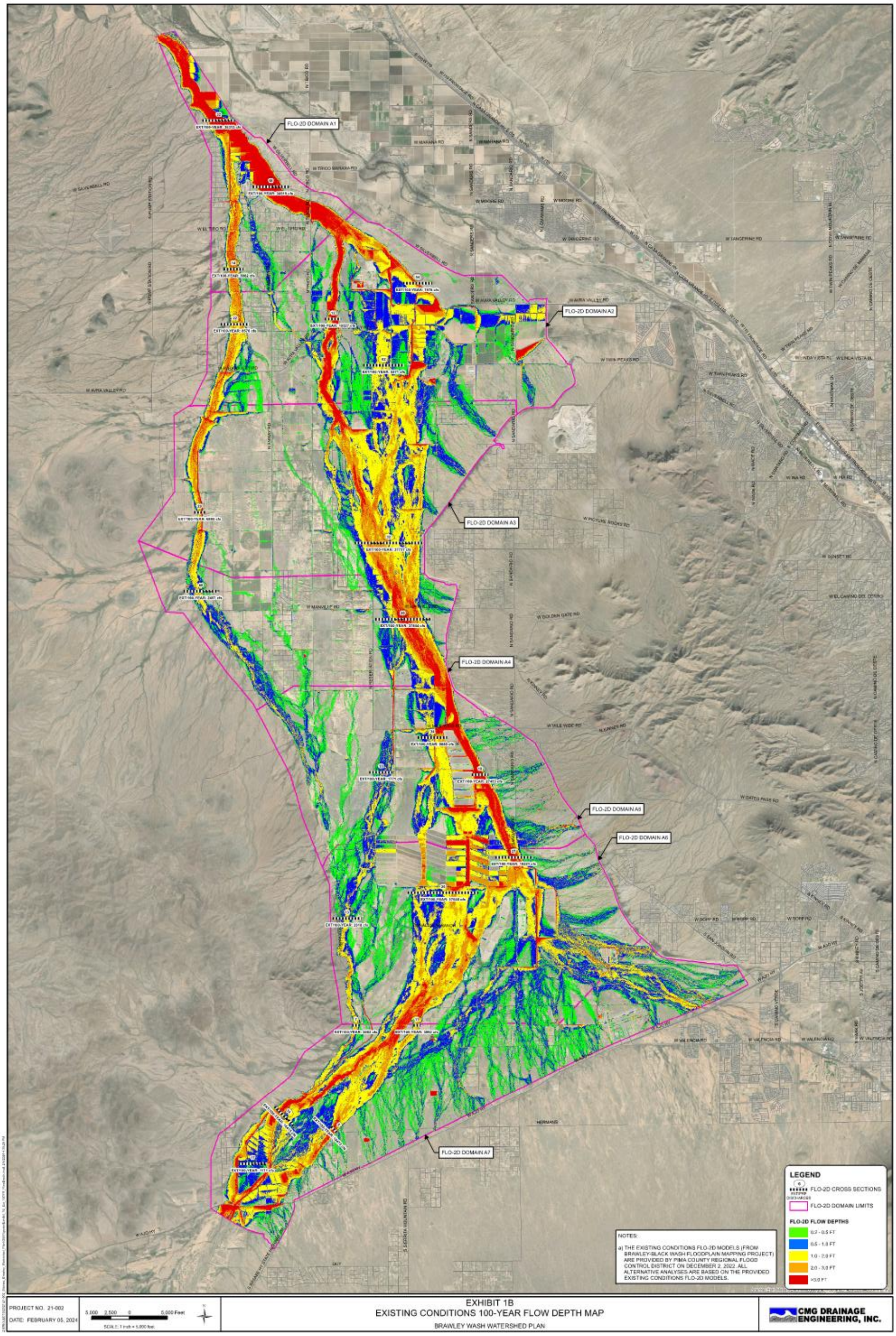
- Exhibit 1A – Existing Conditions 10-Year Flow Depth Map
- Exhibit 1B – Existing Conditions 100-Year Flow Depth Map
- Exhibit 2A – (P1A1) Proposed 10-Year Flow Depth Map
- Exhibit 2B – (P1A1) Proposed 100-Year Flow Depth Map
- Exhibit 2C – (P1A1) 10-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 2D – (P1A1) 100-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 6A – (P6A1) Proposed 10-Year Flow Depth Map
- Exhibit 6B – (P6A1) Proposed 100-Year Flow Depth Map
- Exhibit 6C – (P6A1) 10-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 6D – (P6A1) 100-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 7A – (P6A2) Proposed 10-Year Flow Depth Map
- Exhibit 7B – (P6A2) Proposed 100-Year Flow Depth Map
- Exhibit 7C – (P6A2) 10-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 7D – (P6A2) 100-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 8A – (P7A1) Proposed 10-Year Flow Depth Map
- Exhibit 8B – (P7A1) Proposed 100-Year Flow Depth Map
- Exhibit 8C – (P7A1) 10-Year Flow Depth Difference (Proposed – Existing) Map
- Exhibit 8D – (P7A1) 100-Year Flow Depth Difference (Proposed – Existing) Map

- Include:
- Exhibit Summary Table
- Exhibits (provided in a separate folder)

## Exhibit 1A – Existing Conditions 10-Year Flow Depth Map



## Exhibit 1B – Existing Conditions 100-Year Flow Depth Map



## Exhibit 2A – (P1A1) Proposed 10-Year Flow Depth Map

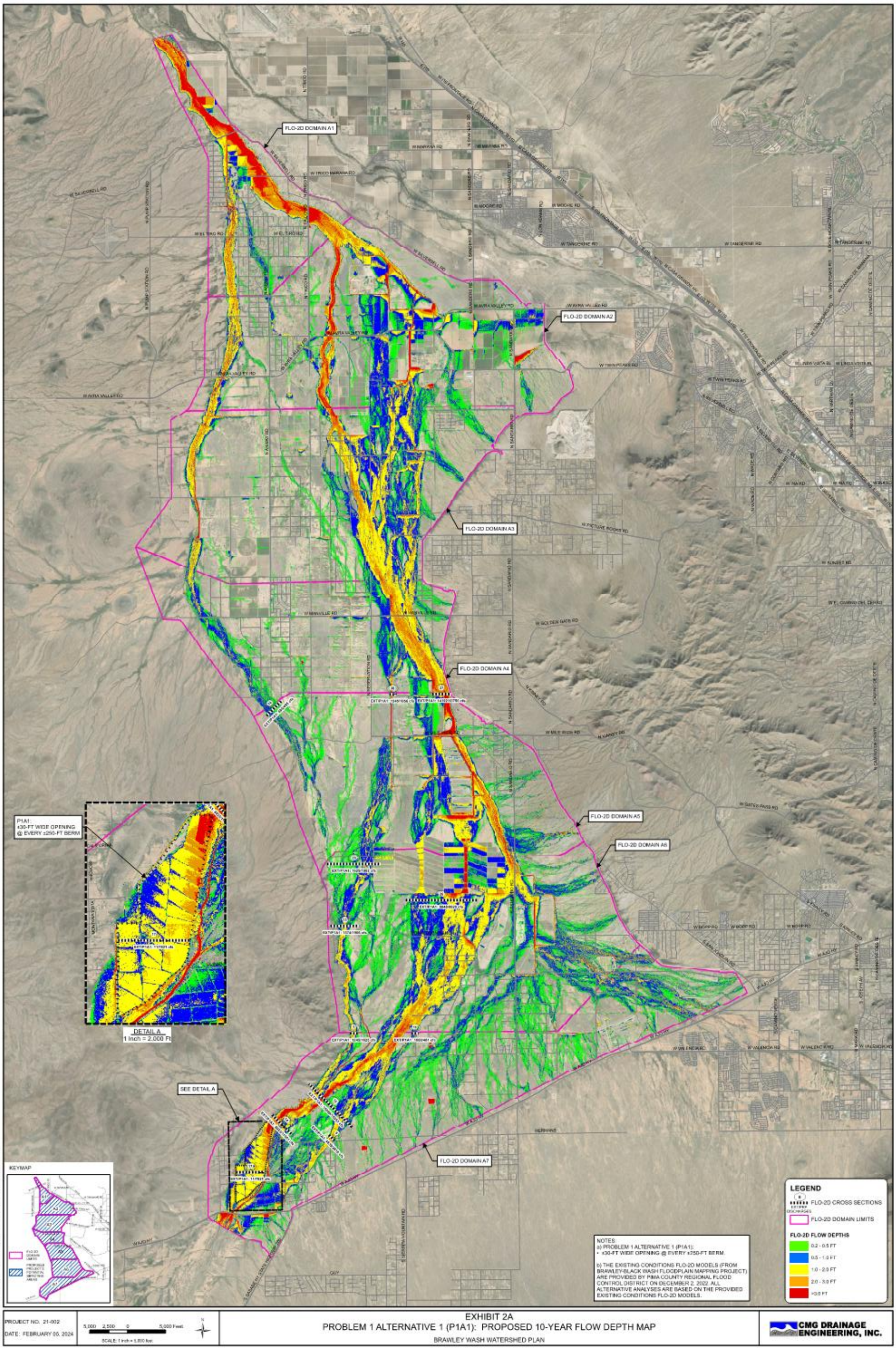


Exhibit 2B – (P1A1) Proposed 100-Year Flow Depth Map

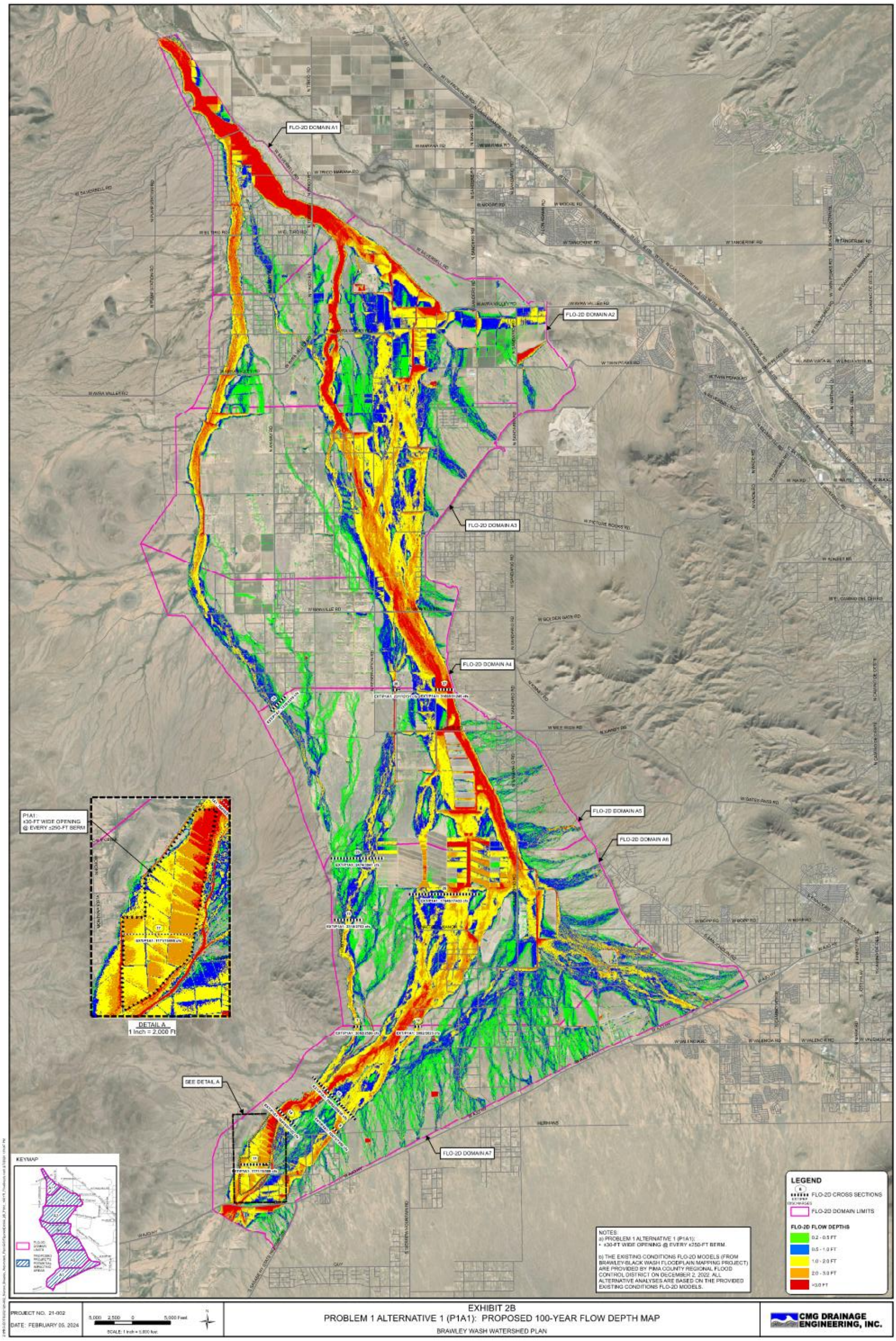



Exhibit 2C – (P1A1) 10-Year Flow Depth Difference (Proposed – Existing) Map

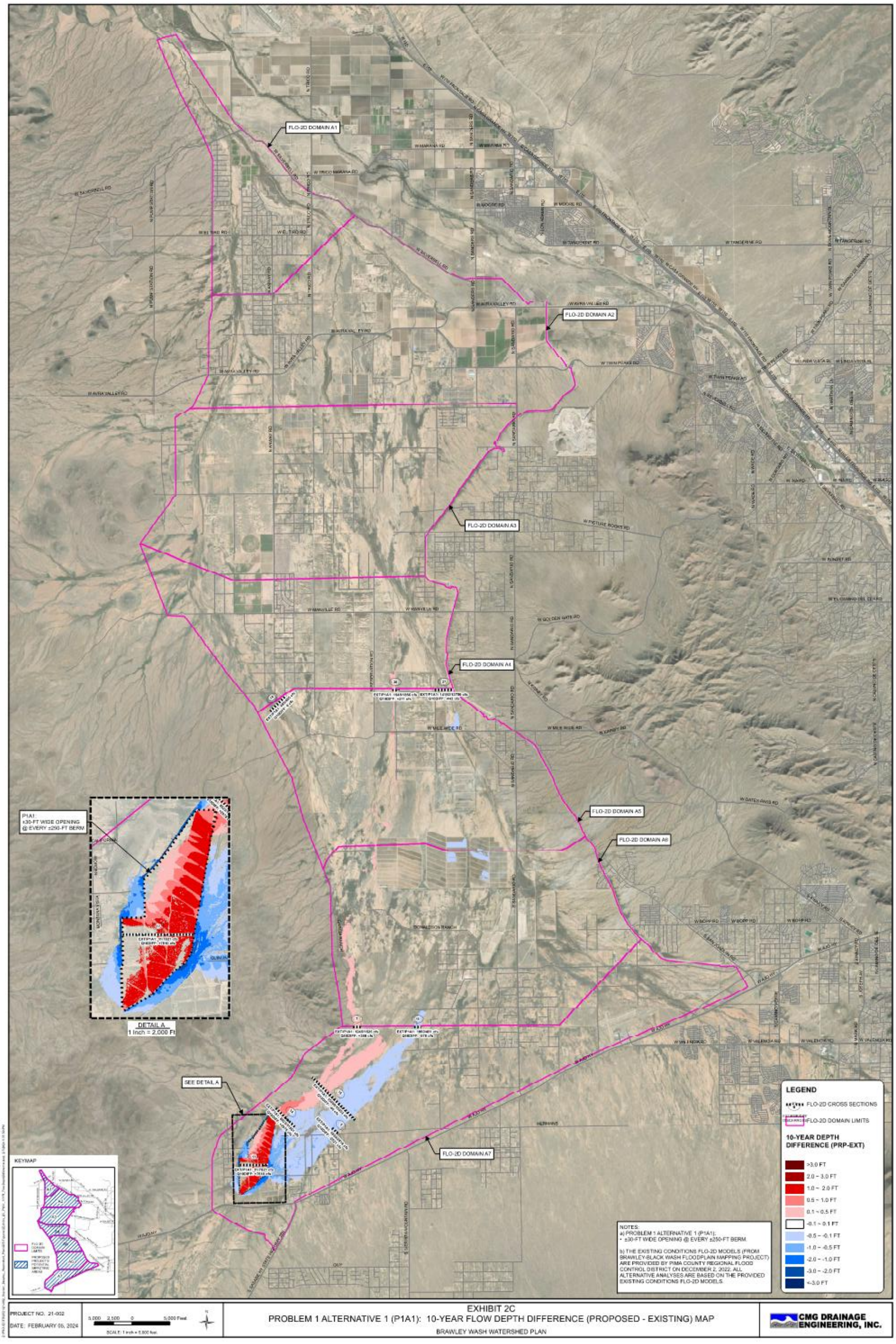
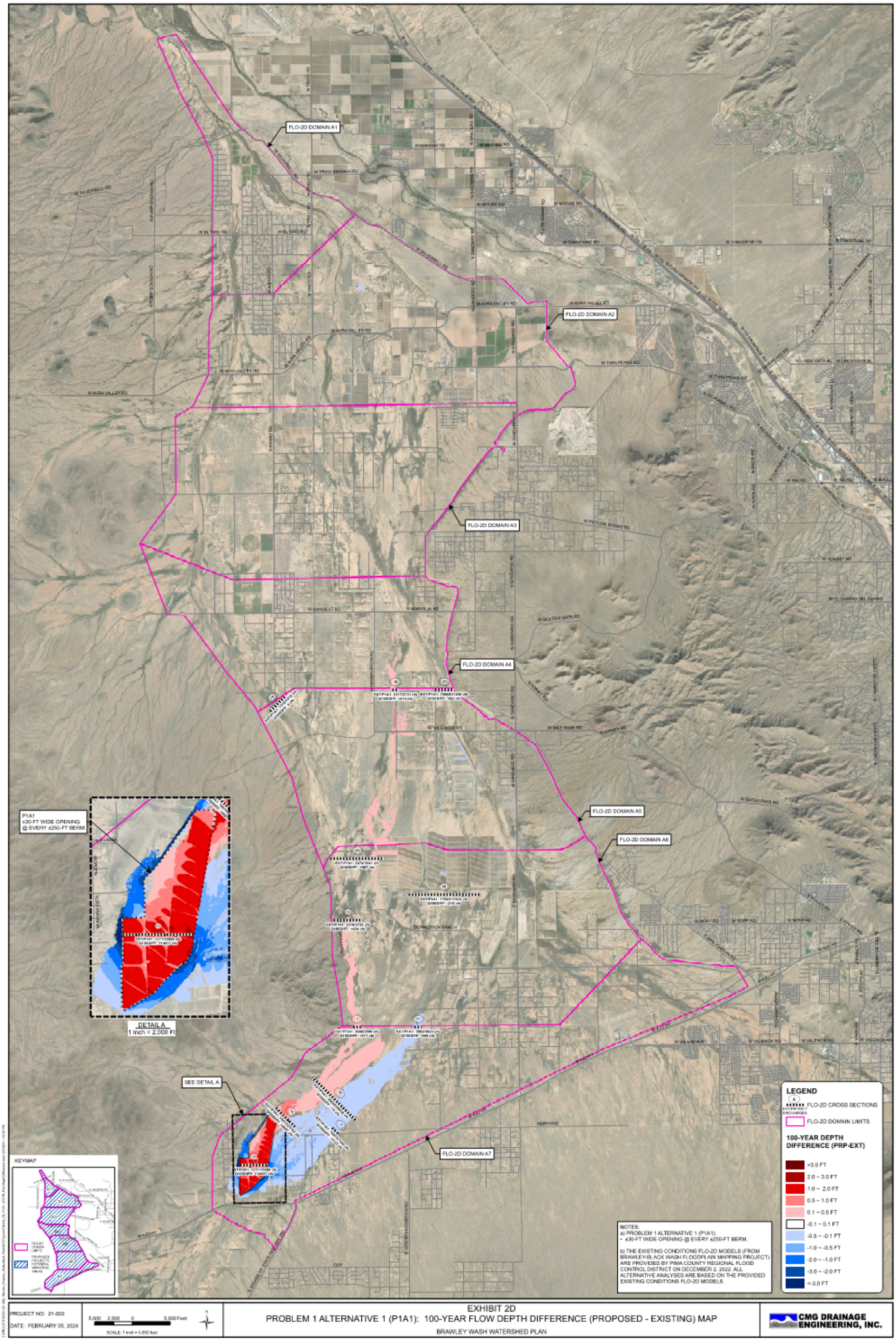
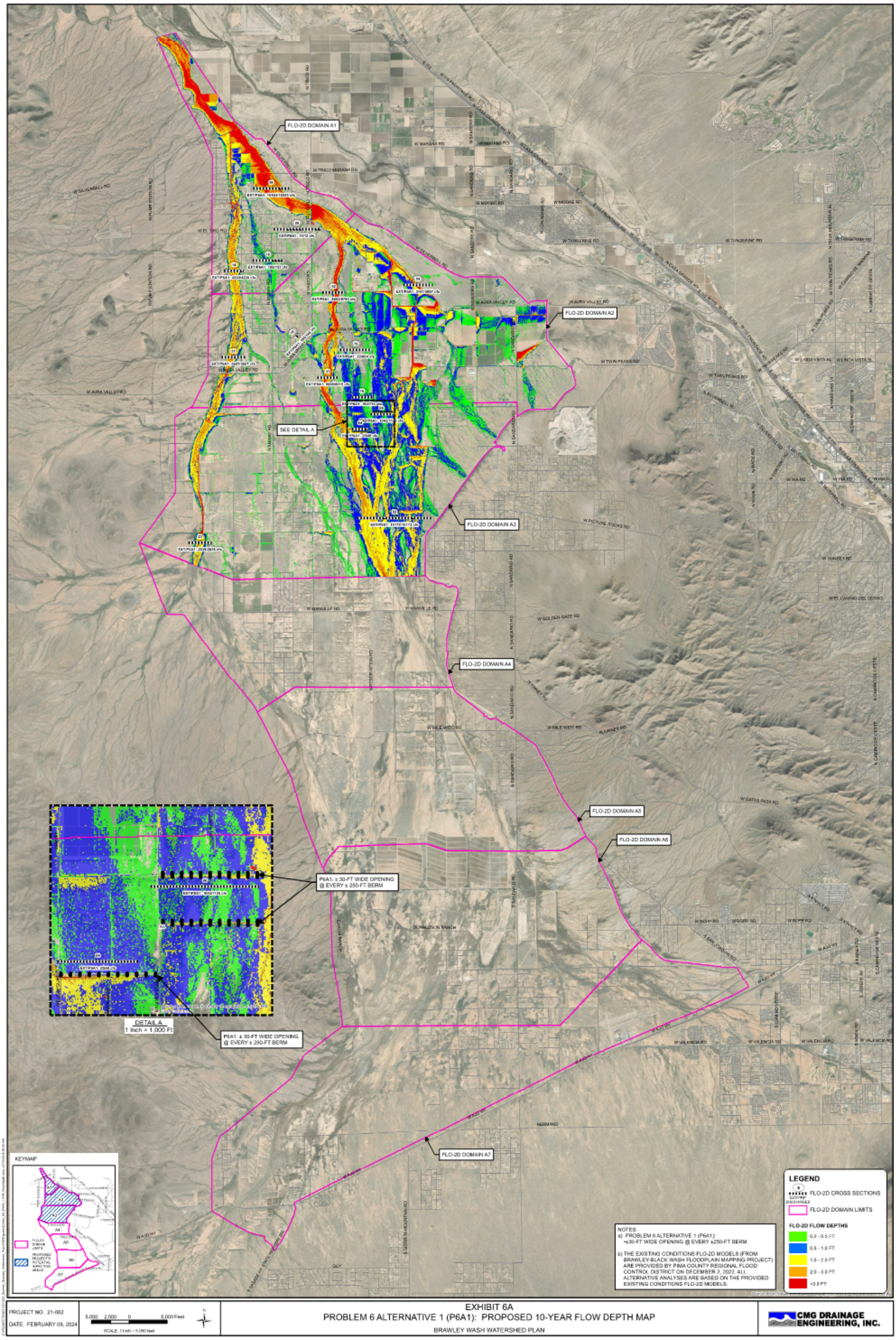

FLO-2D DOMAIN A1
FLO-2D DOMAIN A2
FLO-2D DOMAIN A3
FLO-2D DOMAIN A4
FLO-2D DOMAIN A5
FLO-2D DOMAIN A6
FLO-2D DOMAIN A7
P1A1:
±30-FT WIDE OPENING
@ EVERY ±250-FT BERM
DETAIL A
1 Inch = 2,000 Ft
SEE DETAIL A
KEYMAP
LEGEND
FLO-2D CROSS SECTIONS
FLO-2D DOMAIN LIMITS
10-YEAR DEPTH DIFFERENCE (PRP-EXT)
>3.0 FT
2.0 ~ 3.0 FT
1.0 ~ 2.0 FT
0.5 ~ 1.0 FT
0.1 ~ 0.5 FT
-0.1 ~ 0.1 FT
-0.5 ~ -0.1 FT
-1.0 ~ -0.5 FT
-2.0 ~ -1.0 FT
-3.0 ~ -2.0 FT
<-3.0 FT
NOTES:
a) PROBLEM 1 ALTERNATIVE 1 (P1A1):
• ±30-FT WIDE OPENING @ EVERY ±250-FT BERM.
b) THE EXISTING CONDITIONS FLO-2D MODELS (FROM BRAWLEY-BLACK WASH FLOODPLAIN MAPPING PROJECT) ARE PROVIDED BY PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT ON DECEMBER 2, 2022. ALL ALTERNATIVE ANALYSES ARE BASED ON THE PROVIDED EXISTING CONDITIONS FLO-2D MODELS.
PROJECT NO. 21-002
DATE: FEBRUARY 05, 2024
5,000 2,500 0 5,000 Feet
SCALE: 1 inch = 5,000 feet
EXHIBIT 2C
PROBLEM 1 ALTERNATIVE 1 (P1A1): 10-YEAR FLOW DEPTH DIFFERENCE (PROPOSED - EXISTING) MAP
BRAWLEY WASH WATERSHED PLAN
CMG DRAINAGE ENGINEERING, INC.

