ARIZONA LOWER BASIN DROUGHT CONTINGENCY PLAN

FRAMEWORK AGREEMENT

THIS ARIZONA LOWER BASIN DROUGHT CONTINGENCY PLAN FRAMEWORK AGREEMENT ("Agreement"), dated as of May 20, 2019, is entered into among the United States of America represented by the Secretary of the Interior acting through the Regional Director of the Lower Colorado Region of the Bureau of Reclamation, the State of Arizona acting through the Arizona Department of Water Resources, the Arizona Water Banking Authority, the Central Arizona Water Conservation District, the Salt River Project Agricultural Improvement and Power District, the Salt River Valley Water Users' Association, the Colorado River Indian Tribes, and the Gila River Indian Community.

1.0 RECITALS

1.1 In 2007, the Secretary adopted a Record of Decision: the Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead ("2007 Interim Guidelines").

1.2 Based on the actual operating experience gained after the adoption of the 2007 Interim Guidelines and emerging variability and anticipated decline in Colorado River flow volumes, the Parties recognize and acknowledge that those relying on water from the Colorado River System face increased individual and collective risk of temporary or prolonged interruptions in water supplies, with associated adverse impacts on the society, environment, and economy of the Colorado River Basin. Therefore, the seven Colorado River Basin States and water users within those States, together with the Secretary, have agreed that it is necessary and beneficial to pursue additional actions beyond those contemplated in the 2007 Interim Guidelines to reduce the likelihood of reaching critical elevations in Lake Powell and Lake Mead through the Term.

1.3 The Colorado River Basin States, water users, and the Secretary have developed two drought contingency plans: the Upper Basin Drought Contingency Plan ("Upper Basin DCP"), which affects operations above Lee Ferry, and the Lower Basin Drought Contingency Plan ("Lower Basin DCP"), which affects operations below Lee Ferry. Both the Upper Basin DCP and the Lower Basin DCP are supplemental to and in furtherance of the goals of the 2007 Interim Guidelines.

1.4 The Lower Basin DCP is effectuated through the Lower Basin Drought Contingency Plan Agreement ("LBDCP Agreement"), including the Lower Basin Drought Contingency Operations ("LBOps"), attached to the LBDCP Agreement as Exhibit 1 thereto.

1.5 On April 16, 2019, the President of the United States signed Pub. L. No. 116-14 requiring the U. S. Department of Interior to implement the Colorado River Drought Contingency Plans, which includes the LBDCP Agreement. The State of Arizona, acting through the Director of ADWR, is a party to the LBDCP Agreement, which is designed to address falling elevations in Lake Powell and Lake Mead. The LBDCP Agreement requires reductions in Arizona Colorado River diversions at various Lake Mead elevations. Under the Agreement Regarding Lower Basin Drought Contingency Plan Obligations between the United States and CAWCD, CAWCD agreed to implement certain of Arizona's reductions under the LBDCP Agreement, which will result in net reductions to available CAP Project Water.

1.6 The Lower Basin DCP provides for the storage of water under varying conditions and incentivizes the creation and storage of ICS in Lake Mead. In particular, the LBOps require that Arizona make certain contributions, "Arizona DCP Contributions," either through the conversion of ICS to "DCP ICS" or through the "Creation of Non-ICS Water" as those terms are defined within the LBOps. Arizona DCP Contributions are in addition to the reductions provided in Section XI.G.2.D of the 2007 Interim Guidelines.

1.7 The Arizona DCP Contributions required by the LBOps will have different impacts on various stakeholders within Arizona. ADWR and CAWCD formed an Arizona Steering Committee to discuss and recommend how to adopt and implement the Lower Basin DCP in a manner that is acceptable to Arizona water users. After a series of meetings, as well as work group meetings including additional stakeholder representatives, the Arizona Steering Committee developed a proposal for implementation of the Lower Basin DCP within Arizona ("Arizona Implementation Plan").

1.8 **Exhibit 7.1** sets forth the parameters of the Arizona Implementation Plan. The scenarios set forth in **Exhibit 7.1** are for illustrative purposes only and set forth the general expectations of the Parties as to the quantity of Mitigation Resources, as that term is defined in **Exhibit 5.2**, that Parties and other water users in Arizona may expect to deploy or receive pursuant to the various agreements and measures separately adopted for implementing the

Arizona Implementation Plan. The Parties intend to cooperate in good faith to update **Exhibit 7.1** each Year during the Term as set forth herein.

1.9 The Arizona Implementation Plan includes both a mitigation component and an offset component. The mitigation component relies on firming obligations and additional deliveries of water, including ICS previously stored in Lake Mead by CAWCD ("CAP ICS"), as well as compensation and infrastructure funding, to mitigate for the additional reductions in CAP water deliveries required to fulfill the Arizona DCP Contributions. The offset component is designed to conserve additional water in Lake Mead through the creation of ICS and compensated system conservation to offset the CAP ICS deliveries in the mitigation component.

1.10 The offset component is intended to ensure that the total amount of Arizona ICS stored in Lake Mead at the end of the Term, combined with water retained in Lake Mead through Arizona system conservation, will be at least as great as the amount of CAP ICS stored at the beginning of the Term. The Parties are committed to continuing efforts to identify ways to conserve additional water in Lake Mead during the Term.

1.11 The Arizona Implementation Plan seeks to balance a broad variety of stakeholder interests, further the purpose of the Lower Basin DCP through additional storage in Lake Mead and help Arizona water users prepare for a drier future.

1.12 The Arizona Implementation Plan is authorized, agreed to, and documented through numerous laws, policy, agreements, and actions that collectively gained consensus among Arizona stakeholders. This Agreement sets forth those collective actions.

2.0 DEFINITIONS

For purposes of this Agreement, the following terms shall have the meanings set forth below:

2.1 "2007 Interim Guidelines" has the meaning set forth in **Subparagraph 1.1**.

2.2 "ADWR" means the Arizona Department of Water Resources, the entity established pursuant to Title 45 of the Arizona Revised Statutes, or its successor agency or entity.

2.3 "Agreement" means this agreement and the **Exhibits** attached hereto.

2.4 "Arizona DCP Contributions" means reductions, in addition to any reductions provided in Section XI.G.2.D. of the 2007 Interim Guidelines, Arizona is required to make under the LBOps and further described in **Subparagraph 1.6**.

2.5 "Arizona Implementation Plan" has the meaning set forth in **Subparagraph 1.7**.

2.6 "ASC Fund" has the meaning set forth in **Subparagraph 6.1**.

2.7 "AWBA" means the Arizona Water Banking Authority, the entity established pursuant to Chapter 14 of Title 45 of the Arizona Revised Statutes, or its successor agency or entity.

2.8 "CAP" means the Central Arizona Project, the reclamation project authorized and constructed by the United States in accordance with Title III of the Colorado River Basin Project Act (43 U.S.C. §§ 1521 *et seq.*).

2.9 "CAP ICS" has the meaning set forth in **Subparagraph 1.9**.

2.10 "CAWCD" means the Central Arizona Water Conservation District, the political subdivision of the State of Arizona that is the contractor under the contract dated December 1, 1988 (Contract No. 14-06-W-245, Amendment No. 1) between the United States and the Central Arizona Water Conservation District for Delivery of Water and Repayment of Costs of the Central Arizona Project, as amended and revised.

2.11 "Community" means the Gila River Indian Community, a government composed of members of the Pima Tribe and the Maricopa Tribe and organized under section 16 of the Act of June 18, 1934 (25 U.S.C. § 476).

2.12 "Conservation Offsets" means the water conserved, stored, preserved, or left in Lake Mead pursuant to **Paragraph 6.0** to offset any delivery of CAP ICS pursuant to this Agreement as Mitigation Water, measured in acre-feet.

2.13 "**Exhibit**" means an exhibit to this Agreement.

2.14 "GW Fund" has the meaning set forth in **Subparagraph 5.1.2**.

2.15 "ICS" means Intentionally Created Surplus as defined under the 2007 Interim Guidelines.

2.16 "Irrigation Districts" means the Central Arizona Irrigation and Drainage District, Harquahala Valley Irrigation District, Hohokam Irrigation and Drainage District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation and Drainage District, and San Carlos Irrigation and Drainage District.

2.17 "LBDCP Agreement" has the meaning set forth in **Subparagraph 1.4**.

2.18 "LBOps" has the meaning set forth in **Subparagraph 1.4**.

2.19 "Lower Basin DCP" has the meaning set forth in **Subparagraph 1.3**.

2.20 "Mitigation Water" means certain CAP Project Water dedicated to the Arizona Implementation Plan by CAWCD Board resolution consisting of up to four hundred thousand (400,000) acre-feet ("AF") of CAP ICS and an estimated fifty thousand (50,000) AF of CAP Project Water that the CAWCD Board anticipates being available from CAP operations during the term of the LBDCP Agreement.

2.21 "Offset Demand" means the estimated minimum volume of Conservation Offsets needed to offset the delivery of CAP ICS on at least an acre-foot by acre-foot basis during the Term.

2.22 "**Paragraph**" means a paragraph of this Agreement and "**Subparagraph**" means a subparagraph of any Paragraph of this Agreement.

2.23 "Party" means a party to this Agreement and "Parties" means all the parties to this Agreement.

2.24 "Reclamation" means the United States Bureau of Reclamation within the Department of the Interior.

2.25 "Secretary" means the Secretary of the Interior.

2.26 "Shortage Condition" means a Tier 1, Tier 2a, Tier 2b, or Tier 3 Shortage.

2.27 "SRP" means the Salt River Project Agricultural Improvement and Power District, a political subdivision of the State of Arizona, and the Salt River Valley Water Users' Association, an Arizona Territorial Corporation.

2.28 "Term" shall have the meaning set forth in **Paragraph 9.0**.

2.29 "Tier 1 Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be at or below elevation 1,075 feet and at or above 1,050 feet. For the purpose of this definition, "projected on January 1" means the projected Lake Mead elevation based on the Reclamation 24-Month Study that is conducted in August of the previous Year. The 24-Month Study is the operational study that reflects the current Annual Operating Plan that is updated each month by Reclamation to project future Colorado River reservoir contents and releases.

2.30 "Tier 2a Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,050 feet and at or above 1,045 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Subparagraph 2.31** above.

2.31 "Tier 2b Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,045 feet and at or above 1,025 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Subparagraph 2.31** above.

2.32 "Tier 3 Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,025 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Subparagraph 2.31** above.

2.33 "Upper Basin DCP" has the meaning set forth in **Subparagraph 1.3**.

2.34 "Year" means a calendar year.

3.0 EXHIBITS

Exhibit 5.1	Agreement Among the Arizona Department of Water Resources, Central Arizona Water Conservation District, Central Arizona Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District, and the San Carlos Irrigation and Drainage District for the Mitigation of Reductions to CAP Ag Pool Water under the Drought Contingency Plan
Exhibit 5.2	Agreement Among the United States of America, the Arizona Department of Water Resources, the Central Arizona Water Conservation District, Gila River Indian

	Community, City of Chandler, Town of Gilbert, City of Glendale, City of Mesa, City of Phoenix, City of Scottsdale and City of Tempe for the Mitigation of Reductions to CAP NIA Priority Water Under the Drought Contingency Plan
Exhibit 6.1.1	Agreement among the United States of America through the Department of the Interior, Bureau of Reclamation, the State of Arizona, through the Arizona Department of Water Resources, the Central Arizona Water Conservation District, and the Colorado River Indian Tribes to Fund the Creation of Colorado River System Water through Voluntary Water Conservation and Reductions in Use During Calendar Years 2020-2022
Exhibit 6.1.2	Funding Agreement Between the Arizona Department of Water Resources and the Environmental Defense Fund
Exhibit 6.2.1	Intergovernmental Agreement Between the Arizona Water Banking Authority and the Gila River Indian Community for the Development of Intentionally Created Surplus Firming Credits
Exhibit 6.2.2	Agreement Between the United States of America and the Gila River Indian Community for the Development of Intentionally Created Surplus Firming Credits
Exhibit 6.3	CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan
Exhibit 7.1	Arizona Implementation Plan

4.0 FIRMING OBLIGATIONS

4.1 State of Arizona Firming Obligations.

4.1.1 Pursuant to A.R.S. §§ 45-2423(A)(10) and 45-2491, the AWBA is designated as the agent for the State of Arizona for purposes of carrying out the firming obligations under section 105 of Public Law 108-451, the Arizona Water Settlements Act of 2004.

4.1.2 Pursuant to A.R.S. § 45-2457(B), the AWBA may also distribute certain long-term storage credits under certain conditions to meet the demands of CAWCD's municipal and industrial contractors when "CAWCD's normal diversions from the Colorado river have been or will be disrupted by shortages on the river or by disruptions in the operation of the central Arizona project." On March 4, 2019, the AWBA adopted the Policy Regarding the Distribution of Long-Term Storage Credits for Firming CAP Municipal and Industrial Subcontractors.

4.1.3 For purposes of determining the volume of the obligations and commitments described in **Subparagraphs 4.1.1** and **4.1.2** above in each Year, the AWBA shall calculate such obligations and commitments prior to the inclusion of Mitigation Water to be delivered for mitigation under **Exhibit 5.2**.

4.2 United States Firming Obligations.

4.2.1 Pursuant to section 105 of the Arizona Water Settlements Act of 2004, the United States has a statutory obligation to firm specific CAP water supplies for certain Tribes in a Shortage Condition.

4.2.2 For purposes of determining the volume of the obligations and commitments described in **Subparagraph 4.2.1** above, the United States shall calculate the obligations and commitments prior to the inclusion of Mitigation Water to be delivered for mitigation under **Exhibit 5.2**.

5.0 MITIGATION

5.1 CAP Ag Pool Mitigation.

5.1.1 Pursuant to **Exhibits 5.1** and **5.2**, in any Year from 2020 to 2022, inclusive, in which a Shortage Condition exists, CAWCD shall deliver Mitigation Water to mitigate the reduction of the delivery of CAP Ag Pool Water to the Irrigation Districts caused by Arizona DCP Contributions.

5.1.2 The State of Arizona has deposited $9 million into the Temporary Groundwater and Irrigation Efficiency Projects Fund ("GW Fund") established by A.R.S. § 45-615.01. ADWR will deposit additional monies into the GW Fund from groundwater withdrawal fees levied in the Pinal Active Management Area during Years 2020 through 2026. It is estimated that the total amount of the groundwater withdrawal fees that will be deposited into the GW Fund will be approximately $8 million. ADWR will grant monies from the GW Fund to qualified irrigation districts in the Phoenix Active Management Area, the Pinal Active Management Area and the Harquahala Irrigation Non-expansion Area to fund projects for the construction and rehabilitation of wells and related infrastructure for the withdrawal and efficient delivery of groundwater by the irrigation districts. Monies in the GW Fund derived from groundwater withdrawal fees levied in the Pinal Active Management Area may be granted only to qualified irrigation districts in the Pinal Active Management Area. In granting monies from the GW Fund, ADWR may give preference to wells and related infrastructure that would be used to recover stored water.

5.1.3 CAWCD's Board of Directors has committed up to $5 million in ad valorem taxes for the CAP Ag Pool Groundwater Infrastructure and Efficiency Program, subject to participation by other non-federal cost share partners and the development of a definitive program proposal that incorporates the need for recovery infrastructure.

5.1.4 The Irrigation Districts have committed to contribute a cumulative total of $5 million towards projects to construct and rehabilitate wells and related infrastructure for the withdrawal and delivery of groundwater.

5.1.5 ADWR will apply to the United States Department of Agriculture Natural Resources Conservation Service for $25 million from the Regional Conservation Partnership Program to help fund the construction and rehabilitation of wells and related infrastructure for the withdrawal and delivery of groundwater by the qualified Irrigation Districts in the Phoenix Active Management Area, Pinal Active Management Area and Harquahala Irrigation Non-expansion area. The application will identify a number of other entities as program partners, including the Irrigation Districts, CAWCD, Reclamation, the Arizona Farm Bureau, and Arizona Water Company. The Parties have agreed to provide reasonable, good faith support for the ADWR application filed pursuant to this **Subparagraph**.

5.2 **CAP NIA Priority Mitigation.** Pursuant to **Exhibit 5.2** in any Year from 2020 to 2025, inclusive, in which a Shortage Condition exists CAWCD shall deliver Mitigation Water and provide Compensated Mitigation Resources, as that term is defined in **Exhibit 5.2**, to mitigate the reduction of the delivery of CAP NIA Priority Water to entities with long term CAP contracts caused by Arizona DCP Contributions.

6.0 CONSERVATION OFFSETS.

Offset Demand as of the date of execution of this Agreement requires the creation of at least four hundred thousand (400,000) acre-feet of Conservation Offsets.

6.1 Colorado River Indian Tribes System Conservation.

6.1.1 Pursuant to **Exhibit 6.1.1**, the Colorado River Indian Tribes has agreed to create one hundred fifty thousand (150,000) acre-feet of system conservation through voluntary water conservation and reductions in consumptive use in return for payment from the Arizona System Conservation Fund established by A.R.S. § 45- 118 ("ASC Fund").

6.1.2 Pursuant to **Exhibit 6.1.2**, the Environmental Defense Fund agrees to contribute funding to the ASC Fund for the Colorado River Indian Tribes System Conservation.

6.2 Gila River Indian Community Intentionally Created Surplus (ICS).

6.2.1 Pursuant to **Exhibit 6.2.1**, during the Term the Community shall create fifty thousand (50,000) acre-feet of "AZ Firming ICS" as that term is defined in **Exhibit 6.2.1**.

6.2.2 Pursuant to **Exhibit 6.2.2**, during the Term the Community shall create one hundred thousand (100,000) acre-feet of ICS.

6.2.3 During the Term, in addition to the ICS that the Community shall create pursuant to **Subparagraphs 6.2.1** and **6.2.2**, the Community shall create fifty thousand (50,000) acre-feet of "Community ICS" as required pursuant to **Exhibit 6.2.1**.

6.2.4 ADWR shall notify the Community in writing if additional ICS is required to meet the target of four hundred thousand (400,000) acre-feet of Conservation Offsets. Upon receipt of this written notice, the Community and ADWR shall meet to establish a schedule for the creation of an additional amount of ICS up to a maximum amount of twenty-two thousand

(22,000) acre-feet of "Conditional ICS" as required pursuant to **Exhibit 6.2.1**.

6.3 **CAWCD and SRP Exchange.** Pursuant to **Exhibit 6.3**, CAWCD shall partially meet its mitigation requirement under this Agreement through the delivery of up to fifty thousand (50,000) AF of SRP exchange water in lieu of delivery of CAP ICS, thereby preserving fifty thousand (50,000) AF of CAP ICS in Lake Mead as Conservation Offsets.

7.0 ADJUSTMENTS TO EXHIBIT 7.1

7.1 By May 1 of each Year the Parties will meet and confer to consider amending **Exhibit 7.1** to reflect actual deliveries of Mitigation Resources, as that term is defined in **Exhibit 5.2**, during the prior Year, projected deliveries of Mitigation Resources for each remaining Year of the term of this Agreement, and the projected Offset Demand.

7.2 The Parties will meet in November of each Year to review and confirm Mitigation Water to be delivered in the subsequent Year pursuant to the relevant respective agreements described in this Agreement.

8.0 ADDITIONAL PARTIES.

This Agreement shall be effective upon its execution by the original Parties hereto, including the United States, ADWR, AWBA, CAWCD, Colorado River Indian Tribes and the Community. Any entity that is contributing resources to or receiving resources from the Arizona Implementation Plan may automatically join as a Party upon execution of this Agreement; provided that such execution must occur within sixty (60) calendar days of the Agreement's execution by the original Parties hereto. To effectuate such joinder any entity seeking to join as a Party shall provide its execution page to ADWR.

9.0 TERM.

This Agreement shall become effective on the date on which all of the following have occurred: (a) this Agreement has been executed by all Parties; (b) the LBDCP Agreement has been signed by all parties to that agreement; and, (c) the Agreement Regarding Lower Basin Drought Contingency Plan Obligations has been signed by all parties to that agreement. This Agreement shall terminate on December 31, 2026.

10. CONTINGENT ON APPROPRIATION OR ALLOTMENT OF FUNDS.

The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

11. OFFICIALS NOT TO BENEFIT.

No Member of or Delegate of Congress, Resident Commissioner, or official of the Parties shall benefit from this Agreement other than as a water user or landowner in the same manner as other water users or landowners.