Exhibit 2D – (P1A1) 100-Year Flow Depth Difference (Proposed – Existing) Map



## Exhibit 6A – (P6A1) Proposed 10-Year Flow Depth Map



## Exhibit 6B – (P6A1) Proposed 100-Year Flow Depth Map

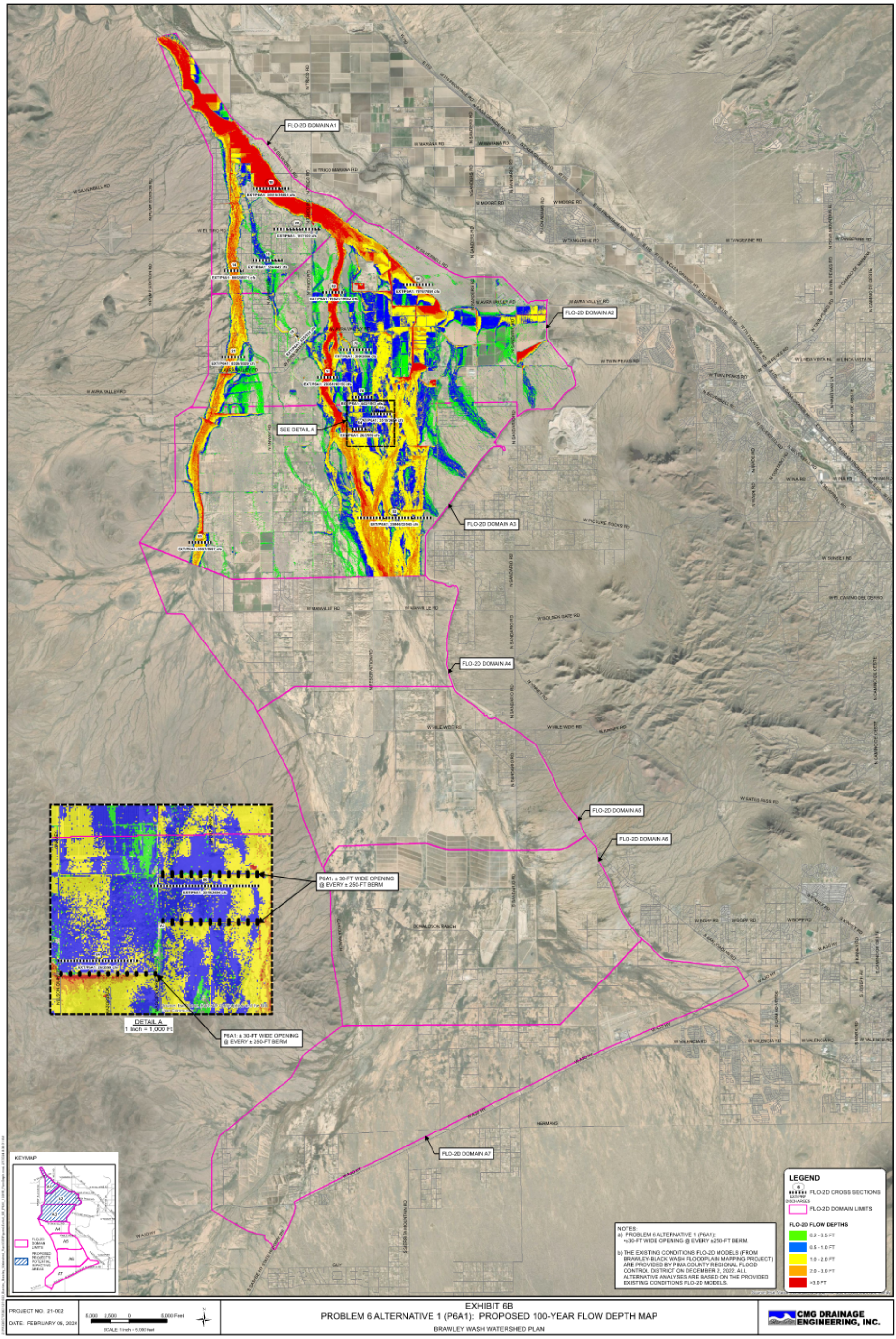
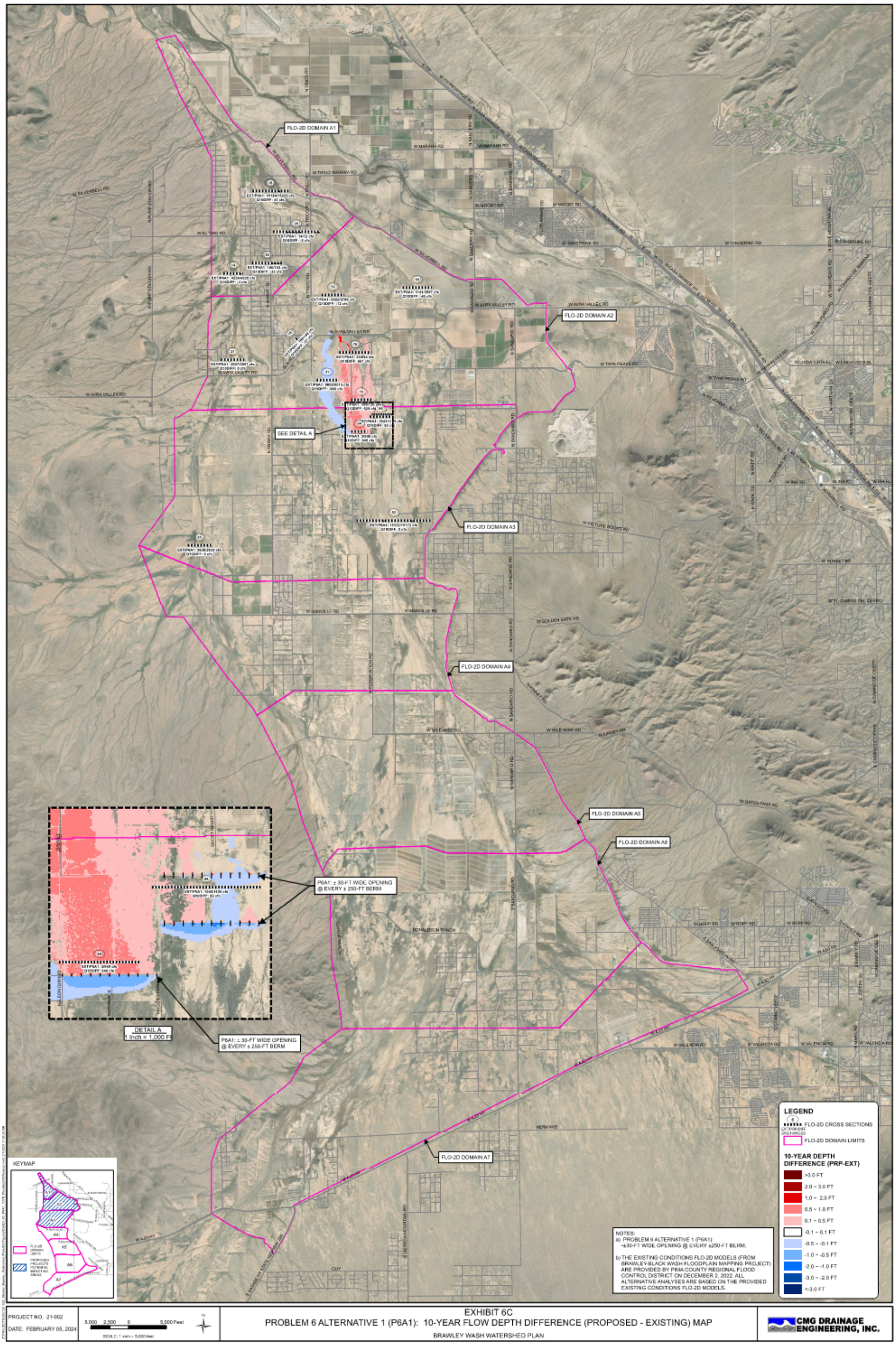
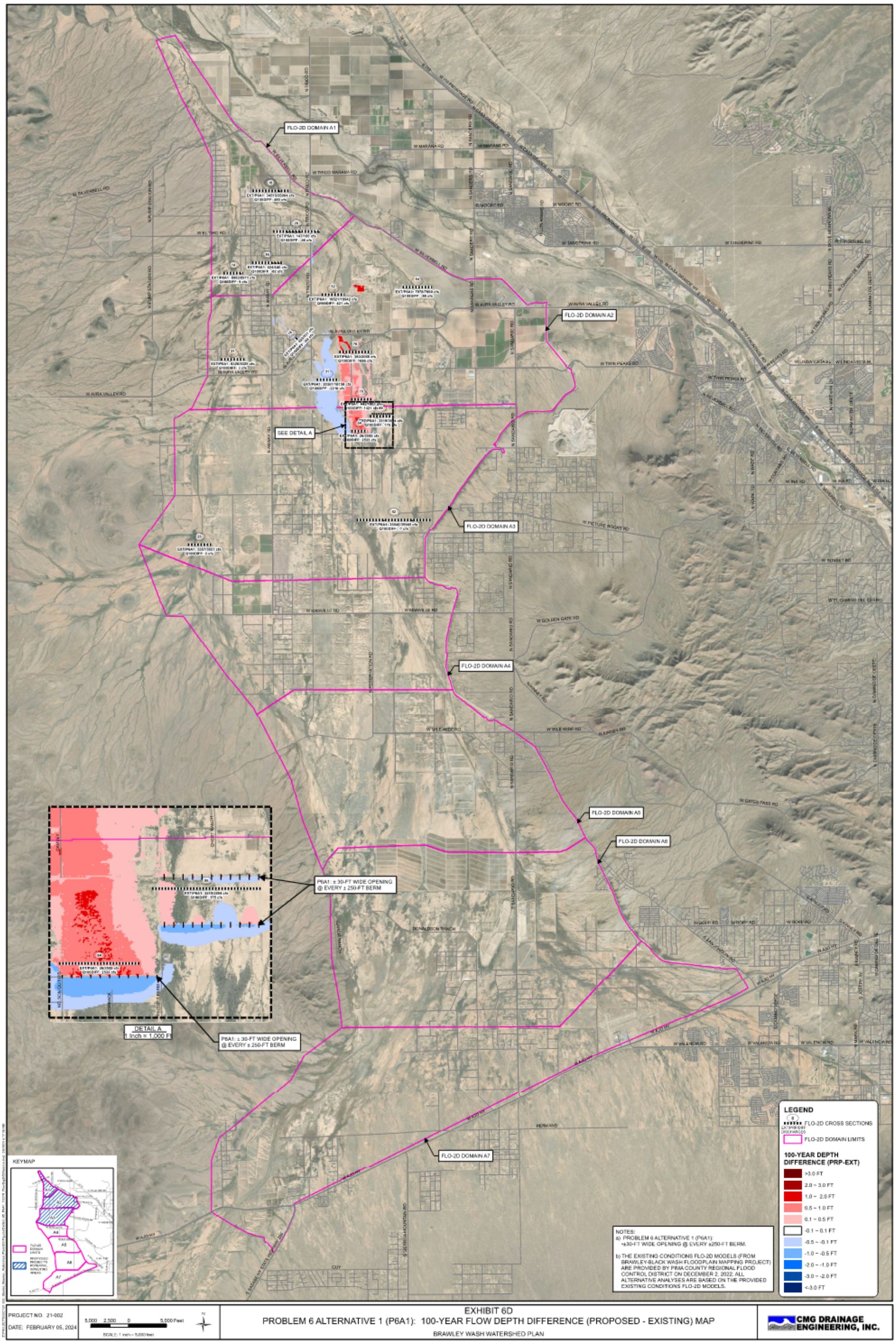


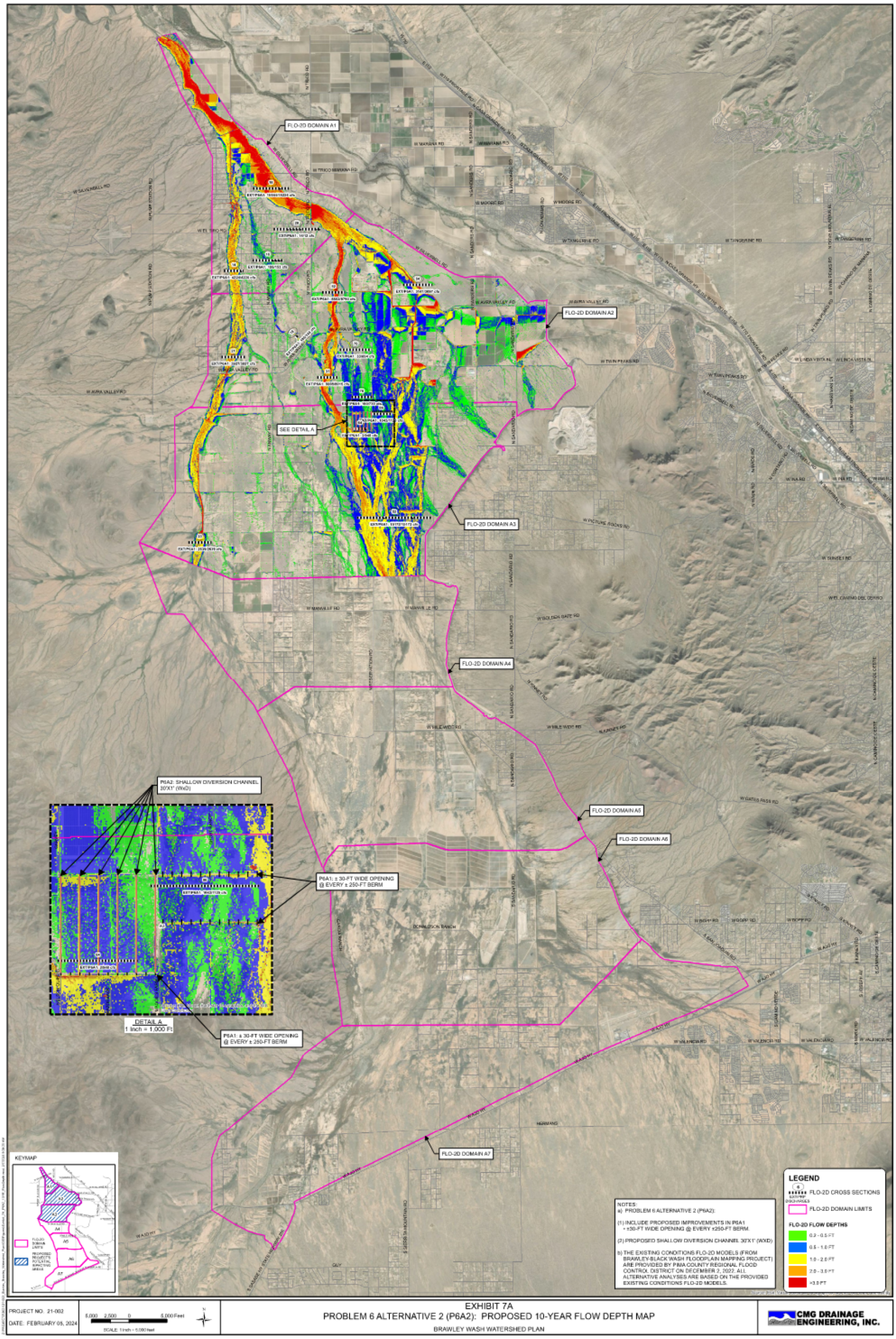
**Exhibit 6C – (P6A1) 10-Year Flow Depth Difference (Proposed – Existing) Map**



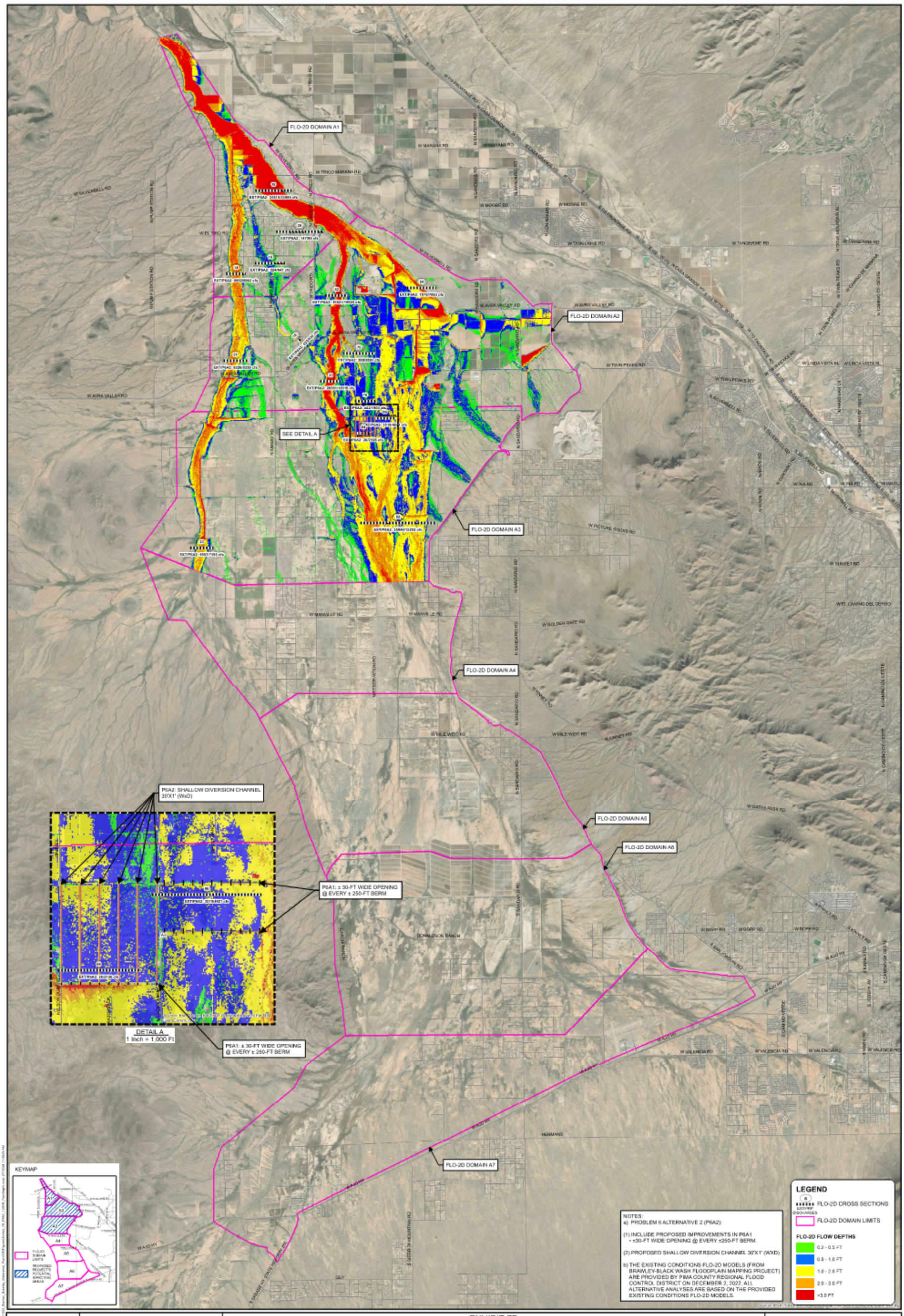
## Exhibit 6D – (P6A1) 100-Year Flow Depth Difference (Proposed – Existing) Map



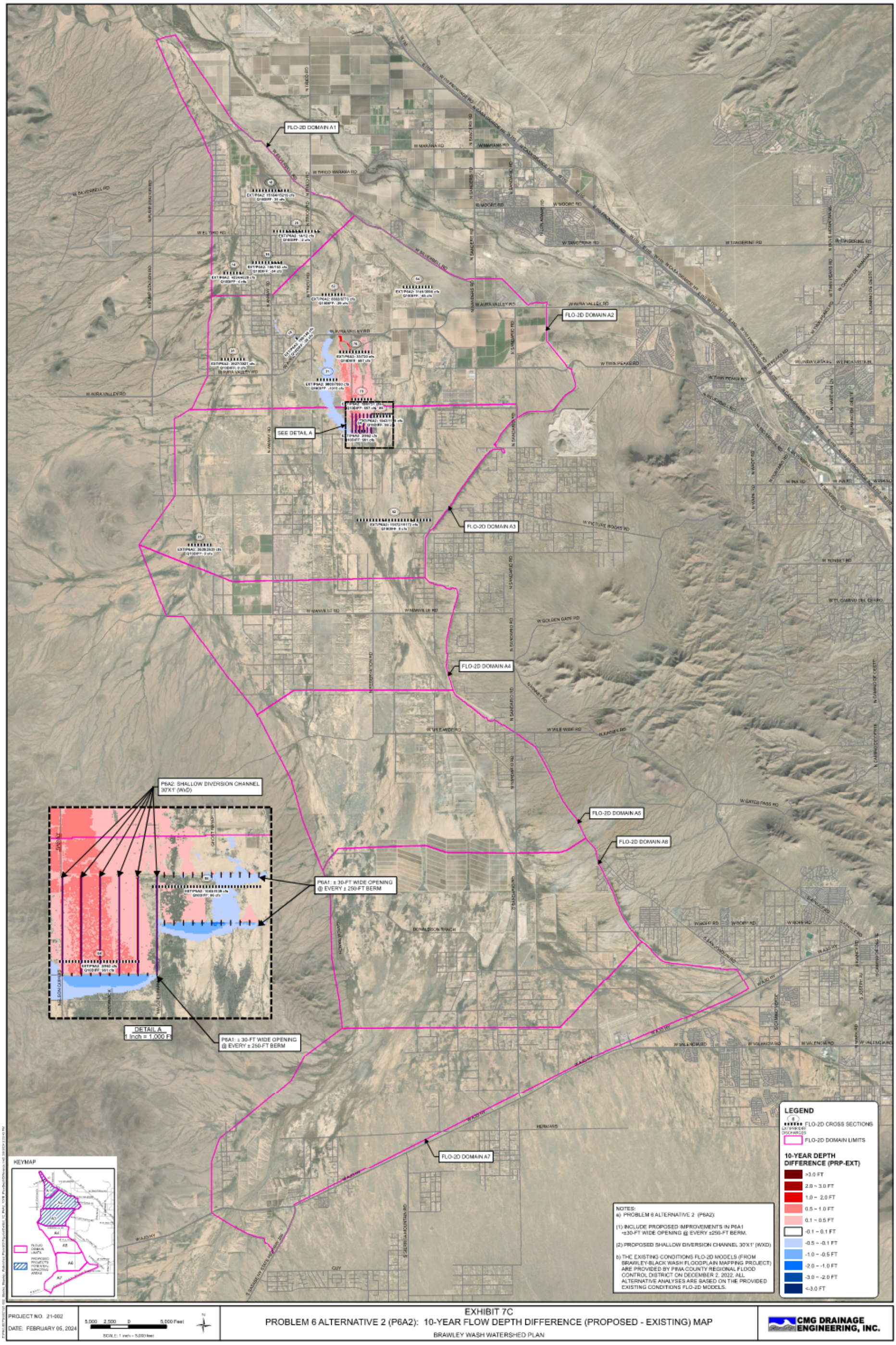
## Exhibit 7A – (P6A2) Proposed 10-Year Flow Depth Map



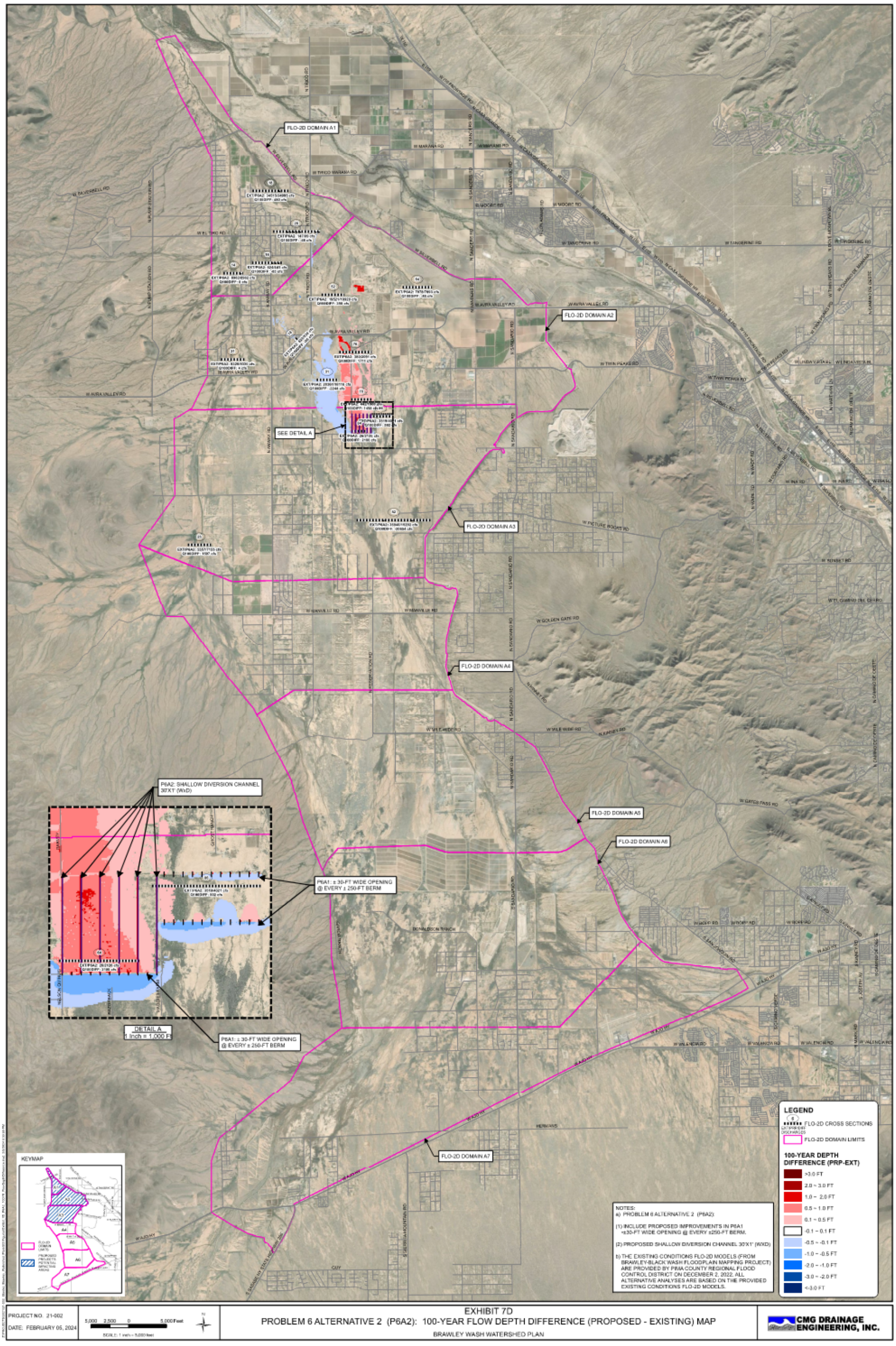
## Exhibit 7B – (P6A2) Proposed 100-Year Flow Depth Map



## Exhibit 7C – (P6A2) 10-Year Flow Depth Difference (Proposed – Existing) Map



## Exhibit 7D – (P6A2) 100-Year Flow Depth Difference (Proposed – Existing) Map



## Exhibit 8A – (P7A1) Proposed 10-Year Flow Depth Map

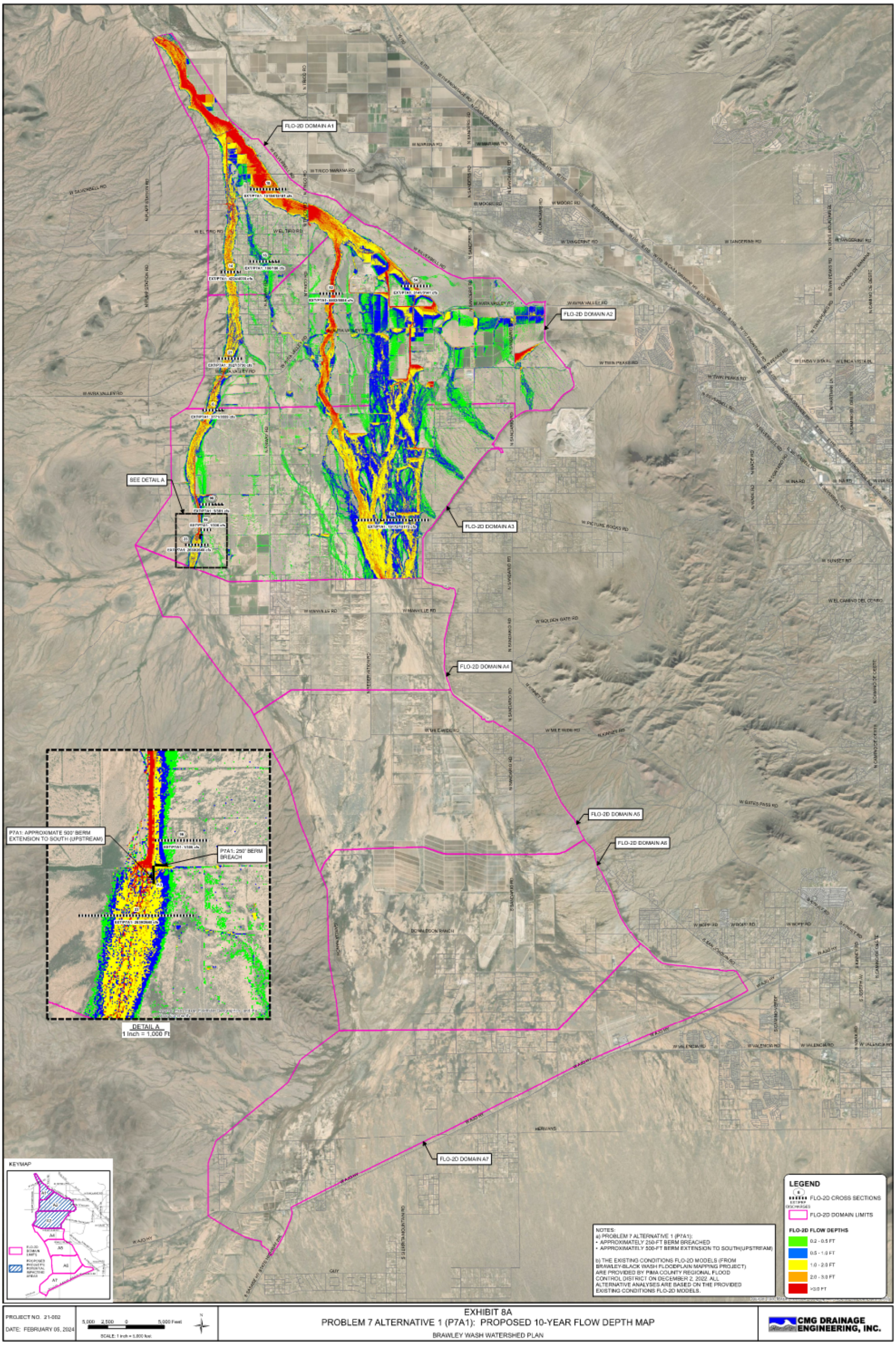


Exhibit 8B – (P7A1) Proposed 100-Year Flow Depth Map

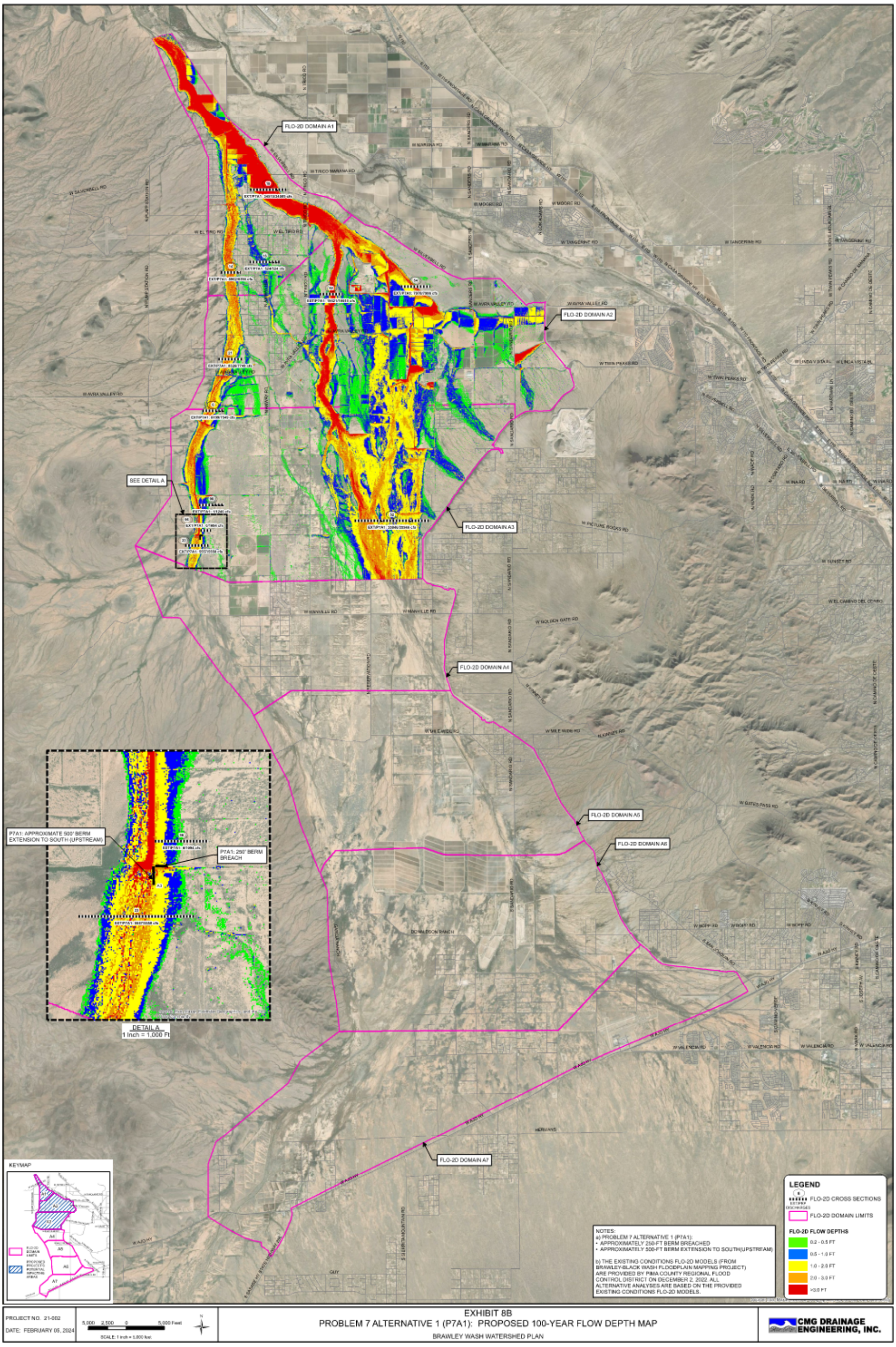
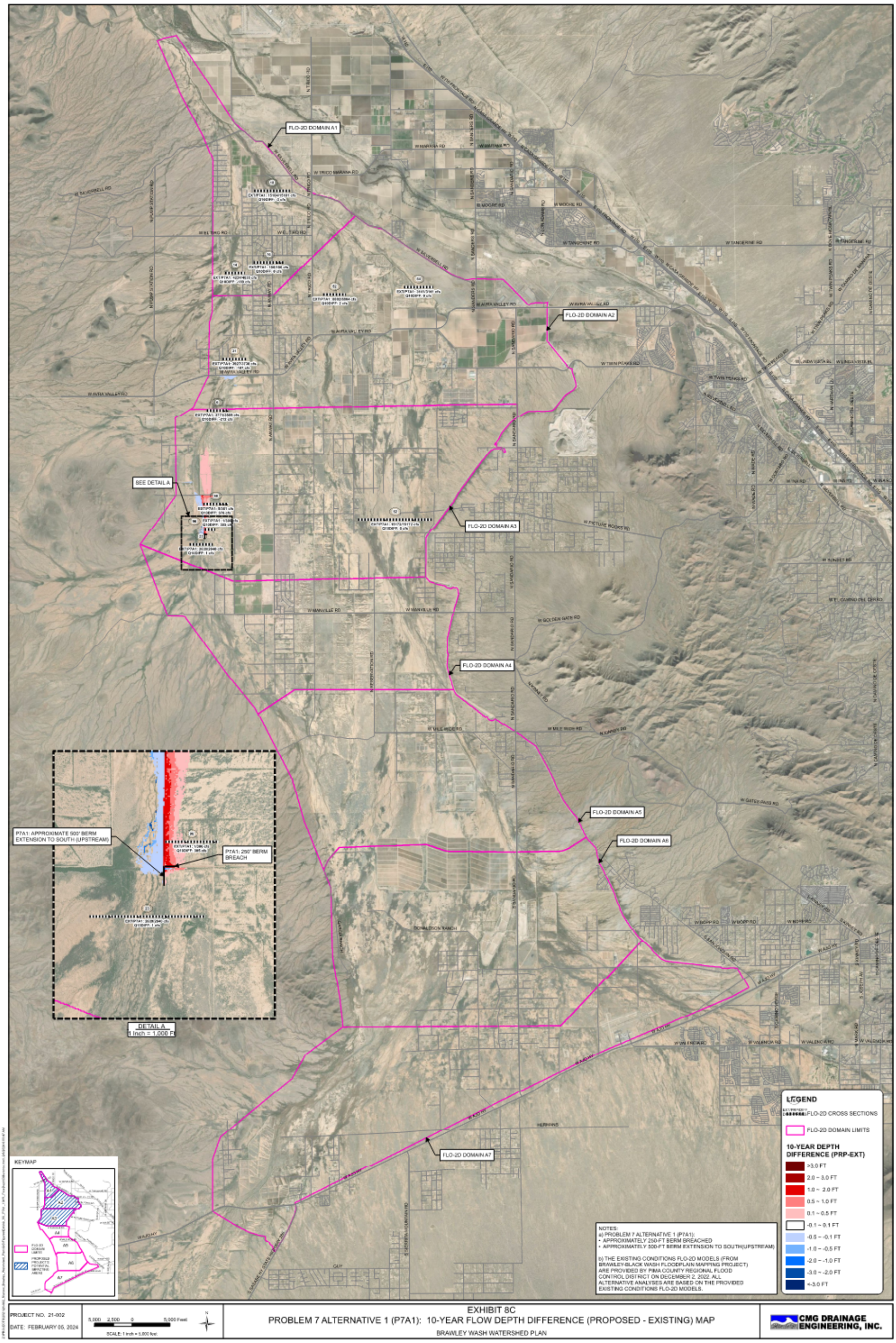
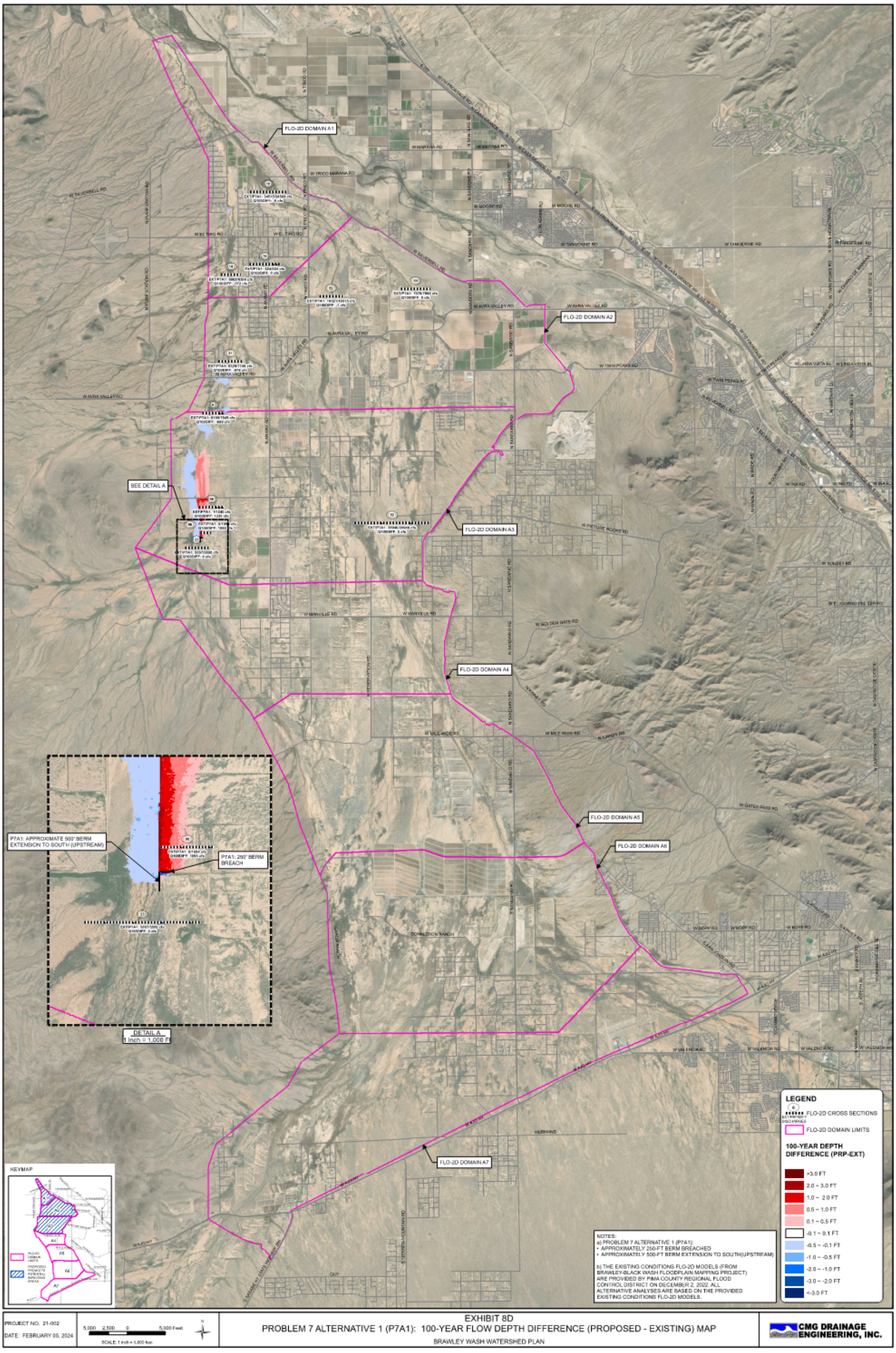


**Exhibit 8C – (P7A1) 10-Year Flow Depth Difference (Proposed – Existing) Map**



## Exhibit 8D – (P7A1) 100-Year Flow Depth Difference (Proposed – Existing) Map



CMG Job #: 21-002

**Brawley Wash Watershed Plan: Summary Table for Alternative Analysis using FLO-2D (for both 10- & 100-year events)**

| Alternative Evaluation ID | Alternatives | Location of Alternative Domain | Storm Events | F2D Domains | | | | | | | Exhibits | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A7 | A6 | A5 | A4 | A3 | A2 | A1 | Flow Depth | Flow Depth Difference |
| Existing Conditions | EXT | N/A | 10YR | i | i | i | i | i | i | i | **Exhibit 1A:** EXT 10YR Flow Depth | n/a |
| | | | 100YR | i | i | i | i | i | i | i | **Exhibit 1B:** EXT 100YR Flow Depth | n/a |
| **Alternative Evaluation without Water Harvesting Basins** | | | | | | | | | | | | |
| 1 | Problem 1, Alt 1: (P1A1) | A7 | 10YR | i | i | i | i | i | i | i | **Exhibit 2A:** P1A1 10YR Flow Depth | **Exhibit 2C:** P1A1 10YR Flow Depth Difference |
| | | | 100YR | i | i | i | i | i | i | i | **Exhibit 2B**: P1A1 100YR Flow Depth | **Exhibit 2D:** P1A1 100YR Flow Depth Difference |
| 2 | Problem 2, Alt 1: (P2A1) | A6 | 10YR | - | i | i | i | i | i | i | **Exhibit 3A:** P2A1 10YR Flow Depth | **Exhibit 3C:** P2A1 10YR Flow Depth Difference |
| | | | 100YR | - | i | i | i | i | i | i | **Exhibit 3B**: P2A1 100YR Flow Depth | **Exhibit 3D:** P2A1 100YR Flow Depth Difference |
| 3 | Problem 5, Alt 1: (P5A1) | A4 | 10YR | - | - | - | i | i | i | i | **Exhibit 4A:** P5A1 10YR Flow Depth | **Exhibit 4C:** P5A1 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | i | i | i | i | **Exhibit 4B**: P5A1 100YR Flow Depth | **Exhibit 4D:** P5A1 100YR Flow Depth Difference |
| 4 | Problem 5, Alt 2: (P5A2) | A4 | 10YR | - | - | - | i | i | i | i | **Exhibit 5A:** P5A2 10YR Flow Depth | **Exhibit 5C:** P5A2 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | i | i | i | i | **Exhibit 5B**: P5A2 100YR Flow Depth | **Exhibit 5D:** P5A2 100YR Flow Depth Difference |
| 5 | Problem 6, Alt 1: (P6A1) | A3 | 10YR | - | - | - | - | i | i | i | **Exhibit 6A:** P6A1 10YR Flow Depth | **Exhibit 6C:** P6A1 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | - | i | i | i | **Exhibit 6B**: P6A1 100YR Flow Depth | **Exhibit 6D:** P6A1 100YR Flow Depth Difference |
| 6 | Problem 6, Alt 2: (P6A2) | A3 | 10YR | - | - | - | - | i | i | i | **Exhibit 7A:** P6A2 10YR Flow Depth | **Exhibit 7C:** P6A2 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | - | i | i | i | **Exhibit 7B**: P6A2 100YR Flow Depth | **Exhibit 7D:** P6A2 100YR Flow Depth Difference |
| 7 | Problem 7, Alt 1: (P7A1) | A3 | 10YR | - | - | - | - | i | i | i | **Exhibit 8A:** P7A1 10YR Flow Depth | **Exhibit 8C:** P7A1 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | - | i | i | i | **Exhibit 8B**: P7A1 100YR Flow Depth | **Exhibit 8D:** P7A1 100YR Flow Depth Difference |
| 8 | Problem 7, Alt 2: (P7A2) | A3 | 10YR | - | - | - | - | i | i | i | **Exhibit 9A:** P7A2 10YR Flow Depth | **Exhibit 9C:** P7A2 10YR Flow Depth Difference |
| | | | 100YR | - | - | - | - | i | i | i | **Exhibit 9B**: P7A2 100YR Flow Depth | **Exhibit 9D:** P7A2 100YR Flow Depth Difference |
| **Alternative Evaluation - One Representative Water Harvesting Basins Alternative** | | | | | | | | | | | | |
| 9 | Problem 1, Alt 2 | A7 | 10-YR | i | - | - | - | - | - | - | **Exhibit 10A:** P1A2 10YR Flow Depth | **Exhibit 10B:** (P1A2 -P1A1) 10YR Flow Depth Difference |

# APPENDIX C

# QUALITY CONTROL

Include:

- Quality Control Certification

**CERTIFICATE OF COMPLIANCE**

DATE: October 18, 2024

TO: Pima County Regional Flood Control District
201 N Stone Ave, 9th Floor
Tucson, AZ 85701

ATTN: Carrie Olson
Project Manager

RE: Quality Control Review – Alternatives Analysis Report Submittal

CONSULTANT: Stantec Consulting Services Inc.
One S Church St, Suite 2100
Tucson, AZ 85701

SUBCONSULTANT: CMG Drainage Engineering, Inc.
3555 N Mountain Ave
Tucson, AZ 85719

CERTIFICATE OF COMPLIANCE

This is to certify that I have monitored the quality control (QC) process during production and review. I have completed and documented the required QC Review of the production documentation (report and exhibits) of this submittal. This QC Review was conducted October 18, 2024, after all QC procedures were complete. Submittal documents with electronic review annotations for the referenced elements have been completed and are available for review upon request.

This certificate was issued to document my review and to confirm that the standards for professional practice processes were followed in producing the submittal documents. In my professional opinion, this report and exhibits meet the standards of the Pima County Regional Flood Control District and are ready for review.

SIGNED: Jerald L. Curless

Jerald L. Curless, PE
Quality Control Manager

CMG DRAINAGE ENGINEERING, INC.

# APPENDIX D

# STANTEC'S PRELIMINARY ALTERNATIVE SELECTION MEMO

Include:

- Stantec's Preliminary Alternative Selection Memo **(See Appendix E – Attachment 14 - Data Collection Technical Memorandum)**

# APPENDIX E

# DIGITAL FILES

Include:

- FLO-2D Models
- Shapefiles for Alternatives and FLO-2D Cross Sections
- Existing Conditions Raster Results
- Proposed Conditions Raster Results
- Report (text, all appendices and Figures; in PDF format).

# SUBAPPENDIX D.3 SOILS AND GEOLOGY

CONTENTS:

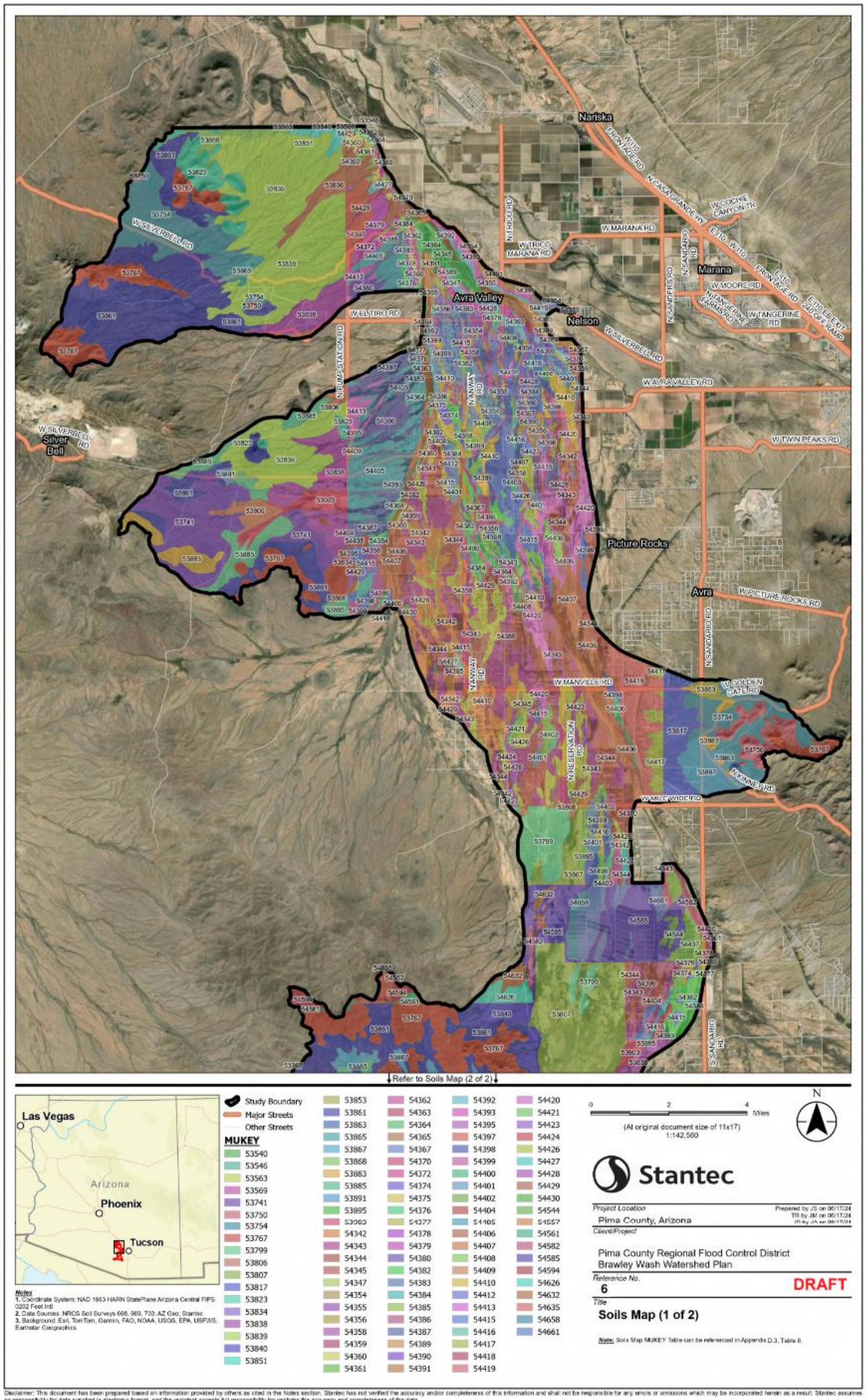

- Table 10 – NRCS Soils within the Brawley Wash Watershed Active Floodplain
- Attachment 4 – Soils Map (1 of 2) and (2 of 2)

Table 10 - NRCS Soils within the Brawley Wash Watershed Active Floodplain

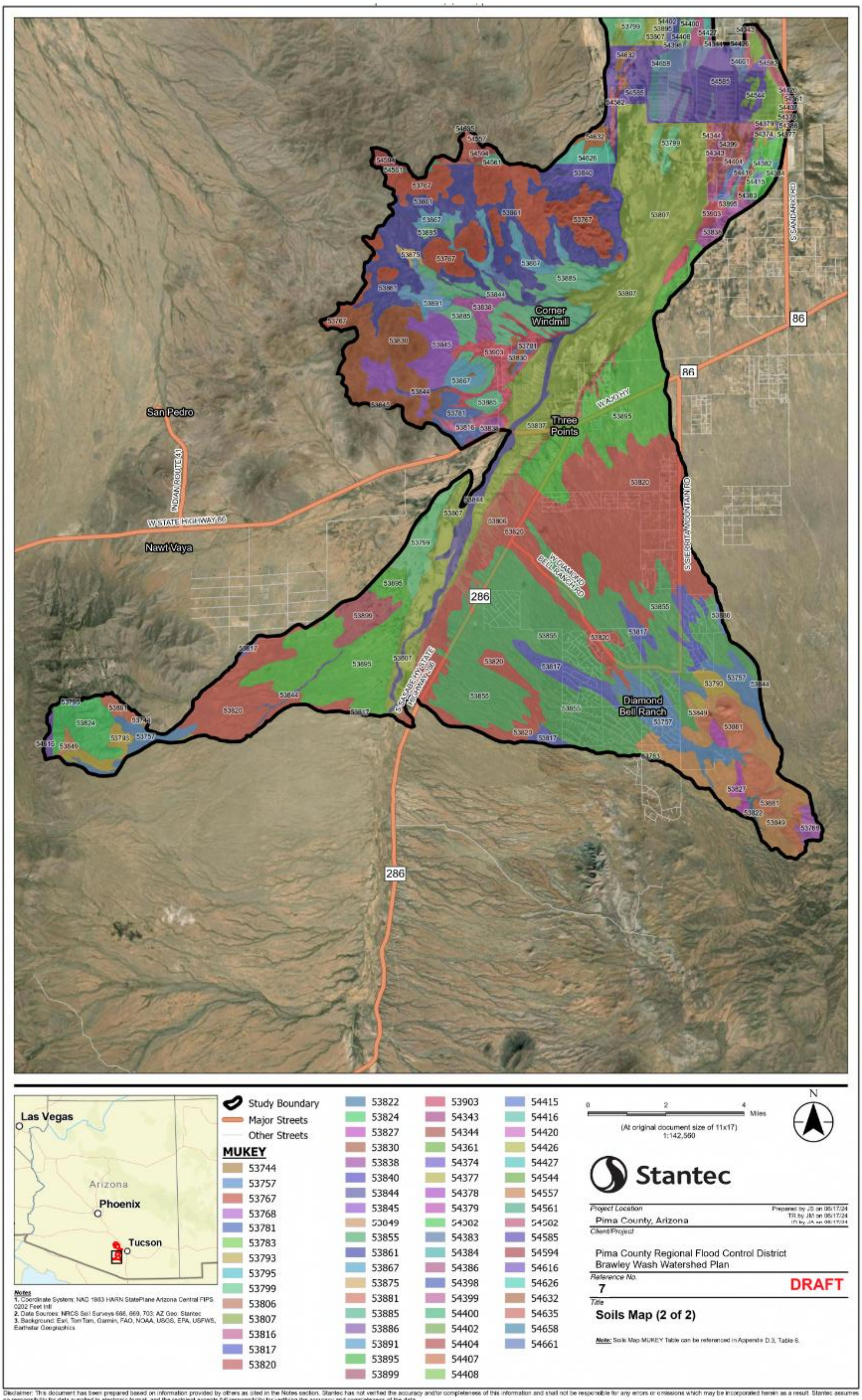
| Mapping Area | Soil Unit | Soil Name | Percentage of Brawley Wash |
|---|---|---|---|
| AZ668 | Aw | Anway silty clay loam | 7% |
| AZ668 | Au | Anway loam | 4% |
| AZ668 | Vo | Vekol silty clay loam | 4% |
| AZ668 | Ts3 | Trix-Estrella complex, severely eroded | 4% |
| AZ668 | Ge3 | Glendale silty clay loam, severely eroded | 3% |
| AZ668 | VaA | Valencia sandy loam, 0 to 1 percent slopes | 3% |
| AZ668 | Tr | Trix silty clay loam | 2% |
| AZ668 | Ge | Glendale silty clay loam | 2% |
| AZ668 | Mo | Mohave clay loam | 1% |
| AZ668 | SmA | Sonoita sandy loam, 0 to 1 percent slopes | 1% |
| AZ668 | AhA | Anthony sandy loam, 0 to 1 percent slopes | 1% |
| AZ668 | TuA | Tubac sandy clay loam, 0 to 1 percent slopes | 1% |
| AZ668 | So | Sonoita sandy clay loam | 1% |
| AZ668 | VnB | Valencia-Sonoita sandy loams, 1 to 5 percent slopes | 1% |
| AZ668 | TtA | Tubac sandy loam, 0 to 1 percent slopes | < 1% |
| AZ668 | MdA | Mohave sandy loam, 0 to 1 percent slopes | < 1% |
| AZ668 | ReC | Rillito gravelly sandy loam, 0 to 8 percent slopes | < 1% |
| AZ668 | Gc | Gila silty clay loam | < 1% |
| AZ668 | Pm | Pima silty clay loam | < 1% |
| AZ668 | Sn | Sonoita loam | < 1% |
| AZ668 | GbA | Gila loam, 0 to 1 percent slopes | < 1% |
| AZ668 | AnA | Anthony gravelly sandy loam, 0 to 1 percent slopes | < 1% |
| AZ668 | Gh | Grabe loam | < 1% |
| AZ668 | Sr | Sonoita silty clay loam | < 1% |
| AZ668 | Ct | Cowan sandy loam | < 1% |
| AZ668 | Gd | Glendale loam | < 1% |
| AZ668 | MhA | Mohave loam, 0 to 1 percent slopes | < 1% |
| AZ668 | VaB | Valencia sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | LeA | Laveen loam, 0 to 1 percent slopes | < 1% |
| AZ668 | PnB | Pinaleno gravelly sandy loam, 1 to 5 percent slopes | < 1% |
| AZ668 | AhB | Anthony sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | SmB | Sonoita sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | ThB | Tres Hermanos gravelly loam, 1 to 3 percent slopes | < 1% |
| AZ668 | Gm | Grabe silty clay loam | < 1% |
| AZ668 | RtB | Rillito-Tres Hermanos complex, 1 to 5 percent slopes | < 1% |
| AZ668 | LaA | Laveen sandy loam, 0 to 1 percent slopes | < 1% |
| AZ668 | AnB | Anthony gravelly sandy loam,1 to 3 percent slopes | < 1% |
| AZ668 | Es | Estrella loam | < 1% |
| AZ668 | MdB | Mohave sandy loam, 1 to 3 percent slopes | < 1% |

| Mapping Area | Soil Unit | Soil Name | Percentage of Brawley Wash |
|---|---|---|---|
| AZ668 | TmB | Tres Hermanos-Mohave complex, 0 to 3 percent slopes | < 1% |
| AZ668 | At | Anway sandy loam | < 1% |
| AZ668 | RdB | Rillito sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | MtB | Mohave-Tres Hermanos complex, 0 to 3 percent slopes | < 1% |
| AZ668 | LaB | Laveen sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | MhB | Mohave loam, 1 to 3 percent slopes | < 1% |
| AZ668 | Ga | Gila sandy loam | < 1% |
| AZ668 | Tv2 | Tubac clay, eroded | < 1% |
| AZ668 | Vt | Vinton sandy loam | < 1% |
| AZ668 | GbB | Gila loam, 1 to 3 percent slopes | < 1% |
| AZ668 | LmB | Laveen complex, 0 to 5 percent slopes | < 1% |
| AZ668 | LeB | Laveen loam, 1 to 3 percent slopes | < 1% |
| AZ668 | CsB | Cowan loamy sand, 1 to 3 percent slopes | < 1% |
| AZ668 | BsB | Brazito gravelly loamy sand, 1 to 3 percent slopes | < 1% |
| AZ668 | Az | Arizo gravelly sandy loam | < 1% |
| AZ668 | LdB | Laveen gravelly sandy loam, 1 to 3 percent slopes | < 1% |
| AZ668 | CsA | Cowan loamy sand, 0 to 1 percent slopes | < 1% |
| AZ668 | Gr | Gravelly alluvial land | < 1% |
| AZ669 | 30 | Glendale silt loam, 0 to 3 percent slopes | 22% |
| AZ669 | 8 | Bucklebar-Sahuarita complex, 0 to 3 percent slopes | 4% |
| AZ669 | 5 | Arizo-Riverwash complex, 0 to 3 percent slopes | 2% |
| AZ669 | 86 | Yaqui fine sandy loam, 1 to 3 percent slopes | 1% |
| AZ669 | 47 | Mohave soils and urban land, 1 to 8 percent slopes | < 1% |
| AZ669 | 3 | Anthony fine sandy loam, 0 to 3 percent slopes | < 1% |
| AZ669 | 29 | Glendale-Bucklebar complex, 0 to 3 percent slopes | < 1% |
| AZ669 | 49 | Nahda-Stagecoach complex, 1 to 15 percent slopes | < 1% |
| AZ669 | 72 | Sahuarita soils, mohave soils and urban land, 1 to 5 percent slopes | < 1% |
| AZ669 | 35 | Hayhook sandy loam, 1 to 5 percent slopes | < 1% |
| AZ669 | 22 | Delnorte-Stagecoach complex, 1 to 20 percent slopes | < 1% |
| AZ669 | 62 | Pinaleno very cobbly sandy loam, 1 to 8 percent slopes | < 1% |
| AZ669 | 2 | Anklam-Cellar-Rock outcrop complex, 15 to 55 percent slopes | < 1% |
| AZ703 | 29 | Glendale silt loam, 1 to 3 percent slopes | 6% |
| AZ703 | 6 | Bucklebar-Hayhook-Tubac complex, 0 to 3 percent slopes | 2% |
| AZ703 | 13 | Chutum loam, 1 to 3 percent slopes | 1% |
| AZ703 | 28 | Glendale clay loam, 0 to 2 percent slopes, flooded | < 1% |
| AZ703 | 58 | Tubac complex, 0 to 2 percent slopes | < 1% |
| AZ703 | 45 | Nahda-Stagecoach complex, 1 to 15 percent slopes | < 1% |
| *Month and year of preparation or update: December 2024* | | | |

## Attachment 4 – Soil Maps




Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.