[Separate Signature Pages to Follow for Each Party]

UNITED STATES OF AMERICA

By: ______________________________

Terrance J. Fulp, Ph.D.
Regional Director
Lower Colorado Region
Bureau of Reclamation

STATE OF ARIZONA
ACTING THROUGH THE ARIZONA DEPARTMENT OF WATER RESOURCES

By: ______________________________
Thomas Buschatzke, Director

Approved as to form:

By: ______________________________
Nicole D. Klobas, Deputy Chief Counsel

GILA RIVER INDIAN COMMUNITY

By ____________________________________
Stephen Roe Lewis, Governor

Approved as to form:

By: ____________________________________ for
Linus Everling, General Council

ARIZONA WATER BANKING AUTHORITY

By: ______________________________

Thomas Buschatzke, Chair

Attest:

By: ______________________________

Kathryn A. Sorensen, Secretary

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: ______________________
Lisa Atkins, President

Attest:

By: ______________________
Sharon Megdal, Secretary

Approved as to form:

By: ______________________
Jay Johnson, General Counsel

COLORADO RIVER INDIAN TRIBES

By: ______________________________

Dennis Patch, Chairman

Approved as to Form:

By: ______________________________

Rebecca Loudbear, Attorney General

TOWN OF GILBERT, an Arizona municipal corporation

By_______________________
Jenn Daniels, Mayor
Date Signed: 6/20/19

ATTEST:

____
Lisa Maxwell, City Clerk

APPROVED AS TO FORM:

____
Title: Town Attorney

SALT RIVER PROJECT AGRICULTURAL IMPROVEMENT AND POWER DISTRICT

By: ______________________________

Approved as to form:

By: ______________________________ FOR

General Counsel

SALT RIVER VALLEY WATER USERS' ASSOCIATION

By: ______________________

Approved as to form:

By: ______________________ FOR

General Counsel

ARIZONA LBDCP FRAMEWORK AGREEMENT
EXHIBIT LIST
EXHIBITS TO BE ATTACHED AS EXECUTED

Exhibit 5.1	Agreement Among the Arizona Department of Water Resources, Central Arizona Water Conservation District, Central Arizona Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District, and the San Carlos Irrigation and Drainage District for the Mitigation of Reductions to CAP Ag Pool Water under the Drought Contingency Plan
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Exhibit 6.3	CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan
Exhibit 7.1	Arizona Implementation Plan

EXHIBIT 5.1

AGREEMENT AMONG THE ARIZONA DEPARTMENT OF WATER RESOURCES, CENTRAL ARIZONA WATER CONSERVATION DISTRICT, CENTRAL ARIZONA IRRIGATION AND DRAINAGE DISTRICT, HOHOKAM IRRIGATION AND DRAINAGE DISTRICT, HARQUAHALA VALLEY IRRIGATION DISTRICT, MARICOPA STANFIELD IRRIGATION & DRAINAGE DISTRICT, QUEEN CREEK IRRIGATION DISTRICT AND SAN CARLOS IRRIGATION AND DRAINAGE DISTRICT FOR THE MITIGATION OF REDUCTIONS TO CAP AG POOL WATER UNDER THE DROUGHT CONTINGENCY PLAN

This Agreement ("Agreement") is made this 30th day of July 2019 among the Arizona Department of Water Resources, Central Arizona Water Conservation District, Central Arizona Irrigation and Drainage District, Hohokam Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District, and San Carlos Irrigation District, sometimes each individually referred to in this Agreement as a "Party" and collectively as the "Parties."

RECITALS

A. The Central Arizona Water Conservation District ("CAWCD") is a political subdivision of the State of Arizona established pursuant to Arizona Revised Statutes §§ 48-3701, et seq., which operates the Central Arizona Project ("CAP") pursuant to contracts and agreements with the United States.

B. The Central Arizona Irrigation and Drainage District, Hohokam Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District, and San Carlos Irrigation District (collectively defined hereinafter as the "Irrigation Districts") each have Contracts for Excess Water that was reserved for agricultural uses pursuant to the CAWCD Policy for Marketing of Excess Water For Non-Indian Agriculture Use – 2004 Through 2030.

C. On April 16, 2019, the President of the United States signed Pub. L. No 116-14, directing the United States Department of the Interior to implement the Colorado River Drought Contingency Plan, which includes the Lower Basin Drought Contingency Plan Agreement ("LBDCP Agreement"). The State of Arizona, acting through the Arizona Department of Water Resources ("ADWR"), is a party to the LBDCP Agreement, which is designed to address falling elevations in Lake Mead. The LBDCP Agreement requires reductions in Arizona Colorado River diversions at various Lake Mead elevations. Under the Agreement Regarding Lower Basin Drought Contingency Plan Obligation, CAWCD agreed to satisfy certain of Arizona's reductions under the LBDCP Agreement, which will result in net reductions to available CAP Project Water.

D. CAWCD and ADWR jointly convened the Lower Basin Drought Contingency Plan Arizona Implementation Steering Committee ("Steering Committee") composed of Arizona water users, stakeholders and legislative leaders to discuss and recommend how to adopt and implement the LBDCP Agreement in a way that is acceptable to Arizona water users. The Steering Committee identified various resources that were expected to be available during the term of the LBDCP Agreement that could partially mitigate the impacts of DCP Reductions on lower-priority CAP water users. This included an estimated 80,000 acre-feet of Project Water that the CAWCD Board anticipated being available from CAP operations during the term of the LBDCP Agreement. The CAWCD Board further committed up to 400,000 acre-feet of Intentionally Created Surplus ("ICS") water held by CAWCD and up to $60,000,000 of compensated mitigation resources. In addition, various CAP users agreed to undertake storage of CAP water at Groundwater Savings Facilities ("GSF") to offset the impacts of DCP Reductions to the Irrigation Districts. Portions of these resources will be used to provide mitigation to CAP NIA Priority contractors and subcontractors, pursuant to the terms of the NIA Mitigation Agreement, while other portions will be used to provide mitigation to the Irrigation Districts pursuant to the terms of this Agreement.

E. This Agreement is intended to govern the mitigation provided to the Irrigation Districts during the Term of this Agreement.

AGREEMENT

1. Definitions.

    a. "Ag Mitigation" means the use of Mitigation Water to provide 105,000 acre-feet ("AF") of water to the Irrigation Districts during each Year 2020, 2021 and/or 2022 that a Tier 1 Shortage exists, and to provide 70,000 AF of water to the Irrigation Districts during each Year 2020, 2021 and/or 2022 that a Tier 2 Shortage exists, as more fully set forth in Section 3 of this Agreement.

    b. "AWBA Exchange Agreement" means the Lower Basin Drought Contingency Plan ("LBDCP") Implementation Plan: Agreement to Exchange Long-Term Storage Credits Between Arizona Water Banking Authority and City of Avondale; City of Chandler; City of Goodyear; City of Peoria; City of Phoenix; City of Scottsdale; City of Tucson; Freeport Minerals Corporation; and EPCOR Water Arizona Inc.

    c. "CAP ICS" means up to 400,000 AF of ICS held by CAWCD and dedicated by resolution of the CAWCD Board for mitigation purposes, including 50,000 AF CAP ICS that will be preserved in Lake Mead for the duration of the Term to allow for the delivery of up to an equivalent amount of exchange water that will be provided by the Salt River Project pursuant to the CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan.

d. "DCP Reduction" means a reduction in available Project Water in a given Year as the result of Arizona DCP Contributions pursuant to the LBDCP Agreement.

e. "Excess Water" means that water defined as Excess Water in the Repayment Stipulation.

f. "Irrigation Districts" means Central Arizona Irrigation and Drainage District, Hohokam Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District, and San Carlos Irrigation District.

g. "Mitigation Water" means a) CAP Water stored by cities, industries, and water utilities at the Irrigation Districts' GSFs during DCP Reductions as described in Exhibit A to the AWBA Exchange Agreement; b) up to 400,000 AF of CAP ICS; c) approximately 50,000 AF of Project Water estimated to be available from CAP operations during the term of this Agreement; and d) exclusively in 2022, Replacement Groundwater Supplies.

h. "NIA Mitigation Agreement" means the Agreement Among the Central Arizona Water Conservation District, Gila River Indian Community, City of Chandler, Town of Gilbert, City of Glendale, City of Mesa, City of Phoenix, City of Scottsdale and City of Tempe for the Mitigation of Reductions to CAP NIA Priority Water under the Drought Contingency Plan.

i. "Repayment Stipulation" means the Stipulated Judgment and the Stipulation for Judgment (including any exhibits to those documents) entered on November 21, 2007, in the United States District Court for the District of Arizona in the consolidated civil action styled *Central Arizona Water Conservation District v. United States, et al.*, and numbered CIV 95-625-TUC-WDB (EHC) and CIV 95-1720-PHX-EHC.

j. "Replacement Groundwater Supplies" means groundwater supplies available to the Irrigation Districts as a result of new groundwater infrastructure development funding provided to the Irrigation Districts consistent with the Regional Conservation Partnership Program proposal "Central Arizona Regionally Irrigation Efficiency and Conservation Project."

k. "Tier 1 Shortage" means a Year in with the Lake Mead content is projected on January 1 of that Year to be at or below elevation 1,075 feet and at or above 1,050 feet. For the purpose of this definition, "projected on January 1" means the projection based on the Reclamation 24-Month Study that is conducted in August of the previous Year. The 24-Month Study is the operational study that reflects the current Annual Operating Plan that is updated each month by Reclamation to project future Colorado River reservoir contents and releases.

l. "Tier 2a Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,050 feet and at or above 1,045 feet. For the purpose of this definition "projected on January 1" shall have the same meaning set forth in Section 1(k) above.

m. "Tier 2b Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,045 feet and at or above 1,025 feet. For the purpose of this definition "projected on January 1" shall have the same meaning set forth in Section 1(k) above.

n. "Tier 3 Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,025 feet. For the purpose of this definition "projected on January 1" shall have the same meaning set forth in Section 1(k) above.

o. "Year" means a calendar year.

2. Term. This Agreement shall become effective when all of the following have occurred: a) this Agreement has been executed by all Parties; b) the LBDCPA Agreement has been signed by all parties to that agreement; and c) the Agreement Regarding Lower Basin Drought Contingency Plan Obligations has been signed by all parties to that agreement. This Agreement shall terminate on December 31, 2026.

3. Ag Mitigation. In 2020, 2021 and 2022, CAWCD and the Irrigation Districts agree that the Irrigation Districts shall be entitled to receive Mitigation Water as provided and subject to the conditions herein:

   a. In a Tier 1 Shortage, the Irrigation Districts shall be entitled to a combined total of 105,000 acre-feet per Year of Mitigation Water.

   b. In a Tier 2 Shortage, the Irrigation Districts shall be entitled to a combined total of 70,000 acre-feet per Year of Mitigation Water.

   c. In the event a Tier 3 Shortage condition exists, the Irrigation Districts shall not be entitled to any Mitigation Water for the Year(s) in which the Tier 3 shortage is in effect; provided however that the Irrigation Districts shall be entitled to use Replacement Groundwater Supplies during any Year in which a Tier 3 Shortage condition exists.

   d. In any Year in which Tier 1 Shortage, Tier 2 Shortage or Tier 3 Shortage is not in effect, CAWCD agrees that Excess Water shall be available to the Irrigation Districts consistent with the terms of the Arizona Water Rights Settlement Agreement, the Excess Water contracts held by the Irrigation Districts, and

CAWCD's Policy for Marketing Excess Water for Non-Indian Agricultural Use 2004 Through 2030 and associated Supplemental Policies.

e. The Irrigation Districts' entitlement to Mitigation Water shall be satisfied from the following resources in the priority order stated below:
   i. First – CAP Water stored by cities, industries, and water utilities at the Irrigation Districts' GSFs during a Tier 1 Shortage or Tier 2 Shortage as described in Exhibit A to the AWBA Exchange Agreement.
   ii. Second – beginning in Year 2022, Replacement Groundwater Supplies
   iii. Third - CAP supplies including:
      1. Up to 50,000 AF of Project Water estimated to be available from CAP operations during the term of this Agreement; and
      2. Up to 400,000 AF of CAP ICS

f. CAWCD may use a portion of the CAP supplies identified in Section 3(e)(iii) to supply water to CAP NIA Priority contractors and subcontractors pursuant to the NIA Mitigation Agreement; provided however, that CAWCD shall not deliver Mitigation Water to the Irrigation Districts unless it has fully satisfied CAP NIA priority contractors' and subcontractors' water orders consistent with the provisions of the NIA Mitigation Agreement.

g. Total deliveries to the Irrigation Districts from the CAP supplies identified in Section 3(e)(iii) shall not exceed the following:

   i. 58,500 AF in Years 2020 or 2021 during a Tier 1 Shortage

   ii. 23,500 AF in Years 2020 or 2021 during a Tier 2a Shortage

   iii. 70,000 AF in Years 2020 or 2021 during a Tier 2b Shortage

   iv. 42,000 AF in Year 2022 during a Tier 1 Shortage

   v. 7,000 AF in Year 2022 during a Tier 2a Shortage

   vi. 53,500 in Year 2022 during a Tier 2b Shortage

h. The total Mitigation Water delivered to the Irrigation Districts in any Year shall be allocated to each irrigation district as follows, unless otherwise agreed to by the Irrigation Districts:
   i. Central Arizona Irrigation and Drainage District: 34%
   ii. Maricopa Stanfield Irrigation & Drainage District: 33%
   iii. Hohokam Irrigation and Drainage District: 11%
   iv. Harquahala Valley Irrigation District: 10%
   v. San Carlos Irrigation and Drainage District: 10%
   vi. Queen Creek Irrigation District: 2%

i. The Irrigation Districts shall not be entitled to Mitigation Water in Years 2023, 2024, 2025, or 2026. The Parties agree that this provision shall in no way be construed to preclude the Irrigation Districts from utilizing Replacement Groundwater Supplies in 2023, 2024, 2025 or 2026.

j. Nothing in this Section 3 shall prevent CAP contractors and subcontractors from entering into voluntary agreements with one or more of the CAP Irrigation Districts to deliver CAP water for storage in GSF facilities.

4. Annual Coordination.

   a. On or before September 1 of 2019, 2020 and 2021, the Parties will meet and confer to discuss the water orders for the next Year and the sources identified in Section 3(e)(i)-(iii) available to satisfy those orders.

   b. In the 2021 annual meeting, the Irrigation Districts will use their best efforts to quantify the amount of Replacement Groundwater Supplies that will be available for use in 2022.

   c. On or before October 1 of 2019, 2020 and 2021, the Irrigation Districts shall provide CAWCD with any agreements among the Irrigation Districts to vary from the allocation of Mitigation Water to each irrigation district as set forth in Section 3(h).

5. Satisfaction of Rights. The Irrigation Districts agree that during the term of this agreement, the Mitigation provided for in Section 3 fully satisfies CAWCD's obligations for delivery of Excess CAP water under the terms of the Arizona Water Rights Settlement Agreement, Excess Water contracts held by the Irrigation Districts, and CAWCD's Policy for Marketing of Excess Water for Non-Indian Agricultural Use 2004 Through 2030 and associated Supplemental Policies.

6. Miscellaneous Provisions.

   a. Notices. Any notice, demand, or request authorized or required by this Agreement shall be in writing and shall be deemed to have been duly given if delivered by email to a valid email address designated by the Parties, or if mailed first class or delivered, to the following address:

If to ADWR	Arizona Department of Water Resources Attn: Director P.O. Box 36020 Phoenix, AZ 85067

If to CAWCD: Central Arizona Water Conservation District
Attn: General Manager
P.O. Box 43020
Phoenix, AZ 85080-3020

If to Central Arizona Irrigation and Drainage District:

Central Arizona Irrigation and Drainage District
Attn: General Manager
231 S. Sunshine Blvd.
Eloy, AZ 85131

If to Hohokam Irrigation and Drainage District:

Hohokam Irrigation and Drainage District
Attn: Sidney Smith, General Manager
142 South Arizona Blvd.
Coolidge, AZ 85128

If to Harquahala Valley Irrigation District:

Harquahala Valley Irrigation District
Attn: Rick Warren, Manager
402 S. Harquahala Valley Road
Tonopah, AZ 85354

If to Maricopa Stanfield Irrigation & Drainage District:

Maricopa Stanfield Irrigation & Drainage District
Attn: MSIDD General Manager
41630 W. Louis Johnson Dr.
Maricopa, AZ 85138

With copy to: Paul R. Orme
2850 E. Camelback Road, Suite 200
Phoenix, AZ 85016

If to Queen Creek Irrigation District:

Queen Creek Irrigation District
Attn: General Manager
P.O. Box 690
Queen Creek, AZ 85142

If to San Carlos Irrigation and Drainage District:

San Carlos Irrigation and Drainage District
Attn: General Manager
P.O. Box 218
Coolidge, AZ 85128

b. Representations and Warranties.
   i. Each Party has all legal power and authority to enter into this Agreement and to perform its obligations hereunder on the terms set forth in this Agreement, and the execution and delivery hereof by each Party and the performance by each Party of its obligations hereunder shall not violate or constitute an event of default under the terms or provisions of any agreement, document, or instrument to which each of the Parties is a party or by which each Party is bound.
   ii. Each Party warrants and represents that the individual executing this Agreement on behalf of the Party has the full power and authority to bind the Party he or she represents to the terms of this Agreement.
   iii. This Agreement constitutes a valid and binding agreement of each Party, enforceable against each Party in accordance with its terms.

c. Binding Effect and Limited Assignment. The provisions of this Agreement shall apply to and bind the successors and assigns of the Parties upon receipt of written agreement to the terms of this Agreement, but no assignment or transfer of this Agreement or any right or interest therein shall be valid until approved in writing by all Parties.

d. Amendment, Modification, and/or Supplement. No amendment, modification, or supplement to this Agreement shall be binding unless it is in writing and signed by all Parties.

e. No Third-Party Beneficiaries. This Agreement is not intended nor shall it be construed to create any third-party beneficiary rights to enforce the terms of this Agreement on any person or entity that is not a Party.

f. Counterparts. This Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Agreement.

g. Uncontrollable Forces. No Party will be considered to be in default in the performance of any of its obligations hereunder when a failure of performance is due to uncontrollable forces. The term "uncontrollable forces" shall mean any cause beyond the control of the Party unable to perform such obligation, including, but not limited to, failure of or threat of failure of facilities, flood, earthquake, storm, fire, lightning and other natural catastrophes, epidemic, war, riot, civil disturbance or disobedience, strike, labor dispute, labor or material shortage, sabotage, terrorism, or restraint by court order or public authority, which by exercise of due diligence such Party could not reasonably have been expected to avoid and which by exercise of due diligence it shall be unable to overcome. Drought and water shortages contemplated by this Agreement are not "uncontrollable forces" for the purposes of this Agreement.

h. Dispute Resolution. The Parties shall attempt to resolve all claims, disputes, controversies, or other matters in question between the Parties arising out of, or relating to this Agreement promptly, equitably, and in good faith. The Parties also agree to resolve all disputes arising out of or relating to this Agreement through arbitration, after exhausting applicable administrative review, to the extent required by A.R.S. § 12-1518.

i. Choice of Law. This Agreement is governed by and shall be construed and interpreted in accordance with Arizona law. Any action to resolve any dispute regarding this Agreement shall be taken in a state court of competent jurisdiction located in Maricopa County, Arizona.

j. Conflict of Interest. The Parties to this Agreement are hereby notified of and acknowledge A.R.S. § 38-511 regarding cancellation for conflict of interest.

k. Records and Inspections. All books, accounts, reports, files and other records in relation to this Agreement shall be subject at all reasonable times to inspection and audit by the Parties throughout the term of this Agreement and for a period of five years after the completion of this Agreement. Upon request, a Party must produce original of any or all such records.

l. Equal Opportunity. The Parties shall comply with State Executive Order No. 75-5, as amended by State Executive Order No. 2009-9, and all other applicable Federal and State laws, rules and regulations relating to equal opportunity and non-discrimination, including the Americans with Disabilities Act.

m. Availability of Funds. In accordance with ARS § 35-154, every payment obligation of the State under this Agreement is conditioned upon the availability of funds appropriated or allocated for payment of such obligation.

Signature pages follow

ARIZONA DEPARTMENT OF WATER RESOURCES

By ______________________
Thomas Buschatzke, Director

Date: 20 May 2019

APPROVED AS TO FORM:

By ______________________
Nicole D. Klobas, Deputy Chief Counsel

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: Lisa A. Atkins
Lisa Atkins, President

Date: 20May19

ATTEST:

By: Sharon B Megdal
Sharon Megdal, Secretary

APPROVED AS TO FORM:

By: ______________________
Jay Johnson, General Counsel

CENTRAL ARIZONA IRRIGATION AND DRAINAGE DISTRICT

By: Daniel Shedd

Daniel Shedd, President

Date: 6-25-19

ATTEST:

By: Ronald McEachern

~~Rodney Shedd, Secretary~~

RONALD McEACHERN ASST./SEC.

APPROVED AS TO FORM:

By: Paul R Orme

HOHOKAM IRRIGATION AND DRAINAGE DISTRICT

By: Waylon Wuertz

Waylon Wuertz, President

Date: 7-10-19

ATTEST:

By: Colin M. Scott

Colin Scott, Secretary

APPROVED AS TO FORM:

By: Michael Curtis

Michael Curtis, District Counsel

HARQUAHALA VALLEY IRRIGATION AND DRAINAGE DISTRICT

By: Rick Warner

Date: 6-20-19

ATTEST:

By: ______________________________

APPROVED AS TO FORM:

By: ______________________________

MARICOPA STANFIELD IRRIGATION & DRAINAGE DISTRICT

By: Bryan M. Hartman
Bryan Hartman, President

Date: 06-26-2019

ATTEST:

By: ______________________________
Kelly Anderson, Secretary

APPROVED AS TO FORM:

By: ______________________________

QUEEN CREEK IRRIGATION DISTRICT

By: ______________________

Date: 6-25-19

ATTEST:

By: Michael K. [illegible]

APPROVED AS TO FORM:

By: ______________________

SAN CARLOS IRRIGATION AND DRAINAGE DISTRICT

By: ______________________

Date: 7/30/19

ATTEST:

By: ______________________

APPROVED AS TO FORM:

By: ______________________

EXHIBIT 5.2

AGREEMENT
AMONG
THE UNITED STATES OF AMERICA REPRESENTED BY THE SECRETARY OF THE INTERIOR ACTING THROUGH THE REGIONAL DIRECTOR OF THE LOWER COLORADO REGION OF THE BUREAU OF RECLAMATION, THE ARIZONA DEPARTMENT OF WATER RESOURCES, THE ARIZONA WATER BANKING AUTHORITY, THE CENTRAL ARIZONA WATER CONSERVATION DISTRICT, THE GILA RIVER INDIAN COMMUNITY, CITY OF CHANDLER, TOWN OF GILBERT, CITY OF GLENDALE, CITY OF MESA, CITY OF PHOENIX, CITY OF SCOTTSDALE AND CITY OF TEMPE
FOR THE MITIGATION OF REDUCTIONS TO NIA PRIORITY CAP WATER UNDER THE DROUGHT CONTINGENCY PLAN

THIS AGREEMENT (this "NIA Mitigation Agreement" or "Agreement") is made this 18th day of July, 2019, among the City of Chandler, Town of Gilbert, City of Glendale, City of Mesa, City of Phoenix, City of Scottsdale, and City of Tempe, (collectively referred to as the "Cities"), the United States of America, the Arizona Department of Water Resources ("ADWR"), the Arizona Water Banking Authority ("AWBA"), the Central Arizona Water Conservation District ("CAWCD"), and the Gila River Indian Community ("Community"), sometimes each referred to in this Agreement as a "Party" and collectively as the "Parties".