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# SUBAPPENDIX D.4 BIOLOGICAL RESOURCES

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- Table 12 Special Status Plant Species Within, or Within Five Miles of the Plan Area
- Table 13 - Wildlife Expected within each Biotic Community
- Table 14 - National Land Cover Database Types in the Planning Area
- Table 15 - Federally Listed Species Potentially Occurring in the Problem Areas, Pima County, Arizona

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- Figure 22 – Brawley Wash Watershed Biotic Communities
- Figure 23 – Brawley Wash Watershed Invasive Species (Vegetation)
- Figure 24 – (Figure 8) Pima County Stakeholder-Identified Linkages – County Overview
- Figure 25 – (Map 8) Arizona's ICZ's and Landscape Network

- Attachment 9 – IPAC Unofficial List Pima County
- Attachment 10 – IPAC Unofficial List Pinal County
- Attachment 11 – Official IPAC List
- Attachment 12 – AGFD – Project Report Brawley Wash Watershed
- Attachment 13 – Bureau of Land Management, Arizona – Bureau Sensitive Species List (February 2017)

Table 11 - Surface Coverage

| Cover Type | Area of Coverage within Project Boundary (Acres) | Percentage of Total Plan Area |
|---|---|---|
| Sonoran Savanna Grassland | 72,539 | 36.6% |
| Sonoran Palo Verde-Mixed Cacti-Mixed Scrub | 52,236 | 26.3% |
| Sonoran Creosote Bursage Scrub | 28,306 | 14.2% |
| Semidesert Grassland | 18,693 | 9.4% |
| Agriculture (Current) | 12,495 | 6.3% |
| Urban | 8,828 | 4.5% |
| Riparian Mesquite Forest | 4,845 | 2.4% |
| Madrean Evergreen Woodland | 285 | >.1% |

*Source: Pima County. Table data generated from spatial data and project boundary shown in the Biotic Communities Map.*

Table 12 - Special Status Plant Species Within, or Within Five Miles of the Plan Area

| Scientific Name | Common Name | Habitat | Agency | Status |
|---|---|---|---|---|
| *Abutilon parishii* | Pima Indian Mallow | Rocky hillsides, cliff bases, canyon bottoms, lower side slopes, ledges of canyons among rocks and boulders; mesic habitat with full sun in higher Sonoran desertscrub | AZDA BLM | SR S |
| *Amsonia kearneyana* | Kearney's Blue-star | 1) Dry, open slopes (20-30 degrees) at 4,000-6,000' elevation in Madrean evergreen woodlands. 2) Stable, partially shaded coarse alluvium along dry washes at 3,600-3,800' elevation under deciduous riparian trees and shrubs in Sonoran desertscrub. | AZDA USFWS | HS LE |
| *Coryphantha scheeri var. robustispina* | Pima Pineapple Cactus | Alluvial basins and hillsides in semi-desert grasslands, desertscrub and the transition area between the two. Open areas on flat ridge-tops or slopes of less than 10-15 percent. | AZDA USFWS | HS LE |
| *Cylindropuntia x kelvinensis* | Kelvin Cholla | Desertscrub, edges of grasslands, rocky flats and slopes, rolling hills | AZDA | SR |
| *Echinocactus horizonthalonius var. nicholii* | Nichol Turk's Head Cactus | Limestone substrates along dissected alluvial fans, inclined terraces and saddles, bajadas, and debris flows. Grows in open to partially shaded areas, including limestone outcrops. | AZDA USFWS | HS LE |
| *Echinocereus fasciculatus* | Magenta-flower Hedgehog Cactus | Flats to steep canyonsides, desert scrub, semidesert grasslands, interior chaparral | AZDA | SR |
| *Echinocereus nicholii* | Nichol's Hedgehog Cactus | Exposed slopes, bajadas, hills, mountains, desert scrub, igneous and sedimentary substrates | AZDA | SR |
| *Eryngium sparganophyllum* | Arizona Eryngo | Riparian zones and marshes 3000-8000’ elevation. | USFWS | LE |
| *Graptopetalum bartramii* | Bartram’s Stonecrop | Rocky outcrops in deep narrow canyons within 30’ of streambeds, springs or seeps 3500-6700’ elevation. | USFWS | LT |
| *Mammillaria thornberi* | Thornber Fishhook Cactus | Desertscrub in valley floors characterized by silty or sandy soils; requires shade, often under *Opuntia spp.* | AZDA | SR |

| Scientific Name | Common Name | Habitat | Agency | Status |
|---|---|---|---|---|
| *Mammillaria viridiflora* | Varied Fishhook Cactus | Semidesert grasslands, interior chaparral, pinyon-juniper and oak woodlands, crevices, boulders, canyon sides and gravelly igneous substrates | AZDA | SR |
| *Peniocereus greggii var. transmontanus* | Desert Night-blooming Cereus | Sandy or gravelly loams, creosote bush-bursage flats, edges of washes and on slopes of small hills | AZDA | SR |
| *Tumamoca macdougalii* | Tumamoc Globeberry | Desertscrub in the shade of nurse plants along gullies and sandy washes of hills and valleys | AZDA<br>BLM | SR<br>S |
| *Vauquelinia californica ssp. sonorensis* | Arizona Sonoran Rosewood | Rocky hillsides | BLM | S |

*Agency Abbreviations: AZDA (Arizona Department of Agriculture), BLM (Bureau of Land Management), USFWS (U.S. Fish and Wildlife Service)*
*Status Codes: HS (Highly Safeguarded), LE (Listed Endangered), S (Sensitive), SR (Salvage Restricted)*

Table 13 - Wildlife Expected within each Biotic Community

| Brown and Lowe Biotic Community | Potentially Occurring Wildlife Species |
|---|---|
| Arizona Upland subdivision of Sonoran Desertscrub | Mammals: mule deer (*Odocoileus hemionous*), javelina (*Tayassu tajacu*), California leaf-nosed bat (*Macrotus californicus*), California myotis (*Myotis californicus*), black-tailed jack· rabbit (*Lepus californicus*), desert cottontail (*Sylvilagus audubonii*), pocketmouse species (*Perognathus* spp), cactus mouse (*Peromyscus eremicus*), white-throated woodrat (*Neotoma albigula*), Gray Fox (*Urocyon cinereoargenteus*), and Harris Antelope Squirrel (*Ammospermophilus harrisil*).<br>Birds: Harris' hawk (*Parabuteo unicinctus*), white-winged dove (*Zenaida macroura*), Inca Dove (*Columbina inca*), pyrrhuloxia (*Carclinalis sinuatus*), Gila woodpecker (*Melanerpes uropygialis*), Gilded flicker (*Colaptes chrysoides*), ladder-backed woodpecker (*Picoides scalaris*), curve-blled thrasher (*Toxostoma curvirostre*), and cactus wren (*Campylorhynchus brunneicapillus*).<br>Reptiles: regal Horned Lizard (*Phrynosoma solare*), western whiptail (*Aspidoscelis tigris*), Gila monster (*Heloderma suspectum*), glossy snake (*Arizona elegans*), Arizona coral snake (*Micruroides euryxanthus*), tiger rattlesnake (*Crotalus tigris*), and Sonoran desert tortoise (*Gopherus morafkai*).<br>Amphibians: Sonoran green toad (*Anaxyrus retiformis*). |
| Interior Chaparral | *Mammals*: eastern cottontail (*Sylvilagus floridanus*), white-footed mouse (*Peromyscus leucopus*), rock mouse (*P. difficilis*), white-throated woodrat, and mule deer.<br>Birds: scrub jay (*Aphelocoma californica*), American bushtit (*Psaltriparus minimus*), canyon wren (*Catherpes mexicanus*), rufous-sided towhee (*Pipilo erythrophthalmus*), rufous-crowned sparrow (*Aimophila ruficeps*), and black-chinned sparrow (*Spizella atrogularis*).<br>Reptiles: side-bloched lizard (*Uta stansburiana*), western blind snake (*Leptotyphlops humilis*), glossy snake, western diamondback rattlesnake (*Crotalus viridis*), and many others. |
| Lower Colorado River Valley subdivision Sonoran Desert scrub | Mammals: desert bighorn sheep (*Ovis canadensis nelsoni*), Sonoran pronghorn (*Antilocapra americana sonoriensis*), coyote (*Canis latrans*), round-tailed ground squirrel (*Spermophilus tereticaudus*), kit fox (*Vulpes macrotis*), whlte-tailed antelope squirrel (*Ammospermophilus leucurus*), pocket mice (*Perognathus* spp), and kangaroo rat (*Dipodomys spp*.).<br>Birds: Arid adapted desert species with some overlap with species found in the other biotic communities in the planning area and including LeConte's thrasher (*Toxostoma lecontei*).<br>Reptiles: flat-tailed horned lizard (*Pbrynosoma mcalli*), banded sand snake (*Chilomeniscus stramineus*), sidewinder (*Crotalus cerastes*), desert spiny lizard (*Sceloporus clarkii*), western whiptail, and many others.<br>Amphibians: Sonoran green toad. |

| Brown and Lowe Biotic Community | Potentially Occurring Wildlife Species |
|---|---|
| Madrean Evergreen Woodland | Mammals: white-tailed deer (Odocoileus virginianus), coati (*Nasua nasua*), yellow-nosed Cotton Rat (*Sigmodon ochrognathus*), southern pocket gopher (*Thomomys umbrinus*), Apache squirrel (*Sciurus nayaritensis*), Bailey's pocket mouse (*Perognathus baileyi*), and eastern cottontail (*Sylvilagus floridanus*).<br>Birds: Many birds on the northern end of their range occur here including Rivoli's hummingbird (*Eugenes fulgens*), violet crowned hummingbird (*Amazilia violiceps*), and white-eared hummingbird (*Hylocharis leucotis*). Additional birds include Montezuma quail (*Cyrtonyx montezumae*), whiskered owl (*Otus trichopsis*), Arizona woodpecker (*Picoides arizonae*), buff-breasted flycatcher (*Empidonax fulvifrons*), Mexican jay (*Aphelocoma ultramarina*), and bridled titmouse (*Parus wollweberi*). In montane areas, Gould's turkey (*Meleagris allopavo mexicana*) could occur.<br>Reptiles: rock rattlesnake (*Crotalus lepidus*), twin-spotted rattlesnake (*Crotalus lepidus*), ridgenose rattlesnake (*C. willardi*), green rat snake (*Elaphe triapsis*), mountain skink (*Eumeces callicephalus*), Sonora mountain kingsnake (*Lampropeltis pyromelana*), Clark's spiny lizard, bunchgrass lizard (*Sceloporus scalaris*), and many others.<br>Amphibians: Barking frog (*Craugaster agusti*). |
| Semidesert Grassland | Mammals: black-tailed jackrabbit, spotted Ground Squirrel (*Spermophilus spilosoma*), hispid pocket mouse (*Perognathus hispidus*), kangaroo rats, white-footed mouse (*Peromyscus leucopus*), cotton rats (*Sigmodon* spp), southern Plains woodrat (*Neotoma* micropus), white-throated woodrat, badger (*Taxidea taxus*), and coyote.<br>Birds: Swainson's hawk (*Buteo swainsoni*), Prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), mourning dove (*Zenaida macroura*), scaled quail (*Callipepla squamata*), roadrunner (*Geococcyx californianus*), burrowing owl (*Athene cunicularia*), verdin (*Auriparus flayiceps*), cactus wren, northern mockingbird (*Mimus polyglottos*), curve-billed thrasher (*Toxostoma curvirostre*), loggerhead shrike (*Lanius ludovicianus*), brownheaded cowbird (*Molothrus ater*), and house finch (*Carpodacus mexicanus*).<br>Reptiles: desert box turtle (*Terrapene omata luteola*), Mexican hognose snake (*Heterodon kennerlyi*), desert grassland whiptail (Aspidoscelis uniparens), southwestern WIlderearless lizard (*Holbrookia texana scitula*), and the western green toad (*Bufo debilis insidior*).<br>Amphibians: Western green toad (*Anaxyrus debilis*). |

*Source: Adapted from Brown (1994 a and b).*

Table 14 - National Land Cover Database Types in the Planning Area

| Land Cover Type | Description | Acres in the Planning area | Percent of Planning area* |
|---|---|---|---|
| Shrub/Scrub | Dominated by shrubs typically less than 5 meters tall with shrub canopy greater than 20 percent of total vegetation. Includes shrubs, young trees, trees stunted from environmental conditions, and young trees in early successional stages. | 175,066.3 | 88.3 |
| Grassland/Herbaceous | Dominated by grasses or herbaceous vegetation (generally more than 80 percent of total vegetation). Usually not subject to intensive management such as tilling but can be used for grazing. | 10,713.8 | 5.4 |
| Developed, Open Space | Developed area with impervious surfaces accounting for less than 20 percent of total cover. Mixture of constructed materials and vegetation (e.g., lawn grasses). Include large-lot single family housing units, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. | 5,852.3 | 3.0 |
| Cultivated Crops | An area used for the production of annual crops (e.g., corn, soybeans, vegetables, tobacco, and cotton), perennial woody crops (e.g., orchards and vineyards), or lands being actively tilled. Crop vegetation accounts for greater than 20 percent of total vegetation. | 3,670.3 | 1.9 |

| | | | |
|---|---|---|---|
| Woody Wetlands | Areas where forest or shrubland vegetation accounts for greater than 20percent of vegetative cover and the soil or substrate is periodically saturated with or covered with water. | 1,229.9 | 0.6 |
| Developed, Low Intensity | Developed area with impervious surfaces accounting for 20 to 49 percent of total cover. Mixture of constructed materials and vegetation that most commonly includes single-family housing units. | 705.1 | 0.4 |
| Pasture/Hay | An area comprised of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture or hay vegetation accounts for greater than 20 percent of total vegetation. | 534.8 | 0.3 |
| Barren Land (Rock/Sand/Clay) | An area containing bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material where vegetation typically accounts for less than 15 percent of total cover. | 193.8 | 0.1 |
| Open Water | Open water. Generally, with less than 25 percent cover of vegetation or soil. | 78.1 | <0.1 |
| Developed, Medium Intensity | Developed area with impervious surfaces accounting for 50 to 79 percent of the total cover. Mixture of constructed materials and vegetation that most commonly includes single-family housing units. | 55.0 | <0.1 |
| Evergreen Forest | Dominated by trees generally greater than 5 meters tall, comprising greater than 20 percent of total vegetation cover. More than 75 percent of tree species maintain leaves all year, and the canopy is never without green foliage. | 55.0 | <0.1 |
| Developed, High Intensity | Highly developed areas where people reside or work in high numbers. Impervious surfaces account for 80 to 100 percent of total cover. Includes apartment complexes, row houses and commercial/industrial. | 11.3 | <0.1 |

Source: USGS (2016a).

*Percents do not total 100% due to rounding.

Table 15 - Federally Listed Species Potentially Occurring in the Problem Areas, Pima County, Arizona

| Common Name (Species Name) | Status* | Range or Habitat Requirements | Potential for Occurrence in the Problem Areas | Determination of Effect |
|---|---|---|---|---|
| Cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) | PT | Historically, this species was common in mesquite (*Prosopis spp*.) bosques and along rivers throughout southern Arizona. Based on current information, habitat is loosely described as streamside cottonwoods and willows and adjacent mesquite bosques, usually with saguaros on nearby slopes. Less often, this species is found along dry washes where large mesquite, palo verde (*Parkinsonia* spp.), ironwood (*Olneya tesota*), and saguaro thrive. | Unlikely to occur. The Problem Areas consist of fallow agricultural field or disturbed areas unlikely to contain saguaros with nesting cavities and stands of relatively dense mesquite/ ironwood/palo verde vegetation. They are also located in areas that has been fragmented by rural and agricultural development and roads. Furthermore, pygmy owl surveys conducted at 17 geographic locations in southern Arizona during spring of 2020, including one in northwest Tucson with 67 call points, only detected this species in Ironwood National Monument, over 10 miles north of the northernmost Problem Area (USFWS 2021: Figure 4.5). | No effect. |

| Common Name (Species Name) | Status* | Range or Habitat Requirements | Potential for Occurrence in the Problem Areas | Determination of Effect |
|---|---|---|---|---|
| Chiricahua leopard frog (*Rana chiricahuensis*) | T | Restricted to springs, livestock tanks, and streams in the upper portions of watersheds at elevations between 3,281 and 8,890 feet amsl in central, east-central, and southeastern Arizona. Populations in central and east-central Arizona are disjunct from those in southeastern Arizona and may be distinct species. | Unlikely to occur. The Problem Areas do not contain aquatic habitat. | No effect. |
| Gila chub (*Gila intermedia*) | E | Normally found in smaller headwater streams, cienegas, and springs or marshes of the Gila River Basin at elevations between 2,720 and 5,420 feet amsl. | Unlikely to occur. There are no perennial water sources in the Problem Areas. | No effect. |
| Gila topminnow (incl. Yaqui) (*Poeciliopsis occidentalis*) | E | Occurs in small streams, springs, and cienegas at elevations below 4,500 feet amsl, primarily in shallow areas with aquatic vegetation and debris for cover. In Arizona, most of the remaining native populations are in the Santa Cruz River system. | Unlikely to occur. There are no perennial water sources in the Problem Areas. | No effect. |
| Jaguar (*Panthera onca*) | E | Jaguars were once prominent in southern Arizona and were found in Sonoran desertscrub up through subalpine conifer forest at elevations between 1,600 and 9,000 feet amsl. Based on 25 historical (from 1902 to 2001) reliable and spatially accurate jaguar sighting records in Arizona, the majority of jaguars were observed in scrub grasslands (56%) and Madrean evergreen forests (20%). All were within 6.2 miles of a water source, and most occurred in moderately rugged to extremely rugged terrain. Additionally, river valleys and other drainage features likely "provide travel corridors for jaguars, along with higher prey densities, cooler air, and denser vegetation than surrounding habitats" (Hatten et al. 2005; Jaguar Recovery Team and USFWS 2012). | Unlikely to occur. The nearest recent occurrence record is from 2015 in the Santa Rita Mountains east of Tubac, over 40 miles southeast of the Problem Areas (Wildlife Conservation Society 2024). | No effect. |
| Masked bobwhite (*Colinus virginianus ridgwayi*) | E | Found at elevations between 1,000 and 4,000 feet amsl in desert grasslands with diverse, moderately dense native grasses and forbs and adequate brush cover. This subspecies has been | Unlikely to occur. The Problem Areas do not contain native grassland habitat, and they are over 25 miles north of the | No effect. |

| Common Name (Species Name) | Status* | Range or Habitat Requirements | Potential for Occurrence in the Problem Areas | Determination of Effect |
|---|---|---|---|---|
| | | found to be closely associated with prairie acacia (*Acacia angustissima*). Known only from reintroduced populations on the Buenos Aires National Wildlife Refuge. | Buenos Aires National Wildlife Refuge. | |
| Mexican spotted owl (*Strix occidentalis lucida*) | T | Found in mature montane forests and woodlands and steep, shady, wooded canyons. Can also be found in mixed-conifer and pine-oak vegetation types. Generally nests in older forests of mixed conifers or ponderosa pine (*Pinus ponderosa*)–Gambel oak (Quercus gambelii). Nests in live trees on natural platforms (e.g., dwarf mistletoe [*Arceuthobium spp*.] brooms), snags, and canyon walls at elevations between 4,100 and 9,000 feet amsl. | Unlikely to occur. The Problem Areas do not contain woodland or forest habitat, and they are below the elevation range of this species. | No effect. |
| Mexican wolf (*Canis lupus baileyi*) | NEP | In Arizona, most individuals only occur within the Mexican Wolf Experimental Population Area south of Interstate 40 to the U.S.–Mexico border; however, individuals have been documented infrequently traveling outside of this area. Mexican wolves are found in a variety of southwestern habitats; however, they are absent from the desert areas and prefer mountain woodlands. Habitat connectivity is important, and the species can use riparian corridors, roads, and trails to travel between suitable habitats. | Unlikely to occur. The Problem Areas are within Wolf Management Zone 2 of the Experimental Population Area; however, they do not contain suitable woodland habitat for this species. | No effect. |
| Monarch butterfly (*Danaus plexippus*) | C | A migratory species found in a variety of habitats, monarch butterfly requires milkweed (*Asclepias spp*.) for breeding (USFWS 2021b). During fall migration in Arizona, monarchs favor nectar from native plants including sunflowers (*Helianthus spp*.), rabbitbrush (*Ericameria spp*.), desertbroom (*Baccharis sarothroides*), sweetbush (*Bebbia juncea*), thistles (Family Asteraceae), mule-fat (*Baccharis salicifolia),* milkweeds, and a variety of other native and garden plants (Morris et al. 2015). Populations in Arizona can migrate either to California or | May occur. Milkweed plants that could be used for reproduction may be present within the Problem Areas, as well as flowering plants that this species could use while foraging. | May impact individuals, but is not likely to result in a trend toward federal listing or loss of viability. |

| Common Name (Species Name) | Status* | Range or Habitat Requirements | Potential for Occurrence in the Problem Areas | Determination of Effect |
|---|---|---|---|---|
| | | Mexico for winter (USFWS 2021b) or may overwinter in the low deserts in California or Arizona (Morris et al. 2015). In the southwestern United States, migrating monarchs often occur near water sources (e.g., rivers, creeks, riparian corridors, roadside ditches, irrigated gardens) (USFWS 2021b). In the low deserts of Arizona, monarchs breed in late August to early September (Morris et al. 2015). | | |
| Ocelot (*Leopardus (=Felis) pardalis)* | E | In Arizona, this species has typically been observed in subtropical thorn forest, thornscrub, and dense, brushy thickets at elevations below 8,000 feet amsl and is often found in riparian bottomlands. The critical habitat component is probably dense cover near the ground and complete avoidance of open country. In Arizona, there are five recent confirmed sightings of ocelot in Cochise County (2009–2012), one near Globe (2010), and unconfirmed sightings in the Chiricahua and Peloncillo Mountains. | Unlikely to occur. The species is very rare, and there are no dense, brushy thickets or riparian bottomlands in the Problem Areas. | No effect. |
| Razorback sucker (*Xyrauchen texanus*) | | Found in riverine and lacustrine areas, generally not in fast-moving water, and may use backwaters at elevations below 6,000 feet amsl. | Unlikely to occur. There are no perennial water sources in the Problem Areas. | No effect. |
| Sonora chub (*Gila ditaenia*) | T | Found at an elevation of approximately 3,900 feet amsl in perennial and intermittent small to medium-sized streams, where it prefers pools near cliffs, boulders, or other cover in stream channels. In Arizona, its range includes Sycamore Creek and Peñasco Canyon in the Atascosa Mountains and California Gulch in Santa Cruz County. | Unlikely to occur. There are no perennial water sources in the Problem Areas. | No effect. |
| Sonoran pronghorn (*Antilocapra americana sonoriensis*) | E/NEP | Found in Sonoran desertscrub within broad, intermountain alluvial valleys with creosote (*Larrea tridentata*)–bursage (*Ambrosia spp.*) and palo verde–mixed cacti associations at elevations between 2,000 and 4,000 feet amsl. The only extant U.S. population is in southwestern | Unlikely to occur. The Problem Areas are outside the range of this species. | No effect. |

| Common Name (Species Name) | Status* | Range or Habitat Requirements | Potential for Occurrence in the Problem Areas | Determination of Effect |
|---|---|---|---|---|
| | | Arizona in extreme eastern Pima County, southwestern Maricopa County, eastern Yuma County, and southern La Paz County. | | |
| Sonoyta mud turtle (*Kinosternon sonoriense longifemorale*) | E | In Arizona, found only in pond and stream habitat at Quitobaquito Springs in Organ Pipe Cactus National Monument. This subspecies of the more common Sonora mud turtle (*Kinosternon sonoriense sonoriense*) also occurs in Rio Sonoyta, Mexico. | Unlikely to occur. The Problem Areas are outside the limited range of this species. | No effect. |
| Southwestern willow flycatcher (*Empidonax traillii extimus*) | E | Found in dense riparian habitats along streams, rivers, and other wetlands where cottonwood, willow, boxelder (*Acer negundo*), saltcedar (*Tamarix* sp.), Russian olive (*Elaeagnus angustifolia*), buttonbush (*Cephalanthus* spp.), and arrowweed (*Pluchea sericea*) are present. Nests are found in thickets of trees and shrubs, primarily those that are 13 to 23 feet high, among dense, homogeneous foliage. Habitat is found at elevations below 8,500 feet amsl. | Unlikely to occur. There is no riparian habitat present in the Problem Areas. | No effect. |
| Yellow-billed cuckoo (*Coccyzus mericanus*) | T | Typically found in riparian woodland vegetation (saltcedar, willow, or cottonwood) at elevations below 6,600 feet amsl. Dense understory foliage appears to be an important factor in nest site selection. The highest concentrations in Arizona are along the Agua Fria, San Pedro, upper Santa Cruz, and Verde River drainages and Cienega and Sonoita Creeks. Migration and wintering habitat needs are not well known, although they appear to include a relatively wide variety of conditions. Migrating yellow-billed cuckoos have been found in coastal scrub, second-growth forests and woodlands, hedgerows, forest edges, and smaller riparian patches than those used for breeding. | Unlikely to occur. There is no riparian habitat present in the Problem Areas. | No effect. |

Range or habitat information is from AGFD (2024b); Arizona Rare Plant Committee (ca. 2001); USFWS (2024c); and Corman and Wise-Gervais (2005).

* USFWS Status Definitions

C = Candidate. Candidate species are those for which the USFWS has sufficient information on biological vulnerability and threats to support proposals to list as endangered or threatened under the ESA. However, proposed rules have not yet been issued because such actions are precluded at present by other listing activity.

E = Endangered. An animal or plant species in danger of extinction throughout all or a significant portion of its range.

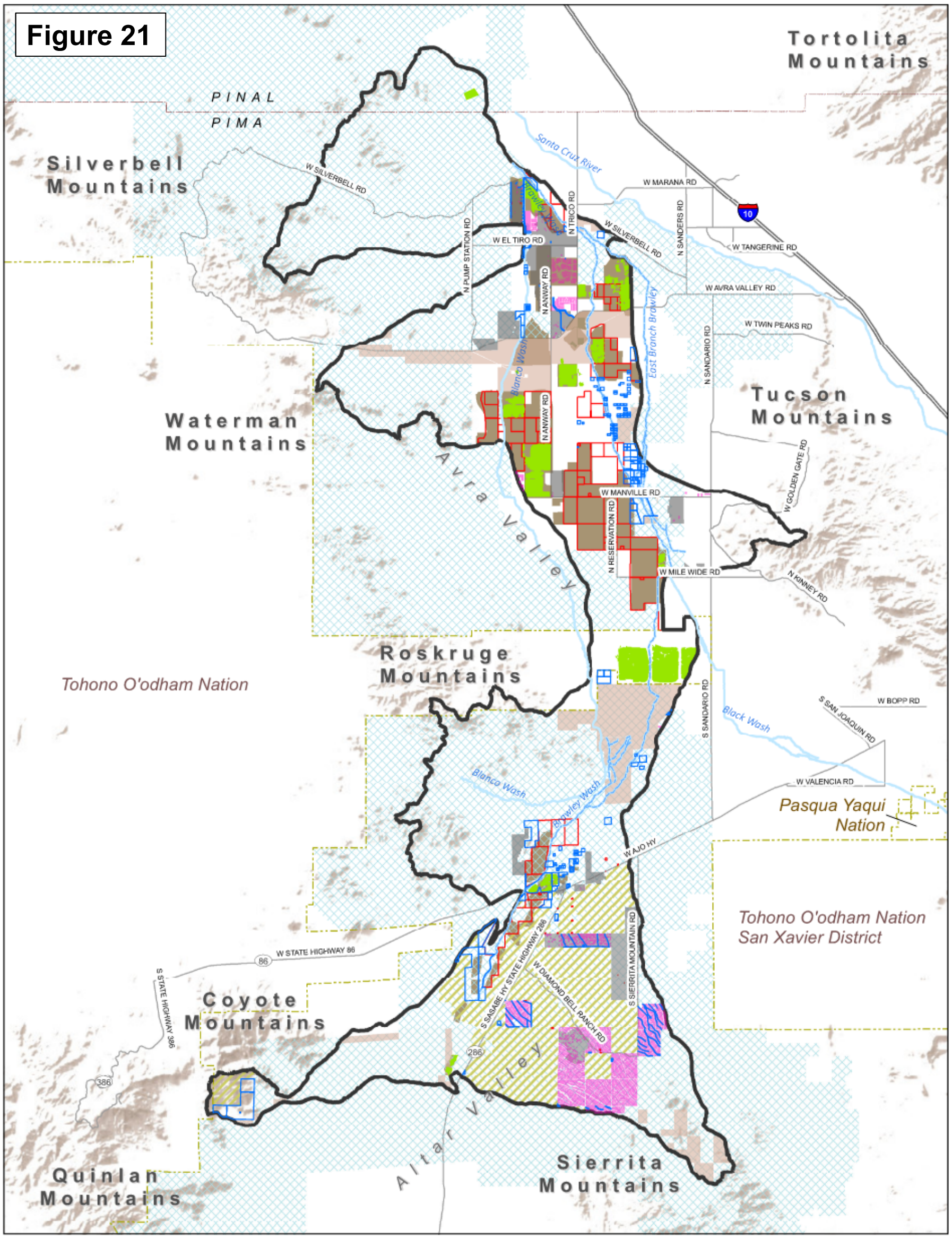
NEP = Non-Essential Experimental Population. Experimental populations of a species designated under Section 10(j) of the ESA for which the USFWS, through the best available information, believes is not essential for the continued existence of the species. Regulatory restrictions are considerably reduced under an NEP designation.

PE = Proposed Endangered. Proposed endangered species are those that are not currently federally protected under the ESA but are eligible to be listed as endangered under the ESA.

PT = Proposed Threatened. Proposed threatened species are those that are not currently federally protected under the ESA but are eligible to be listed as threatened under the ESA.

T = Threatened. An animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

**Figure 21**




## Land Use

**Brawley Wash Watershed**

PCRFCD Project #CT-FC-21-290

*Sources:*
*Pima County, ESRI, BLM, NRCS*

WILDER
Landscape Architects

Legend

- Project Area
- PC Owned Parcels
- COT Owned Parcels
- Urban (Developed)
- Subdivided (Undeveloped Parcels)
- Current Agriculture
- Historic Agriculture
- Ranch Parcels
- Pima County Grazing Leases
- BLM / ASLD Grazing Allotments

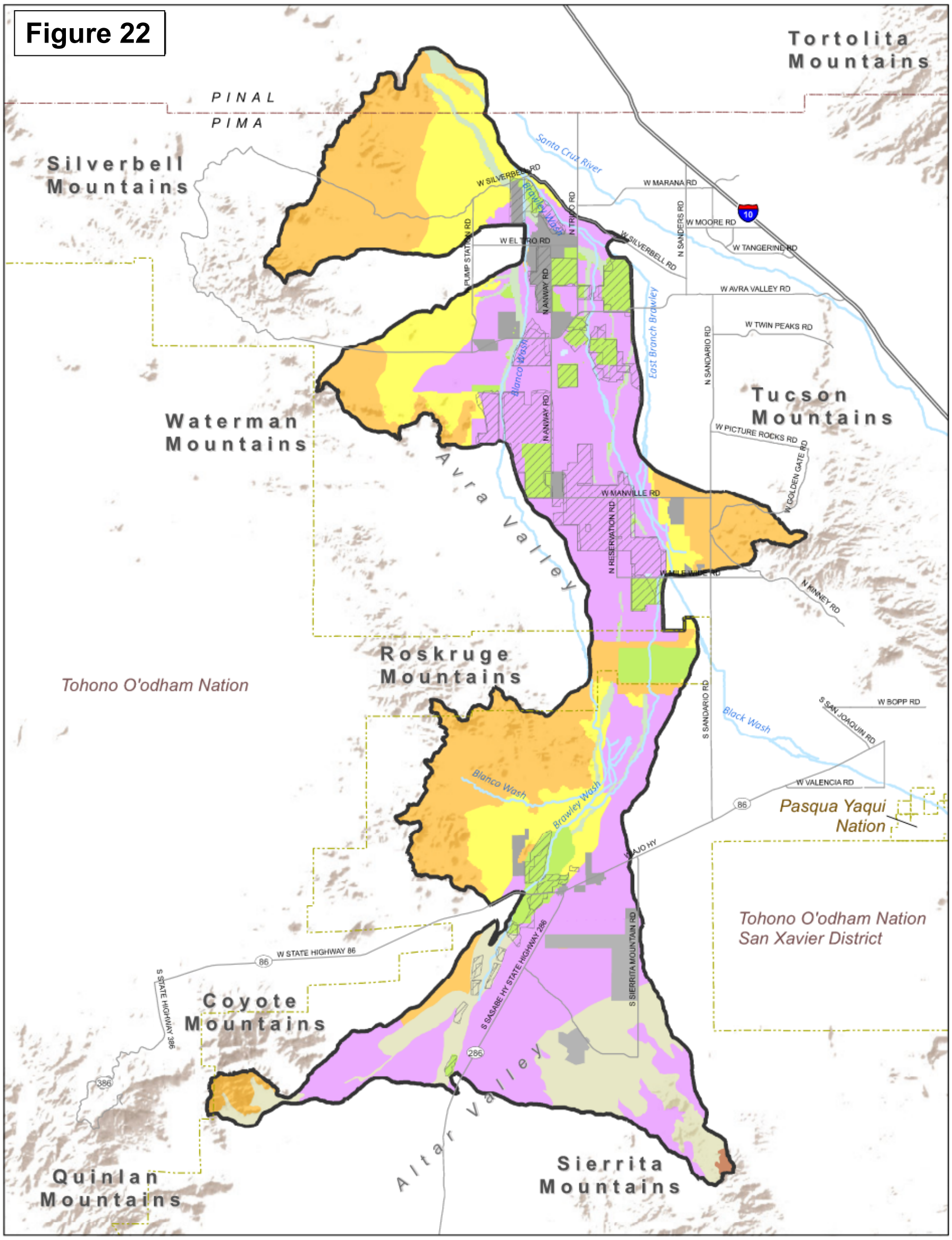
Miles
0 87.5 175 350 525

Project Location



Date Created: 08.18.2021

**Figure 22**




## Biotic Communities

**Brawley Wash Watershed**
PCRFCD Project #CT-FC-21-290

*Sources:*
*David Brown, Pima County, ESRI*

WILDER
Landscape Architects

Legend

- Project Area
- Current Agriculture
- Historic Agriculture
- Madrean Evergreen Woodland
- Riparian Mesquite Forest
- Semidesert Grasslands
- Sonoran Creosote Bursage Scrub
- Sonoran Paloverde-Mixed Cacti-Mixed Scrub
- Sonoran Savanna Grassland
- Urban

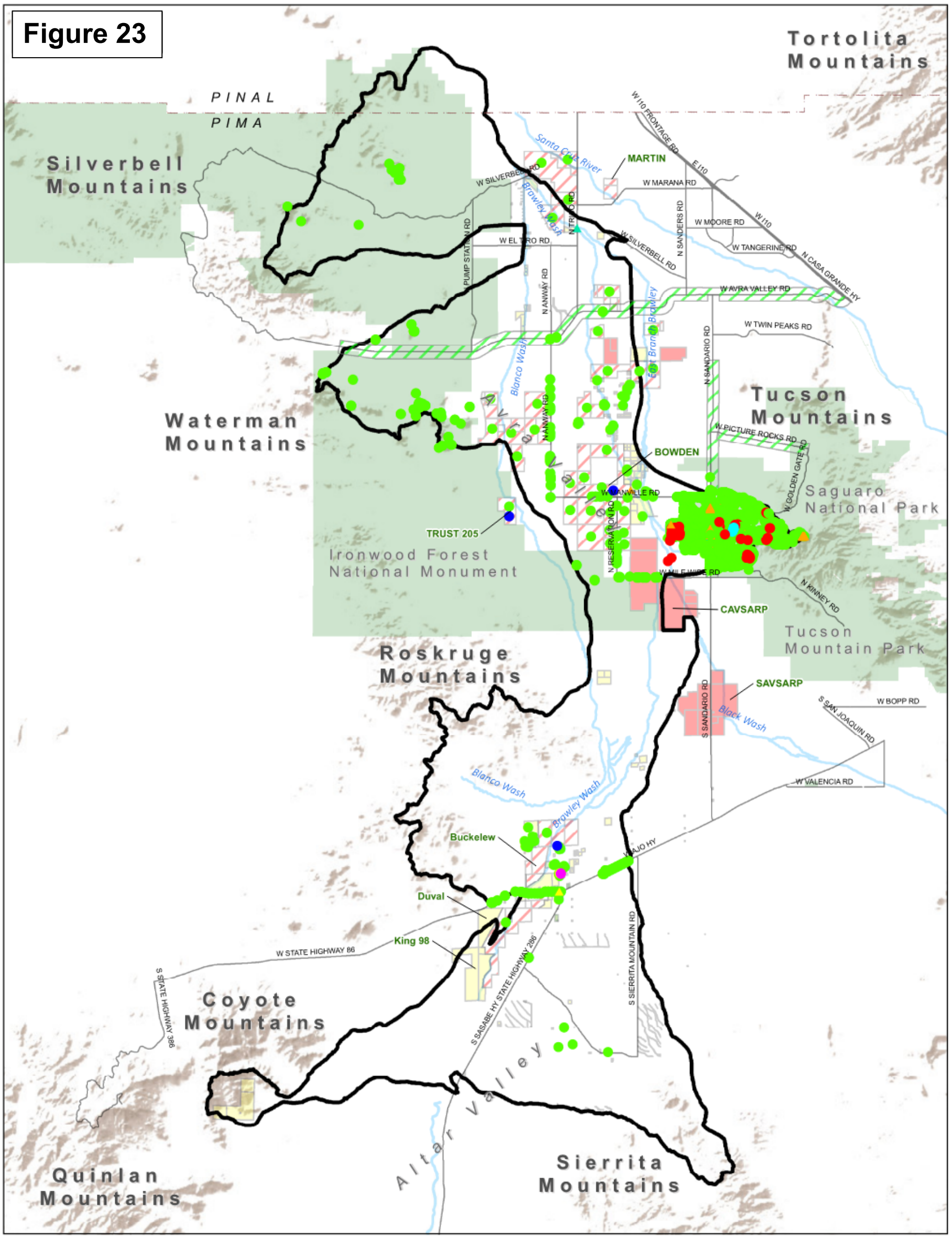
Miles
0 87.5 175 350 525

Project Location



Date Created: 08.18.2021

**Figure 23**




# Invasive Species

## Brawley Wash Watershed

PCRFCD Project #CT-FC-21-290

*Sources:*
*AZ Sonora Desert Museum, AZ Native Plant Society, BLM, Pima County RFCD, Saguaro National Park, iMap Invasives*

WILDER
Landscape Architects

Legend

- Buffelgrass
- Fountain Grass
- Johnsongrass
- African Lovegrass
- Lehmann Lovegrass
- Natal Grass
- Malta Starthistle
- Sahara Mustard
- Stinknet

- Project Area
- Parks & Recreational Areas
- AZNPS Treatment
- Pima County Owned Parcel
- City of Tucson Owned Parcel
- City of Tucson Owned Parcel - Invasive Treatment by BKW

Miles
0 1.25 2.5 5 7.5

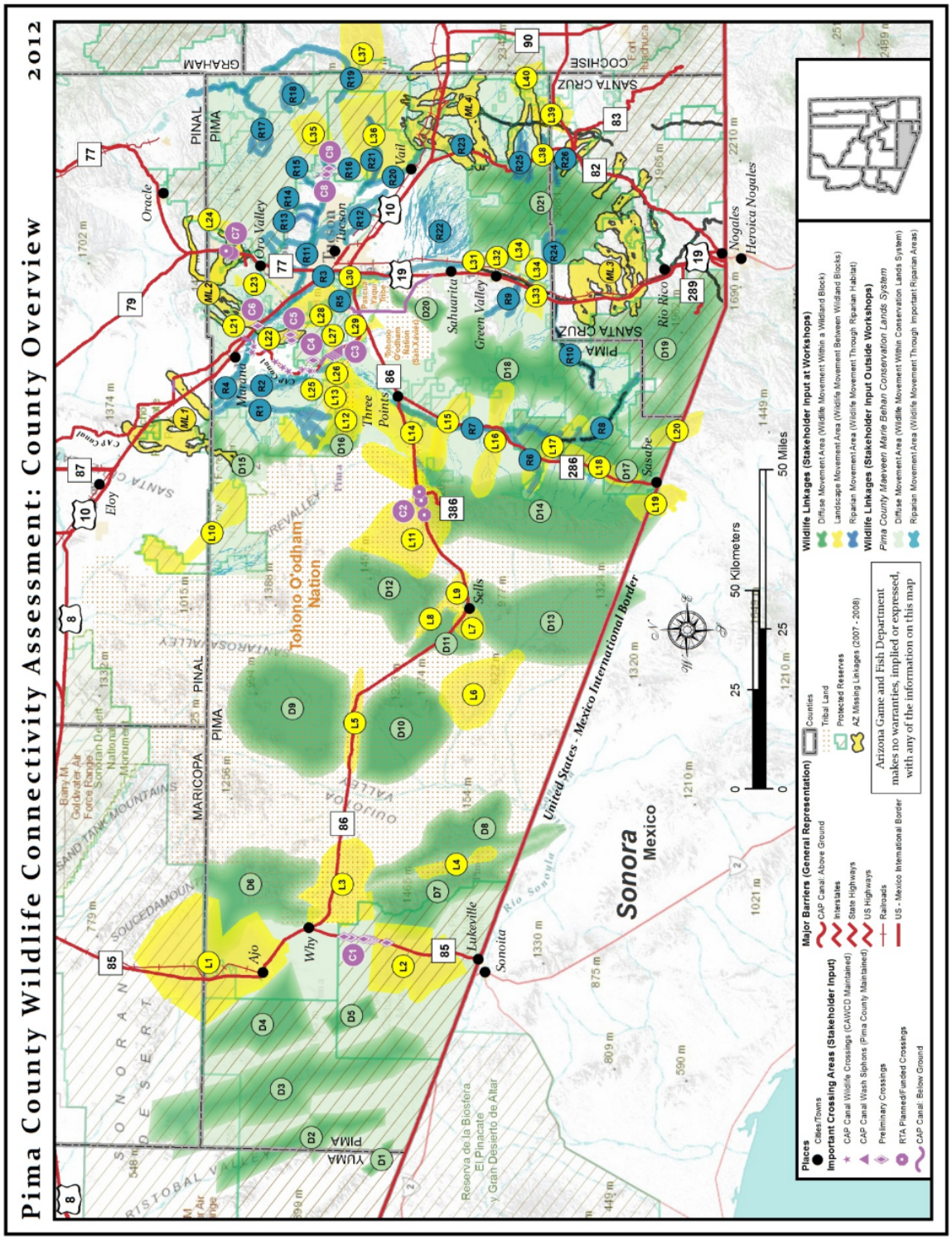
Project Location



Date Created: 08.18.2021

# Figure 24

***Figure 8: Pima County stakeholder-identified linkages – County overview***



# Figure 25

MAP 8: ARIZONA'S ICZs AND LANDSCAPE NETWORK



Attachment 9 - IPAC Unofficial List Pima County



IPaC U.S. Fish & Wildlife Service

# IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

## Location

Pima County, Arizona




## Local office

Arizona Ecological Services Field Office

(602) 242-0210
(602) 242-2513

9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517

http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies_Main.html

# Endangered species

**This resource list is for informational purposes only and does not constitute an analysis of project level impacts.**

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

## Mammals

| NAME | STATUS |
|---|---|

NOT FOR CONSULTATION

Jaguar Panthera onca — Endangered
Wherever found
There is final critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/3944

Ocelot Leopardus (=Felis) pardalis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4474

Sonoran Pronghorn Antilocapra americana sonoriensis — Endangered
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4750

Sonoran Pronghorn Antilocapra americana sonoriensis — EXPN
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4750

## Birds

| NAME | STATUS |
|---|---|

California Least Tern Sterna antillarum browni — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/8104

Masked Bobwhite (quail) Colinus virginianus ridgwayi — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/3484

Mexican Spotted Owl Strix occidentalis lucida — Threatened
Wherever found
There is final critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/8196

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
Wherever found
There is final critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/6749

NOT FOR CONSULTATION

| | |
|---|---|
| Yellow-billed Cuckoo Coccyzus americanus<br>There is final critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/3911 | Threatened |

## Reptiles

| NAME | STATUS |
|---|---|
| Northern Mexican Gartersnake Thamnophis eques megalops<br>Wherever found<br>There is final critical habitat for this species. The location of the *critical habitat is not available.*<br>https://ecos.fws.gov/ecp/species/7655 | Threatened |
| Sonoran Desert Tortoise Gopherus morafkai<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/9289 | Candidate |
| Sonoyta Mud Turtle Kinosternon sonoriense longifemorale<br>Wherever found<br>There is final critical habitat for this species. The location of the critical habitat is not available.<br>https://ecos.fws.gov/ecp/species/7276 | Endangered |

## Amphibians

| NAME | STATUS |
|---|---|
| Chiricahua Leopard Frog Rana chiricahuensis<br>Wherever found<br>There is final critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/1516 | Threatened |

## Fishes

| NAME | STATUS |
|---|---|
| Desert Pupfish Cyprinodon macularius<br>Wherever found<br>There is final critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/7003 | Endangered |

NOT FOR CONSULTATION

Gila Chub Gila intermedia — Endangered
Wherever found
There is final critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/51

Gila Topminnow (incl. Yaqui) Poeciliopsis occidentalis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/1116

Sonora Chub Gila ditaenia — Threatened
Wherever found
There is final critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/1394

## Insects

| NAME | STATUS |
|---|---|
| Monarch Butterfly Danaus plexippus<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/9743 | Candidate |

## Flowering Plants

| NAME | STATUS |
|---|---|
| Acuna Cactus Echinomastus erectocentrus var. acunensis<br>Wherever found<br>There is final critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/5785 | Endangered |
| Canelo Hills Ladies-tresses Spiranthes delitescens<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/8098 | Endangered |
| Huachuca Water-umbel Lilaeopsis schaffneriana var. recurva<br>Wherever found<br>There is final critical habitat for this species. The location of the critical habitat is not available.<br>https://ecos.fws.gov/ecp/species/1201 | Endangered |

NOT FOR CONSULTATION

Kearney's Blue-star Amsonia kearneyana — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/7485

Nichol's Turk's Head Cactus Echinocactus horizonthalonius var. nicholii — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/5343

*Pima Pineapple Cactus* *Coryphantha scheeri var. robustispina* — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4919

# Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

| NAME | TYPE |
|---|---|
| Acuna Cactus Echinomastus erectocentrus var. acunensis<br>https://ecos.fws.gov/ecp/species/5785#crithab | Final |
| Arizona Eryngo Eryngium sparganophyllum<br>For information on why this critical habitat appears for your project, even though Arizona Eryngo is not on the list of potentially affected species at this location, contact the local field office.<br>https://ecos.fws.gov/ecp/species/10705#crithab | Proposed |
| Beardless Chinch Weed Pectis imberbis<br>For information on why this critical habitat appears for your project, even though Beardless Chinch Weed is not on the list of potentially affected species at this location, contact the local field office.<br>https://ecos.fws.gov/ecp/species/1348#crithab | Proposed |
| Chiricahua Leopard Frog Rana chiricahuensis<br>https://ecos.fws.gov/ecp/species/1516#crithab | Final |
| Desert Pupfish Cyprinodon macularius<br>https://ecos.fws.gov/ecp/species/7003#crithab | Final |

NOT FOR CONSULTATION

| | |
|---|---|
| Gila Chub Gila intermedia<br>https://ecos.fws.gov/ecp/species/51#crithab | Final |
| Jaguar Panthera onca<br>https://ecos.fws.gov/ecp/species/3944#crithab | Final |
| Mexican Spotted Owl Strix occidentalis lucida<br>https://ecos.fws.gov/ecp/species/8196#crithab | Final |
| Southwestern Willow Flycatcher Empidonax traillii extimus<br>https://ecos.fws.gov/ecp/species/6749#crithab | Final |
| Yellow-billed Cuckoo Coccyzus americanus<br>https://ecos.fws.gov/ecp/species/3911#crithab | Final |

NOT FOR CONSULTATION

# Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

MIGRATORY BIRD INFORMATION IS NOT AVAILABLE AT THIS TIME

**Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and

avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

**What does IPaC use to generate the migratory birds potentially occurring in my specified location?**

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

**What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?**

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

**How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?**

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

**What are the levels of concern for migratory birds?**

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird

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impacts and requirements for eagles, please see the FAQs for these topics.

**Details about birds that are potentially affected by offshore projects**

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

**What if I have eagles on my list?**

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

**Proper Interpretation and Use of Your Migratory Bird Report**

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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# Facilities

## Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

# Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the NWI map for a full list.

FRESHWATER EMERGENT WETLAND

- PEM1C
- PEM1Cx
- PEM1A
- PEM1Ah
- PEM1B

FRESHWATER FORESTED/SHRUB WETLAND

- PSSC
- PFOC
- PSS1/2A
- PSS1A
- PSS1J

FRESHWATER POND

- PUBF
- PUB
- PAB4Fx
- PABHx

LAKE

- L2USAh
- L1UBH
- L2UBH
- L2USC
- L2EM2F

A full description for each wetland code can be found at the National Wetlands Inventory website

**Data limitations**

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error

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is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

### Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial *imagery as the primary data source used to detect wetlands.* These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

### Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Attachment 10 – IPAC Unofficial List Pinal County



IPaC U.S. Fish & Wildlife Service

# IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

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## Location

Pinal County, Arizona




## Local office

Arizona Ecological Services Field Office

(602) 242-0210
(602) 242-2513

9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517

http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies_Main.html

# Endangered species

**This resource list is for informational purposes only and does not constitute an analysis of project level impacts.**

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly *impact the species by reducing or eliminating water flow downstream). Because species can move,* and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

## Mammals

| NAME | STATUS |
|---|---|

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Ocelot Leopardus (=Felis) pardalis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4474

Sonoran Pronghorn Antilocapra americana sonoriensis — EXPN
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/4750

## Birds

| NAME | STATUS |
|---|---|

Mexican Spotted Owl Strix occidentalis lucida — Threatened
Wherever found
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/8196

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered
Wherever found
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/6749

Yellow-billed Cuckoo Coccyzus americanus — Threatened
There is **final** critical habitat for this species. Your location overlaps the critical habitat.
https://ecos.fws.gov/ecp/species/3911

Yuma Ridgways (clapper) Rail Rallus obsoletus [=longirostris] yumanensis — Endangered
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/3505

## Reptiles

| NAME | STATUS |
|---|---|

Northern Mexican Gartersnake Thamnophis eques megalops — Threatened
Wherever found
There is **final** critical habitat for this species. The location of the critical habitat is not available.
https://ecos.fws.gov/ecp/species/7655

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Sonoran Desert Tortoise Gopherus morafkai — Candidate
Wherever found
No critical habitat has been designated for this species.
https://ecos.fws.gov/ecp/species/9289

## Amphibians

| NAME | STATUS |
|---|---|
| Chiricahua Leopard Frog Rana chiricahuensis<br>Wherever found<br>There is **final** critical habitat for this species. The location of the *critical habitat is not available.*<br>https://ecos.fws.gov/ecp/species/1516 | Threatened |

## Fishes

| NAME | STATUS |
|---|---|
| Gila Chub Gila intermedia<br>Wherever found<br>There is **final** critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/51 | Endangered |
| Gila Topminnow (incl. Yaqui) Poeciliopsis occidentalis<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/1116 | Endangered |
| Loach Minnow Tiaroga cobitis<br>Wherever found<br>There is **final** critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/6922 | Endangered |
| Razorback Sucker Xyrauchen texanus<br>Wherever found<br>There is **final** critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/530 | Endangered |
| Spikedace Meda fulgida<br>Wherever found<br>There is **final** critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/6493 | Endangered |

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# Insects

| NAME | STATUS |
|---|---|
| Monarch Butterfly Danaus plexippus<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/9743 | Candidate |

# Flowering Plants

| NAME | STATUS |
|---|---|
| Acuna Cactus Echinomastus erectocentrus var. acunensis<br>Wherever found<br>There is final critical habitat for this species. Your location overlaps the critical habitat.<br>https://ecos.fws.gov/ecp/species/5785 | Endangered |
| Arizona Hedgehog Cactus Echinocereus triglochidiatus var. arizonicus<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/1702 | Endangered |
| Nichol's Turk's Head Cactus Echinocactus horizonthalonius var. nicholii<br>Wherever found<br>No critical habitat has been designated for this species.<br>https://ecos.fws.gov/ecp/species/5343 | Endangered |

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# Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

This location overlaps the critical habitat for the following species:

| NAME | TYPE |
|---|---|
| Acuna Cactus Echinomastus erectocentrus var. acunensis<br>https://ecos.fws.gov/ecp/species/5785#crithab | Final |
| Gila Chub Gila intermedia<br>https://ecos.fws.gov/ecp/species/51#crithab | Final |
| Loach Minnow Tiaroga cobitis<br>https://ecos.fws.gov/ecp/species/6922#crithab | Final |

| | |
|---|---|
| Mexican Spotted Owl Strix occidentalis lucida<br>https://ecos.fws.gov/ecp/species/8196#crithab | Final |
| Razorback Sucker Xyrauchen texanus<br>https://ecos.fws.gov/ecp/species/530#crithab | Final |
| Southwestern Willow Flycatcher Empidonax traillii extimus<br>https://ecos.fws.gov/ecp/species/6749#crithab | Final |
| Spikedace Meda fulgida<br>https://ecos.fws.gov/ecp/species/6493#crithab | Final |
| Yellow-billed Cuckoo Coccyzus americanus<br>https://ecos.fws.gov/ecp/species/3911#crithab | Final |

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# Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird

species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

| NAME | BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.) |
|---|---|
| Arizona Woodpecker Picoides arizonae<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds Apr 10 to Jun 30 |
| Bald Eagle Haliaeetus leucocephalus<br>This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.<br>https://ecos.fws.gov/ecp/species/1626 | Breeds Oct 15 to Aug 31 |
| Bendire's Thrasher Toxostoma bendirei<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9435 | Breeds Mar 15 to Jul 31 |
| Black Throated Sparrow Amphispiza bilineata<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds Mar 15 to Sep 5 |
| Black-chinned Sparrow Spizella atrogularis<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9447 | Breeds Apr 15 to Jul 31 |

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| | |
|---|---|
| **Black-throated Gray Warbler** *Dendroica nigrescens*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds May 1 to Jul 20 |
| **Blue-throated Hummingbird** *Lampornis clemenciae*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds Feb 15 to Oct 10 |
| **Botteri's Sparrow** *Aimophila botterii*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds Jun 15 to Sep 15 |
| **Burrowing Owl** *Athene cunicularia*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/9737 | Breeds Mar 15 to Aug 31 |
| **Chestnut-collared Longspur** *Calcarius ornatus*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds elsewhere |
| **Clark's Grebe** *Aechmophorus clarkii*<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds Jan 1 to Dec 31 |
| **Common Black-hawk** *Buteogallus anthracinus*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds Apr 1 to Sep 20 |
| **Costa's Hummingbird** *Calypte costae*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/9470 | Breeds Jan 15 to Jun 10 |
| **Elf Owl** *Micrathene whitneyi*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/9085 | Breeds May 1 to Jul 15 |
| **Gila Woodpecker** *Melanerpes uropygialis*<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/5960 | Breeds Apr 1 to Aug 31 |

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Golden Eagle Aquila chrysaetos — Breeds Jan 1 to Aug 31
This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.
https://ecos.fws.gov/ecp/species/1680

Grace's Warbler Dendroica graciae — Breeds May 20 to Jul 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Grasshopper Sparrow Ammodramus savannarum ammolegus — Breeds Jun 1 to Aug 20
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Gray Vireo Vireo vicinior — Breeds May 10 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8680

Lark Bunting Calamospiza melanocorys — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Lawrence's Goldfinch Carduelis lawrencei — Breeds Mar 20 to Sep 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9464

Lewis's Woodpecker Melanerpes lewis — Breeds Apr 20 to Sep 30
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9408

Long-billed Curlew Numenius americanus — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/5511

Marbled Godwit Limosa fedoa — Breeds elsewhere
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/9481

Mexican Whip-poor-will Antrostomus arizonae — Breeds May 1 to Aug 20
This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

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| | |
|---|---|
| Mountain Plover Charadrius montanus<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/3638 | Breeds elsewhere |
| Phainopepla phainopepla nitens<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA<br>https://ecos.fws.gov/ecp/species/1372 | Breeds Mar 1 to Aug 20 |
| Red-faced Warbler Cardellina rubrifrons<br>*This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA* | Breeds May 10 to Jul 15 |
| Rufous Hummingbird selasphorus rufus<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/8002 | Breeds elsewhere |
| Rufous-winged Sparrow Aimophila carpalis<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds Jun 15 to Sep 30 |
| Sprague's Pipit Anthus spragueii<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/8964 | Breeds elsewhere |
| Varied Bunting Passerina versicolor<br>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA | Breeds Apr 25 to Sep 30 |
| Virginia's Warbler Vermivora virginiae<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9441 | Breeds May 1 to Jul 31 |
| Whimbrel Numenius phaeopus<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.<br>https://ecos.fws.gov/ecp/species/9483 | Breeds elsewhere |
| Willet Tringa semipalmata<br>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. | Breeds elsewhere |

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# Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

**Probability of Presence (■)**

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

**Breeding Season (■)**
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

**Survey Effort (|)**
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

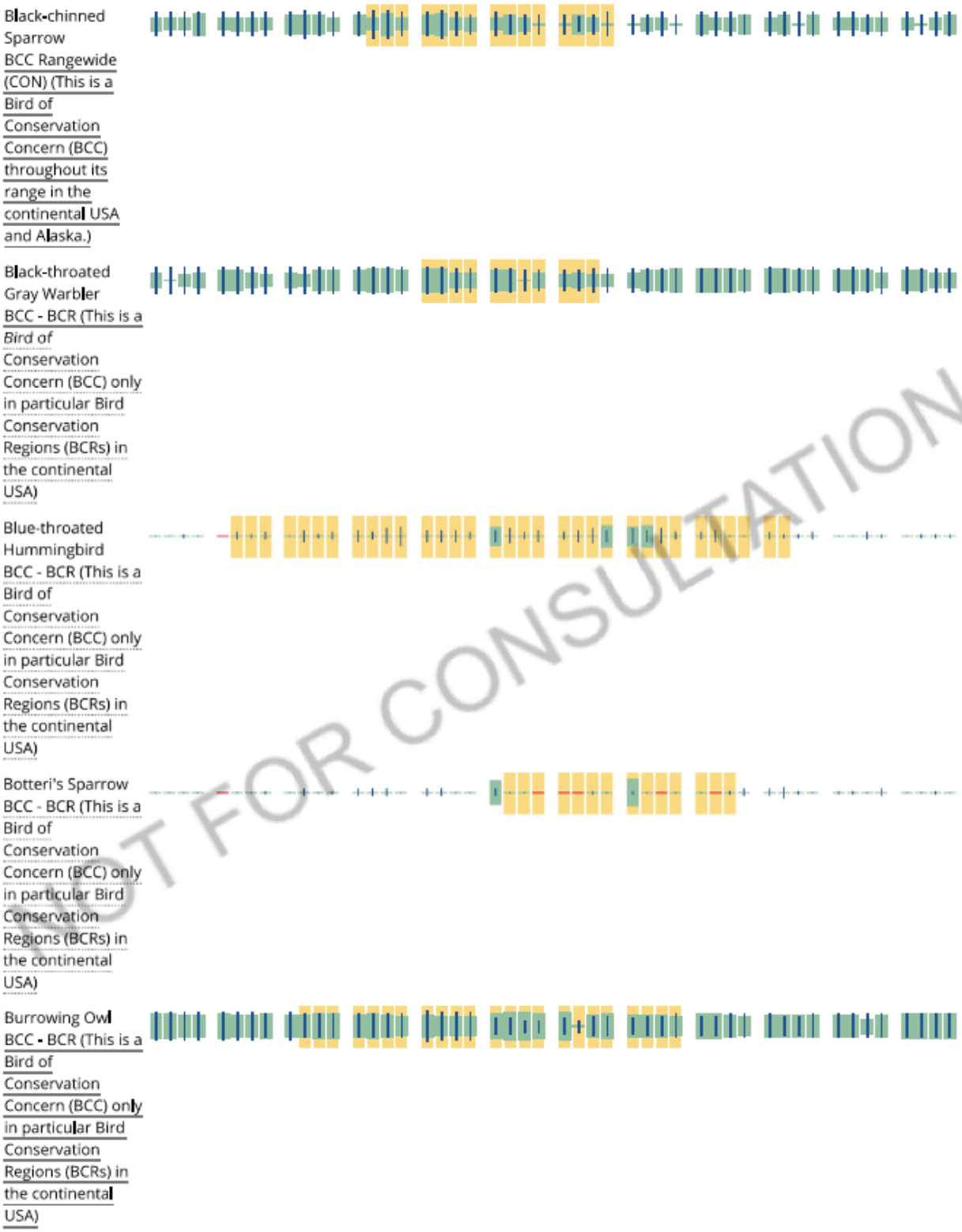
**No Data (–)**
A week is marked as having no data if there were no survey events for that week.