Recitals

A. Cities are municipal corporations that operate municipal utilities and serve water to customers within their service areas. Cities are legally entitled to Non-Indian Agricultural Priority ("NIA Priority") water from the Central Arizona Project ("CAP") through various contracts, subcontracts and agreements with the U.S. Bureau of Reclamation ("Reclamation"), CAWCD, and other parties.

B. The Community is a federally-recognized Indian Tribe that is legally entitled to NIA Priority CAP water from the CAP under the Arizona Water Settlements Act of 2004, Pub. Law 108-451 (Dec. 10, 2004), and through an agreement with the United States through Reclamation.

C. CAWCD is a political subdivision of the State of Arizona, established pursuant to Arizona Revised Statutes § 48-3701 *et seq.*, which operates the CAP pursuant to various contracts and agreements with Reclamation.

D. On April 16, 2019, the President of the United States signed Pub. L. No. 116-14, requiring the United States Department of the Interior to implement the Colorado River Drought Contingency Plans, which includes the Lower Basin Drought Contingency Plan Agreement ("LBDCP Agreement"). The State of Arizona ("Arizona"), acting through the Director of ADWR, is a party to the LBDCP Agreement, which is designed to address falling elevations in Lake Powell and

Lake Mead. The LBDCP Agreement requires reductions in Arizona Colorado River diversions at various Lake Mead elevations. Under the Agreement Regarding Lower Basin Drought Contingency Plan Obligations between the United States and CAWCD, CAWCD agreed to implement certain of Arizona's reductions under the LBDCP Agreement, which will result in net reductions to available CAP Project Water.

E. The Lower Basin Drought Contingency Plan Arizona Implementation Steering Committee ("Steering Committee") developed the "Arizona DCP Implementation Framework". CAWCD, Reclamation, ADWR, AWBA, the Community and certain other major water users in Arizona entered into the Arizona DCP Implementation Framework Agreement ("DCP Framework Agreement"). Consistent with the DCP Framework Agreement, various Arizona parties are entering into agreements and arrangements that, taken together, are intended to partially "mitigate" the impacts of DCP Reductions on lower-priority CAP water users.

F. The DCP Framework Agreement identified various resources that were expected to be available during the term of the LBDCP Agreement that could reduce these impacts. This included an estimated eighty thousand (80,000) acre-feet of Project Water that the CAWCD Board anticipated being available from CAP carry-over and Lake Pleasant operations during the term of the LBDCP Agreement and committed to the Arizona Implementation Framework. The CAWCD Board further committed up to four hundred thousand (400,000) acre-feet of Intentionally Created Surplus ("ICS") water held by CAWCD and up to $60,000,000 of Compensated Mitigation Resources (as defined elsewhere in this Agreement). In addition, various CAP users agreed to undertake storage of CAP water at Groundwater Savings Facilities ("GSFs") to offset the impacts of DCP Reductions to CAP agricultural districts.

G. Pursuant to Section 105 of Public Law 108-451, the Arizona Water Settlements Act of 2004, the United States and Arizona have a statutory obligation to firm specific CAP water supplies for certain Tribes in times of shortage. Therefore, the Tohono O'odham Nation is not a party to this Agreement as their NIA priority entitlement will be firmed by the United States and will not require mitigation.

H. Finally, the DCP Framework Agreement includes the storage of additional ICS by the Community and compensated reductions in use by certain other parties as "system conservation" to offset additional withdrawals from Lake Mead that could occur as a result of the delivery of CAP ICS, as well as the preservation of fifty thousand (50,000) acre-feet of CAP ICS in Lake Mead for the duration of the Term.

I. Certain of the resources described in Recital F are within the control of CAWCD and are to be deployed to replace or increase deliveries of Project Water to parties with contractual entitlements to M&I, Indian Priority, and NIA Priority CAP water during any Tier 1 Shortage, Tier 2a Shortage, or Tier 2b Shortage (as hereinafter defined) if such conditions occur during the Years 2020, 2021, and/or 2022, and thereafter to provide for deliveries of Project Water to certain agricultural districts during a Tier 1 Shortage, Tier 2a Shortage, and Tier 2b Shortage, if such condition(s) occur during 2020, 2021, and/or 2022, as specifically set forth in the Ag Mitigation Agreement and this Agreement. If those shortage conditions occur during 2023, 2024, and/or 2025, the remaining resources are to be deployed to replace or increase deliveries of Project Water to parties with contractual entitlements to M&I, Indian Priority, and NIA Priority CAP water as specifically set forth in this Agreement.

J. This Agreement is intended to govern how the NIA Mitigation will be undertaken as part of the DCP Framework Agreement. The Parties' ability and willingness to enter into this Agreement are contingent upon the Director of ADWR executing the LBDCP Agreement.

1. <u>Definitions</u>. Unless otherwise defined within this Agreement, the definitions within the Parties' CAP contracts and subcontracts and the Repayment Stipulation shall apply to this Agreement. Definitions contained in the Recitals to this Agreement are hereby incorporated by reference.

   a. "Ag Mitigation" means water supplies provided to the CAP Irrigation Districts in accordance with the Ag Mitigation Agreement and this Agreement.

   b. "Ag Mitigation Agreement" means the Agreement Among the Central Arizona Water Conservation District, Central Arizona Irrigation and Drainage District, Hohokam Irrigation and Drainage District, Harquahala Valley Irrigation District, Maricopa Stanfield Irrigation & Drainage District, Queen Creek Irrigation District and San Carlos Irrigation and Drainage District for the Mitigation of Reductions to CAP Ag Pool Water Under the Drought Contingency Plan.

   c. "Annual Operating Plan" means the final water delivery schedules prepared annually by CAWCD, confirming the volumes of water to be delivered during the following Year.

d. "CAP Delivery Supply" means the amount of Project Water determined to be available for delivery to CAP contractors and subcontractors in the Annual Operating Plan.

e. "CAP Irrigation Districts" means the various CAP irrigation districts that are parties to the Ag Mitigation Agreement.

f. "CAP ICS" means up to four hundred thousand (400,000) acre-feet of ICS held by CAWCD, dedicated by resolution of the CAWCD Board for mitigation purposes as outlined in the DCP Framework Agreement, including fifty thousand (50,000) acre-feet of CAP ICS that will be preserved in Lake Mead for the duration of the Term to allow for the delivery of up to an equivalent amount of exchange water that will be provided by the Salt River Project pursuant to the CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan.

g. "Compensated Mitigation Resources" means up to sixty million dollars ($60,000,000) dedicated by resolution of the CAWCD Board to provide (1) compensation to a NIA Party as mitigation for a DCP Reduction or (2) resources developed pursuant to a Compensated Conservation Agreement, to the extent such expenditures are required to provide NIA Mitigation and Ag Mitigation as provided in this Agreement.

h. "Compensated Conservation Agreement" has the meaning prescribed in **Section 3(i)(vi)**.

i. "DCP Reduction" means a reduction in available Project Water in a given Year as the result of Arizona DCP Contributions pursuant to the LBDCP Agreement.

j. "Excess Water" means that water defined as Excess Water in the Repayment Stipulation.

k. "Firming Obligation" means (i) the United States' or AWBA's statutory requirement under section 105 of Public Law 108-451, the Arizona Water Settlements Act of 2004, to satisfy all or a portion of a tribal CAP water order that is reduced due to water shortages, and (b) the AWBA's commitment in its Policy Regarding Distribution of Long-Term Storage Credits for Firming CAP Municipal and Industrial Subcontractors, adopted on March 4, 2019. For purposes of this Agreement, a Firming Obligation shall be calculated prior to the deployment of Mitigation Resources.

l. "Long-term Contract" shall mean a long-term contract or subcontract for delivery of a Project Water entitlement as defined in footnote 1 to section 4(a) of the Repayment Stipulation.

m. "Master Repayment Contract" means the Contract Between the United States and the Central Arizona Water Conservation District for Delivery of Water and Repayment of Costs of the Central Arizona Project, Contract No. 14-06-W-245, Amendment No. 1, dated December 1, 1988, as it may be amended and supplemented.

n. "Mitigation Resources" shall mean the combination of both Compensated Mitigation Resources and Mitigation Water.

o. "Mitigation Water" means certain Project Water consisting of up to four hundred thousand (400,000) acre-feet of CAP ICS and an estimated fifty thousand (50,000) acre-feet of Project Water that the CAWCD Board anticipated being available from CAP operations during the term of the LBDCP Agreement.

p. "NIA Mitigation" shall mean the use of Mitigation Resources to fully satisfy the water orders of parties with contractual entitlements to NIA Priority CAP water during any Tier 1 Shortage, Tier 2a Shortage, or Tier 2b Shortage, if such conditions occur during the Years 2020, 2021, and/or 2022, or, if those shortage conditions occur during 2023, 2024, and/or 2025, the use of Mitigation Resources to partially satisfy the water orders of parties with contractual entitlements to NIA Priority CAP water at the level identified by the Tier Percent, as more fully set forth in **<u>Section 3</u>**.

q. "NIA Parties" shall mean certain NIA Priority CAP water contractors and subcontractors, specifically the Community and the Cities, that will receive NIA Mitigation pursuant to this Agreement, each individually an "NIA Party." If other entities receive a right to NIA Priority CAP water as provided in **<u>Section 5</u>**, those entities shall also be considered NIA Parties.

r. "NIA Priority Pool" shall mean that volume of Project Water available to satisfy the water orders of entities holding a Long-term Contract to NIA Priority CAP water.

s. "Project Water" means that water defined as Project Water in the Repayment Stipulation.

t. "Repayment Stipulation" shall mean the Stipulated Judgment and the Stipulation for Judgment (including any exhibits to those documents) entered on November 21, 2007, in the United States District Court for the District of Arizona in the consolidated civil action styled *Central Arizona Water Conservation District v. United States, et al.*, and numbered CIV 95-625-TUC-WDB (EHC) and CIV 95-1720-PHX-EHC.

u. "**Section**" means a section of this Agreement.

v. "Term" has the meaning set forth in **Section 2**.

w. "Tier 1 Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be at or below elevation 1,075 feet and at or above 1,050 feet. For the purpose of this definition, "projected on January 1" means the projected Lake Mead elevation based on the Reclamation 24-Month Study that is conducted in August of the previous Year. The 24-Month Study is the operational study that reflects the current Annual Operating Plan that is updated each month by Reclamation to project future Colorado River reservoir contents and releases.

x. "Tier 2a Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,050 feet and at or above 1,045 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Section 1(w)** above.

y. "Tier 2b Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,045 feet and at or above 1,025 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Section 1(w)** above.

z. "Tier 3 Shortage" means a Year in which Lake Mead content is projected on January 1 of that Year to be below elevation 1,025 feet. For the purpose of this definition, "projected on January 1" shall have the same meaning set forth in **Section 1(w)** above.

aa. "Tier Percent" shall be the percentage to be applied to the water orders of NIA Parties to determine the appropriate level of NIA Mitigation in the Years 2023, 2024 and 2025. The following Tier Percents shall be applied in the following shortage conditions: (a) seventy-five percent (75%) in a Tier 1 Shortage; (b) seventy-five percent (75%) in a Tier 2a Shortage; (c) fifty percent (50 %) in a Tier 2b Shortage; and (d) zero percent (0%) in a Tier 3 Shortage.

bb. "Year" means a calendar Year.

2. Term. This Agreement shall become effective on the date on which all of the following have occurred: (a) this Agreement has been executed by all Parties; (b) the LBDCP Agreement has been signed by all parties to that agreement; (c) the Agreement Regarding Lower Basin Drought Contingency Plan Obligations has been signed by all parties to that agreement, and (d) the DCP Framework Agreement has been signed by all of the original parties to that agreement. This Agreement shall terminate on December 31, 2026.

3. NIA Mitigation.

   a. In any Year prior to a Tier 1 Shortage, in determining the available CAP Delivery Supply in the Annual Operating Plan, CAWCD will include water in Lake Pleasant that is in excess of the fifty thousand (50,000) acre-feet that CAWCD has determined is required for operational needs, consistent with the terms of the Central Arizona Project System Use Agreement Between the United States and the Central Arizona Water Conservation District, Agreement No. 17-XX-30-W0622 (Feb. 2, 2017). CAWCD shall operate in good faith to maximize the volume of Project Water to entities with Long-term Contracts during the Term, consistent with its current operating practices.

   b. In any Year between 2020 and 2025, when a DCP Reduction will reduce the available CAP Delivery Supply such that the water delivery schedules for NIA Priority CAP water cannot be fully satisfied, CAWCD will utilize available Mitigation Resources to provide NIA Mitigation as provided in this **Section 3**.

   c. CAWCD's obligation to provide NIA Mitigation under this Agreement expires at the earlier of (i) the satisfaction of the obligations set forth in this **Section 3**, or (ii) when all Mitigation Resources have been exhausted. All deliveries of water derived from the use of Mitigation Resources shall be made in a manner consistent with the requirements of existing Long-term Contracts for delivery of Project Water.

   d. In any Year between 2020 and 2025 during which a DCP Reduction is occurring that reduces the water supply available to M&I and Indian Priority CAP water users, CAWCD will utilize available Mitigation Resources to replace or increase the volume of Project Water available for delivery to M&I and Indian Priority CAP water users as needed to fully satisfy the water delivery schedules for M&I and Indian Priority CAP water, after accounting for any Firming Obligations that will be available to satisfy those schedules; provided, however, that Mitigation Resources will not be deployed in any Year in which a Tier 3 Shortage is in effect on the Colorado River.

e. If a DCP Reduction occurs in Years 2020, 2021 or 2022, CAWCD shall utilize available Mitigation Resources to replace or increase the volume of Project Water available for delivery to NIA Priority CAP water users, as needed to fully satisfy the water delivery schedules for NIA Priority CAP water after accounting for any Firming Obligations provided by the AWBA or the United States; provided, however, that Mitigation Resources will not be deployed in any Year in which the a Tier 3 Shortage is in effect on the Colorado River.

f. If a DCP Reduction occurs in Years 2023, 2024 or 2025, CAWCD shall utilize available Mitigation Resources to replace or increase the volume of Project Water available for delivery to NIA Priority CAP water users, as needed to partially satisfy, at the level defined by the Tier Percent, the water delivery schedules for NIA Priority CAP water after accounting for any Firming Obligations provided by the AWBA or the United States; provided, however, that Mitigation Resources will not be deployed in any Year in which a Tier 3 Shortage is in effect on the Colorado River.

g. In any Year in which a Tier 1, 2a or 2b Shortage is in effect CAWCD shall use as Mitigation Water any SRP exchange water available pursuant to and consistent with the terms of the CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan, dated February 27, 2019, prior to deploying any CAP ICS.

h. If a Tier 1, Tier 2a or Tier 2b Shortage occurs in 2020, 2021 or 2022, and provided that CAWCD has deployed Mitigation Resources as required in this **Section 3**, CAWCD may utilize available Mitigation Water to increase the amount of Project Water available for delivery as needed to supply Excess Water to CAP Irrigation Districts pursuant to the Ag Mitigation Agreement, subject to the following terms and conditions.

    i. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts during a Tier 1 Shortage that occurs in either of the Years 2020 or 2021 shall not exceed fifty-eight thousand five hundred (58,500) acre-feet.

ii. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts during a Tier 2a Shortage that occurs in either of the Years 2020 or 2021 shall not exceed twenty-three thousand five hundred (23,500) acre-feet.

iii. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts during a Tier 2b Shortage that occurs in either of the Years 2020 or 2021 shall not exceed seventy thousand (70,000) acre-feet.

iv. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts during a Tier 1 Shortage that occurs in Year 2022 shall not exceed forty-two thousand (42,000) acre-feet.

v. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts, during a Tier 2a Shortage that occurs in Year 2022 shall not exceed seven thousand (7,000) acre-feet.

vi. Total CAWCD Mitigation Water deliveries to the CAP Irrigation Districts during a Tier 2b Shortage that occurs in Year 2022 shall not exceed fifty-three thousand five hundred (53,500) acre-feet.

vii. CAWCD shall not use any Mitigation Resources to create Excess Water for any other purpose.

viii. Nothing in this **Section 3** shall prevent CAP contractors and subcontractors from entering into voluntary agreements with one or more of the CAP Irrigation Districts to deliver CAP water for storage in GSF facilities.

i. Compensated Mitigation Resources shall be utilized to comprise a portion of the NIA Mitigation by satisfying, on an acre-foot by acre-foot basis, a portion of the annual water orders of NIA Parties who agree to accept compensated mitigation payments at the rate identified in **Section 3(i)(iv)** below, consistent with the following:

   i. During 2020, 2021, and 2022, any NIA Mitigation provided to the Community pursuant to this Agreement shall include Compensated Mitigation Resources equivalent to not less than sixty percent (60%) nor more than eighty percent (80%) of the total amount of NIA Mitigation provided to the Community in that Year.

ii. During 2023, 2024, and 2025, any NIA Mitigation provided to the Community pursuant to this Agreement shall include Compensated Mitigation Resources equivalent to not less than forty percent (40%) nor more than eighty percent (80%) of the total amount of NIA Mitigation provided to the Community in that Year.

iii. Through the Year 2025, any other NIA Party may agree to accept a payment of Compensated Mitigation Resources in exchange for agreeing to reduce its order of NIA Priority CAP water in a given water Year and thereby reduce the Community's obligations to accept Compensated Mitigation Resources under this **Section 3(i)**, provided that:

1. On or before October 1 of each Year of this Agreement, such NIA Party agreeing to accept Compensated Mitigation Resources submits a written statement to CAWCD indicating the maximum quantity, if any, of Compensated Mitigation the NIA Party is willing to accept for the following water Year as part of its order for NIA Priority CAP water, subject to the provisions of this **Section 3**;

2. CAWCD determines that the delivery of Compensated Mitigation Resources to such other NIA Party is consistent with meeting its obligations to provide NIA Mitigation under this Agreement; and,

3. The Community provides notice to CAWCD by October 1 of such Year that it accepts such a reduction to the Compensated Mitigation it would otherwise receive for the following water Year.

iv. To receive Compensated Mitigation, an NIA Party must reduce the quantity in acre-feet of their CAP water order for that water Year by an amount equal to the per acre-foot compensation that NIA Party has agreed to receive, based on a valuation of two hundred forty dollars ($240) per acre-foot in 2019, escalated thereafter at three percent (3%) per Year, as follows:

1. 2019 - $240.00/acre-foot
2. 2020 - $247.20/acre-foot
3. 2021 - $254.40/acre-foot
4. 2022 - $261.60/acre-foot
5. 2023 - $268.80/acre-foot

6. 2024 - $276.00/acre-foot
7. 2025 - $283.20/acre-foot

v. Each NIA Party shall submit a final water delivery schedule that incorporates any reductions in water deliveries that may be required by this **Section 3** no later than October 23 of the Year prior to the water delivery Year.

vi. CAWCD may, in coordination with the United States, enter into compensated conservation agreements with M&I CAP subcontractors or Indian Priority CAP contractors (each, a "Compensated Conservation Agreement") using available Compensated Mitigation Resources, in addition to or in lieu of agreements with the NIA Parties, provided that (a) the party has a history of actual use of such water; (b) the party reduces their order of Project Water in that water Year on an acre-foot by acre-foot basis; (c) the party is willing to participate in such arrangements at a cost less than the per-acre foot Compensated Mitigation payment valuation applicable in the Year that the water is delivered pursuant to subsection (iv) of this **Section 3**; and (d) the resulting Project Water supplies available to the NIA Priority Pool increase by an equivalent volume on a per acre-foot basis as compared to the amount that would have been available to the NIA Priority Pool in the absence of the agreement. Each Compensated Conservation Agreement shall reduce the total pool of Compensated Mitigation Resources based on the amount of funding actually expended in that agreement.

vii. By October 20, or the first business day thereafter, of each Year of this Agreement, CAWCD shall notify each NIA Party agreeing to accept Compensated Mitigation Resources of the amount of Compensated Mitigation Resources that will be available to them the following Year. CAWCD shall make two (2) lump sum payments equal to fifty percent (50%) of the Compensated Mitigation Resources due for that Year to each applicable NIA Party on each of April 15 and October 15 of that Year. In its sole discretion, a NIA Party may elect to have payments spread equally across the Year and applied as a credit to its water delivery charges each month.

4. Deployment of Mitigation Resources. CAWCD shall not deploy Mitigation Resources except as set forth in this Agreement. Consistent with the requirements of this Agreement, CAWCD will use its reasonable discretion to deploy Mitigation Resources in a manner that extends the availability of both CAP ICS and Compensated Mitigation

Resources for as long as feasible during the term of this Agreement, and to avoid exhausting one Mitigation Resource before the other.

a. In the event that the remaining Mitigation Resources are insufficient to provide the full amount of the NIA Mitigation required in any water Year, CAWCD shall utilize the remaining Mitigation Resources as follows:

   i. For NIA Parties electing to receive Compensated Mitigation Resources, first distribute available Compensated Mitigation Resources to such parties;

   ii. Then, deploy all remaining Mitigation Resources to the NIA Priority Pool.

b. Each NIA Party shall submit a final water delivery schedule that incorporates any reductions in water deliveries that may be required by **Section 4(a)** no later than October 23 of the Year prior to the water delivery Year.

5. White Mountain Apache Tribe Settlement. The Parties acknowledge that if the White Mountain Apache Tribe Settlement Agreement becomes enforceable during the Term, then the entities receiving a right to NIA Priority Pool water pursuant to that Settlement Agreement not already Parties to this Agreement shall be treated as additional NIA Parties.

6. Waiver of Claims Related to Conservation Activities.

   The NIA Parties agree that they will not make any claim against CAWCD in connection with:

   a. CAWCD's actions that are in compliance with the terms of this Agreement;

   b. CAWCD's failure to schedule for delivery water strictly resulting from activities generating ICS pursuant to conservation activities authorized by the Framework Agreement Among The United States, The State of Arizona and Central Arizona Water Conservation District for an Arizona ICS Program; or

   c. Reductions in the use of mainstream Colorado River water by the Colorado River Indian Tribes in accordance with its Agreement among the United States of America through the Department of the Interior, Bureau of Reclamation, the State of Arizona through the Arizona Department of Water Resources, the Central Arizona Water Conservation District, and the Colorado River Indian

Tribes to Fund the Creation of Colorado River System Water through Voluntary Water Conservation and Reductions in Use During Calendar Years 2020-2022.

Such waiver shall apply strictly and only to such CAWCD action(s) or inaction(s) during the Term.

7. Scope of the Agreement. This Agreement governs only the definition and use of Mitigation Resources during the Term, and shall not establish a course of dealing nor have any other effect outside the Term. The sole intent of the Parties is to set forth their understanding of the use of Mitigation Resources during the Term. Nothing in this Agreement shall amend any provision of, or contravene or diminish the rights or obligations of any party under the Master Repayment Contract, the Repayment Stipulation, the Central Arizona Project System Use Agreement Between the United States and the Central Arizona Water Conservation District, Agreement No. 17-XX-30-W0622 (Feb. 2, 2017), any Long-term Contract, or other pre-existing agreement. This Agreement shall not be considered to be an interpretation of the intent or understanding of the Parties as to such Long-term Contracts and other agreements, the provisions of which will also control in the case of any conflict with this Agreement.

8. Miscellaneous Provisions.

    a. Notices. Any notice, demand, or request authorized or required by this Agreement shall be in writing and shall be deemed to have been duly given if delivered by email to a valid email address designated by the Parties, or if mailed first class or delivered, to the following address:

If to Reclamation:	Bureau of Reclamation Lower Colorado Region Attn: Regional Director P.O. Box 61470 Boulder City, NV 89006-1470
With a copy to:	Bureau of Reclamation Phoenix Area Office Attn: Area Manager 6150 West Thunderbird Road Glendale, AZ 85306

If to AWBA:	Manager Arizona Water Banking Authority P.O. Box 36020 Phoenix, Arizona 85067-6020 voconnell@azwater.gov
If to ADWR:	Arizona Department of Water Resources Attn: Director P.O. Box 36020 Phoenix, AZ 85067
If to CAWCD:	Central Arizona Water Conservation District Attn: General Manager P.O. Box 43020 Phoenix, AZ 85080-3020
If to the City of Chandler:	Water Resources Manager City of Chandler P. O. Box 4008, Mail Stop 905 Chandler, Arizona 85244-4008 Facsimile: (480) 782-3805
With a copy to:	City Attorney City of Chandler P. O. Box 4008, Mail Stop 602 Chandler, Arizona 85244-4008 Facsimile: (480) 782-4652
If to the Community:	Stephen R. Lewis, Governor 525 West Gu u Ki P.O. Box 97 Sacaton, Arizona 85147
With a copy to:	Linus Everling, General Counsel 525 West Gu u Ki P.O. Box 97 Sacaton, Arizona 85147
If to the Town of Gilbert	Town of Gilbert Attn: Town Manager 50 East Civic Center Drive Gilbert, AZ 85296

If to the City of Glendale	Glendale City Manager Ken Phelps 5850 West Glendale Ave. Suite 431 Glendale, Arizona 85301
If to the City of Mesa	City Manager Christopher J. Brady PO Box 1466 Mesa, AZ 85211-1466
<u>If to the City of Phoenix:</u>	Water Services Director City of Phoenix 200 West Washington Street, 9th Floor Phoenix, Arizona 85003-1611
With a copy to:	City Attorney City of Phoenix 200 West Washington Street, 13th Floor Phoenix, Arizona 85003-1611
If to the City of Scottsdale	9379 E. San Salvador Dr. Scottsdale, Arizona 85258 Attention: Water Director
With a copy to:	3939 N. Drinkwater Blvd. Scottsdale, Arizona 85251 Attention: City Attorney
If to the City of Tempe	Water Resources Manager P.O. Box 5002 Tempe, AZ 85280
With a copy to:	Judi Baumann City Attorney 21 E. Sixth Street, Suite 201 Tempe, Arizona 85281

The designation of the address or addressee, including email addresses, may be changed by notice given as provided in this **<u>Section 8(a)</u>**.

b. <u>Non-waiver</u>. Except as provided in **<u>Section 6</u>**, no Party shall be considered to have waived any right hereunder except when such waiver of the right is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or a relinquishment of any such rights for the future, but such provisions and rights shall continue and remain in full force and effect.

c. Representations and Warranties.

   i. Each Party has all legal power and authority to enter into this Agreement and to perform its obligations hereunder on the terms set forth in this Agreement, and the execution and delivery hereof by each Party and the performance by each Party of its obligations hereunder shall not violate or constitute an event of default under the terms or provisions of any agreement, document, or instrument to which each of the Parties is a party or by which each Party is bound.

   ii. Each Party warrants and represents that the individual executing this Agreement on behalf of the Party has the full power and authority to bind the Party he or she represents to the terms of this Agreement.

   iii. This Agreement constitutes a valid and binding agreement of each Party, enforceable against each Party in accordance with its terms.

d. Governing Law. This Agreement shall be interpreted, governed by, and construed under applicable Federal law and any relevant provisions of Arizona state law. In case of conflict between Federal law and Arizona state law, Federal law controls. To the extent permissible under the Federal Rules of Civil Procedure and other applicable Federal authority, venue for adjudication of any disputes under this Agreement shall be in an appropriate Federal court.

e. Binding Effect and Limited Assignment. The provisions of this Agreement shall apply to and bind the successors and assigns of the Parties upon receipt of written agreement to the terms of this Agreement, but no assignment or transfer of this Agreement or any right or interest therein shall be valid until approved in writing by all Parties.

f. Amendment, Modification, and/or Supplement. No amendment, modification, or supplement to this Agreement shall be binding unless it is in writing and signed by all Parties.

g. Dispute Resolution.

i. The Parties shall meet and confer in good faith to resolve any dispute that may arise under this Agreement.

ii. Should the Parties be unable to resolve such dispute after meeting to try to resolve the dispute, any Party may file an action in any court of competent jurisdiction to seek specific performance of any obligation, provision, term or condition set forth in this Agreement.

iii. Monetary damages, other than through specific performance of an obligation under this Agreement, shall not be available as a remedy for any dispute under this Agreement.

iv. No Party, other than the United States, shall raise a defense of sovereign immunity to any action filed against them solely for the purpose of seeking specific performance of any obligation under this Agreement. This provision is a limited waiver of the Community's sovereign immunity for the purpose of seeking specific performance of any obligation under this Agreement.

h. Availability of Information. Subject to applicable laws and regulations, each Party shall have the right during office hours to examine and make copies of the other Party's books and records solely and exclusively relating to matters specifically covered by this Agreement. All information and data obtained or developed with the performance of duties mentioned in this Agreement shall be available upon request to a Party, subject to the provisions of applicable law. However, use of said reports, data and information shall appropriately reference the source for the respective documents.

i. No Third-Party Beneficiaries. This Agreement is not intended nor shall it be construed to create any third-party beneficiary rights to enforce the terms of this Agreement on any person or entity that is not a Party.

j. Counterparts. This Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Agreement.

k. Conflict of Interest. The Parties to this Agreement are hereby notified of and acknowledge A.R.S. § 38-511 regarding cancellation for conflict of interest.

l. Equal Opportunity. The Parties shall comply with State Executive Order No. 75-5, as amended by State Executive Order No. 2009-9, and all other applicable

Federal and State laws, rules and regulations relating to equal opportunity and non-discrimination, including the Americans with Disabilities Act.

m. Availability of Funds. In accordance with ARS § 35-154, every payment obligation of the State under this Agreement, if any, is conditioned upon the availability of funds appropriated or allocated for payment of such obligation.

n. Force Majeure. No Party will be considered to be in default in the performance of any of its obligations hereunder when a failure of performance is due to uncontrollable forces. The term "uncontrollable forces" shall mean any cause beyond the control of the Party unable to perform such obligation, including, but not limited to, failure of or threat of failure of facilities, flood, earthquake, storm, fire, lightning and other natural catastrophes, epidemic, war, riot, civil disturbance or disobedience, strike, labor dispute, labor or material shortage, sabotage, terrorism, or restraint by court order or public authority, which by exercise of due diligence such Party could not reasonably have been expected to avoid and which by exercise of due diligence it shall be unable to overcome. Drought and water shortages contemplated by this Agreement are not "uncontrollable forces" for the purposes of this Agreement.

o. Contingent on Appropriations or Allotment of Funds. The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

p. Officials Not to Benefit. No Member of or Delegate of Congress, Resident Commissioner, or official of the Parties shall benefit from this Agreement other than as a water user or landowner in the same manner as other water users or landowners.

Signature pages follow

ARIZONA DEPARTMENT OF WATER RESOURCES

By: ______________________
Thomas Buschatzke, Director

Date: 5/20/19

APPROVED AS TO FORM:

By: ______________________
Nicole D. Klobas, Deputy Chief Counsel

ARIZONA WATER BANKING AUTHORITY

By: ______________________________
Thomas Buschatzke, Chair

Date: 5/20/19

ATTEST:

By: ______________________________
Kathryn A. Sorensen, Secretary

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

By: Lisa A. Atkins
Lisa Atkins, President

Date: 20 May 19

ATTEST:

By: Sharon B Megdal
Sharon Megdal, Secretary

APPROVED AS TO FORM:

By: ______________________
Jay Johnson, General Counsel

GILA RIVER INDIAN COMMUNITY

By: ______________________
Stephen Roe Lewis, Governor

Date: 5-20-2019

APPROVED AS TO FORM:

By: Javier G Ramos for
Linus Everling, General Counsel

UNITED STATES OF AMERICA

By: ______________________________
Terrance J. Fulp, Ph.D.
Regional Director
Lower Colorado Region
Bureau of Reclamation

Date: 7-18-2019

CITY OF CHANDLER, an Arizona municipal corporation

By: Kevin Hartke

Kevin Hartke, Mayor

Date: 7-12-19

ATTEST:

Dana R DeLong

Dana DeLong, City Clerk

APPROVED AS TO FORM:

J J Winkler JJW

Jenny J. Winkler, Assistant City Attorney

CITY OF CHANDLER CORPORATE SEAL ARIZONA

TOWN OF GILBERT, an Arizona municipal corporation

By: Jenn Daniels
Jenn Daniels, Mayor

Date: June 11, 2019

ATTEST:

Lisa Maxwell, City Clerk

APPROVED AS TO FORM:

Title: Town Attorney

CITY OF GLENDALE, an Arizona municipal corporation

By: ______________________
for Kevin Phelps, Glendale City Manager

Date: 6/19/19

ATTEST:

____

APPROVED AS TO FORM:

____

CITY OF MESA, an Arizona municipal corporation

By: ______________________

Date: 7/11/19

ATTEST:

____

APPROVED AS TO FORM:

____

CITY OF MESA
CORPORATE
SEAL
MARICOPA COUNTY, AZ

CITY OF PHOENIX, an Arizona municipal corporation

Ed Zuercher, City Manager

By: Kathryn Sorensen

Kathryn Sorensen
Director, Water Services Department

Date: 6/11/19

ATTEST:

ACTING City Clerk

APPROVED AS TO FORM:

Acting City Attorney CLC

2019 JUN 20 AM 11: 27

CITY CLERK DEPT.

CITY OF SCOTTSDALE, an Arizona municipal corporation

By: ______________________________
W.J. "Jim" Lane, Mayor

Date: 7/2/2019

ATTEST:

____
Carolyn Jagger, City Clerk

APPROVED AS TO FORM:

Janis L. Bladine
City Attorney
By Janis L. Bladine, Senior Assistant City Attorney

CITY OF TEMPE, an Arizona municipal corporation

By: Lauren Kuby for
Mark Mitchell, Mayor

Date: 06/27/2019

ATTEST:

Carla Reece
Carla Reece, City Clerk

APPROVED AS TO FORM:

J Baum
Judi Baumann, City Attorney

EXHIBIT 6.1.1

AGREEMENT AMONG

THE UNITED STATES OF AMERICA, THROUGH THE DEPARTMENT OF THE INTERIOR, BUREAU OF RECLAMATION, THE STATE OF ARIZONA, THROUGH THE ARIZONA DEPARTMENT OF WATER RESOURCES, THE CENTRAL ARIZONA WATER CONSERVATION DISTRICT, AND THE COLORADO RIVER INDIAN TRIBES TO FUND THE CREATION OF COLORADO RIVER SYSTEM WATER THROUGH VOLUNTARY WATER CONSERVATION AND REDUCTIONS IN USE DURING CALENDAR YEARS 2020-2022

1. **PREAMBLE**. THIS AGREEMENT ("Agreement") is entered into this 26th day of July, 2019, by and between the UNITED STATES OF AMERICA ("United States"), represented by the Secretary of the Interior ("Secretary") acting through the Regional Director of the Bureau of Reclamation, Lower Colorado Region ("Reclamation"), the State of Arizona, acting through the Arizona Department of Water Resources ("ADWR"), the Central Arizona Water Conservation District ("CAWCD") and the Colorado River Indian Tribes ("CRIT") each being referred to individually as "Party" and collectively as the "Parties".

2. **EXPLANATORY RECITALS**

2.1 WHEREAS, on December 13, 2007, the Secretary executed a Record of Decision that included Interim Guidelines for Lower Basin Shortages and Coordinated Operations of Lake Powell and Lake Mead ("2007 Guidelines");

2.2. WHEREAS, the State of Arizona, certain other parties in the Lower Basin of the Colorado River and the Secretary developed the Lower Basin Drought Contingency Plan ("LBDCP") to address and reduce the likelihood of the continued decline of the elevation of Lake Mead;

2.3 WHEREAS, the major terms of the LBDCP are set forth in the Lower Basin Drought Contingency Operations ("LBOps");

2.4 WHEREAS, Section IV.F. of the LBOps provides that the Secretary shall not release pursuant to Article II of the Consolidated Decree water intentionally conserved by a conservation program within a Lower Division State in which the Secretary participates and that results in reductions in consumptive use;

2.5. WHEREAS, stakeholders within Arizona, together with Arizona legislative leaders, developed a plan to implement the LBDCP in Arizona, including partially mitigating the impacts of the LBDCP on certain water users in Arizona and conserving additional water in Lake Mead to protect the elevation of the lake (Arizona Lower Basin Drought Contingency Plan Framework Agreement).

2.6 WHEREAS, the Parties desire to take steps during calendar years 2020, 2021 and 2022 towards conserving water in Lake Mead, consistent with Section IV.F of the LBOps and the Law of the River, to achieve the goals of the Arizona Lower Basin Drought Contingency Plan Framework Agreement;

2.7 WHEREAS, CRIT holds Entitlements to Colorado River water in the states of Arizona and California as specified in the Consolidated Decree of the Supreme Court of the United States in the case of *Arizona v. California, et al.*, entered March 27, 2006, (547 U.S. 150), as it may be further modified ("Consolidated Decree");

2.8 WHEREAS, CRIT's Colorado River water Entitlement for use in the State of Arizona is set forth in Article I.A of the Appendix to the Consolidated Decree (Federal Establishments' Present Perfected Rights) as: (i) an annual diversion of a total of 662,402 acre-feet, or (ii) the consumptive use required for irrigation of 99,375 acres and for satisfaction of related uses, whichever of (i) or (ii) is less;

2.9 WHEREAS, CRIT and Reclamation entered into System Conservation Implementation Agreements ("SCIA") No. 16-XX-30-W0606 dated September 14, 2016, No. 18-XX-30-W0634 dated September 14, 2018 and No. 19-XX-30-W0647 dated February 25, 2019 as part of a Pilot Program established by Reclamation and four municipal entities in July 2014 to fund the creation of Colorado River system water through voluntary water conservation and reductions in use. The SCIA provided for the creation of System Conservation Water by CRIT through the fallowing of lands within the Colorado River Indian Reservation in Arizona ("CRIR"), establishing a methodology to account for reduced consumptive use as system water;

2.10 WHEREAS, the Arizona legislature passed SB 1227 which was signed into law by the Governor on January 31, 2019 creating the Arizona System Conservation Fund ("Fund") to receive contributions and provide funding for the creation of System Conservation Water as contemplated by this Agreement (A.R.S. § 45-118, added by Laws 2019, Chapter 1, Sec. 1);

2. 11 WHEREAS, CRIT will forego water deliveries and fallow lands within a portion of CRIR for three years beginning January 1, 2020 and ending December 31, 2022, and make the conserved water available to the Lower Colorado River System thereby increasing storage in Lake Mead in exchange for payment from the Fund;

2.12 WHEREAS, the Parties have differences of opinion as to CAWCD's rights and obligations with respect to the creation of System Conservation Water but have agreed to CAWCD's inclusion as a Party as provided in Section 9 below in order to provide additional certainty in the implementation of this Agreement;

2.13 WHEREAS, the Parties desire to enter into this Agreement to provide for: (1) payment of monies from the Fund to CRIT for the fallowing of sufficient land within CRIR to create 50,000 acre-feet per year of System Conservation Water during calendar years 2020 and 2021 and an additional volume of System Conservation Water in calendar year 2022, not to exceed 150,000 acre-feet of System Conservation Water over the three years, and (2) for the monitoring and accounting for the water created by CRIT as System Conservation Water in Lake Mead by Reclamation and CRIT (the "Project"); and,

2.14 WHEREAS, the Parties understand that the cost to create 150,000 acre-feet of System Conservation Water in Lake Mead is $38,160,000. The Arizona State Legislature appropriated $30,000,000 to be deposited in the Fund and the Parties understood that an additional $8,000,000 would be contributed to the Fund by the Environmental Defense Fund (EDF) with monies contributed by certain non-governmental organizations ("NGO's"). To the extent that the full $8,000,000 is not contributed by EDF, the Parties will seek additional funding. Interest on any monies deposited in the Fund for the purposes of funding the Project shall accrue to the benefit of this Agreement up to the total amount of funding for CRIT to create 150,000 acre-feet of System Conservation Water.

NOW, THEREFORE, in consideration of the mutual promises contained in this Agreement, the Parties agree as follows:

3. DEFINITIONS. For the purposes of this Agreement, the following definitions shall apply:

3.1 Accounting and Water Use Report means Reclamation's annual Colorado River Accounting and Water Use Report; Arizona, California and Nevada, published on or about May 15th each year.

3.2 Adjusted Maximum Diversion means the maximum volume of water CRIT will divert in any given year during the Fallowing Period. This number is calculated by subtracting from the Baseline Diversion the sum of the Reduced Diversion Amounts stated for each parcel identified in Exhibit A.

3.3 Baseline Diversion is 612,725 acre-feet per year, which was calculated using the average of the four highest years 2013 through 2017 as reported in the Accounting and Water Use Report and adding back any diversion reduction created under the applicable SCIA.

3.4 BIA means the Bureau of Indian Affairs, an agency within the U.S. Department of the Interior.

3.5 CRIR means the portion of the Colorado River Indian Reservation lands located in the State of Arizona.

3.6 Colorado River System shall have the meaning ascribed to such term in the Colorado River Compact, signed on November 24, 1922, at Santa Fe, New Mexico, pursuant to an act of Congress approved August 19, 1921 (42 Stat. 171) and approved in Section 13(a) of the Boulder Canyon Project Act.

3.7 Consolidated Decree means the decree entered by the United States Supreme Court in the matter of *Arizona* v. *California* on March 27, 2006 (547 U.S. 150).

3.8 Consumptive Use Reduction Quantity means, for any given year during the Fallowing Period, the calculated quantity of reduction in CRIT consumptive use required within CRIR Project Lands as set forth in Paragraph 6.2 and Exhibit A of this Agreement.

3.9 DCP Contribution shall have the same meaning as set forth in the LBOps.

3.10 Entitlement shall have the same meaning as "allocation" as found in the Consolidated Decree.

3.11 Exhibit A consists of Exhibit A 2020, Exhibit A 2021 and Exhibit A 2022, each of which includes a list of Project Lands and the Technical Memoranda for each parcel within the

Project Lands that will be fallowed during the applicable year. Exhibit A 2020 is attached hereto and made part of this Agreement. Exhibit A 2021 and Exhibit A 2022 shall be prepared by CRIT and provided to the other Parties as described in Paragraph 6.5.

3.12 Exhibit B is a copy of the Project Funding Agreement between the Arizona Department of Water Resources and Environmental Defense Fund ("EDF") which is a Project specific funding agreement. Exhibit B is attached hereto and made part of this Agreement.

3.13 Fallowing Period means the period beginning January 1, 2020 and ending December 31, 2022.

3.14 Fund means the Arizona System Conservation Fund established by the Arizona State Legislature in A.R.S. § 45-118 (Laws 2019, Chapter 1, Sec. 1).

3.15 Future Funding Exhibit refers to funding exhibits executed by ADWR and as yet unidentified contributors to the Fund for the express purpose of funding the Project. Upon execution, such exhibits will be attached hereto as Exhibits B "X" with "X" representing a consecutive number and made part of this Agreement.

3.16 LBOps means the Lower Basin Drought Contingency Operations attached as Exhibit 1 to the LBDCP Agreement and incorporated by reference therein.

3.17 Project means those activities described in this Agreement and Exhibit A attached herein.

3.18 Project Lands means the lands, designated in Exhibit A and updated annually, located within CRIR that have been irrigated in four out of the most recent five years unless fallowed pursuant to a SCIA, or this Agreement.

3.19 Reduced Diversion Amount means, for any given year during the Fallowing Period, the reduction in CRIT diversions that needs to be made during the year in order to achieve the Consumptive Use Reduction Quantity within Project Lands as set forth in Paragraph 6.2.