**Survey Timeframe**
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

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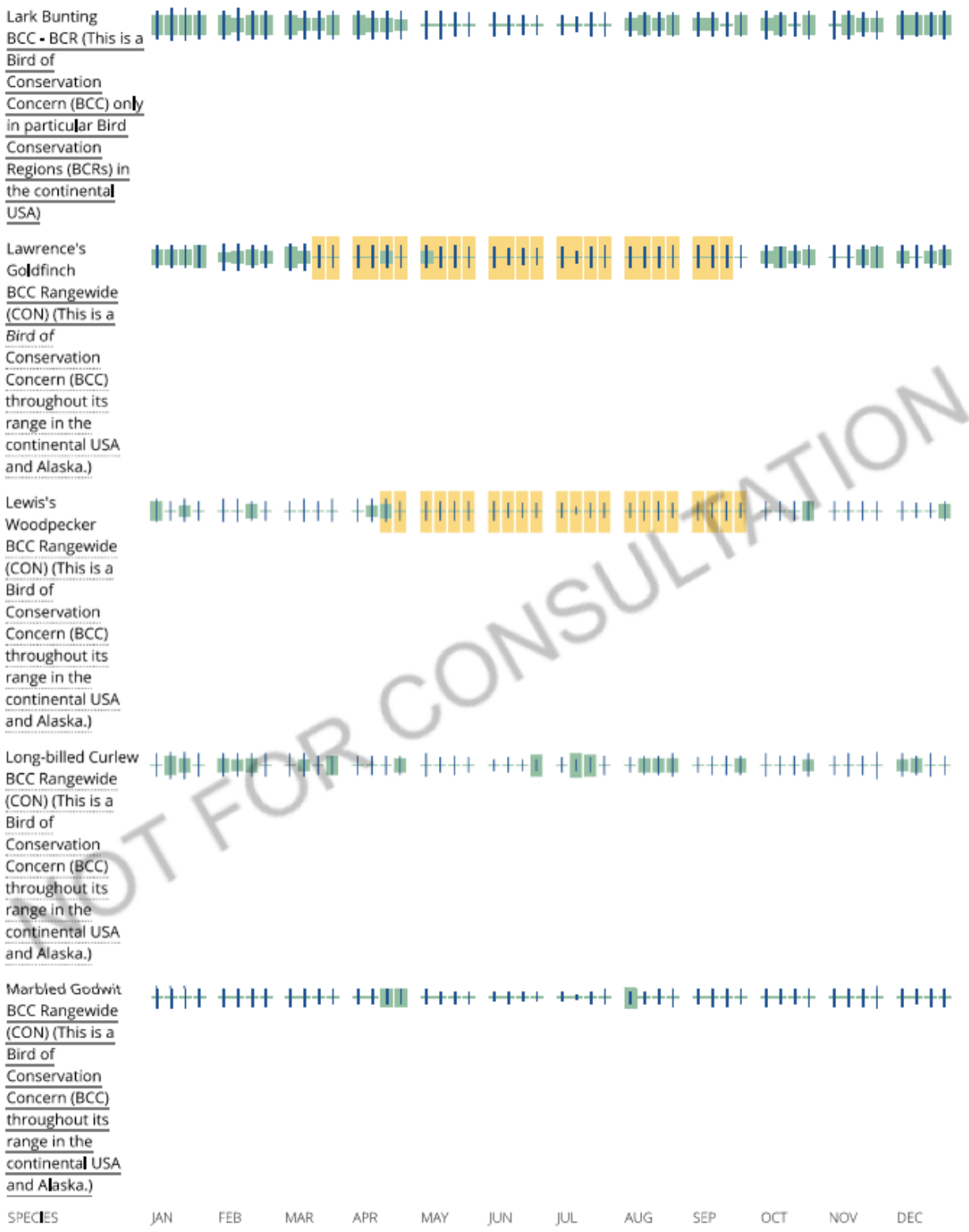

NOT FOR CONSULTATION



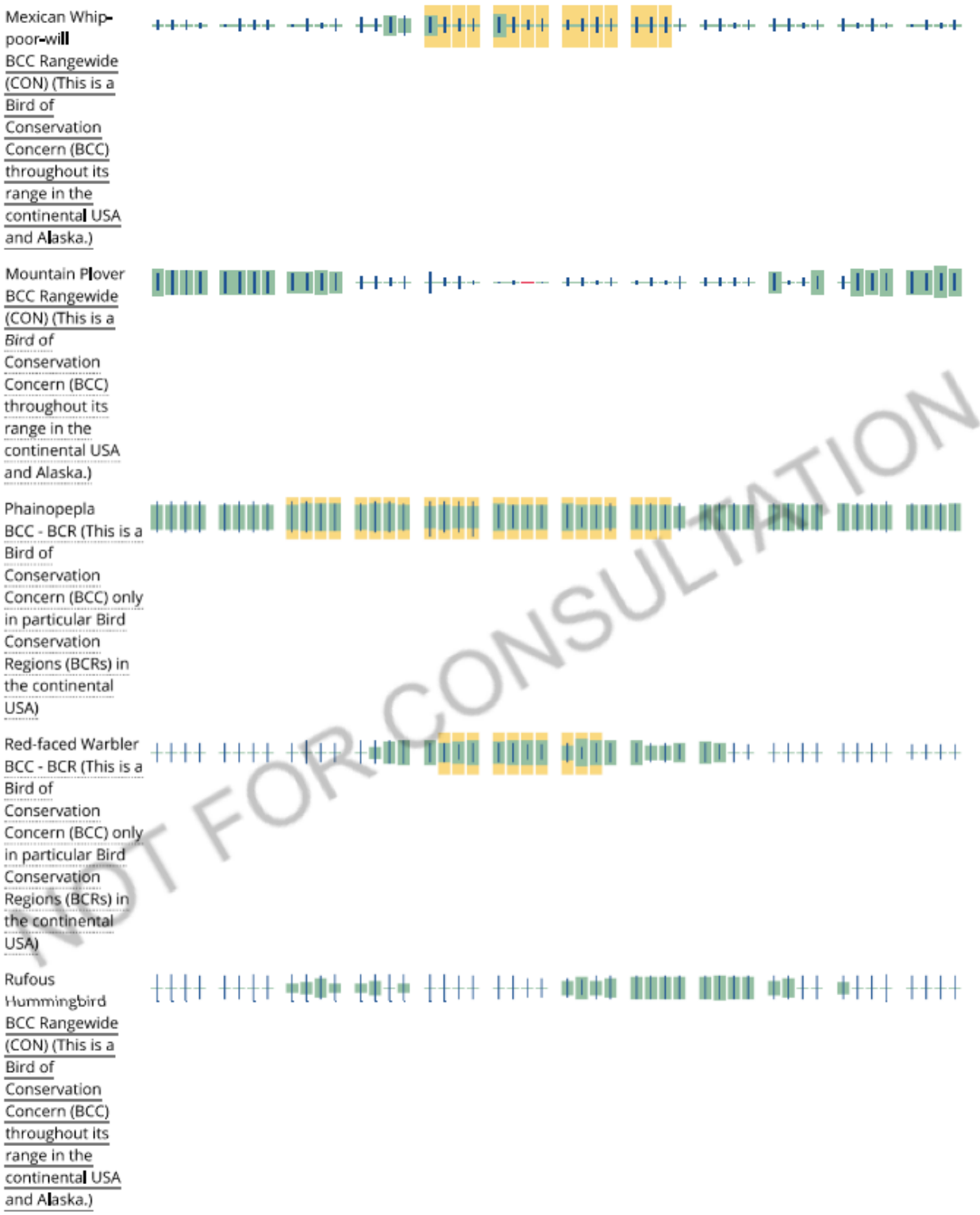

DRAFT FOR CONSULTATION




NOT FOR CONSULTATION




NOT FOR CONSULTATION




NOT FOR CONSULTATION




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Willet BCC Rangewide (CON) (This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.)



**Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at *any location year round. Implementation of these measures is particularly important when birds are most likely to* occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

**What does IPaC use to generate the migratory birds potentially occurring in my specified location?**

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the AKN Phenology Tool.

**What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?**

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

**How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?**

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

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**What are the levels of concern for migratory birds?**

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

**Details about birds that are potentially affected by offshore projects**

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

**What if I have eagles on my list?**

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

**Proper Interpretation and Use of Your Migratory Bird Report**

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

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# Facilities

## National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS AT THIS LOCATION.

## Fish hatcheries

THERE ARE NO FISH HATCHERIES AT THIS LOCATION.

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## Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish and Wildlife Service office or visit the NWI map for a full list.

FRESHWATER EMERGENT WETLAND

- PEM1C

FRESHWATER FORESTED/SHRUB WETLAND

- PSS2A
- PSSC
- PSS
- PSS1C
- PFOC
- PFO1A

PSS1A
PFO1C
PFO1Ah

FRESHWATER POND
PUBF
PUSC
PUBHx
PUBKx
PUS
PUSCh
PUSAh
*PUB*
PUBHh
PUSAx

LAKE
L2USK
L2UBH
L1UBH
L2USC
L2US

RIVERINE
R2USC
R2UBH
R2UBF
R4SBA
R4SBC
R2EM2F

A full description for each wetland code can be found at the National Wetlands Inventory website

**Data limitations**

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

**Data exclusions**

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Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

**Data precautions**

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

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Attachment 11 – Official IPAC List

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Arizona Ecological Services Field Office
9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517
Phone: (602) 242-0210 Fax: (602) 242-2513
http://www.fws.gov/southwest/es/arizona/
http://www.fws.gov/southwest/es/EndangeredSpecies_Main.html

In Reply Refer To: April 29, 2021
Consultation Code: 02EAAZ00-2021-SLI-0736
Event Code: 02EAAZ00-2021-E-01984
Project Name: Brawley Wash Watershed

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The Fish and Wildlife Service (Service) is providing this list under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). The list you have generated identifies threatened, endangered, proposed, and candidate species, and designated and proposed critical habitat, that may occur within one or more delineated United States Geological Survey 7.5 minute quadrangles with which your project polygon intersects. Each quadrangle covers, at minimum, 49 square miles. In some cases, a species does not currently occur within a quadrangle but occurs nearby and could be affected by a project. Please refer to the species information links found at:
http://www.fws.gov/southwest/es/arizona/Docs_Species.htm
http://www.fws.gov/southwest/es/arizona/Documents/MiscDocs/AZSpeciesReference.pdf .

The purpose of the Act is to provide a means whereby threatened and endangered species and the habitats upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of Federal trust resources and to consult with us if their projects may affect federally listed species and/or designated critical habitat. A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, we recommend preparing a biological evaluation similar to a Biological Assessment to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If the Federal action agency determines that listed species or critical habitat may be affected by a federally funded, permitted or authorized activity, the agency must consult with us pursuant to 50 CFR 402. Note that a "may affect" determination includes effects that may not be adverse and that may be beneficial, insignificant, or discountable. You should request consultation with us even if only one individual or habitat segment may be affected. The effects analysis should include the entire action area, which often extends well outside the project boundary or "footprint." For example, projects that involve streams and river systems should consider downstream effects. If the Federal action agency determines that the action may jeopardize a proposed species or adversely modify proposed critical habitat, the agency must enter into a section 7 conference. The agency may choose to confer with us on an action that may affect proposed species or critical habitat.
Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend considering them in the planning process in the event they become proposed or listed prior to project completion. More information on the regulations (50 CFR 402) and procedures for section 7 consultation, including the role of permit or license applicants, can be found in our Endangered Species Consultation Handbook at:
http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF.

We also advise you to consider species protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712) and the Bald and Golden Eagle Protection Act (Eagle Act) (16 U.S.C. 668 et seq.). The MBTA prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when authorized by the Service. The Eagle Act prohibits anyone, without a permit, from taking (including disturbing) eagles, and their parts, nests, or eggs. Currently 1026 species of birds are protected by the MBTA, including species such as the western burrowing owl (Athene cunicularia hypugea). Protected western burrowing owls are often found in urban areas and may use their nest/burrows year-round; destruction of the burrow may result in the unpermitted take of the owl or their eggs.

If a bald eagle (or golden eagle) nest occurs in or near the proposed project area, you should evaluate your project to determine whether it is likely to disturb or harm eagles. The National Bald Eagle Management Guidelines provide recommendations to minimize potential project impacts to bald eagles:
https://www.fws.gov/migratorybirds/pdf/management/
nationalbaldeaglenanagementguidelines.pdf
https://www.fws.gov/birds/management/managed-species/eagle-management.php.

The Division of Migratory Birds (505/248-7882) administers and issues permits under the MBTA and Eagle Act, while our office can provide guidance and Technical Assistance. For more information regarding the MBTA, BGEPA, and permitting processes, please visit the following: https://www.fws.gov/birds/policies-and-regulations/incidental-take.php. Guidance for minimizing impacts to migratory birds for communication tower projects (e.g. cellular, digital television, radio, and emergency broadcast) can be found at:
https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds/collisions/communication-towers.php.

Activities that involve streams (including intermittent streams) and/or wetlands are regulated by the U.S. Army Corps of Engineers (Corps). We recommend that you contact the Corps to determine their interest in proposed projects in these areas. For activities within a National Wildlife Refuge, we recommend that you contact refuge staff for specific information about refuge resources.
If your action is on tribal land or has implications for off-reservation tribal interests, we encourage you to contact the tribe(s) and the Bureau of Indian Affairs (BIA) to discuss potential tribal concerns, and to invite any affected tribe and the BIA to participate in the section 7 consultation. In keeping with our tribal trust responsibility, we will notify tribes that may be affected by proposed actions when section 7 consultation is initiated.

We also recommend you seek additional information and coordinate your project with the Arizona Game and Fish Department. Information on known species detections, special status species, and Arizona species of greatest conservation need, such as the western burrowing owl and the Sonoran desert tortoise (Gopherus morafkai) can be found by using their Online Environmental Review Tool, administered through the Heritage Data Management System and Project Evaluation Program https://www.azgfd.com/Wildlife/HeritageFund/.

For additional communications regarding this project, please refer to the consultation Tracking Number in the header of this letter. We appreciate your concern for threatened and endangered species. If we may be of further assistance, please contact our following offices for projects in these areas:

Northern Arizona: Flagstaff Office 928/556-2001
Central Arizona: Phoenix office 602/242-0210
Southern Arizona: Tucson Office 520/670-6144

Sincerely,
/s/ Jeff Humphrey Field Supervisor

Attachment

Attachment(s):

- Official Species List

# Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

**Arizona Ecological Services Field Office**
9828 North 31st Ave
#c3
Phoenix, AZ 85051-2517
(602) 242-0210

# Project Summary

Consultation Code: 02EAAZ00-2021-SLI-0736
Event Code: 02EAAZ00-2021-E-01984
Project Name: Brawley Wash Watershed
Project Type: LAND - RESTORATION / ENHANCEMENT
Project Description: Brawley Wash Watershed Planning
Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.22644915,-111.27302828843187,14z




Counties: Pima and Pinal counties, Arizona

## Endangered Species Act Species

There is a total of 12 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

### Mammals

| NAME | STATUS |
|---|---|
| Jaguar *Panthera onca*<br>There is **final** critical habitat for this species. Your location overlaps the critical habitat.<br>Species profile: https://ecos.fws.gov/ecp/species/3944 | Endangered |
| Sonoran Pronghorn *Antilocapra americana sonoriensis*<br>Population: U.S.A. (AZ), Mexico<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/4750 | Experimental Population, Non-Essential |

### Birds

| NAME | STATUS |
|---|---|
| California Least Tern *Sterna antillarum browni*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/8104 | Endangered |
| Yellow-billed Cuckoo *Coccyzus americanus*<br>Population: Western U.S. DPS<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/3911 | Threatened |

## Reptiles

| NAME | STATUS |
|---|---|
| Northern Mexican Gartersnake *Thamnophis eques megalops*<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/7655 | Threatened |
| Sonoran Desert Tortoise *Gopherus morafkai*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9289 | Candidate |
| Sonoyta Mud Turtle *Kinosternon sonoriense longifemorale*<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/7276 | Endangered |

## Amphibians

| NAME | STATUS |
|---|---|
| Chiricahua Leopard Frog *Rana chiricahuensis*<br>There is **final** critical habitat for this species. The location of the critical habitat is not available.<br>Species profile: https://ecos.fws.gov/ecp/species/1516 | Threatened |

## Insects

| NAME | STATUS |
|---|---|
| Monarch Butterfly *Danaus plexippus*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/9743 | Candidate |

## Flowering Plants

| NAME | STATUS |
|---|---|
| Kearney's Blue-star *Amsonia kearneyana*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/7485 | Endangered |
| Nichol's Turk's Head Cactus *Echinocactus horizonthalonius var. nicholii*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/5343 | Endangered |
| Pima Pineapple Cactus *Coryphantha scheeri var. robustispina*<br>No critical habitat has been designated for this species.<br>Species profile: https://ecos.fws.gov/ecp/species/4919 | Endangered |

## Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

| NAME | STATUS |
| --- | --- |
| Jaguar *Panthera onca*<br>https://ecos.fws.gov/ecp/species/3944#crithab | Final |

Attachment 12 – AGFD – Project Report Brawley Wash Watershed

# Arizona Environmental Online Review Tool Report

***Arizona Game and Fish Department Mission***
***To conserve Arizona's diverse wildlife resources and manage for safe, compatible outdoor recreation opportunities for current and future generations.***

**Project Name:**
Brawley Wash Watershed

**User Project Number:**
63720

**Project Description:**
Brawley Wash Watershed planning

**Project Type:**
Habitat Conservation and Restoration, Land Use Planning

**Contact Person:**
Russell Waldron

**Organization:**
SWCA

**On Behalf Of:**
PIMA

**Project ID:**
HGIS-13348

***Please review the entire report for project type and/or species recommendations for the location information entered. Please retain a copy for future reference.***

**Disclaimer:**

1. This Environmental Review is based on the project study area that was entered. The report must be updated if the project study area, location, or the type of project changes.
2. This is a preliminary environmental screening tool. It is not a substitute for the potential knowledge gained by having a biologist conduct a field survey of the project area. This review is also not intended to replace environmental consultation (including federal consultation under the Endangered Species Act), land use permitting, or the Departments review of site-specific projects.
3. The Departments Heritage Data Management System (HDMS) data is not intended to include potential distribution of special status species. Arizona is large and diverse with plants, animals, and environmental conditions that are ever changing. Consequently, many areas may contain species that biologists do not know about or species previously noted in a particular area may no longer occur there. HDMS data contains information about species occurrences that have actually been reported to the Department. Not all of Arizona has been surveyed for special status species, and surveys that have been conducted have varied greatly in scope and intensity. Such surveys may reveal previously undocumented population of species of special concern.
4. HabiMap Arizona data, specifically Species of Greatest Conservation Need (SGCN) under our State Wildlife Action Plan (SWAP) and Species of Economic and Recreational Importance (SERI), represent potential species distribution models for the State of Arizona which are subject to ongoing change, modification and refinement. The status of a wildlife resource can change quickly, and the availability of new data will necessitate a refined assessment.

**Locations Accuracy Disclaimer:**
Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Report is solely responsible for the project location and thus the correctness of the Project Review Report content.

**Recommendations Disclaimer:**

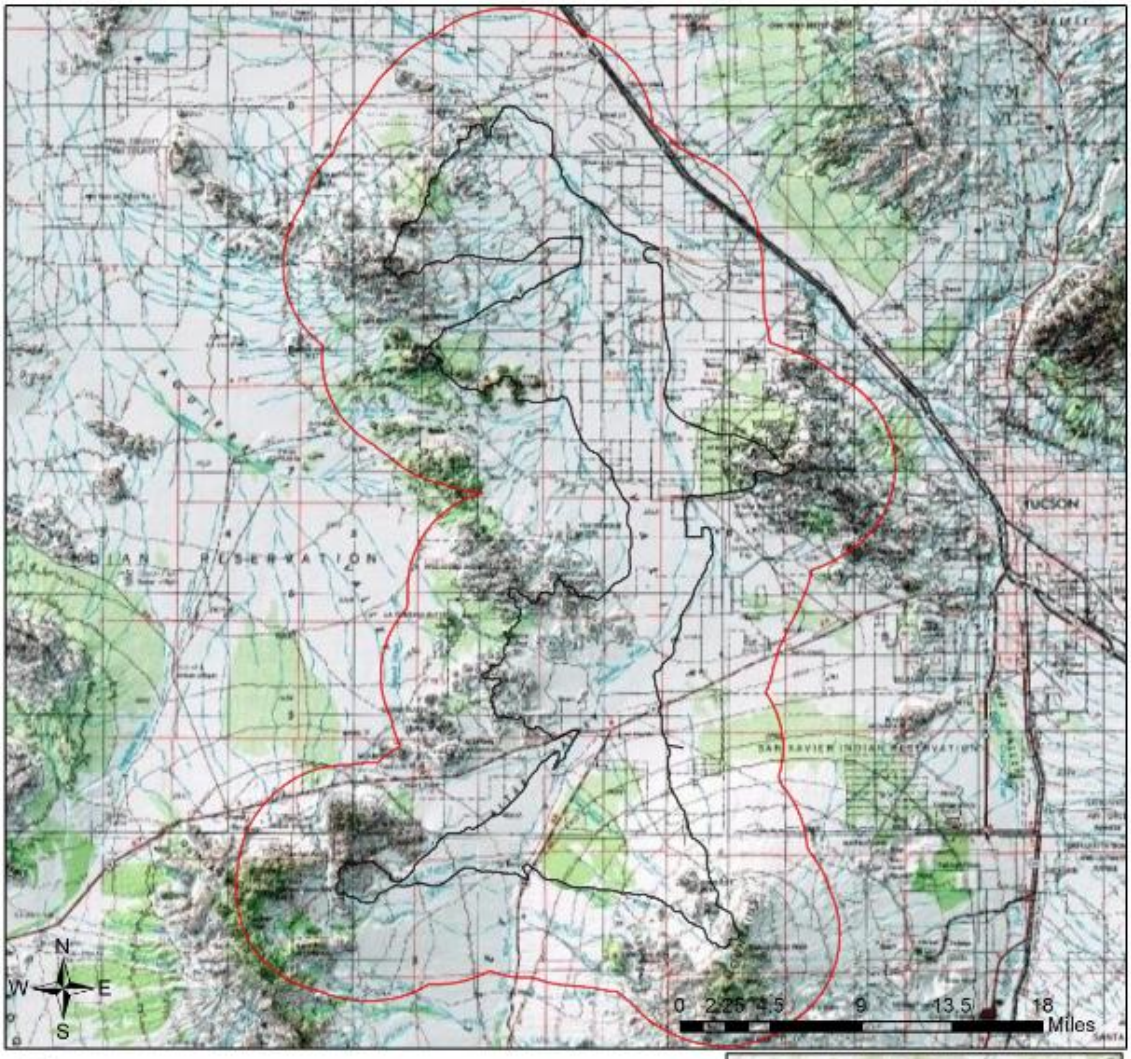
1. The Department is interested in the conservation of all fish and wildlife resources, including those species listed in this report and those that may have not been documented within the project vicinity as well as other game and nongame wildlife.
2. Recommendations have been made by the Department, under authority of Arizona Revised Statutes Title 5 (Amusements and Sports), 17 (Game and Fish), and 28 (Transportation).
3. Potential impacts to fish and wildlife resources may be minimized or avoided by the recommendations generated from information submitted for your proposed project. These recommendations are preliminary in scope, designed to provide early considerations on all species of wildlife.
4. Making this information directly available does not substitute for the Department's review of project proposals, and should not decrease our opportunity to review and evaluate additional project information and/or new project proposals.
5. Further coordination with the Department requires the submittal of this Environmental Review Report with a cover letter and project plans or documentation that includes project narrative, acreage to be impacted, how construction or project activity(s) are to be accomplished, and project locality information (including site map). Once AGFD had received the information, please allow 30 days for completion of project reviews. Send requests to:
   **Project Evaluation Program, Habitat Branch**
   **Arizona Game and Fish Department**
   **5000 West Carefree Highway**
   **Phoenix, Arizona 85086-5000**
   **Phone Number: (623) 236-7600**
   **Fax Number: (623) 236-7366**
   **Or**
   PEP@azgfd.gov
6. Coordination may also be necessary under the National Environmental Policy Act (NEPA) and/or Endangered Species Act (ESA). Site specific recommendations may be proposed during further NEPA/ESA analysis or through coordination with affected agencies

Arizona Game and Fish Department
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# Brawley Wash Watershed

## USA Topo Basemap With Locator Map




Project Boundary

Buffered Project Boundary

Project Size (acres): 198,166.38

Lat/Long (DD): 32.0114 / -111.3503

County(s): Pima; Pinal

AGFD Region(s): Tucson

Township/Range(s): T10S, R10E; T10S, R9E; T11S, R10E +

USGS Quad(s): AVRA; BROWN MOUNTAIN +



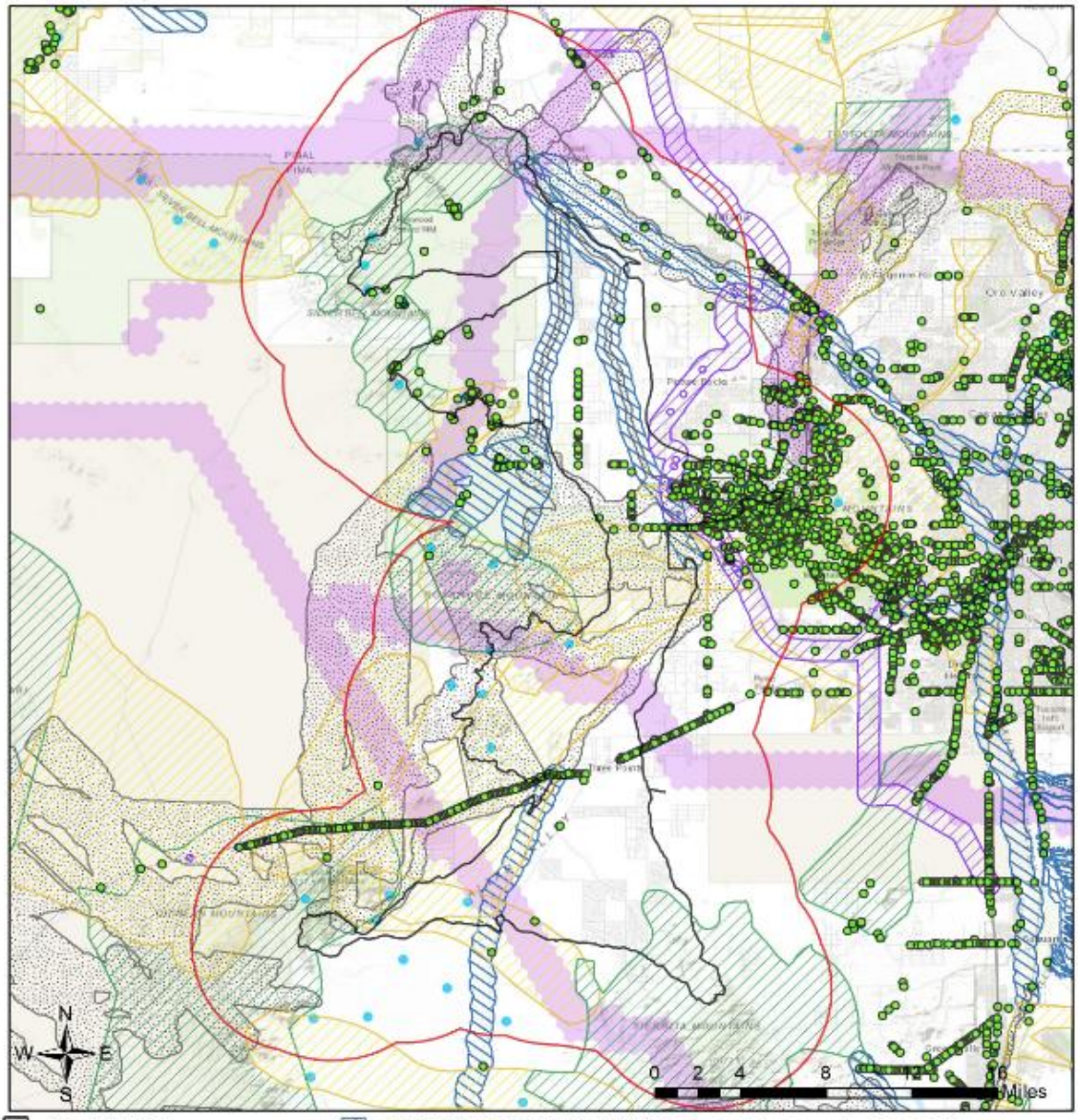

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap

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# Brawley Wash Watershed

Web Map As Submitted By User




Project Boundary
Buffered Project Boundary
id_imapinvasives.org_presence_points

**County Stakeholder Assessment**

Wildlife Crossing Area
Wildlife Movement Area - Diffuse
Wildlife Movement Area - Landscape
Wildlife Movement Area - Riparian/Wash
Important Connectivity Zones
Wildlife Connectivity
AGFDWildlifeWaters

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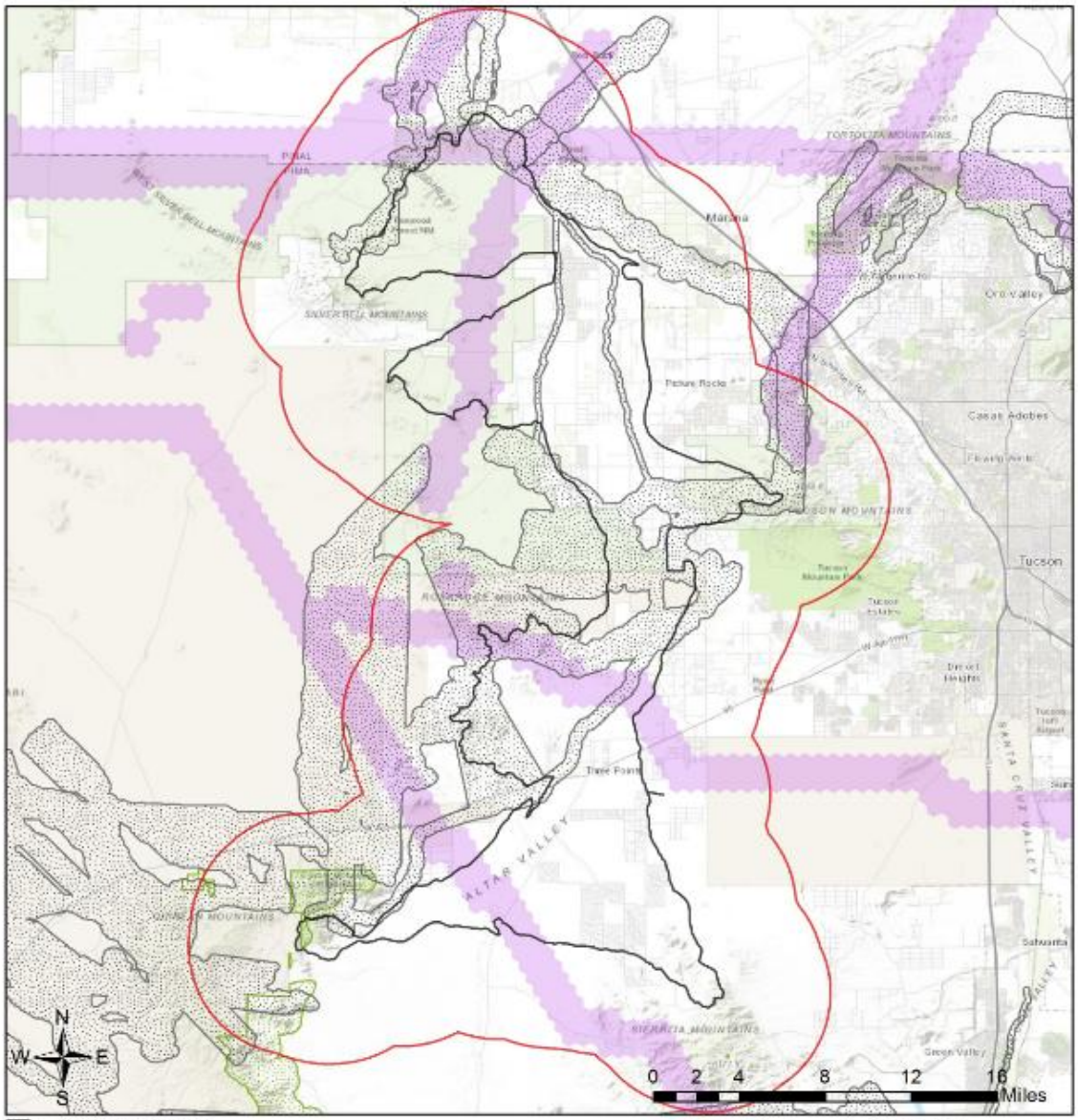
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
AGFD SSDV Habitat Enhancement Program

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# Brawley Wash Watershed

## Important Areas




- Project Boundary
- Buffered Project Boundary
- Wildlife Connectivity
- Important Connectivity Zones
- Critical Habitat
- Important Bird Areas

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USGS Quad(s): AVRA; BROWN MOUNTAIN +