3.20 Remaining Balance means all monies remaining in the Fund as of July 15, 2021 that were deposited for the purpose of funding the Project and all accrued interest on those monies. The Remaining Balance shall also include a commercially reasonable estimate of interest to be accrued while those monies remain in the Fund until the Final Payment is made pursuant to Section 8.5.3.

3.21 Shortfall means, for any year in which CRIT fails to meet the System Conservation Water requirement, the difference in the volume of System Conservation Water created in the year and the Consumptive Use Reduction Quantity for that year.

3.22 System Conservation Implementation Agreement ("SCIA") means the agreements listed in Paragraph 2.9 entered into by Reclamation and CRIT to implement a Pilot System Conservation Program for the funding and creation of water for the Colorado River System through voluntary water conservation and reductions in use by CRIT.

3.23 System Conservation Water means water that is conserved for storage in Lake Mead to benefit the Colorado River System through a voluntary, measurable reduction of Consumptive Use of Colorado River water by CRIT.

4. EFFECTIVE DATE

The obligations of the Parties under this Agreement shall become effective on the date signed by all of the Parties.

5. SYSTEM CONSERVATION WATER NOT A DCP CONTRIBUTION.

The Parties to this Agreement agree that the System Conservation Water created under this Agreement shall not be used to satisfy any Lower Basin States' DCP Contribution required under the LBOps.

6. CRIT AGREEMENTS

6.1 *Cancellation of SCIA*: Upon execution of this Agreement, CRIT shall provide written notice to the parties to the applicable SCIA that it is not exercising its right to extend any SCIA beyond December 31, 2019. CRIT shall provide a copy of such notice to the Parties to this Agreement.

6.2 *Consumptive Use Reduction Quantity:* CRIT shall fallow sufficient Project Lands each year during the Fallowing Period to produce an annual Consumptive Use Reduction Quantity as follows:

6.2.1 A Consumptive Use Reduction Quantity of no less than 50,000 acre-feet per year during calendar years 2020 and 2021.

6.2.2 A Consumptive Use Reduction Quantity during calendar year 2022 of no less than the quantity of System Conservation Water that the Fund can secure at a price of $261.60 per acre-foot, but not to exceed 150,000 acre-feet of System Conservation Water over the entire Fallowing Period.

6.3 *Project Lands:* The Project Lands shall be located in CRIR, as listed annually in Exhibit A. In order to qualify for fallowing, these lands must have been irrigated for at least four out of the most recent five years unless fallowed pursuant to a SCIA or this Agreement. CRIT states that absent this Agreement, the Project Lands would have been irrigated during the Fallowing Period.

6.4 *ICS Creation:* During the Fallowing Period, CRIT may designate any Consumptive Use Reduction Quantity in excess of the amounts set forth in Paragraph 6.2 as Extraordinary Conservation Intentionally Created Surplus ("EC-ICS") to the benefit of CRIT, provided that such Consumptive Use Reduction Quantity also qualifies as EC-ICS under the 2007 Guidelines and the CRIT ICS Exhibit, and provided further that the creation of EC-ICS is consistent with the LBOps, and the Framework Agreement among the United States, ADWR, and CAWCD for an Arizona ICS Program ("Arizona ICS Framework Agreement").

6.5 *Technical Memorandum:* The Technical Memorandum for the first year of the Fallowing Period is attached to this Agreement as Exhibit A 2020. On or before August 1, 2020, CRIT shall provide to the other Parties the Technical Memorandum for 2021, which shall be Exhibit A 2021. On or before August 1, 2021, CRIT shall provide to the other Parties the Technical Memorandum for 2022, which shall be Exhibit A 2022. Each Exhibit A Technical Memorandum shall identify each parcel of Project Lands to be fallowed during the year and include the historic farming practices on the parcels, the quantification methods and calculations used to determine the Consumptive Use Reduction Quantity for those parcels and the anticipated annual Reduced Diversion Amount. The Technical Memorandum shall also include a map showing the location of the parcels. Technical Memoranda for 2021 and 2022 shall be similar in form and content to Exhibit A 2020. After CRIT provides to the other Parties the Technical Memorandum for 2021 or 2022, the other Parties shall have thirty (30) days to review the Technical Memorandum and provide comments to CRIT. CRIT shall meet and confer with the Parties to address any identified issues during the following September with sufficient time to prepare and submit the annual water order to BIA on or about October 1. If a Reclamation on-field verification pursuant to Paragraph 7.1 finds that less land has been fallowed than indicated in the annual Technical Memorandum attached as Exhibit A to this Agreement, CRIT agrees to immediately increase the acreage of fallowed lands in accordance with the applicable Technical Memorandum.

6.6 *Vegetation Control:* During the Fallowing Period, in order to ensure that any vegetation remaining on the Project Lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, ensure that any such vegetation is desiccated or eradicated through application of herbicides or other means while maintaining land cover or other sufficient dust control methods or technology and controlling and eliminating, to the extent possible, growth of any weeds. CRIT agrees to provide Reclamation with information and updates, when requested, regarding the live vegetation desiccation and eradication, dust control and weed control program.

6.7 *CRIT Limitation of Consumptive Use:* The Parties acknowledge that the creation of System Conservation Water must be achieved through a reduction in the consumptive use of Colorado River water by the farming operations within CRIR controlled by CRIT during the Fallowing Period. Approximately 71 percent of the land irrigated within CRIR is leased to third parties for farming or is held as an assignment or allotment (designated "lessees" herein). CRIT does not control the number of acres irrigated by the lessees nor the crops that are planted on those acres. Both of these factors affect the total annual water diversions and consumptive use within CRIR. Nevertheless, in addition to the active fallowing program created by the Project, CRIT also agrees that during the Fallowing Period, it shall use best efforts to limit the consumptive use within CRIR at or below the average of the four highest consumptive use years from 2013 through 2017 as reported for CRIR in the Accounting and Water Use Report adding back any consumptive use reduction according to a SCIA that is not reported in an Accounting and Water Use Report for this period.

6.8 *CRIT Costs:* CRIT agrees to bear all of its costs for implementation of this Section, including the activities specified in Paragraph 6.6 and the operation and maintenance costs for the Colorado River Irrigation Project payable to the BIA for lands that are included in the Project.

6.9 *Forbearance:* In order to provide further assurances to the Parties regarding water use on CRIR, CRIT further agrees to the following during the Fallowing Period as agreed upon forbearance:

6.9.1 CRIT shall not permit irrigation water to be used on more than a total of 72,871 acres within CRIR each year during the Fallowing Period. The total acreage is based on the highest amount of acreage within CRIR with a history of irrigation within the most recent five years. The annual calculation of total acreage shall include those lands fallowed for the purposes of this Agreement and for the creation of ICS.

6.9.2 CRIT agrees not to irrigate any lands, or lease any lands, for irrigated agriculture within CRIR that have not been historically irrigated.

6.9.3 CRIT shall not use Colorado River water for irrigation or other purposes from any new infrastructure that could be used to reduce return flows from CRIR to the Colorado River.

6.9.4 For each year of the Fallowing Period, CRIT agrees to maintain total water diversions from the Colorado River at or below the Adjusted Maximum Diversion for that year. For each year of the Fallowing Period, CRIT will reduce its annual water order request to the BIA so that the order does not exceed the Adjusted Maximum Diversion. CRIT agrees to monitor its water diversions and adjust its diversions as needed to avoid exceeding the Adjusted Maximum Diversion in each year.

6.9.4.1 If, after July 1st of any year during the Fallowing Period, the daily forecast published on Reclamation's website consistently indicates a diversion in excess of the monthly schedule contained in CRIT's annual water order, CRIT shall take the following actions:

a. Meet with the BIA Irrigation Project Management and Reclamation to determine the reason for the excess diversion.

b. If necessary, request that the monthly schedule for the balance of the year be reduced so as to not exceed the Adjusted Maximum Diversion by the end of the year.

6.9.4.2 In the event that the actual diversion of water by CRIT as measured by USGS and reported to Reclamation at the end of the year exceeds the Adjusted Maximum

Diversion for that year, CRIT agrees to work with Reclamation to arrange to repay the Colorado River System in the amount by which the actual diversion exceeded the Adjusted Maximum Diversion as follows:

a. If the exceedance occurs in 2020 or 2021 and the Inadvertent Overrun and Payback Policy ("IOPP") is in effect for the year of the exceedance, Reclamation will, before the Accounting and Water Use Report is issued by Reclamation for that year, and in consultation with CRIT, account for the excess diversion as delivery of CRIT ICS to CRIT in the year of the exceedance, up to the amount of full balance of CRIT's ICS. If CRIT does not have ICS available to cover the full exceedance, CRIT shall submit an IOPP payback plan to Reclamation by July 1st. The plan shall require that the amount of water diverted in excess of the Adjusted Maximum Diversion, less any amount accounted for as delivery of CRIT ICS to CRIT, be paid back in one or more of the following ways: (1) amend CRIT's water order for the current year to reduce CRIT diversions to the Adjusted Maximum Diversion for that year, plus the amount of the previous year exceedance; or (2) undertake other mechanisms mutually acceptable to the Parties by which the excess diversion may be repaid to the Colorado River System.

b. If the exceedance occurs in 2020 or 2021 and the IOPP is not in effect for the year of exceedance, CRIT shall nevertheless pay back the Colorado River System according to one or more of the methods described in 6.9.4.2(a).

c. If the exceedance occurs in 2022, Reclamation will, before the Accounting and Water Use Report is issued by Reclamation for that year, and in consultation with CRIT, account for the excess diversion as delivery of CRIT ICS to CRIT in 2022, up to the amount of the full balance of CRIT's ICS. If sufficient CRIT ICS is not available to cover this exceedance, ADWR may reduce its Final Payment to CRIT in accordance with the provisions in Paragraph 8.5.3, or the Parties may agree to one or more of the mechanisms described in Paragraph 6.9.4.2(a) to leave water in the Colorado River System in the year after the excess diversion.

6.9.5 CRIT agrees to furnish and install padlocks to lock the irrigation ditch turnouts on fields fallowed under the terms of this Agreement. In the event that a turnout serves multiple fields which are not all being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

6.10 *Same Year System Conservation Adjustments:* The Parties agree to meet during the month of October in each year of the Fallowing Period to review available Reclamation field verification, remotely-sensed imagery and other data regarding fallowing of the lands identified in Exhibit A for the current year. If the amount of System Conservation Water is likely to be less than the Consumptive Use Reduction Quantity for that year, the Parties agree that CRIT shall do one or more of the following to meet the System Conservation Water creation requirement for that year: (1) amend its ICS creation plan to decrease the current year ICS creation and increase the current year System Conservation Water creation; or (2) fallow additional lands.

6.11 *Remedies For Failure to Meet System Conservation Water Requirement*: If CRIT fails to meet the System Conservation Water requirement for a year during the Fallowing Period, as reflected in the Arizona Conservation Table of the Accounting and Water Use Report, the following shall apply.

6.11.1 If CRIT fails to meet the System Conservation Water requirement for 2020 or 2021, CRIT shall: (1) take delivery of CRIT ICS in the year in which the Shortfall occurs and leave the water in Lake Mead for the benefit of the Colorado River System; or (2) amend CRIT's ICS creation plan for the year after the year in which the Shortfall occurs to decrease ICS creation in that year and increase System Conservation Water in that year; or (3) undertake other mechanisms acceptable to the Parties by which the Shortfall is made up.

6.11.2 If CRIT fails to meet the System Conservation Water requirement for 2022, ADWR shall adjust its Final Payment to CRIT pursuant to 8.5.3 unless a different remedy can be agreed to by the Parties.

6.12 *CRIT ICS:* CRIT will diligently work to accumulate 9,000 acre-feet of ICS in Lake Mead. Once created, CRIT agrees to maintain a balance of no less than 9,000 acre-feet of

ICS until all events of Paragraph 8.5.3 have occurred. If CRIT's ICS account falls below 9,000 acre-feet after repaying an exceeded diversion amount under this Section or any Shortfall in creation of System Conservation Water required in Paragraph 6.10. CRIT will replenish its ICS account as soon as practicable to meet the commitments in this Paragraph.

6.12.1 If during any single fallowing year CRIT both exceeds the Adjusted Maximum Diversion with a payback to be charged against CRIT ICS according to Paragraph 6.9.4.2 and CRIT has a Shortfall that shall be charged against CRIT ICS according to Paragraph 6.11, the full amount of any Shortfall shall be charged against CRIT ICS before any payback of excess diversions.

6.13 *Access to CRIR:* CRIT hereby grants access to Reclamation and agrees to grant access to the other Parties upon request to perform periodic on-site inspections of the Project to verify compliance with this Agreement.

7. RECLAMATION AGREEMENTS

7.1 *Verification:* Reclamation agrees to verify and document reductions in consumptive use of Colorado River water for the Project by CRIT, consistent with this Agreement and the 2007 Guidelines. Reclamation further agrees to account for reductions in consumptive use in Exhibit A 2020 and Exhibit A 2021 that is in excess of 50,000 acre-feet as CRIT extraordinary conservation ICS ("EC-ICS") if consistent with the 2007 Guidelines, the LBOps, the CRIT ICS Exhibit and the Arizona ICS Framework Agreement.

7.2 *System Conservation Water:* Reclamation will use its existing water order approval process and other authorities including the LBOps Section IV.F to ensure that the System Conservation Water created under this Agreement is not released pursuant to Article II of the Consolidated Decree.

7.3 *Information Sharing:* Reclamation will use its existing in-person, periodic, on-field verification process, and satellite imagery in conjunction with its *Remotely Sensed Data Acquisition Program* to determine whether the lands associated with this Agreement are being fallowed in accordance with Exhibit A. Reclamation further agrees to provide all data related to this Agreement to the Parties by the end of September of each year of this Agreement and to participate in any meetings of the Parties.

7.4 *Reporting*: In 2020, 2021 and 2022, Reclamation shall provide written confirmation to ADWR that Reclamation has received a copy of CRIT's annual water order reducing its annual diversion to an amount not more than the Adjusted Maximum Diversion for the applicable year.

7.5 *Accounting:* Reclamation shall account for the quantity of System Conservation Water created each year pursuant to this Agreement in the section of the Accounting and Water Use Report titled, "Transfers, Exchanges and Water Made Available by Extraordinary Conservation," or such other section(s) as may be added. Reclamation agrees to work with the Parties to timely review and identify any exceedance of diversion over the Adjusted Maximum Diversion or Shortfall in System Conservation Water in each year and to work with the Parties to apply the remedies for such exceedance or Shortfall as selected from the options provided in Section 6 above.

8. <u>ADWR AGREEMENTS</u>

8.1 *Appropriated Funds:* During fiscal year 2019-20, the State of Arizona will deposit $30,000,000 of appropriated funds in the Fund to pay CRIT for a reduction in its consumptive use during the Fallowing Period. Interest accrued on the monies deposited in the Fund for the purpose of funding this Project shall accrue to the benefit of this Agreement up to the total amount required to pay CRIT in accordance with Paragraphs 8.4 and 8.5. This amount shall be the maximum amount of the State's obligation to CRIT under this Agreement.

8.2 *EDF Funding:* EDF has agreed in a Project Funding Agreement with ADWR to contribute a total of $2,000,000 to the Fund before January 31, 2020 to assist in the funding of the Project during the Fallowing Period. EDF has made significant progress toward raising an additional $2,000,000 to $3,000,000 to contribute to the Fund by January 31, 2021 and has agreed to use best efforts to raise an additional amount of money to contribute to the Fund on or before July 15, 2021 in an amount equal to the difference between $8,000,000 and the total amount of monies previously contributed to the Fund by EDF. A copy of the ADWR and EDF Project Funding Agreement is attached as Exhibit B.

8.2.1 Neither ADWR nor EDF shall be liable for the other's failure to contribute funds as required by this Agreement or the Project Funding Agreement. EDF has agreed that should it be unable to meet any of its funding commitments as set forth in Exhibit B, it shall provide advance written notice to ADWR and CRIT by July 1, 2021 stating the reason it is not meeting its funding commitments. Upon receipt of such notice, ADWR shall immediately notify the Parties who shall meet and confer to determine what, if any, options may be available to complete the storage of the full 150,000 acre-feet of CRIT System Conservation Water in Lake Mead during the Fallowing Period. Parties to Future Funding Exhibits shall be subject to a similar notice requirement.

8.3 *CRIT Payback and Shortfall:* Notwithstanding any other provision in this Agreement, CRIT must meet any annual payback obligation for exceeded diversion amounts as required in Paragraph 6.9.4.2 and make up any Shortfall required by Paragraph 6.11 before being compensated for any additional System Conservation Water under this Agreement.

8.4 *Payments for System Conservation Water Created in 2020 and 2021:* ADWR shall pay CRIT a total of $25,080,000 from the Fund in the amounts and at the times designated below for the creation of 100,000 acre-feet of System Conservation Water in 2020 and 2021:

Payments	**Amounts & Approximate Payment Dates**
Year 1, Payment 1.1	$7,770,000 (End of 2019)
Year 1, Payment 1.2	$5,770,000 (Sept 2020)
Year 2, Payment 2.1	$5,770,000 (Feb 2021)
Year 2, Payment 2.2	$5,770,000 (Sept 2021)
Total Payment for 2020 and 2021 of the Fallowing Period	**$25,080,000**

8.4.1 ADWR shall pay CRIT Payment 1.1 in the amount of $7,770,000 no later than 60 days after the last of following events occurs: (1) the Effective Date of this Agreement; (2) CRIT provides ADWR with a copy of its BIA water order reflecting a reduction in its 2020 annual diversion to an amount not more than the Adjusted Maximum Diversion for 2020; and (3) at least $7,770,000 has been deposited in the Fund.

8.4.2 ADWR shall pay CRIT Payment 1.2 in the amount of $5,770,000 no later than 60 days after both of the following events occurs: (1) Reclamation provides written confirmation to the Parties that the 2020 designated Project Lands in Exhibit A 2020 are fallowed after performance of Reclamation's spring/summer 2020 field verification inspection; and (2) CRIT provides to the Parties its best available aerial imagery in conjunction with the Reclamation's *Remotely Sensed Data Acquisition Program* illustrating that the designated Project Lands in Exhibit A 2020 are being fallowed in 2020.

8.4.3 ADWR shall pay CRIT Payment 2.1 in the amount of $5,770,000 no later than 60 days after the last of the following events occurs: (1) CRIT provides a copy of its BIA water order reflecting a reduction in its 2021 annual diversion to an amount not more than the Adjusted Maximum Diversion for 2021; (2) Reclamation provides written confirmation to ADWR that the 2020 designated Project Lands in Exhibit A 2020 were fallowed after performance of Reclamation's December 2020 field verification inspection; and (3) any exceedance of the Adjusted Maximum Diversion or Shortfall in System Conservation Water has been properly addressed under Paragraphs 6.9.4 and 6.11.

8.4.4 ADWR shall pay CRIT Payment 2.2 in the amount of $5,770,000 no later than 60 days after the last of the following events occurs: (1) Reclamation provides written confirmation to the Parties that the 2021 designated Project Lands in Exhibit A 2021 are fallowed after performance of Reclamation's spring/summer 2021 field verification inspection; (2) CRIT provides to the Parties its best available imagery in conjunction with the Reclamation's *Remotely Sensed Data Acquisition Program* illustrating that the designated Project Lands in Exhibit A 2021 are being fallowed in 2021; and (3) any exceedance of the Adjusted Maximum Diversion or Shortfall in System Conservation Water has been properly addressed under Paragraphs 6.9.4 and 6.11.

8.5 *Payment for System Conservation Water Created in 2022:* No later than July 16, 2021, ADWR shall provide CRIT with an accounting of the Remaining Balance in the Fund as of July 15, 2021. Based upon the Remaining Balance, ADWR and CRIT shall determine the maximum quantity of System Conservation Water that can be created by CRIT in 2022 (not to exceed 50,000 acre-feet) that the Fund can secure at a price of $261.60 per acre-foot without exceeding the Remaining Balance. CRIT shall prepare Exhibit A 2022 for conservation of that quantity of water and submit it to the Parties no later than August 1, 2021. That quantity, multiplied by the price of $261.60 per acre foot, shall be the 2022 cost for System Conservation

Water. ADWR shall pay CRIT for the 2022 cost of System Conservation Water in three installments on the dates designated below:

Payments	Amounts & Approximate Payment Dates
Year 3, Payment 3.1	1/3 of 2022 cost (Feb 2022)
Year 3, Payment 3.2	1/3 of 2022 cost (Sept 2022)
Final Payment	1/3 of 2022 cost (May 2023), subject to adjustment as provided below

8.5.1 ADWR shall pay CRIT Payment 3.1 in the amount of one-third of the 2022 cost no later than 60 days after the last of the following events occurs: (1) CRIT provides the Parties with a copy of its BIA water order reflecting a reduction in its 2022 annual diversion request to an amount not more than the Adjusted Maximum Diversion for 2022; (2) Reclamation provides written confirmation to ADWR that the 2021 designated Project Lands in Exhibit A 2021 were fallowed after performance of Reclamation's December 2021 field verification inspection; and (3) any exceedance of the Adjusted Maximum Diversion or Shortfall in System Conservation Water has been properly addressed under Paragraphs 6.9.4 and 6.11.

8.5.2 ADWR shall pay CRIT Payment 3.2 in the amount of one-third of the 2022 cost no later than 60 days after the last of the following events occurs: (1) Reclamation provides written confirmation to the Parties that the 2022 designated Project Lands in Exhibit A 2022 are fallowed after performance of Reclamation's spring/summer 2022 field verification inspection; (2) CRIT provides to the Parties its best available imagery in conjunction with Reclamation's *Remotely Sensed Data Acquisition Program* illustrating that the designated Project Lands in Exhibit A 2022 are being fallowed in 2022; and (3) any exceedance of the Adjusted Maximum Diversion or Shortfall in System Conservation Water has been properly addressed under Paragraphs 6.9.4 and 6.11.

8.5.3 ADWR shall pay CRIT the Final Payment in the amount of one third of the 2022 cost no later than 30 days after publication of the 2022 Accounting and Water Use Report subject to the following:

8.5.3.1 If the amount reported is less than the amount of System Conservation Water required to be created in Exhibit A 2022, the Final Payment shall be reduced by $261.60 (2022 water price) per acre-foot for each acre-foot not conserved in Lake Mead as contemplated under Exhibit A 2022, unless the Parties have agreed to a different remedy for the Shortfall pursuant to Paragraph 6.11.2.

8.5.3.2 If CRIT exceeded the Adjusted Maximum Diversion in 2022, the Final Payment shall be reduced by $122.95 (47% of the 2022 water price) per acre-foot for each acre-foot of the excess diversion, unless the Parties have agreed to a different remedy for the excess diversion pursuant to Paragraph 6.9.4.2(c).

8.5.3.3 The reductions in payment expressed in Paragraphs 8.5.3.1 and 8.5.3.2 are cumulative. If the total amount of the payment reductions exceeds the amount of the Final Payment, ADWR shall not make the Final Payment and CRIT shall pay to ADWR the difference between the total amount of the payment reductions and the amount of the Final Payment within 30 days after publication of the 2022 Accounting and Water Use Report.

9. CAWCD AGREEMENTS

9.1 CAWCD agrees not to divert or order delivery of System Conservation Water created under this Agreement provided that such creation is consistent with the technical memoranda prepared by CRIT pursuant to Paragraph 6.5.

9.2 CAWCD agrees that participation in this Agreement is for the limited purposes of agreeing not to divert or order delivery of System Conservation Water created by CRIT, participating in meetings of the Parties in order to implement this Agreement, and to receive notices from the Parties.

9.3 CAWCD specifically and further agrees that it does not have enforcement authority against any other Party to this Agreement. In the event any court of competent jurisdiction interprets this Agreement to provide CAWCD with enforcement authority, CAWCD waives any such right to enforce against ADWR, CRIT, Reclamation and any other third party contributing to the Fund, including EDF.

9.4 To the extent that any court finds that CAWCD has sovereign immunity, CAWCD waives such immunity for the limited purpose of enforcing CAWCD's agreement not to divert or order delivery of System Conservation Water created under this Agreement.

10. <u>LIMITED WAIVER OF SOVEREIGN IMMUNITY</u>. CRIT hereby agrees to a limited waiver of its sovereign immunity from suit solely for the purpose of enforcement of this Agreement. Enforcement is limited to claims to recoup monies actually paid or to be paid under this Agreement by ADWR to CRIT where CRIT has failed to satisfy the terms and conditions for payment. In no event shall CRIT's liability for any claim arising under this Agreement exceed the amounts paid or to be paid under this Agreement. This limited waiver of sovereign immunity does not extend to claims by any other party to this Agreement or third parties, claims brought for declaratory injunctive relief, claims brought under tort liability, or claims for indirect, special, incidental, consequential or punitive damages, or specific performance. Any claims to recoup monies actually paid under this Agreement must be brought by ADWR within one (1) year from when ADWR has knowledge of a failure to satisfy the terms and conditions of a payment made under the Agreement. This limited waiver of sovereign immunity shall terminate one (1) year after Reclamation issues its Accounting and Water Use Report for calendar year 2022 but shall continue in effect with respect to any lawsuit brought by ADWR that is timely filed before the termination date. Any judgment may only be satisfied through the unrestricted assets of CRIT.

11. <u>GENERAL TERMS.</u>

11.1 *Non-waiver*. No Party to this Agreement shall be considered to have waived any right hereunder except when such waiver of the right is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or a relinquishment of any such rights for the future, but such provisions and rights shall continue and remain in full force and effect.

11.2 *Uncontrollable Forces*. No Party shall be considered to be in default in the performance of any of its obligations under this Agreement when a failure of performance shall be due to any cause beyond the control of the Party affected, including but not limited to, facilities failure, flood, earthquake, storm, lightning, fire, epidemic, war, riot, civil disturbance, labor disturbance, sabotage, and restraint by court or public authority which by exercise of due diligence and foresight such Party could not have reasonably expected to avoid. A Party rendered unable to fulfill any of its obligations under this Agreement by reason of an Uncontrollable Force shall give prompt written notice of such act to the other Parties and shall exercise due diligence to remove such inability with all reasonable dispatch. Failure to perform under this provision shall excuse reciprocal performance until cured.

11.3 *Representations and Warranties.*

11.3.1 Each Party has all legal power and authority to enter into this Agreement and to perform its obligations hereunder on the terms set forth in this Agreement, and the execution and delivery hereof by each Party and the performance by each Party of its obligations hereunder shall not violate or constitute an event of default under the terms or provisions of any agreement, document, or instrument to which each of the Parties is a party or by which each Party is bound.

11.3.2 Each Party warrants and represents that the individual executing this Agreement on behalf of the Party has the full power and authority to bind the Party he or she represents to the terms of this Agreement.

11.3.3 This Agreement constitutes a valid and binding agreement of each Party, enforceable against each Party in accordance with its terms.

11.3.4 Each Party: (i) warrants and represents that such Party is authorized by, and has undertaken all prerequisite actions required by, applicable Federal and State laws and regulations to perform the obligations and exercise the rights contemplated herein, (ii) acknowledges that such warranty and representation is a material inducement to, and has been relied upon by, the other Parties in entering into this Agreement and performing their respective obligations hereinafter; and (iii) with respect to System Conservation Water funded by this Agreement, the Parties will cooperate to use reasonable best efforts in the support, preservation and defense thereof, including any lawsuit or administrative proceeding challenging the legality, validity or enforceability related to such System Conservation Water, and will to the extent appropriate enter into such agreements, including joint defense or common interest agreements, as are necessary therefor; provided that each Party shall bear its own costs of participation and representation in any such matter.

11.4 *Governing Law and Venue.* Federal law controls the interpretation and enforcement of CRIT water rights in the Lower Colorado River Basin, and is the basis for all functions and responsibilities the Secretary performs as Water Master of the Lower Colorado River. This Agreement shall be interpreted, governed by, and construed under Arizona state law. Any action between the State of Arizona and CRIT to enforce the terms of this Agreement shall be in Arizona state court and CRIT shall waive its right to remove it to Federal court. This Agreement does not waive the United States' right to object to any Arizona state court exercising jurisdiction over disputes brought under this Agreement involving the United States as a party.

11.5 *Binding Effect and Limited Assignment.* The provisions of this Agreement shall apply to and bind the successors and assigns of the Parties only upon receipt of written agreement to the terms of this Agreement, but no assignment or transfer of this Agreement or any right or interest therein shall be valid unless and until approved in writing by all Parties. This Agreement is and shall be binding upon and shall inure to the benefit of the Parties and, upon dissolution, the legal successors and assigns of their assets and liabilities.

11.6 *Amendment, Modification, and/or Supplement.* This Agreement may be amended, modified, or supplemented only by the written agreement of the Parties. No amendment, modification, or supplement shall be binding unless it is in writing and signed by all Parties.

11.7 *Drafting Considerations.* Each Party and its counsel have participated fully in the drafting, review, and revision of this Agreement, each of whom is sophisticated in the matters to which this Agreement pertains, and no one Party shall be considered to have drafted this Agreement.

11.8 *Notices.* All notices and requests required or allowed under the terms of this Agreement shall be in writing and shall be mailed first class postage paid to the following entities at the following addresses:

State of Arizona
Arizona Department of Water Resources
P.O. Box 36020
Phoenix, AZ 85067
Attn: Director

Colorado River Indian Tribes
Colorado River Indian Reservation
26600 Mohave Road
Parker, AZ 85344
Attn: Attorney General

U.S. Department of the Interior, Bureau of Reclamation
Lower Colorado Regional Office
P.O Box 61470
Boulder City, NV 89006-1470
Attn: Regional Director

Central Arizona Water Conservation District
P.O Box 43020
Phoenix, AZ 85080-3020
Attn: General Manager

Notice shall be deemed complete three (3) business days after mailing. A Party may change its address by giving the other Parties advance notice of the change in writing.

11.9 *Consultation Required.* In the event that any dispute arises regarding this Agreement, the Parties agree to meet and attempt to resolve the dispute before seeking any other remedy.

11.10 *Availability of Information.* Subject to applicable State laws and regulations, each Party to this Agreement shall have the right during office hours to examine and make copies of the other Party's books and records relating to matters covered by this Agreement. All information and data obtained or developed within the performance of duties mentioned in this Agreement shall be available upon request to a Party, subject to the provisions of the Arizona Public Records Law or other applicable law. However, use of said reports, data and information shall appropriately reference the source for the respective documents.

11.11 *State Obligation Contingent on Appropriation or Allotment of Funds*. The expenditure or advance of any money as provided in Section 8 herein, or the performance of any obligation for payment under this Agreement shall be contingent upon the respective appropriation or allotment of funds. Nothing in this Agreement shall bind the State of Arizona or ADWR to expenditures in excess of funds appropriated and allotted for the purposes set forth in this Agreement.

11.12 *Federal Obligation Contingent on Appropriation or Allotment of Funds*. The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

11.13 *Cancellation of State Contracts*. The Parties to this Agreement are hereby notified of A.R.S. § 38-511.

11.14 *Equal Opportunity/Non-Discrimination*. The Parties to this Agreement agree to comply with all applicable federal or state laws relating to equal opportunity and non-discrimination.

11.15 *Officials Not to Benefit*. No Member of or Delegate to the Congress, or Resident Commissioner, or official of the State of Arizona, the BIA, Reclamation, or CRIT shall benefit from this Agreement other than as a water user or landowner in the same manner as other water users or landowners.

11.16 *No Third-Party Beneficiaries*. This Agreement is not intended nor shall it be construed to create any third-party beneficiary rights to enforce the terms of this Agreement on any person or entity that is not a Party.

11.17 *Counterparts*. This Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Agreement.

11.18 *Authority of the Secretary*. Nothing in this Agreement diminishes or abrogates the authority of the Secretary under applicable Federal law, regulation, or the Consolidated Decree, as it may be further modified.

11.19 *Compliance with Law.* CRIT agrees to remain in compliance with applicable Federal, State, and local environmental, cultural, and paleontological resource protection laws and regulations throughout the term of this Agreement.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement on the day and year first written above.

ARIZONA DEPARTMENT OF WATER RESOURCES

By: Tom Buschatzke

Name: Thomas Buschatzke

Title: Director

Date: 7/8/19

Approved as to form: Ken Slowinski

Name: Ken Slowinski

Title: Chief Counsel

COLORADO RIVER INDIAN TRIBES

By: [signature]

Name: Dennis Patch

Title: Chairman

Date: JUL - 3 2019

Approved as to form: [signature]

Name: Rebecca A. Loudbear

Title: Attorney General

THE UNITED STATES OF AMERICA

By: Terrance J. Fulp
Terrance J. Fulp, Ph.D.
Regional Director
Lower Colorado Region
Bureau of Reclamation

Date: 7/26/19

CENTRAL ARIZONA WATER CONSERVATION DISTRICT

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Title: President

Date: 3 July 19

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EXHIBIT A – TECHNICAL MEMORANDUMS

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

G. Farm Unit: CRIT Farms CRIT II Unit

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022.
Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

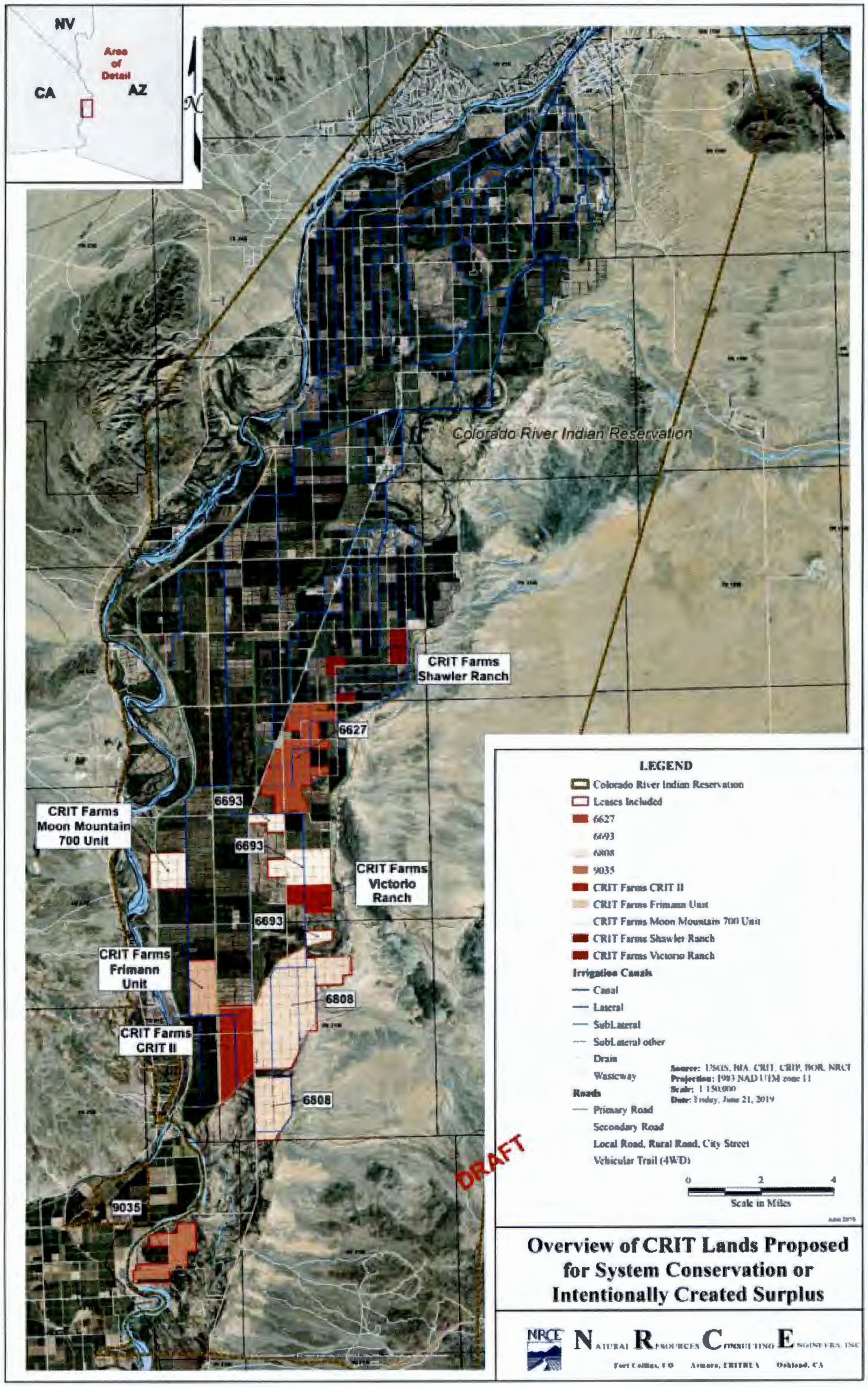

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T + 273} u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

G. Farm Unit: CRIT Farms CRIT II Unit

Farm Description and Location

The CRIT Farms CRIT II Unit is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 18, 19, and 30 Township 5N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. The CRIT II Unit is bounded by the Lower Main Drain on the west, Mesa Drain on the north, Mohave Road on the east and Tyson Wasteway on the south. Figure G1 is an overview map of the Unit. A maximum of 1,238.74 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on the CRIT II Unit is served primarily by Sub-lateral Lower 90 of the Project. While the CRIT II Unit is the last farm unit served by Lower 90, Project operational spill to Tyson Wash/Wasteway occurs at the end of Lower 90 and thus it cannot be turned off at the head gate or another upstream check structure. Farm gate turnouts on Sublateral Lower 90 serving the CRIT II Unit will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 64 irrigated field parcels were identified within the actively irrigated area of the Unit (see Figure G1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure G1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

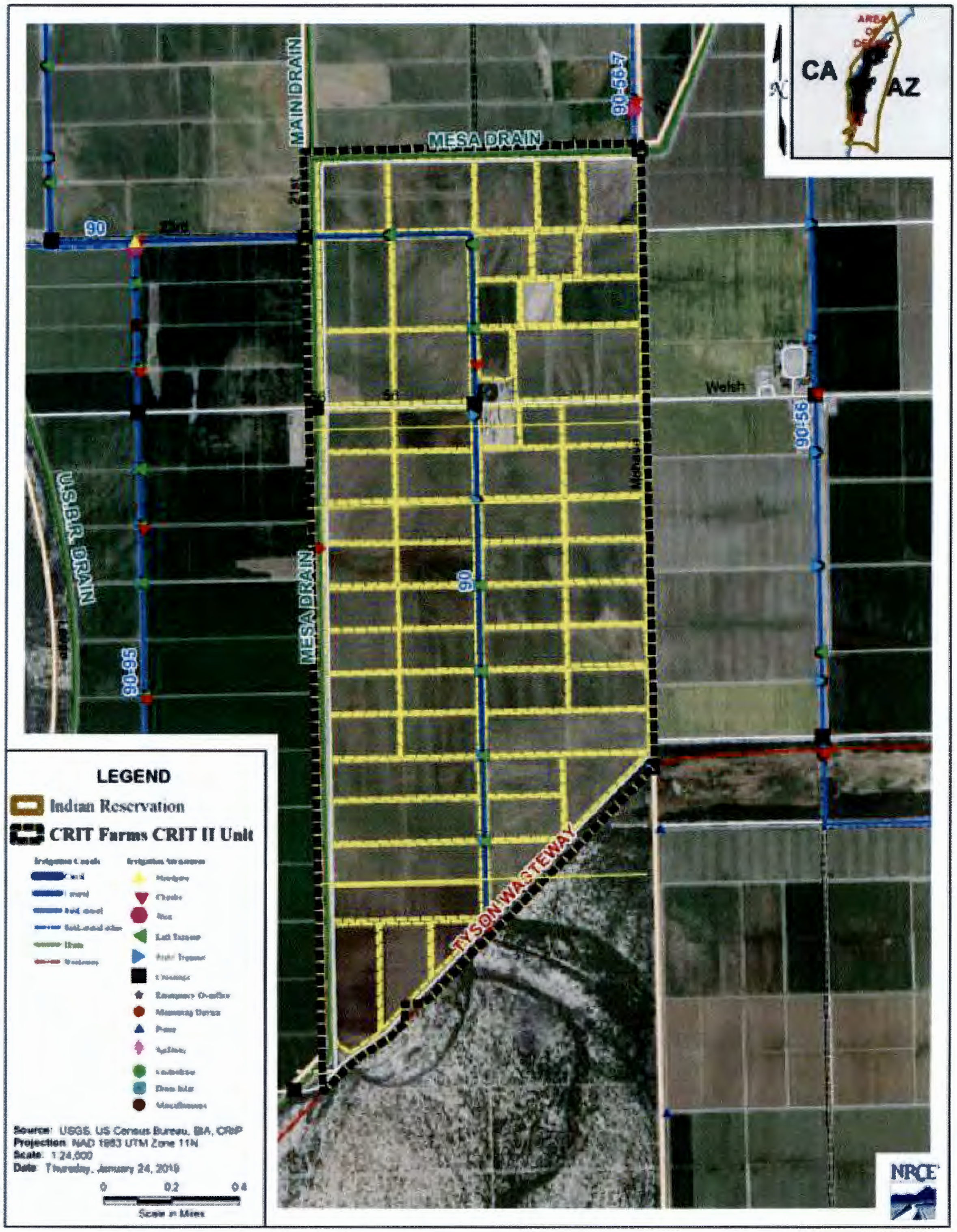

Figure G1. Overview Map of CRIT Farms CRIT II Unit.

Cropping Patterns

Crop patterns/crop mix for field parcels on the CRIT II Unit for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table G1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for the CRIT II Unit is mapped in Figures G2-G6, for years 2014-2018, respectively.