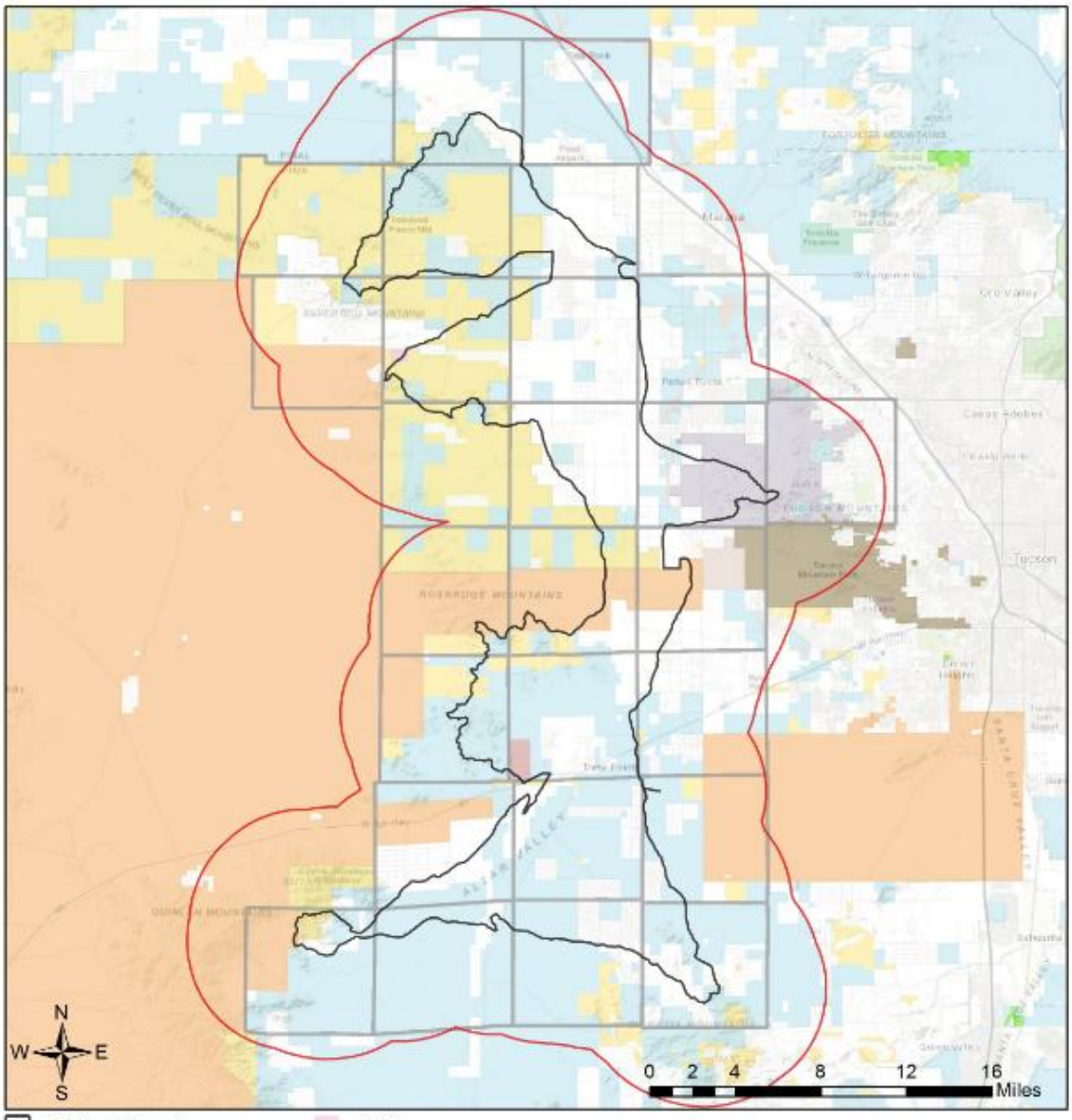
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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# Brawley Wash Watershed

## Township/Ranges and Land Ownership




Project Boundary
Buffered Project Boundary
Township/Ranges

**Land Ownership**

AZ Game & Fish Dept.
BLM
BOR
Indian Res.
Military
Mixed/Other
National Park/Mon.
Private
State & Regional Parks
State Trust
US Forest Service
Wildlife Area/Refuge

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USGS Quad(s): AVRA; BROWN MOUNTAIN +

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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**Special Status Species Documented within 5 Miles of Project Vicinity**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Abutilon parishii | Pima Indian Mallow | SC | S | S | SR | |
| Anaxyrus retiformis | Sonoran Green Toad | | | S | | 1B |
| Aquila chrysaetos | Golden Eagle | BGA | | S | | 1B |
| Aspidoscelis stictogramma | Giant Spotted Whiptail | SC | S | | | 1B |
| Aspidoscelis xanthonota | Red-backed Whiptail | SC | S | | | 1B |
| Athene cunicularia hypugaea | Western Burrowing Owl | SC | S | S | | 1B |
| Bat Colony | | | | | | |
| Chionactis occipitalis klauberi | Tucson Shovel-nosed Snake | SC | | | | 1A |
| Coccyzus americanus | Yellow-billed Cuckoo (Western DPS) | LT | S | | | 1A |
| Corynorhinus townsendii pallescens | Pale Townsend's Big-eared Bat | SC | S | S | | 1B |
| Coryphantha scheeri var. robustispina | Pima Pineapple Cactus | LE | | | HS | |
| Craugastor augusti cactorum | Western Barking Frog | | S | | | 1B |
| Crotaphytus nebrius | Sonoran Collared Lizard | | | | | 1B |
| Cylindropuntia x kelvinensis | Kelvin Cholla | | | | SR | |
| Echinocactus horizonthalonius var. nicholii | Nichol Turk's Head Cactus | LE | | | HS | |
| Echinocereus fasciculatus | Magenta-flower Hedgehog-cactus | | | | SR | |
| Echinocereus nicholii | Nichol's Hedgehog Cactus | | | | SR | |
| Empidonax traillii extimus | Southwestern Willow Flycatcher | LE | | | | 1A |
| Erigeron arisolius | Arid Throne Fleabane | | S | | | |
| Falco peregrinus anatum | American Peregrine Falcon | SC | S | S | | 1A |
| Glaucidium brasilianum cactorum | Cactus Ferruginous Pygmy-owl | SC | S | S | | 1B |
| Gopherus morafkai | Sonoran Desert Tortoise | C | S | S | | 1A |
| Heloderma suspectum suspectum | Reticulate Gila Monster | | | | | 1A |
| Heloderma suspectum | Gila Monster | | | | | 1A |
| Leptonycteris yerbabuenae | Lesser Long-nosed Bat | SC | | | | 1A |
| Lepus alleni | Antelope Jackrabbit | | | | | 1B |
| Lithobates chiricahuensis | Chiricahua Leopard Frog | LT | | | | 1A |
| Lithobates yavapaiensis | Lowland Leopard Frog | SC | S | S | | 1A |
| Macrotus californicus | California Leaf-nosed Bat | SC | | S | | 1B |
| Mammillaria thornberi | Thornber Fishhook Cactus | | | | SR | |
| Mammillaria viridiflora | Varied Fishhook Cactus | | | | SR | |
| Myotis velifer | Cave Myotis | SC | | S | | 1B |
| Nyctinomops femorosaccus | Pocketed Free-tailed Bat | | | | | 1B |
| Panthera onca | Jaguar | LE | | | | 1A |
| Passiflora arizonica | Arizona Passionflower | | S | | | |
| Peniocereus greggii var. transmontanus | Desert Night-blooming Cereus | | | | SR | |
| Peucaea carpalis | Rufous-winged Sparrow | | | | | 1B |

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**Special Status Species Documented within 5 Miles of Project Vicinity**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Phrynosoma cornutum | Texas Horned Lizard | SC | | | | |
| Poeciliopsis occidentalis occidentalis | Gila Topminnow | LE | | | | 1A |
| Sigmodon ochrognathus | Yellow-nosed Cotton Rat | SC | | | | 1C |
| Sonorella ambigua ambigua | Papago Talussnail | | | | | 1C |
| Strix occidentalis lucida | Mexican Spotted Owl | LT | | | | 1A |
| Terrapene ornata luteola | Desert Box Turtle | | | S | | 1A |
| Tumamoca macdougalii | Tumamoc Globeberry | DL | S | S | SR | |
| Vauquelinia californica ssp. sonorensis | Arizona Sonoran Rosewood | | | S | | |

*Note: Status code definitions can be found at* https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/

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**Special Areas Documented that Intersect with Project Footprint as Drawn**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Altar Wash | Pima County Wildlife Movement Area - Riparian/Wash | | | | | |
| Baboquivari Mountains through Mendoza/Fresnal Wash to Sierrita Mountains | Pima County Wildlife Movement Area - Landscape | | | | | |
| Baboquivari/Coyote Mountains to Roskruge Mountains | Pima County Wildlife Movement Area - Landscape | | | | | |
| Baboquivari/Coyote/Quinlan Mountains Wildland Block | Pima County Wildlife Movement Area - Diffuse | | | | | |
| Blanco Wash | Pima County Wildlife Movement Area - Riparian/Wash | | | | | |
| Brawley Wash | Pima County Wildlife Movement Area - Riparian/Wash | | | | | |
| Brawley Wash/Avra Valley across CAP Canal Wash Siphon to Saguaro National Park (West) | Pima County Wildlife Movement Area - Landscape | | | | | |
| CAP Canal Wildlife Crossing (CAWCD Maintained) | Pima County Wildlife Crossing Area | | | | | |
| CAP Canal | Pima County Wildlife Crossing Area | | | | | |
| CH for Panthera onca | Jaguar Designated Critical Habitat | | | | | |
| Coyote - Ironwood - Tucson Linkage Design | Wildlife Connectivity | | | | | |
| Important Connectivity Zone | Wildlife Connectivity | | | | | |
| Ironwood - Picacho Linkage Design | Wildlife Connectivity | | | | | |
| Riparian Area | Riparian Area | | | | | |
| Roskruge Mountains Wildland Block | Pima County Wildlife Movement Area - Diffuse | | | | | |

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**Special Areas Documented that Intersect with Project Footprint as Drawn**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Roskruge Mountains to Avra Valley | Pima County Wildlife Movement Area - Landscape | | | | | |
| Saguaro National Park (West) across buried CAP Canal Pipeline to Avra Valley | Pima County Wildlife Movement Area - Landscape | | | | | |
| Saguaro National Park (West)/Sandario Road Wash Crossing (Culvert) | Pima County Wildlife Crossing Area | | | | | |
| Sierrita Mountains Wildland Block | Pima County Wildlife Movement Area - Diffuse | | | | | |
| Silver Bell/Waterman Mountains/Samaniego Hills Wildland Block | Pima County Wildlife Movement Area - Diffuse | | | | | |
| Tohono O'odham Nation | Tohono O'odham Nation | | | | | |
| Waterman Mountains to Roskruge Mountains | Pima County Wildlife Movement Area - Landscape | | | | | |

*Note: Status code definitions can be found at* https://www.azgfd.com/wildlife/planning/wildlifeguidelines/statusdefinitions/

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**Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Accipiter gentilis | Northern Goshawk | SC | S | S | | 1B |
| Aix sponsa | Wood Duck | | | | | 1B |
| Ammodramus savannarum perpallidus | Western Grasshopper Sparrow | | | | | 1B |
| Ammospermophilus harrisii | Harris' Antelope Squirrel | | | | | 1B |
| Amphispiza quinquestriata | Five-striped Sparrow | | | | | 1B |
| Anaxyrus retiformis | Sonoran Green Toad | | | S | | 1B |
| Anthus spragueii | Sprague's Pipit | SC | | | | 1A |
| Antrostomus ridgwayi | Buff-collared Nightjar | | S | | | 1B |
| Aquila chrysaetos | Golden Eagle | BGA | | S | | 1B |
| Aspidoscelis stictogramma | Giant Spotted Whiptail | SC | S | | | 1B |
| Aspidoscelis xanthonota | Red-backed Whiptail | SC | S | | | 1B |
| Athene cunicularia hypugaea | Western Burrowing Owl | SC | S | S | | 1B |
| Botaurus lentiginosus | American Bittern | | | | | 1B |
| Buteo regalis | Ferruginous Hawk | SC | | S | | 1B |
| Buteo swainsoni | Swainson's Hawk | | | | | 1C |
| Callipepla squamata | Scaled Quail | | | | | 1C |
| Calypte costae | Costa's Hummingbird | | | | | 1C |
| Charadrius montanus | Mountain Plover | SC | | | | 1B |
| Chilomeniscus stramineus | Variable Sandsnake | | | | | 1B |

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**Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Chionactis annulata | Resplendent Shovel-nosed Snake | SC | | | | 1C |
| Chordeiles minor | Common Nighthawk | | | | | 1B |
| Cistothorus palustris | Marsh Wren | | | | | 1C |
| Coccyzus americanus | Yellow-billed Cuckoo (Western DPS) | LT | S | | | 1A |
| Colaptes chrysoides | Gilded Flicker | | | S | | 1B |
| Colinus virginianus ridgwayi | Masked Bobwhite | LE | | | | 1A |
| Coluber bilineatus | Sonoran Whipsnake | | | | | 1B |
| Corynorhinus townsendii pallescens | Pale Townsend's Big-eared Bat | SC | S | S | | 1B |
| Crotalus tigris | Tiger Rattlesnake | | | | | 1B |
| Crotaphytus nebrius | Sonoran Collared Lizard | | | | | 1B |
| Cynanthus latirostris | Broad-billed Hummingbird | | S | | | 1B |
| Cyrtonyx montezumae | Montezuma Quail | | | | | 1C |
| Dipodomys spectabilis | Banner-tailed Kangaroo Rat | | | S | | 1B |
| Empidonax wrightii | Gray Flycatcher | | | | | 1C |
| Euderma maculatum | Spotted Bat | SC | S | S | | 1B |
| Eumops perotis californicus | Greater Western Bonneted Bat | SC | | S | | 1B |
| Eumops underwoodi | Underwood's Bonneted Bat | SC | | | | 1B |
| Falco peregrinus anatum | American Peregrine Falcon | SC | S | S | | 1A |
| Glaucidium brasilianum cactorum | Cactus Ferruginous Pygmy-owl | SC | S | S | | 1B |
| Glaucidium gnoma gnoma | Mountain Pygmy-owl | | | | | 1B |
| Gopherus morafkai | Sonoran Desert Tortoise | C | S | S | | 1A |
| Haliaeetus leucocephalus | Bald Eagle | SC, BGA | S | S | | 1A |
| Heloderma suspectum | Gila Monster | | | | | 1A |
| Hypsiglena sp. nov. | Hooded Nightsnake | | | | | 1B |
| Incilius alvarius | Sonoran Desert Toad | | | | | 1B |
| Junco phaeonotus | Yellow-eyed Junco | | S | | | 1B |
| Kinosternon sonoriense sonoriense | Desert Mud Turtle | | | S | | 1B |
| Lampornis clemenciae | Blue-throated Hummingbird | | | | | 1B |
| Lasiurus blossevillii | Western Red Bat | | S | | | 1B |
| Lasiurus xanthinus | Western Yellow Bat | | S | | | 1B |
| Leopardus pardalis | Ocelot | LE | | | | 1A |
| Leptonycteris yerbabuenae | Lesser Long-nosed Bat | SC | | | | 1A |
| Lepus alleni | Antelope Jackrabbit | | | | | 1B |
| Lithobates chiricahuensis | Chiricahua Leopard Frog | LT | | | | 1A |
| Macrotus californicus | California Leaf-nosed Bat | SC | | S | | 1B |
| Megascops trichopsis | Whiskered Screech-owl | | S | | | 1B |
| Melanerpes uropygialis | Gila Woodpecker | | | | | 1B |
| Melospiza lincolnii | Lincoln's Sparrow | | | | | 1B |

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**Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Melozone aberti | Abert's Towhee | | S | | | 1B |
| Micrathene whitneyi | Elf Owl | | | | | 1C |
| Micruroides euryxanthus | Sonoran Coralsnake | | | | | 1B |
| Myiarchus tuberculifer | Dusky-capped Flycatcher | | | | | 1B |
| Myiarchus tyrannulus | Brown-crested Flycatcher | | | | | 1C |
| Myiodynastes luteiventris | Sulphur-bellied Flycatcher | | S | | | 1B |
| Myotis occultus | Arizona Myotis | SC | | S | | 1B |
| Myotis velifer | Cave Myotis | SC | | S | | 1B |
| Myotis yumanensis | Yuma Myotis | SC | | | | 1B |
| Notiosorex cockrumi | Cockrum's Desert Shrew | | | | | 1B |
| Nyctinomops femorosaccus | Pocketed Free-tailed Bat | | | | | 1B |
| Odocoileus virginianus | White-tailed Deer | | | | | 1B |
| Oreoscoptes montanus | Sage Thrasher | | | | | 1C |
| Oreothlypis luciae | Lucy's Warbler | | | | | 1C |
| Ovis canadensis mexicana | Mexican Desert Bighorn Sheep | | | | | 1B |
| Panthera onca | Jaguar | LE | | | | 1A |
| Passerculus sandwichensis | Savannah Sparrow | | | | | 1B |
| Patagioenas fasciata | Band-tailed Pigeon | | | | | 1C |
| Perognathus longimembris | Little Pocket Mouse | No Status | | | | 1B |
| Peucaea botterii arizonae | Arizona Botteri's Sparrow | | | S | | 1B |
| Peucaea carpalis | Rufous-winged Sparrow | | | | | 1B |
| Peucedramus taeniatus | Olive Warbler | | | | | 1C |
| Phrynosoma goodei | Goode's Horned Lizard | | | | | 1B |
| Phrynosoma solare | Regal Horned Lizard | | | | | 1B |
| Phyllorhynchus browni | Saddled Leaf-nosed Snake | | | | | 1B |
| Picoides arizonae | Arizona Woodpecker | | S | | | 1B |
| Polioptila nigriceps | Black-capped Gnatcatcher | | | | | 1B |
| Progne subis hesperia | Desert Purple Martin | | | S | | 1B |
| Psiloscops flammeolus | Flammulated Owl | | | | | 1C |
| Sciurus arizonensis | Arizona Gray Squirrel | | | | | 1B |
| Senticolis triaspis | Green Ratsnake | | S | | | 1B |
| Setophaga petechia | Yellow Warbler | | | | | 1B |
| Sialia sialis fulva | Azure Bluebird | | | | | 1B |
| Smilisca fodiens | Lowland Burrowing Treefrog | | | S | | 1B |
| Sonorella eremita | San Xavier Talussnail | CCA | | | | 1A |
| Sonorella papagorum | Black Mountain Talussnail | | | | | 1B |
| Sorex arizonae | Arizona Shrew | SC | S | | | 1B |
| Sphyrapicus nuchalis | Red-naped Sapsucker | | | | | 1C |

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**Species of Greatest Conservation Need Predicted that Intersect with Project Footprint as Drawn, based on Predicted Range Models**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Spizella atrogularis | Black-chinned Sparrow | | | | | 1C |
| Spizella breweri | Brewer's Sparrow | | | | | 1C |
| Strix occidentalis lucida | Mexican Spotted Owl | LT | | | | 1A |
| Sturnella magna | Eastern Meadowlark | | | | | 1C |
| Tadarida brasiliensis | Brazilian Free-tailed Bat | | | | | 1B |
| Terrapene ornata | Ornate Box Turtle | | | | | 1A |
| Thomomys umbrinus intermedius | Southern Pocket Gopher | | | | | 1B |
| Toxostoma lecontei | LeConte's Thrasher | | | S | | 1B |
| Troglodytes pacificus | Pacific Wren | | | | | 1B |
| Vireo bellii arizonae | Arizona Bell's Vireo | | | | | 1B |
| Vulpes macrotis | Kit Fox | No Status | | | | 1B |

**Species of Economic and Recreation Importance Predicted that Intersect with Project Footprint as Drawn**

| Scientific Name | Common Name | FWS | USFS | BLM | NPL | SGCN |
|---|---|---|---|---|---|---|
| Callipepla gambelii | Gambel's Quail | | | | | |
| Callipepla squamata | Scaled Quail | | | | | 1C |
| Cyrtonyx montezumae | Montezuma Quail | | | | | 1C |
| Odocoileus hemionus | Mule Deer | | | | | |
| Odocoileus virginianus | White-tailed Deer | | | | | 1B |
| Ovis canadensis mexicana | Mexicana Desert Bighorn Sheep | | | | | 1B |
| Pecari tajacu | Javelina | | | | | |
| Puma concolor | Mountain Lion | | | | | |
| Zenaida asiatica | White-winged Dove | | | | | |
| Zenaida macroura | Mourning Dove | | | | | |

**Project Type: Habitat Conservation and Restoration, Land Use Planning**

**Project Type Recommendations:**
Fence recommendations will be dependant upon the goals of the fence project and the wildlife species expected to be impacted by the project. General guidelines for ensuring wildlife-friendly fences include: barbless wire on the top and bottom with the maximum fence height 42", minimum height for bottom 16". Modifications to this design may be considered for fencing anticipated to be routinely encountered by elk, bighorn sheep or pronghorn (e.g., Pronghorn fencing would require 18" minimum height on the bottom). Please refer to the Department's Fencing Guidelines located on Wildlife Friendly Guidelines page, which is part of the WIldlife Planning button at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/.

During the planning stages of your project, please consider the local or regional needs of wildlife in regards to movement, connectivity, and access to habitat needs. Loss of this permeability prevents wildlife from accessing resources, finding mates, reduces gene flow, prevents wildlife from re-colonizing areas where local extirpations may have occurred, and ultimately prevents wildlife from contributing to ecosystem functions, such as pollination, seed dispersal, control of prey numbers, and resistance to invasive species. In many cases, streams and washes provide natural movement corridors for wildlife and should be maintained in their natural state. Uplands also support a large diversity of species, and should be contained within important wildlife movement corridors. In addition, maintaining biodiversity and ecosystem functions can be facilitated through improving designs of structures, fences, roadways, and culverts to promote passage for a variety of wildlife. Guidelines for many of these can be found at: https://www.azgfd.com/wildlife/planning/wildlifeguidelines/.

Minimize the potential introduction or spread of exotic invasive species, including aquatic and terrestrial plants, animals, insects and pathogens. Precautions should be taken to wash and/or decontaminate all equipment utilized in the project activities before entering and leaving the site. See the Arizona Department of Agriculture website for a list of prohibited and restricted noxious weeds at https://www.invasivespeciesinfo.gov/unitedstates/az.shtml and the Arizona Native Plant Society https://aznps.com/invas for recommendations on how to control. To view a list of documented invasive species or to report invasive species in or near your project area visit iMapInvasives - a national cloud-based application for tracking and managing invasive species at https://imap.natureserve.org/imap/services/page/map.html.

- To build a list: zoom to your area of interest, use the identify/measure tool to draw a polygon around your area of interest, and select "See What's Here" for a list of reported species. To export the list, you must have an account and be logged in. You can then use the export tool to draw a boundary and export the records in a csv file.

Within sensitive riparian areas consider livestock management activities that include rotational grazing, fencing, and providing off-site water developments. Please refer to the Department's Fencing Guidelines located on the home page of this application . In endangered species habitats, guidelines may be established in Recovery Plans http://www.fws.gov/southwest/es/arizona/.

The Department's Landowner Relations Program works with the state's private landowners to promote and encourage incorporation of habitat creation and improvement for a variety of wildlife species. The program has grown significantly in recent years offering new alternatives and larger projects to all the cooperators. There are various options under this program to partner with the Department to enhance or restore wildlife habitat. To view specific program options and criteria, please refer to the following link: https://www.azgfd.com/wildlife/landowners/

The construction or maintenance of water developments should include: incorporation of aspects of the natural environment and the visual resources, maintaining the water for a variety of species, water surface area (e.g., bats require a greater area due to in-flight drinking), accessibility, year-round availability, minimizing potential for water quality problems, frequency of flushing, shading of natural features, regular clean-up of debris, escape ramps, minimizing obstacles, and minimizing accumulation of silt and mud.

Habitat and forage recommendations are community, location, and species specific. We recommend early and direct coordination with Project Evaluation Program to determine site-specific recommendations.

Minimize impacts to wildlife and wildlife habitat by staying on designated roads and trails, and by minimizing use during spring and summer breeding periods. Additional information concerning OHV use is located at https://www.azgfd.com/OHV

Habitat restoration recommendations are dependant on habitat communities, target species, species located within the project area, site history, restoration goals, and treatment types. General project scoping should include defined project goals with measurable success criteria, site evaluation (e.g., soil conditions, local and watershed hydrological conditions and regimes), pre-project fish and wildlife surveys to determine project impacts and baseline data for post-project evaluation, established plan and methods for site preparation and revegetation (plant species evaluation based on current or expected site environmental conditions), consideration/incorporation of wildlife habitat features that may be secondary to project objectives (e.g., retaining snags for roost sites) and effects to habitat and wildlife at landscape scales (broader than project area), post-project monitoring plans and funding commitments, and an adaptive management plan. We recommend early coordination with Department personnel on project designs. Contact information can be found at https://www.azgfd.com/Agency/Offices or email our Project Evaluation Program at PEP@azgfd.gov

Pre- and post-survey/monitoring should be conducted to determine alternative access/exits to mines and to identify and/or minimize potential impacts to bat species. For further information when developing alternatives to mine closures, contact the Arizona Game and Fish Department Nongame Bat Coordinator at the Main Office in Terrestrial Branch, https://www.azgfd.com/agency/offices or (602) 942-3000.

Consider incorporating project components that may allow for the inclusion to promote, enhance, create, or restore wildlife habitat. Contact Project Evaluation Program for further information and opportunities, PEP@azgfd.gov or (623) 236-7600 or https://www.azgfd.com/agency/offices/

***The Department requests further coordination to provide project/species specific recommendations, please contact Project Evaluation Program directly at*** PEP@azgfd.gov.

**Project Location and/or Species Recommendations:**
HDMS records indicate that one or more native plants listed on the **Arizona Native Plant Law and Antiquities Act** have been documented within the vicinity of your project area. Please contact:
Arizona Department of Agriculture
1688 W Adams St.
Phoenix, AZ 85007
Phone: 602.542.4373
https://agriculture.az.gov/sites/default/files/Native%20Plant%20Rules%20-%20AZ%20Dept%20of%20Ag.pdf starts on page 44

HDMS records indicate that one or more **Listed, Proposed, or Candidate** species or **Critical Habitat** (Designated or Proposed) have been documented in the vicinity of your project. The Endangered Species Act (ESA) gives the US Fish and Wildlife Service (USFWS) regulatory authority over all federally listed species. Please contact USFWS Ecological Services Offices at http://www.fws.gov/southwest/es/arizona/ or:

**Phoenix Main Office**
9828 North 31st Avenue #C3
Phoenix, AZ 85051-2517
Phone: 602-242-0210
Fax: 602-242-2513

**Tucson Sub-Office**
201 N. Bonita Suite 141
Tucson, AZ 85745
Phone: 520-670-6144
Fax: 520-670-6155

**Flagstaff Sub-Office**
SW Forest Science Complex
2500 S. Pine Knoll Dr.
Flagstaff, AZ 86001
Phone: 928-556-2157
Fax: 928-556-2121

HDMS records indicate that **Western Burrowing Owls** have been documented within the vicinity of your project area. Please review the western burrowing owl resource page at:
https://www.azgfd.com/wildlife/speciesofgreatestconservneed/burrowingowlmanagement/.

Arizona Game and Fish Department | project_report_brawley_wash_watershed_42617_44203.pdf
Project ID: HGIS-13348 | Review Date: 5/6/2021 11:59:58 AM

HDMS records indicate that **Sonoran Desert Tortoise** have been documented within the vicinity of your project area. Please review the Tortoise Handling Guidelines found at: https://www.azgfd.com/wildlife/nongamemanagement/tortoise/

HDMS records indicate that **Chiricahua Leopard Frogs** have been documented within the vicinity of your project area. Please review the Chiricahua Leopard Frog Management Guidelines found at: https://s3.amazonaws.com/azgfd-portal-wordpress/PortalImages/files/wildlife/planningFor/wildlifeFriendlyGuidelines/FINALLithchirHabitatGdlns.pdf

Tribal Lands are within the vicinity of your project area and may require further coordination. Please contact:
**Tohono O'odham Nation**
PO Box 837
Sells, AZ 85634
(520) 383-1511
(520) 383-3377 (fax)

Analysis indicates that your project is located in the vicinity of an identified ***wildlife habitat linkage corridor***. The **Arizona Missing Linkages** represent ideal connections within or between intact blocks or core habitats. The blocks are currently disconnected or isolated and the linkages should be examined for improving permeability, or are currently intact and in need of preservation and/or enhancement. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to: https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors/. Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.

Analysis indicates that your project is located in the vicinity of an identified ***wildlife habitat connectivity feature***. The **Detailed Wildlife Connectivity Assessments** represent ideal connections within or between intact blocks or core habitats. The blocks are currently disconnected or isolated and the linkages should be examined for improving permeability, or are currently intact and in need of preservation and/or enhancement. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to: https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors/
Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.

This review has identified **riparian areas** within the vicinity of your project. During the planning stage of your project, avoid, minimize, or mitigate any potential impacts to riparian areas identified in this report. Riparian areas play an important role in maintaining the functional integrity of the landscape, primarily by acting as natural drainages that convey water through an area, thereby reducing flood events. In addition, riparian areas provide important movement corridors and habitat for fish and wildlife. Riparian areas are channels that contain water year-round or at least part of the year. Riparian areas also include those channels which are dry most of the year, but may contain or convey water following rain events. All types of riparian areas offer vital habitats, resources, and movement corridors for wildlife. The Pinal County Comprehensive Plan (i.e. policies *6.1.2.1* and *7.1.2.4*), Open Space and Trails Master Plan, Drainage Ordinance, and Drainage Design Manual all identify riparian area considerations, guidance, and policies. Guidelines to avoid, minimize, or mitigate impacts to riparian habitat can be found at https://www.azgfd.com/wildlife/planning/wildlifeguidelines/. Based on the project type entered, further consultation with the Arizona Game and Fish Department and Pinal County may be warranted.

Analysis indicates that your project is located in the vicinity of an identified ***wildlife habitat connectivity feature***. The **County-level Stakeholder Assessments** contain five categories of data (Barrier/Development, Wildlife Crossing Area, Wildlife Movement Area- Diffuse, Wildlife movement Area- Landscape, Wildlife Movement Area- Riparian/Washes) that provide a context of select anthropogenic barriers, and potential connectivity. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to: https://www.azgfd.com/wildlife/planning/habitatconnectivity/identifying-corridors/.
Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.

Analysis indicates that your project is located in the vicinity of an identified ***wildlife habitat connectivity feature***. The **Statewide Wildlife Connectivity Assessment's Important Connectivity Zones** (ICZs) represent general areas throughout the landscape which contribute the most to permeability of the whole landscape. ICZs may be used to help identify, in part, areas where more discrete corridor modeling ought to occur. The reports provide recommendations for opportunities to preserve or enhance permeability. Project planning and implementation efforts should focus on maintaining and improving opportunities for wildlife permeability. For information pertaining to the linkage assessment and wildlife species that may be affected, please refer to: https://s3.amazonaws.com/azgfd-portal-wordpress/azgfd.wp/wp-content/uploads/0001/01/23120719/ALIWCA_Final_Report_Perkl_2013_lowres.pdf.
Please contact the Project Evaluation Program (pep@azgfd.gov) for specific project recommendations.