Table G1. Cropping Patterns/Crop Mix of the CRIT Farms CRIT II Unit, 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	1238.7	51%	40%	0%	0%	0%	9%	9.0
2015	1238.7	66%	8%	26%	0%	0%	0%	9.0
2016	1238.7	89%	8%	3%	0%	0%	0%	9.0
2017	1238.7	78%	20%	0%	2%	0%	0%	9.0
2018	1199.1	80%	20%	0%	0%	0%	0%	48.7
Average		73%	19%	6%	0%	0%	2%	

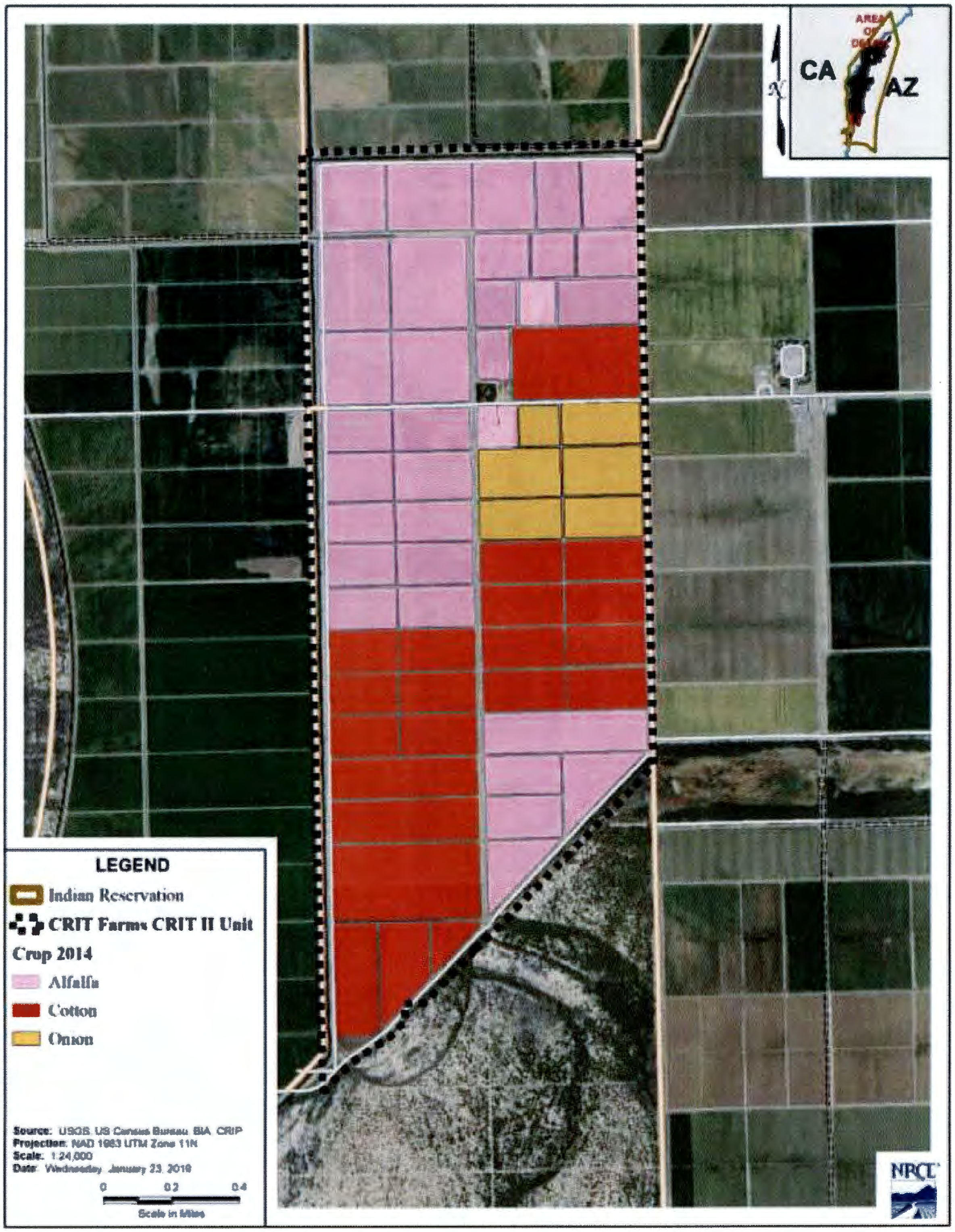

Figure G2. Cropping Pattern on CRIT Farms CRIT II Unit in 2014.

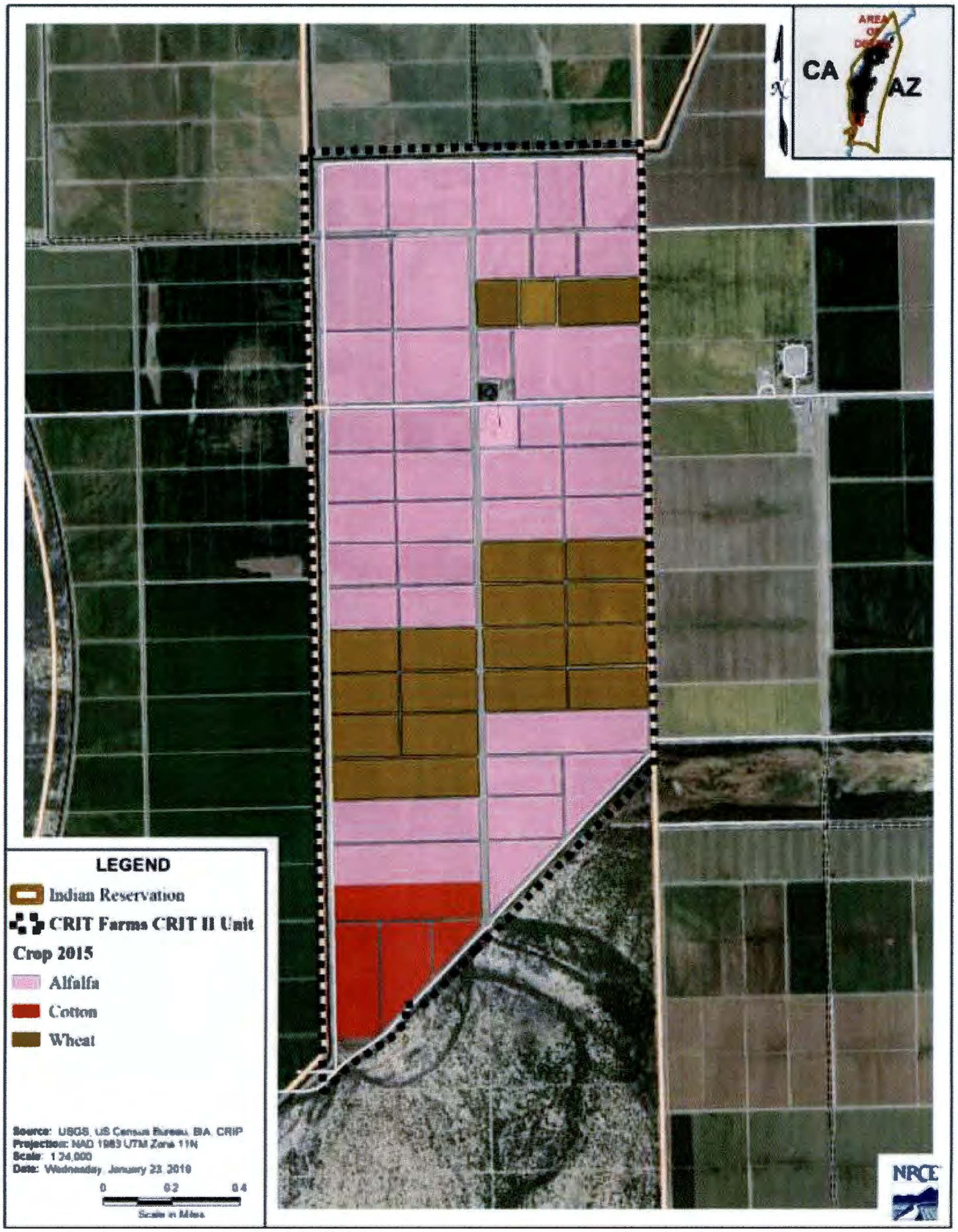

Figure G3. Cropping Pattern on CRIT Farms CRIT II Unit in 2015.

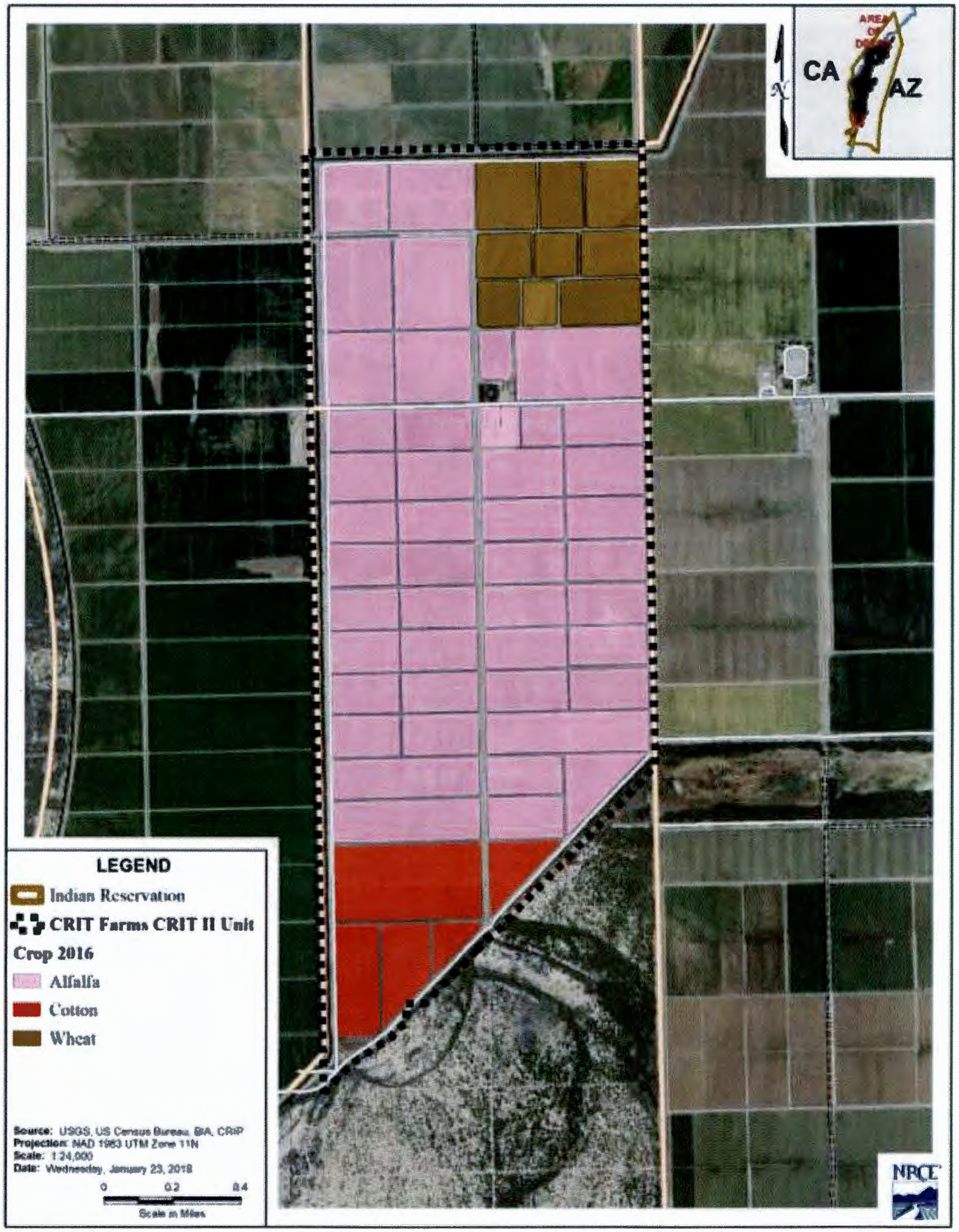

Figure G4. Cropping Pattern on CRIT Farms CRIT II Unit in 2016.

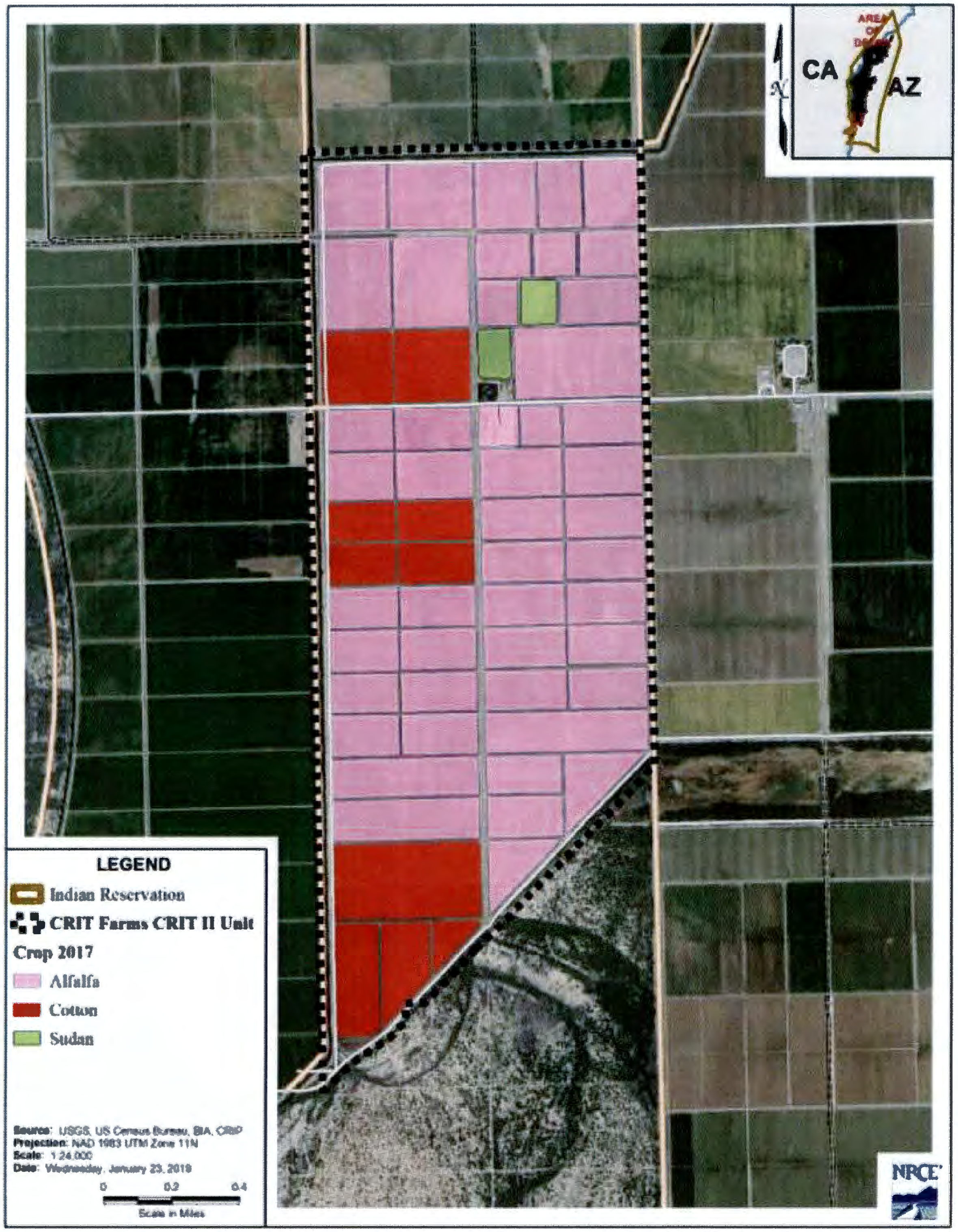

Figure G5. Cropping Pattern on CRIT Farms CRIT II Unit in 2017.

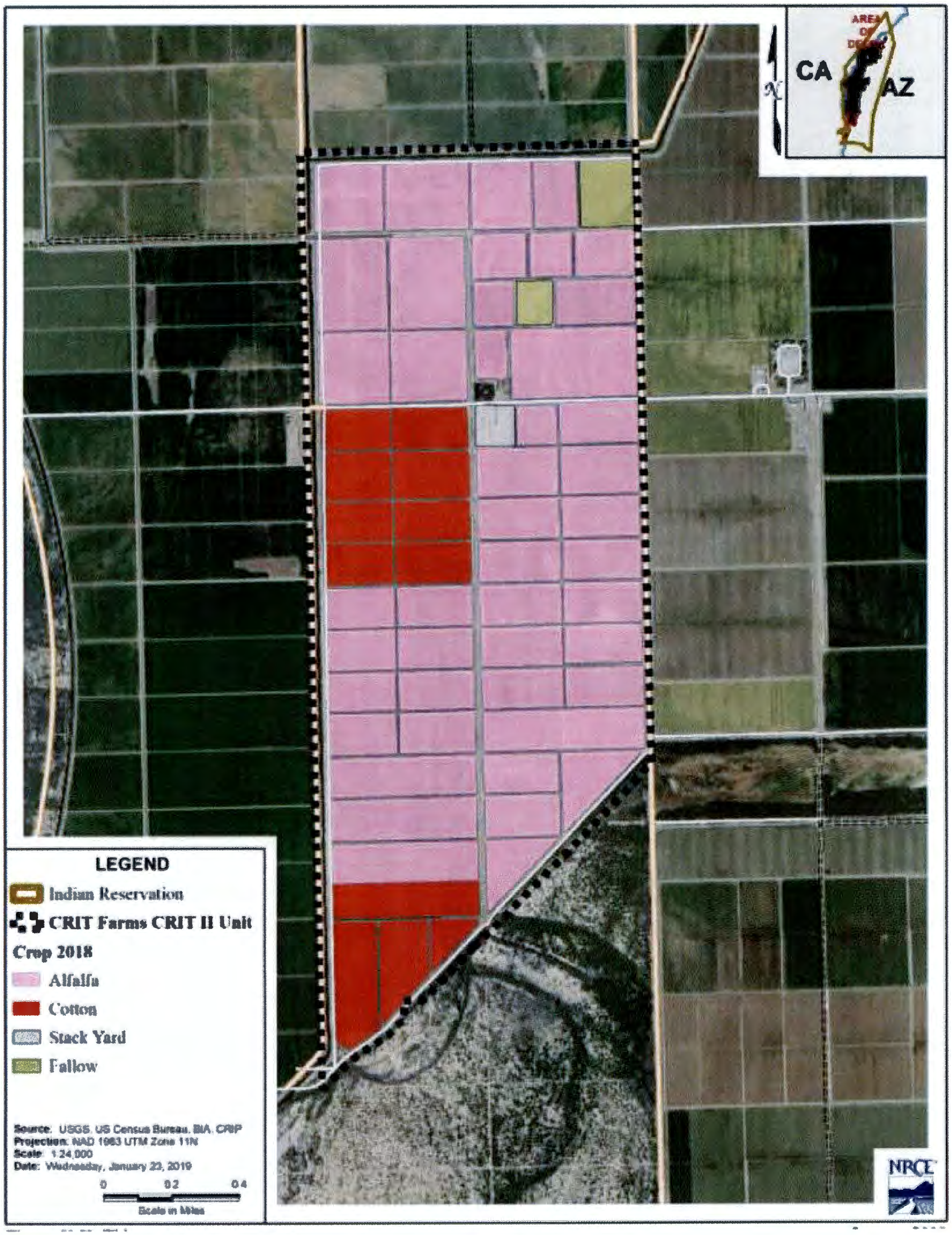

Figure G6. Cropping Pattern on CRIT Farms CRIT II Unit in 2018.

Estimated Crop Evapotranspiration

Table G2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table G2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table G3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated <u>average annual unit area consumptive use</u> on this Farm Unit for 2014-2018 is 5.04 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 674.7 acres on the Farm Unit is 6,246 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 11,676 AFY.

Table G3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. CRIT Farms CRIT II Unit.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	53.85	0.30	53.64	1,238.7	5,537	10,350
2015	75.19	54.02	0.93	53.22	1,238.7	5,493	10,268
2016	81.43	69.97	1.03	69.01	1,238.7	7,124	13,316
2017	77.70	64.15	0.82	63.49	1,238.7	6,554	12,251
2018	76.86	63.92	0.70	63.28	1,199.1	6,323	11,819
Average	77.26	61.18	0.76	60.53	1,230.8	6,206	11,601
				Unit area Net CU (AF/ac)		5.04	
				Max acreage	1,238.7	6,246	11,676

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for CRIT Farms CRIT II Unit is presented in Table G4.

Table G4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, CRIT Farms CRIT II Unit, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	180.1	336.6
February	3.57	5.09%	318.1	594.5
March	4.82	6.87%	429.3	802.4
April	6.83	9.74%	608.3	1,136.9
May	7.93	11.31%	706.7	1,320.9
June	9.09	12.96%	809.4	1,512.9
July	9.20	13.13%	820.0	1,532.6
August	8.71	12.42%	776.0	1,450.4
September	7.80	11.12%	694.7	1,298.6
October	4.40	6.28%	392.2	733.0
November	2.72	3.88%	242.2	452.7
December	3.03	4.32%	269.7	504.1
Annual	70.12	100.00%	6,246.5	11,675.7

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

F. Farm Unit: CRIT Farms Frimann Unit

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

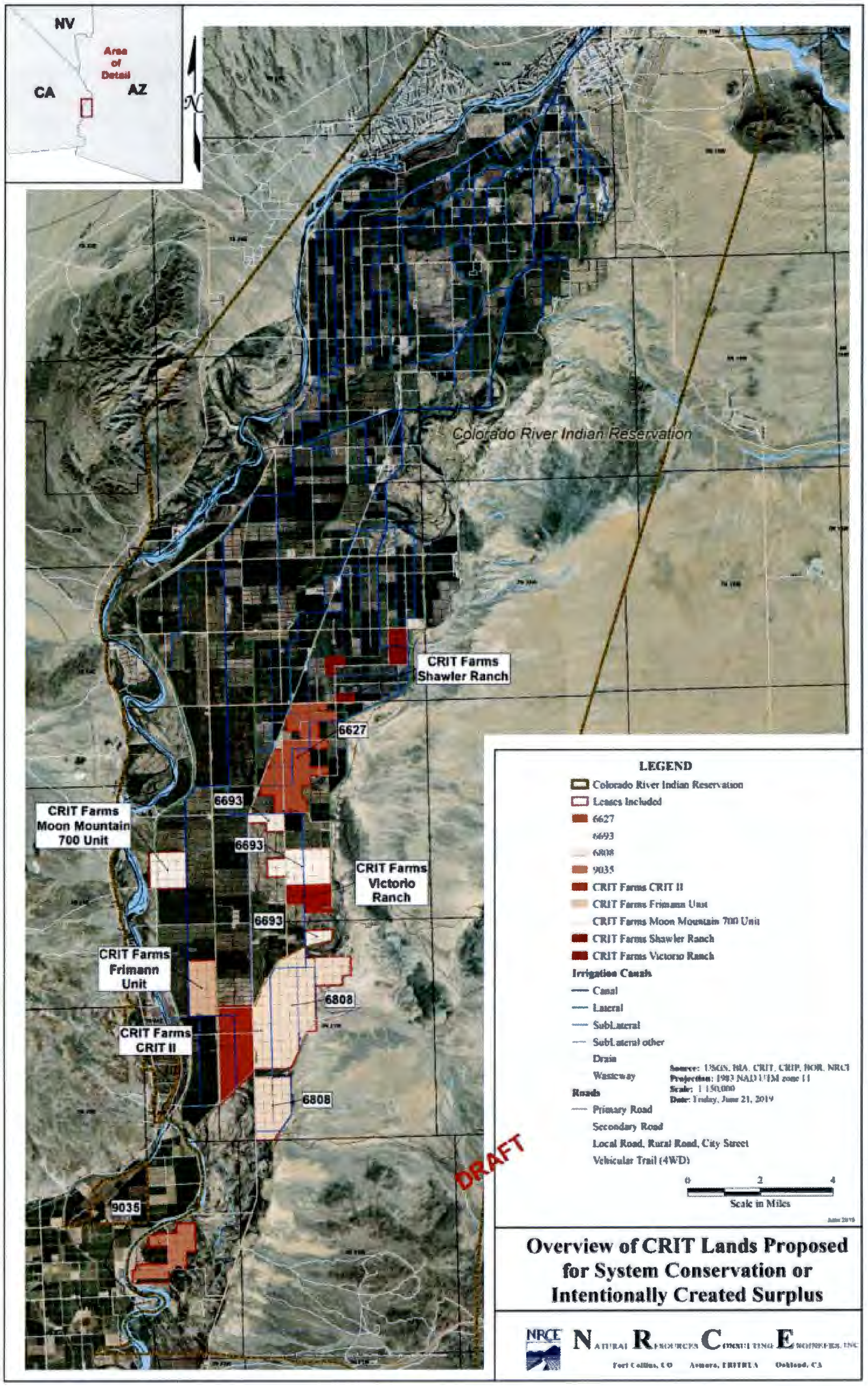

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bemuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bemuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bemuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bemuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bemuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bemuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$\mathrm{ET_c} = \mathrm{K_C} * \mathrm{ET_o}$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T+273} u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