# Attachment 13 – Bureau of Land Management, Arizona – Bureau Sensitive Species List (February 2017)

| Bureau of Land Management, Arizona - Bureau Sensitive Species List (February 2017) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **INVERTEBRATES** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| Arizona Cave Amphipod | *Stygobromus arizonensis* | BLMS | | | h | | wet caves and mines |
| Bylas Springsnail | *Pyrgulopsis arizonae* | BLMS | | | v | | springs **(Positive 90-day Finding)** |
| Desert Springsnail | *Pyrgulopsis deserta* | BLMS | h | | | | springs along the Virgin River |
| Gila Tryonia | *Tryonia gilae* | BLMS | | | v | | springs **(Positive 90-day Finding)** |
| Grand Wash Springsnail | *Pyrgulopsis bacchus* | BLMS | v | | | | springs **(Positive 90-day Finding)** |
| Kingman Springsnail | *Pyrgulopsis conica* | BLMS | | v | | | springs **(Positive 90-day Finding)** |
| Monarch Butterfly | *Danaus plexippus plexippus* | BLMS | v | v | v | v | **(Positive 90-day Finding)** |
| Sonoran Talussnail | *Sonorella magdalenensis* | BLMS | | | v | | talus slopes **(Positive 90-day Finding)** |
| **FISH** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| Bluehead Sucker | *Catostomus discobolus* | BLMS | h | | h | | **Conservation Agreement** |
| **Bonytail Chub** | ***Gila elegans*** | **FE w/CH** | | **v-CH** | | | **See Federal Register & Recovery Plan** |
| **Desert Pupfish** | ***Cyprinodon macularius*** | **FE** | | | **v** | **v** | **See Federal Register & Recovery Plan** |
| Desert Sucker | *Catostomus clarki* | BLMS | v | v | v | v | aquatic |
| Flannelmouth Sucker | *Catostomus latipinnis* | BLMS | v | | | | **Conservation Agreement** |
| **Gila Chub** | ***Gila intermedia*** | **FE w/CH** | | | **v-CH** | **v-CH** | **See Federal Register & Recovery Plan** |
| **Gila Topminnow** | ***Poeciliopsis occidentalis occidentalis*** | **FE** | | | **v** | **v** | **See Federal Register & Recovery Plan** |
| **Little Colorado Spinedace** | ***Lepidomeda vittata*** | **FT** | | | **v** | | **See Federal Register & Recovery Plan** |
| Little Colorado Sucker | *Catostomus* sp. | BLMS | | | v | | **Conservation Agreement** |
| **Loach Minnow** | ***Tiaroga cobitis*** | **FE w/CH** | | | **v-CH** | | **See Federal Register & Recovery Plan** |
| Longfin Dace | *Agosia chrysogaster* | BLMS | | v | v | v | aquatic |
| **Razorback Sucker** | ***Xyrauchen texanus*** | **FE w/CH** | | **v-CH** | **h-CH** | | **See Federal Register & Recovery Plan** |
| **Roundtail Chub** | ***Gila robusta*** | ***p*T BLMS** | | **v** | **v** | | **Conservation Agreement, See Federal Register** |
| Sonora Sucker | *Catostomus insignis* | BLMS | | v | v | v | aquatic |
| Speckled Dace | *Rhinichthys osculus* | BLMS | v | v | v | v | aquatic |
| **Spikedace** | ***Meda fulgida*** | **FE w/CH** | | | **v-CH** | **h** | **See Federal Register & Recovery Plan** |
| **Virgin River Chub** | ***Gila seminuda*** | **FE w/CH** | **v-CH** | | | | **See Federal Register & Recovery Plan** |
| Virgin Spinedace | *Lepidomeda mollispinis mollispinis* | BLMS | v | | | | **Conservation Agreement (Positive 90-day Finding)** |

Attachment 1-1

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Woundfin** | ***Plagopterus argentissimus*** | **FE w/CH** | **v-CH** | | | | **See Federal Register & Recovery Plan** |
| **AMPHIBIANS** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| Arizona Toad | *Anaxyrus microscaphus* | BLMS | v | v | v | v | mid elevation riparian/wetlands **(Positive 90-day Finding)** |
| **Chiricahua Leopard Frog** | ***Lithobates chiricahuensis*** | **FT w/CH** | | | **v-CH** | | **See Federal Register & Recovery Plan** |
| Great Plains Narrow-mouthed Toad | *Gastrophryne olivacea* | BLMS | | | v | v | healthy grasslands |
| Lowland Burrowing Treefrog | *Smilisca fodiens* | BLMS | | | | v | healthy grasslands |
| Lowland Leopard Frog | *Lithobates yavapaiensis* | BLMS | | v | v | v | wetlands |
| Northern Leopard Frog | *Lithobates pipiens* | BLMS | v | | v | h | wetlands |
| Plains Leopard Frog | *Lithobates blairi* | BLMS | | | h | | wetlands |
| Relict Leopard Frog | *Lithobates onca* | BLMS | h | v | | | **Conservation Agreement, See Federal Register (12 Month Finding)** |
| Sonoran Green Toad | *Anaxyrus retiformis* | BLMS | | | v | v | healthy grasslands |
| **REPTILES** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| Arizona Striped Whiptail | *Aspidoscelis arizonae* | BLMS | | | v | | healthy grasslands, north end of Wilcox Playa **(Positive 90-day Finding)** |
| Desert Massasauga | *Sistrurus catenatus edwarsii* | BLMS | | | h | | healthy grasslands (Positive 90-day Finding) |
| Desert Ornate Box Turtle | *Terrapene ornata* | BLMS | | | v | | healthy grasslands |
| Flat-tailed Horned Lizard | *Phrynosoma mcallii* | BLMS | | v | | | **Conservation Agreement** |
| **Mojave Desert Tortoise** | ***Gopherus agassizii*** | **FT w/CH** | **v-CH** | **v** | | | **See Federal Register & Recovery Plan** |
| Mojave Fringe-toed Lizard | *Uma scoparia* | BLMS | | v | | | sand |
| **Narrow-headed Gartersnake** | ***Thamnophis rufipunctatus*** | **FT w/*p*CH** | | | **h-*p*CH** | | **See Federal Register** |
| **New Mexico Ridge-nosed Rattlesnake** | ***Crotalus willardi obscurus*** | **FT** | | | **v** | | **See Federal Register & Recovery Plan** |
| **Northern Mexican Gartersnake** | ***Thamnophis eques megalops*** | **FT w/*p*CH** | | **v-*p*CH** | **v-*p*CH** | **h-*p*CH** | **See Federal Register** |
| Slevin's Bunchgrass Lizard | *Sceloporus slevini* | BLMS | | | v | | healthy grasslands |
| Sonoran Desert Tortoise | *Gopherus morafkai* | BLMS | | v | v | v | **Conservation Agreement** |
| Sonora Mud Turtle | *Kinosternon sonoriense sonoriense* | BLMS | | v | v | v | Riparian/aquatic |
| Yuman Desert Fringe-toed Lizard | *Uma rufopunctata* | BLMS | | v | | | sand **(Positive 90-day Finding)** |
| **BIRDS (breeding)** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| American Peregrine Falcon | *Falco peregrinus anatum* | BLMS | v | v | v | v | cliffs |
| Arizona Botteri's Sparrow | *Peucaea botterii arizonae* | BLMS | | | v | | healthy grasslands |

Attachment 1-2

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|---|---|---|---|---|---|---|---|
| Arizona Grasshopper Sparrow | *Ammodramus savannarum ammolegus* | BLMS | | | v | | healthy grasslands |
| Bald Eagle | *Haliaeetus leucocephalus* | BLMS | h | v | v | v | **Conservation Agreement [BGEPA]** |
| Cactus Ferruginous Pygmy-Owl | *Glaucidium brasilianum cactorum* | BLMS | | | v | v | dense Sonoran scrub washes |
| California Black Rail | *Laterallus jamaicensis coturniculus* | BLMS | | v | h | | marshes |
| **California Condor** | ***Gymnogyps californianus*** | **FE/NEP** | **v** | **h** | **h** | **h** | **See Federal Register, Recovery Plan & 10(j) Rule** |
| **California Least Tern** | ***Sterna antillarum browni*** | **FE** | | **h** | **h** | **h** | **See Federal Register & Recovery Plan** |
| Desert Purple Martin | *Progne subis hesperia* | BLMS | | h | v | v | saguaro cacti |
| Ferruginous Hawk | *Buteo regalis* | BLMS | v | h | v | h | healthy grasslands |
| Gilded Flicker | *Colaptes chrysoides* | BLMS | | v | v | v | saguaro cacti |
| Golden Eagle | *Aquila chrysaetos* | BLMS | v | v | v | v | **[BGEPA]** |
| Le Conte's Thrasher | *Toxostoma lecontei* | BLMS | | v | v | v | remote creosote scrub |
| **Mexican Spotted Owl** | ***Strix occidentalis lucida*** | **FT w/CH** | **h-CH** | **h** | **v** | **h** | **See Federal Register & Recovery Plan** |
| **Northern Aplomado Falcon** | ***Falco femoralis septentrionalis*** | **FE/NEP** | | | **h** | | **See Federal Register, Recovery Plan & 10(j) Rule** |
| Northern Goshawk | *Accipiter gentilis atricapillus* | BLMS | v | v | h | h | healthy forests |
| Pinyon Jay | *Gymnorhinus cyanocephalus* | BLMS | v | v | v | v | healthy pinyon pine |
| **Southwestern Willow Flycatcher** | ***Empidonax traillii extimus*** | **FE w/CH** | **v-CH** | **v-CH** | **v-CH** | **h** | **See Federal Register & Recovery Plan** |
| Western Burrowing Owl | *Athene cunicularia hypugaea* | BLMS | v | v | v | v | grasslands, undeveloped valley bottoms |
| **Western Yellow-billed Cuckoo (DPS)** | ***Coccyzus americanus*** | **FT w/*p*CH** | **v-*p*CH** | **v-*p*CH** | **v-*p*CH** | **v-*p*CH** | **See Federal Register** |
| **Yuma Ridgway's (Clapper) Rail** | ***Rallus obsoletus (=longirostris) yumanensis*** | **FE** | **h** | **v** | **h** | **v** | **See Federal Register & Recovery Plan** |
| **MAMMALS** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| Allen's Big-eared Bat | *Idionycteris phyllotis* | BLMS | v | v | v | h | caves, mines |
| Arizona Myotis | *Myotis occultus* | BLMS | h | v | v | h | caves, mines |
| Banner-tailed Kangaroo Rat | *Dipodomys spectabilis* | BLMS | | | v | | healthy grasslands |
| Black-tailed Prairie Dog | *Cynomys ludovicianus* | BLMS | | | v | | healthy grasslands |
| California Leaf-nosed Bat | *Macrotus californicus* | BLMS | h | v | v | v | caves, mines |
| Cave Myotis | *Myotis velifer* | BLMS | | v | v | v | caves, mines |
| Greater Western Mastiff Bat | *Eumops perotis californicus* | BLMS | v | v | v | v | caves, mines |
| Gunnison's Prairie Dog | *Cynomys gunnisoni* | BLMS | | h | v | h | healthy grasslands |
| Houserock Valley Chisel-toothed Kangaroo Rat | *Dipodomys microps leucotis* | BLMS | v | | | | Atriplex scrub |
| **Hualapai Mexican Vole** | ***Microtus mexicanus hualpaiensis*** | **FE *p*Delist** | | **v** | | | **See Federal Register & Recovery Plan** |
| **Jaguar** | ***Panthera onca*** | **FE w/CH** | | | **v-CH** | | **See Federal Register & Recovery Plan** |
| **Lesser Long-nosed Bat** | ***Leptonycteris curasoae yerbabuenae*** | **FE pDelist** | | | **v** | **v** | **See Federal Register & Recovery Plan** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Mexican Gray Wolf** | ***Canis lupus baileyi*** | **FE/NEP** | | | **h** | **h** | **See Federal Register, Recovery Plan & 10(j) Rule** |
| Mexican Long-tongued Bat | *Choeronycteris mexicana* | BLMS | | | v | | caves/mines |
| **Ocelot** | ***Leoparus pardalis*** | **FE** | | | **h** | | **See Federal Register & Recovery Plan** |
| **Sonoran Pronghorn** | ***Antilocapra americana sonoriensis*** | **FE/NEP** | | **v** | **h** | **v** | **See Federal Register, Recovery Plan & 10(j) Rule** |
| Spotted Bat | *Euderma maculatum* | BLMS | v | h | h | h | caves/ mines |
| Townsend's Big-eared Bat | *Corynorhinus* (=*Plecotus*) *townsendii* | BLMS | v | v | v | v | caves/mines |
| **PLANTS** | | | | | | | |
| **Common Name** | **Scientific Name** | **Status** | **ASDO** | **CRDO** | **GDO** | **PDO** | **Habitat/Notes** |
| **Acuna Cactus** | ***Echinomastus erectocentrus var. acunensis*** | **FE w/CH** | | | **v-CH** | **v-CH** | **See Federal Register** |
| Aquarius Milkvetch | *Astragalus newberryi* var. *aquaria* | BLMS | | v | | | narrow range, limestone deposits, Burro Creek area |
| Aravaipa Sage | *Salvia amissa* | BLMS | | | v | | narrow range, floodplain terraces in shady canyons |
| Aravaipa Woodfern | *Thelypteris puberula* var. *sonorensis* | BLMS | | v | v | h | few scattered springs |
| **Arizona Cliffrose** | ***Purshia subintegra*** | **FE** | | **v** | | | **See Federal Register & Recovery Plan** |
| Arizona Eryngo | *Eryngium sparganophyllum* | BLMS | | | v | | Arid land springs, cienegas |
| **Arizona Hedgehog Cactus** | ***Echinocereus triglochidiatus var. arizonicus*** | **FE** | | | **v** | **h** | **See Federal Register** |
| Arizona Sonoran Rosewood | *Vauquelinia californica* ssp. *sonorensis* | BLMS | | | v | v | relict species in shady canyons |
| Bartram Stonecrop | *Graptopetalum bartramii* | BLMS | | | v | | narrow range, rocky outcrops in canyons w/Madrean Woodland **(Positive 90-day Finding)** |
| Blue Sand Lily | *Triteleiopsis palmeri* | BLMS | | v | | | sand dunes and sandy soils |
| **Brady Pincushion Cactus** | ***Pediocactus bradyi*** | **FE** | **v** | | | | **See Federal Register & Recovery Plan** |
| California Flannelbush | *Fremontodendron californicum* | BLMS | | v | | v | relict populations in shady canyons |
| Chihuahua Breadroot (Scurfpea) | *Pediomelum pentaphyllum* | BLMS | | | v | | Healthy grasslands **(Positive 90-day Finding)** |
| Clifton Rock Daisy | *Perityle ambrosiifolia* | BLMS | | | v | | narrow range, cliff faces of Gila Conglomerate |
| Dalhouse Spleenwort | *Asplenium* (=*Ceterach*) *dalhousiae* | BLMS | | | v | | cliff face seeps, Mule Mountains |
| Diamond Butte Milkvetch | *Astragalus toanus* var. *scidulus* | BLMS | v | | | | narrow range, Moenkopi Formation badlands w/red soils |
| **Fickeisen Plains Cactus** | ***Pediocactus peeblesianus var. fickeiseniae*** | **FE w/CH** | **v-CH** | | | **v-CH** | **See Federal Register** |
| Fish Creek Fleabane | *Erigeron piscaticus* | BLMS | | | v | | narrow range, floodplain terraces shady canyons **(Positive 90-day Finding)** |
| Gentry Indigo Bush | *Dalea tentaculoides* | BLMS | | | v | | narrow range, floodplain terraces in shady canyons |
| Giant Sedge | *Carex spissa* | BLMS | | | v | v | springs |
| **Gierisch Mallow** | ***Sphaeralcea gierischii*** | **FE w/CH** | **v-CH** | | | | **See Federal Register** |
| Grand Canyon Rose | *Rosa stellata* var. *abyssa* | BLMS | v | | | | narrow range, limestone cliff rims |

Attachment 1-4

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Holmgren (Paradox) Milk Vetch** | ***Astragalus holmgreniorum*** | **FE w/CH** | **v-CH** | | | | **See Federal Register & Recovery Plan** |
| Huachuca Golden Aster | *Heterotheca rutteri* | BLMS | | | v | | narrow range, Plains Grassland, LCNCA |
| Huachuca Milkvetch | *Astragalus hypoxylus* | BLMS | | | h | | narrow range |
| **Huachuca Water Umbel** | ***Lilaeopsis schaffneriana ssp. recurva*** | **FE w/CH** | | | **v-CH** | | **See Federal Register** |
| **Jones Cycladenia** | ***Cycladenia humilis var. jonesii*** | **FT** | **v** | | | | **See Federal Register** |
| Joshua Tree | *Yucca brevifolia* | BLMS | v | v | | v | **(Positive 90-day Finding)** |
| Kaibab (Paradine) Plains Cactus | *Pediocactus paradinei* | BLMS | v | | | | **Conservation Agreement** |
| **Kearney's Blue Star** | ***Amsonia kearneyana*** | **FE** | | | **v** | | **See Federal Register & Recovery Plan** |
| Kearney Sumac | *Rhus kearneyi* ssp. *kearneyi* | BLMS | | v | | | relict species in shady canyons |
| Kofa Mountain Barberry | *Berberis harrisoniana* | BLMS | | v | | v | relict species in shady canyons |
| Marble Canyon Indigo Bush | *Psorothamnus arborescens* var. *pubescens* | BLMS | v | | | | narrow range, red soils of Moenkopi Formation, Marble Canyon |
| Marble Canyon Milkvetch | *Astragalus cremnophylax* var. *hevronii* | BLMS | v | | | | narrow range, limestone cliff rims, Marble Canyon |
| Mt Trumbull Beardtongue | *Penstemon distans* | BLMS | v | | | | narrow range, limestone soils |
| Murphey Agave | *Agave murpheyi* | BLMS | | | h | v | low numbers, desert foothills, central AZ |
| **Nichol Turk's Head Cactus** | ***Echinocactus horizonthalonius var. nicholii*** | **FE** | | | **v** | | **See Federal Register & Recovery Plan** |
| Paria Plateau (Siler) Fishhook Cactus | *Sclerocactus sileri* | BLMS | v | | | | narrow range, sandy soils, Paria Plateau |
| Parish Phacelia | *Phacelia parishii* | BLMS | | v | | | narrow range, limestone deposits, Burro Creek area, dry lake beds, Red Lake |
| Parish Wild Onion | *Allium parishii* | BLMS | | v | | | narrow range, higher elevation desert mountains, Mohave Mountains |
| **Peebles Navajo Cactus** | ***Pediocactus peeblesianus var. peeblesianus*** | **FE** | | | **v** | | **See Federal Register & Recovery Plan** |
| Pima Indian Mallow | *Abutilon parishii* | BLMS | | h | v | h | rocky slopes, desert mountains |
| **Pima Pineapple Cactus** | ***Coryphantha scheeri var. robustispina*** | **FE** | | | **v** | | **See Federal Register** |
| Pinto Beardtongue | *Penstemon bicolor* | BLMS | | v | | | narrow range, desert washes, Black Mountains |
| Purple-spike Coralroot | *Hexalectris warnockii* | BLMS | | | v | | few populations, leaf litter under Madrean Woodland, Mule Mtns |
| Round-leaf Broom | *Errazurizia rotundata* | BLMS | | | v | | narrow range, Shinarump Hills, Holbrook area |
| San Pedro River Wild Buckwheat | *Eriogonum terrenatum* | BLMS | | | v | | narrow range, limestone and clay soils of St. David Formation, SPRNCA |
| Sand Food | *Pholisma sonorae* | BLMS | | v | | | sand dunes, Yuma area |
| Scaly Sand Food | *Pholisma arenarium* | BLMS | | v | | | sand dunes, Cactus Plain |
| Schott Wire-lettuce | *Stephanomeria exigua* ssp. *exigua* | BLMS | | v | | h | sand dunes, sandy soils |
| September 11 Stickleaf | *Mentzelia memorabilis* | BLMS | v | | | | narrow range, gypsum soils of Harrisburg Formation |
| **Siler Pincushion Cactus** | ***Pediocactus sileri*** | **FT** | **v** | | | | **See Federal Register & Recovery Plan** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Silverleaf Sunray | *Enceliopsis argophylla* | BLMS | v | v | | | narrow range, gypsum soils of Moenkopi Formation |
| Smooth Catseye | *Cryptantha semiglabra* | BLMS | v | | | | extremely narrow range |
| Sticky Wild Buckwheat | *Eriogonum viscidulum* | BLMS | v | | | | narrow range, sandy loam soils, Virgin River Valley |
| Three-cornered Milkvetch | *Astragalus geyeri* var. *triquetrus* | BLMS | v | | | | narrow range, sandy loam soils, Virgin River Valley |
| Tumamoc Globeberry | *Tumamoca macdougalii* | BLMS | | | v | v | few populations, Sonoran Desert plains |
| **Welch's Milkweed** | ***Asclepias welshii*** | **FT** | **v** | | | | **See Federal Register & Recovery Plan** |
| White-margined Penstemon | *Penstemon albomarginatus* | BLMS | | v | | | narrow range, sandy loam soils |

**Status and Occurrence Abbreviations:**

| Abbreviation | Definition |
|---|---|
| **FE** | Federally Endangered |
| ***p*E** | Proposed Endangered |
| **FT** | Federally Threatened |
| ***p*T** | Proposed Threatened |
| **CH** | Designated Critical Habitat |
| ***p*CH** | Proposed Critical Habitat |
| ***p*Delist** | Proposed for Delisting |
| **NEP** | Nonessential Experimental Population designated pursuant to Section 10(j) of the ESA |
| **DPS** | Distinct Population Segment |
| **C** | Federal Candidate |
| **BLMS** | Arizona Bureau of Land Management Sensitive |
| **BGEPA** | Bald and Golden Eagle Protection Act of 1940 |
| **v** | Known Occurrence within the last 10 years |
| **h** | Historic or Potential Occurrence |
| **Positive 90-day Finding** | Petition for listing was found to contain substantial information indicating listing may be warranted. |
| **ASDO** | Arizona Strip District Office: [Grand Canyon – Parashant NM & Arizona Strip Field Office including Vermillion Cliffs NM] |
| **CRDO** | Colorado River District Office: [Kingman, Lake Havasu and Yuma field offices] |
| **GDO** | Gila District Office: [Safford Field Office including Gila Box Riparian NCA & Tucson Field Office including Ironwood Forest NM, San Pedro Riparian NCA, & Las Cienegas NCA] |
| **PDO** | Phoenix District Office: [Hassayampa Field Office including Agua Fria NM & Lower Sonoran Field Office including Sonoran Desert NM] |

# SUBAPPENDIX D.5 SOCIOECONOMICS

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- Table 16 – Existing Land Ownership within the Project Area
- Table 17 – Age Groups in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona
- Table 18 – Race and Ethnicity in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, Arizona
- Table 19 – Educational Attainment in the Project Vicinity
- Table 20 – Employment by Industry in the Project Area
- Table 21 – Median Housing Value in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County and Arizona
- Table 22 – Rent in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona
- Table 23 – Poverty by Age in Avra Valle, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona
- Table 24 – Employment by Industry in the Project Area

Table 16 - Existing Land Ownership within the Project Area

| Owner | Acres |
|---|---|
| BLM | 33,137 |
| Tribal Lands | 6,478 |
| Military | 108 |
| Private | 73,956 |
| State (ASLD) | 77,268 |
| National Park Service | 5,338 |
| State Wildlife Area | 1,187 |
| Bureau of Reclamation | 623 |
| Local or State Parks | 40 |
| Pima County | 31 |

*Month and year of preparation or update: October 2024*

| | |
|---|---|
| Rural/Agricultural | 136,681 |
| Reserve Lands | 36,680 |
| Residential | 18,488 |
| Undeveloped Open Space | 4,997 |
| Industrial | 1,386 |

*Month and year of preparation or update: November 2024*

Table 17 - Age Groups in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona

| Location | Under 19-Years | 19-Years to 64-Years | 65-Years and Over |
|---|---|---|---|
| Arizona | 24% | 56% | 19% |
| Pima County | 22% | 55% | 22% |
| Avra Valley CDP | 24% | 60% | 15% |
| Picture Rocks CDP | 19% | 55% | 24% |
| Three Points CDP | 27% | 48% | 24% |
| Pinal County | 23% | 55% | 21% |

Source: U.S. Census Bureau (2022a-f).

Table 18 - Race and Ethnicity in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, Arizona

| Location | White Alone | American Indian or Alaska Native Alone | Asian Alone | Black or African American Alone | Native Hawaiian or Islander | Two or More Races | Other | Hispanic or Latino |
|---|---|---|---|---|---|---|---|---|
| Arizona | 52% | 3% | 3% | 4% | 0% | 3% | 0% | 32% |
| Pima County | 50% | 2% | 2% | 3% | 0% | 3% | 0% | 38% |
| Avra Valley CDP | 72% | 1% | 0% | 0% | 0% | 8% | 0% | 17% |
| Picture Rocks CDP | 71% | 0% | 0% | 0% | 0% | 1% | 0% | 26% |
| Three Points CDP | 57% | 0% | 0% | 0% | 0% | 7% | 0% | 33% |
| Pinal County | 54% | 3% | 1% | 4% | 0% | 3% | 0% | 31% |

Sources: U.S. Census Bureau (2022a-f).

*Notes: Percentages may not add up exactly to 100 due to the margin of error included in U.S. Census estimates. This margin of error can range from 0.1% to 25.0%.*

Table 19 - Educational Attainment in the Project Vicinity

| Educational Attainment | Avra Valley CDP | Picture Rocks CDP | Three Points CDP | Pima County | Pinal County |
|---|---|---|---|---|---|
| High school or equivalent degree; no college | 43% | 31% | 29% | 21% | 28% |
| Some college, no degree | 29% | 31% | 31% | 23% | 28% |
| Associate's degree | 6.6% | 11% | 7% | 8% | 10% |
| Bachelor's degree | 7% | 7% | 6% | 20% | 15% |
| Graduate or professional degree | 3% | 6% | 5% | 15% | 6% |
| Total | 91% | 87% | 81% | 90% | 88% |

Sources: U.S. Census Bureau (2022a–e).

Table 20 - Employment by Industry in the Project Area

| Industry | Avra Valley CDP | Picture Rocks CDP | Three Points CDP | Pima County | Pinal County | Arizona |
|---|---|---|---|---|---|---|
| Agriculture, forestry, fishing and hunting, and mining | 0% | 5% | 6% | 1% | 2% | 1% |
| Construction | 9% | 8% | 11% | 6% | 7% | 7% |
| Manufacturing | 4% | 4% | 7% | 7% | 9.3% | 7% |
| Wholesale trade | 3% | 3% | 4% | 1% | 1% | 2% |
| Retail trade | 25% | 14% | 14% | 11% | 12% | 11% |
| Transportation and warehousing, and utilities | 6% | 6% | 2% | 4% | 6% | 5% |
| Information | 0% | 2% | 1% | 1% | 1% | 1% |
| Finance and insurance, and real estate and rental and leasing | 1% | 5% | 3% | 5% | 6% | 8% |
| Professional, scientific, and management, and administrative and waste management services | 12% | 8% | 9% | 12% | 11% | 12% |
| Educational services, and health care and social assistance | 16% | 23% | 17% | 25% | 20% | 21% |
| Arts, entertainment, and recreation, and accommodation and food services | 13% | 6% | 9% | 10% | 8% | 9% |
| Other services, except public administration | 1% | 7% | 7% | 4% | 4% | 4% |
| Public administration | 4% | 2% | 3% | 5% | 6% | 4% |

Sources: U.S. Census Bureau (2022a–f).

Table 21 - Median Housing Value in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County and Arizona

| House Value | Avra Valley CDP | Picture Rocks CDP | Three Points CDP | Pima County | Pinal County | Arizona |
|---|---|---|---|---|---|---|
| Less than $50,000 | 14% | 10% | 9% | 7% | 8% | 5% |
| $50,000 to $99,999 | 15% | 22% | 27% | 4% | 6% | 3% |
| $100,000 to $149,999 | 31% | 18% | 19% | 7% | 6% | 2% |
| $150,000 to $199,999 | 21% | 9% | 11% | 12% | 9% | 3% |
| $200,000 to $299,999 | 6% | 17% | 20% | 28% | 27% | 12% |
| $300,000 to $499,999 | 10% | 14% | 11% | 26% | 31% | 37% |
| $500,000 to $999,999 | 1% | 6% | 0% | 10% | 8% | 28% |
| $1,000,000 or more | 0% | 0% | 0% | 2% | 1% | 5% |
| Median value (dollars) | $135,400 | $144,800 | $135,200 | $258,300 | $268,900 | $411,200 |

Sources: U.S. Census Bureau (2022a–f).

Table 22 - Rent in Avra Valley, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona

| Rent Value | Avra Valley CDP | Picture Rocks CDP | Three Points CDP | Pima County | Pinal County | Arizona |
|---|---|---|---|---|---|---|
| Less than $500 | 41% | 3% | 0% | 4% | 5% | 4% |
| $500 to $999 | 34% | 44% | 55% | 39% | 24% | 13% |
| $1,000 to $1,499 | 24% | 35% | 44% | 34% | 30% | 25% |
| $1,500 to $1,999 | 0% | 16% | 0% | 15% | 27% | 28% |
| $2,000 to $2,499 | 0% | 0% | 0% | 3% | 9% | 16% |
| $2,500 to $2,999 | 0% | 0% | 0% | 1% | 1% | 6% |
| $3,000 or more | 0% | 0% | 0% | 0% | 0% | 4% |
| Median value (dollars) | $685 | $1,035 | $987 | $1,071 | $1,317 | $1,608 |

Sources: U.S. Census Bureau (2022a–f).

Table 23 - Poverty by Age in Avra Valle, Picture Rocks, Three Points, Pima County, Pinal County, and Arizona

| Poverty By Age | Avra Valley CDP | Picture Rocks CDP | Three Points CDP | Pima County | Pinal County | Arizona |
|---|---|---|---|---|---|---|
| Under 18 years | 33% | 14% | 17% | 17% | 10% | 17% |
| 18 to 64 years | 17% | 17% | 13% | 13% | 10% | 12% |
| 65 years and older | 11% | 13% | 4% | 11% | 13% | 9% |

Sources: U.S. Census Bureau (2022a–e).

Table 24 - Employment by Industry in the Project Area

| Industry | Pima County | Pinal County | Arizona |
|---|---|---|---|
| Agriculture, forestry, fishing and hunting | $89,393 | $322,189 | $2,615,645 |
| Mining, quarrying, and oil and gas extraction | $988,246 | $375859 | $6,969,929 |
| Utilities | $442,768 | $214055 | $8,991,575 |
| Construction | $2,224,825 | $753,175 | $2,7345,827 |
| Manufacturing | $7,838,012 | $1,789,724 | $39,416,700 |
| Wholesale trade | $1,348,996 | $286,654 | $25,697,177 |
| Retail trade | $3,813,587 | $854,980 | $36,242,281 |
| Transportation and warehousing, and utilities | $1,659,511 | $279,277 | $18,334,466 |
| Information | $1,600,859 | $61,640 | $16,116,403 |
| Finance and insurance, and real estate and rental and leasing | $10,936,465 | $2,780,746 | $111,672,999 |
| Professional, scientific, and management, and administrative and waste management services | $5,280,913 | $765,451 | $55,067,631 |
| Educational services, and health care and social assistance | $5,551,399 | $504,323 | $43,862,902 |
| Arts, entertainment, and recreation, and accommodation and food services | $2,598,699 | $401,396 | $21,324,217 |
| Other services, except public administration | $1,428,731 | $280,735 | $9,589,001 |
| Public administration | $9,997,235 | $2,248,092 | $52,406,946 |
| All industry total | **$55,799,638** | **$11,918,297** | **$475,653,697** |

Sources: U.S. Bureau of Economic Analysis (2022a–c).

# SUBAPPENDIX D.6 PRELIMINARY ALTERNATIVES DEVELOPMENT AND FORMULATION PROCESS

CONTENTS:

- No Content.