F. Farm Unit: CRIT Farms Frimann Unit

Farm Description and Location

The CRIT Farms Frimann Unit is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 12 and 13 Township 5N Range 22W (Gila and Salt River Meridian), La Paz County, Arizona. The Frimann Unit is bounded by Project Sub-lateral Lower 90 on the west and south, irrigated crop land on the north, the Lower Main Drain on the east. Figure F1 is an overview map of the Unit. A maximum of 674.74 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on the Frimann Unit is served primarily by Sub-lateral Lower 90 of the Project. This sublateral serves other farm fields in the area and thus cannot be turned off at the head gate. Farm gate turnouts on Sublateral Lower 90 serving the Frimann Unit will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 30 irrigated field parcels were identified within the actively irrigated area of the Unit (see Figure F1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure F1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

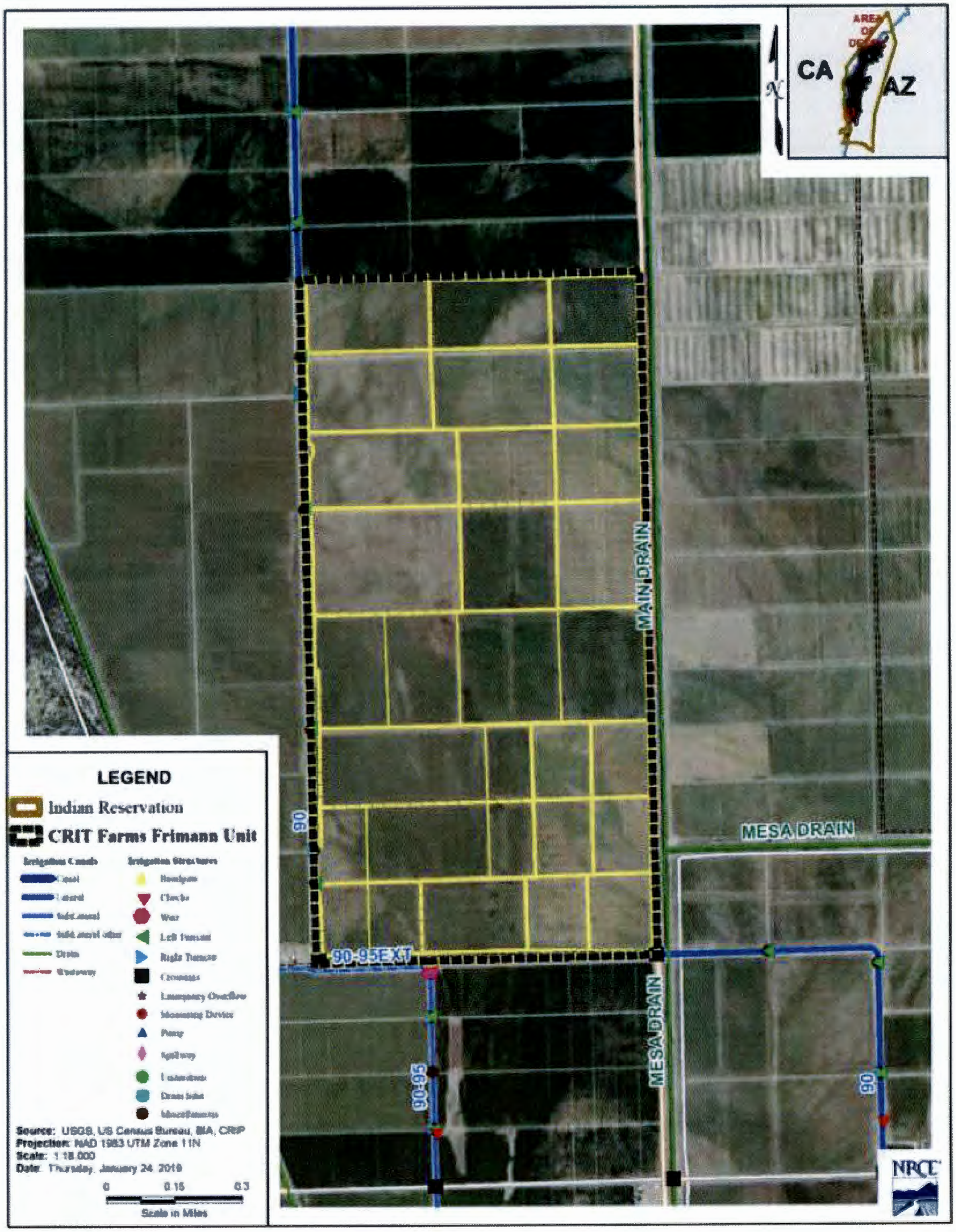

Figure F1. Overview Map of CRIT Farms Frimann Unit.

Cropping Patterns

Crop patterns/crop mix for field parcels on the Frimann Unit for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table F1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for the Frimann Unit is mapped in Figures F2-F6, for years 2014-2018, respectively.

Table F1. Cropping Patterns/Crop Mix of the CRIT Farms Frimann Unit, 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	674.7	43%	38%	19%	0%	0%	0%	0.0
2015	674.7	60%	0%	40%	0%	0%	0%	0.0
2016	674.7	23%	47%	30%	0%	0%	0%	0.0
2017	674.7	35%	45%	0%	0%	20%	0%	0.0
2018	674.7	100%	0%	0%	0%	0%	0%	0.0
Average		52%	26%	18%	0%	4%	0%	0.0

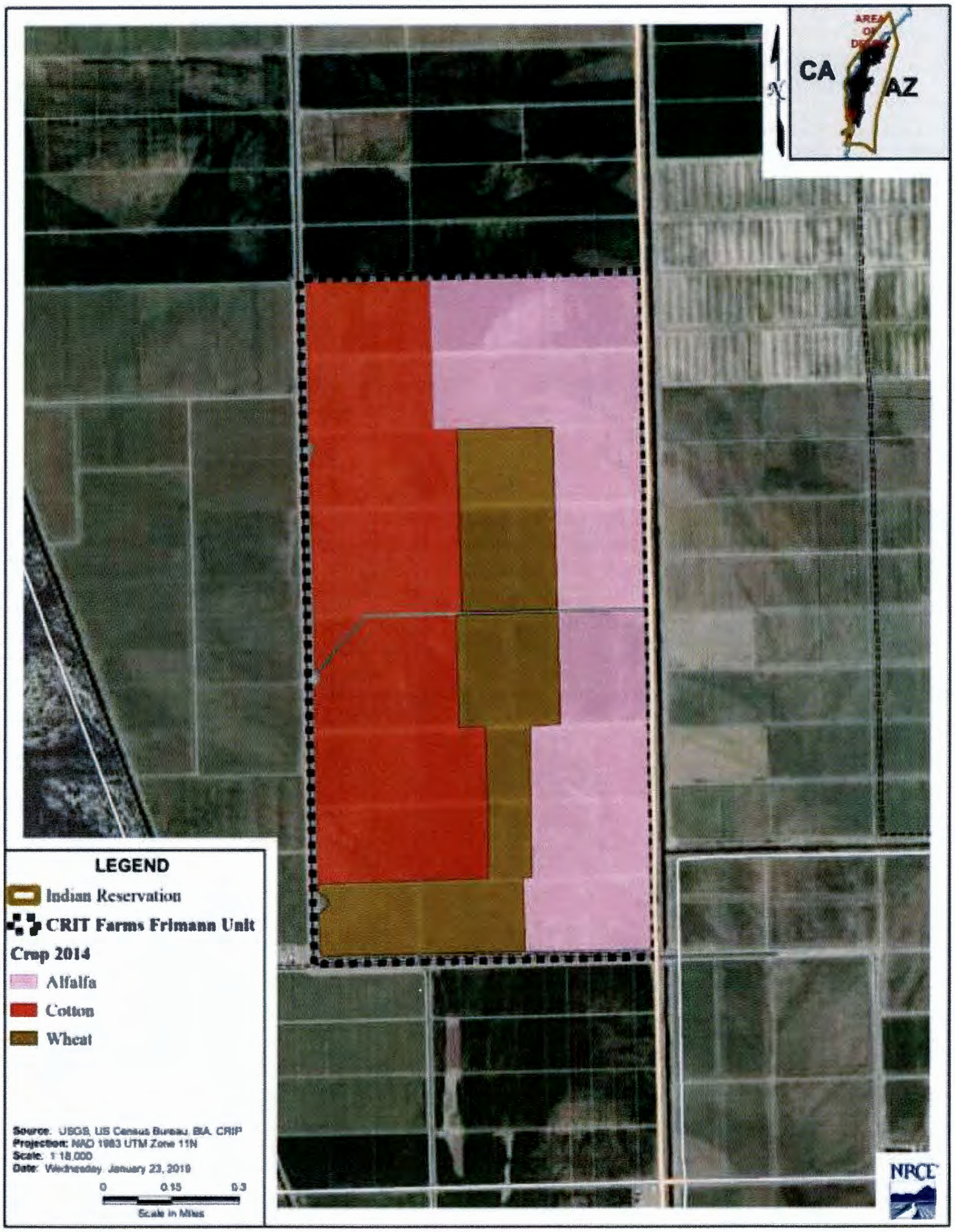

Figure F2. Cropping Pattern on CRIT Farms Frimann Unit in 2014.

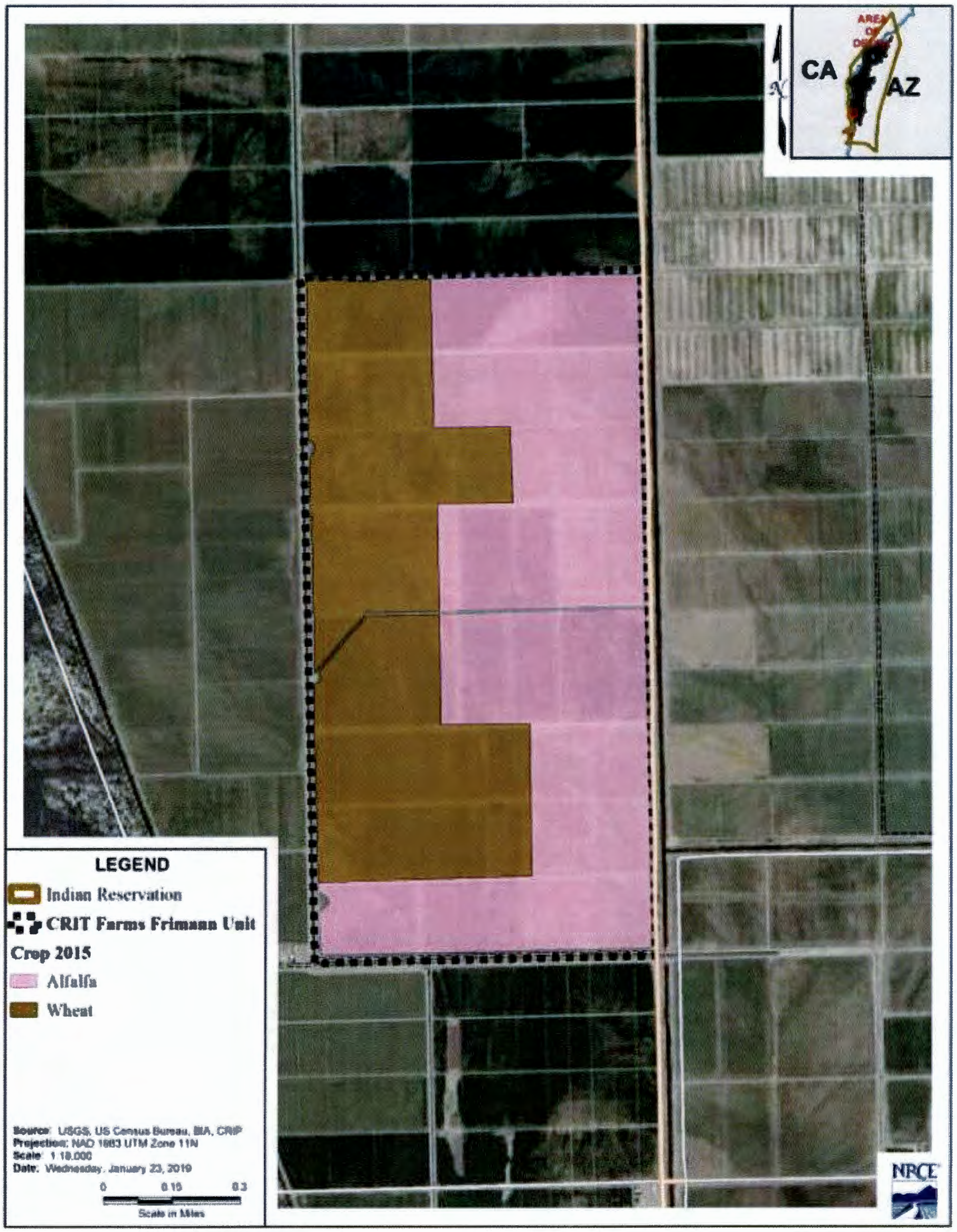

Figure F3. Cropping Pattern on CRIT Farms Frimann Unit in 2015.

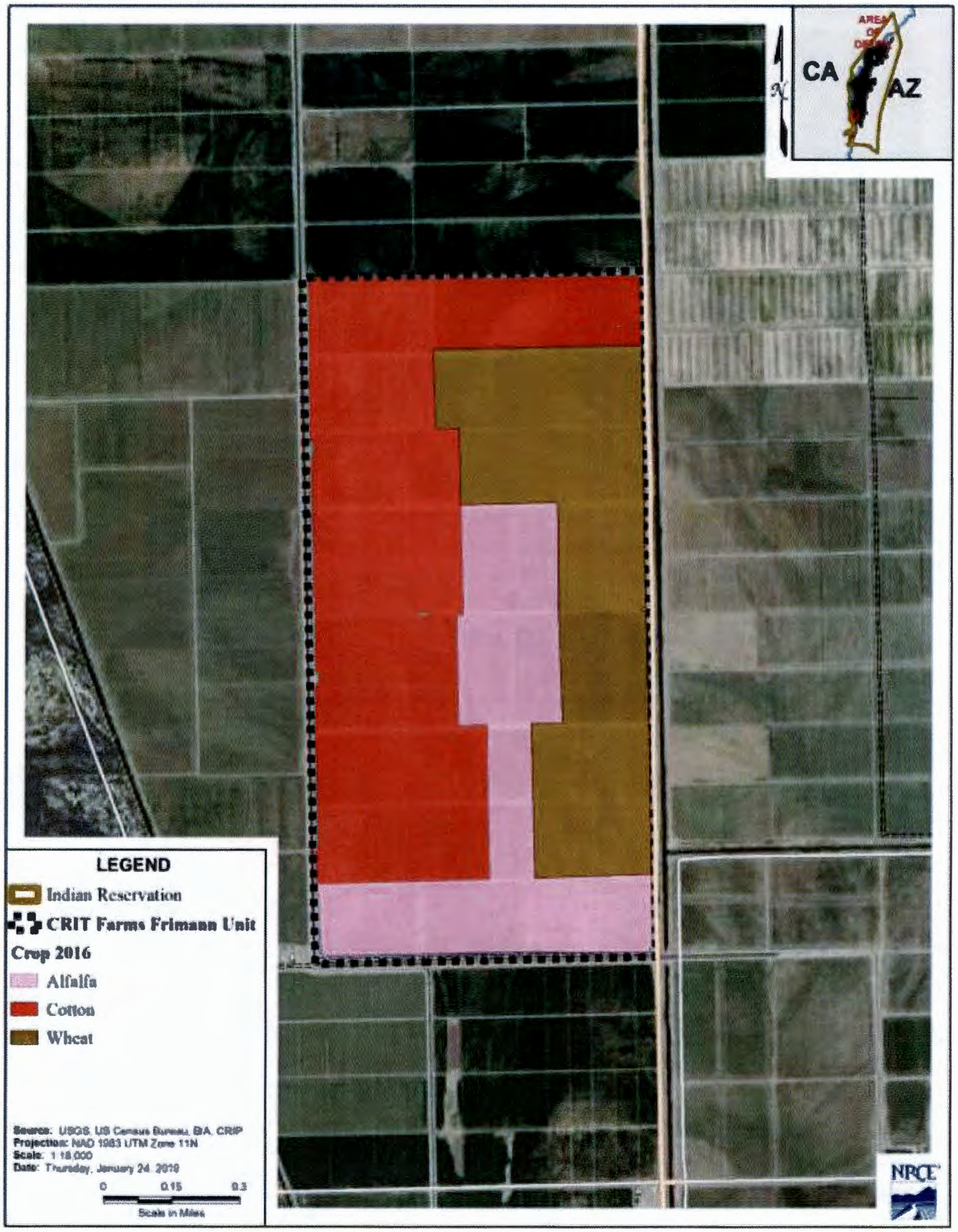

Figure F4. Cropping Pattern on CRIT Farms Frimann Unit in 2016.

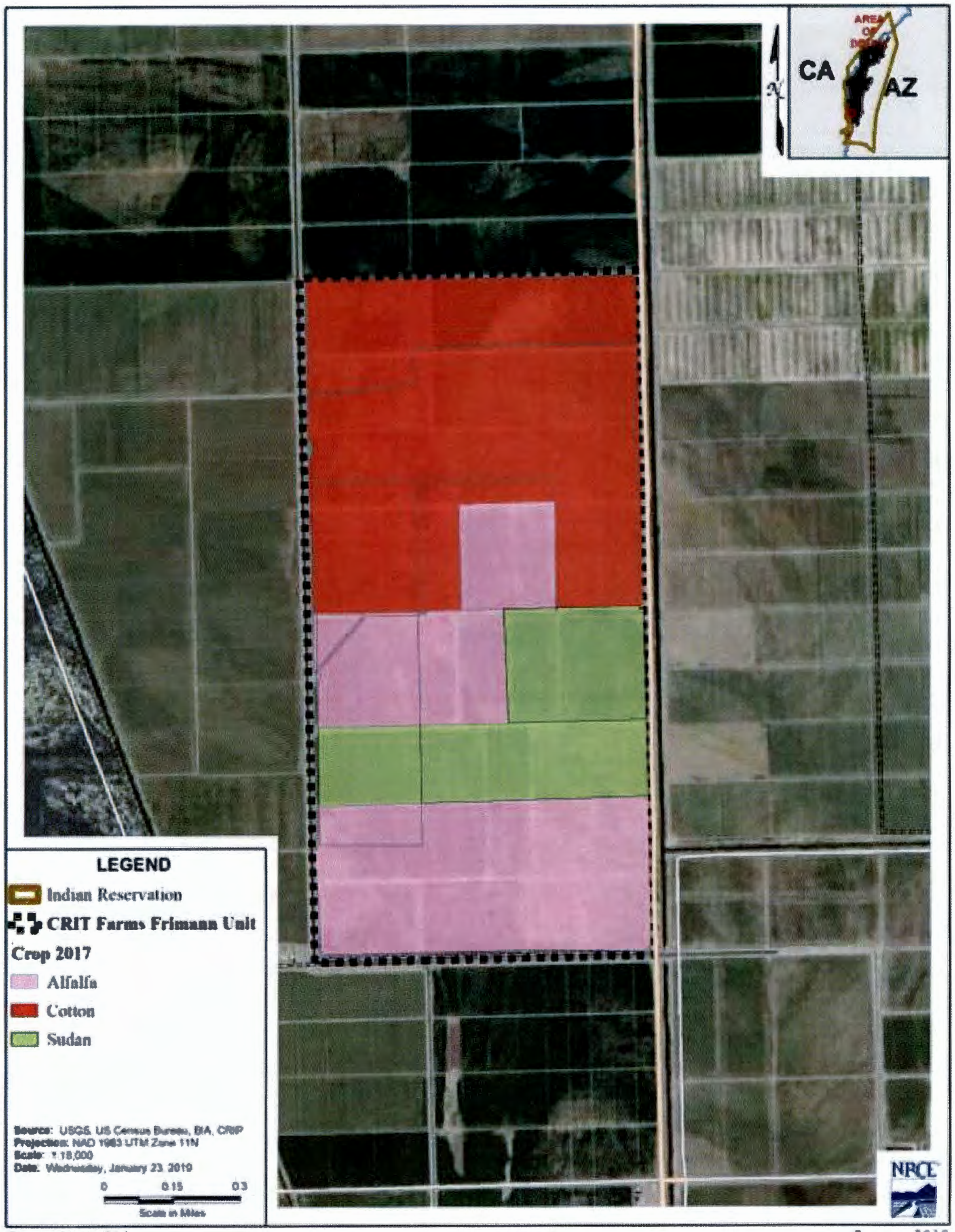

Figure F5. Cropping Pattern on CRIT Farms Frimann Unit in 2017.

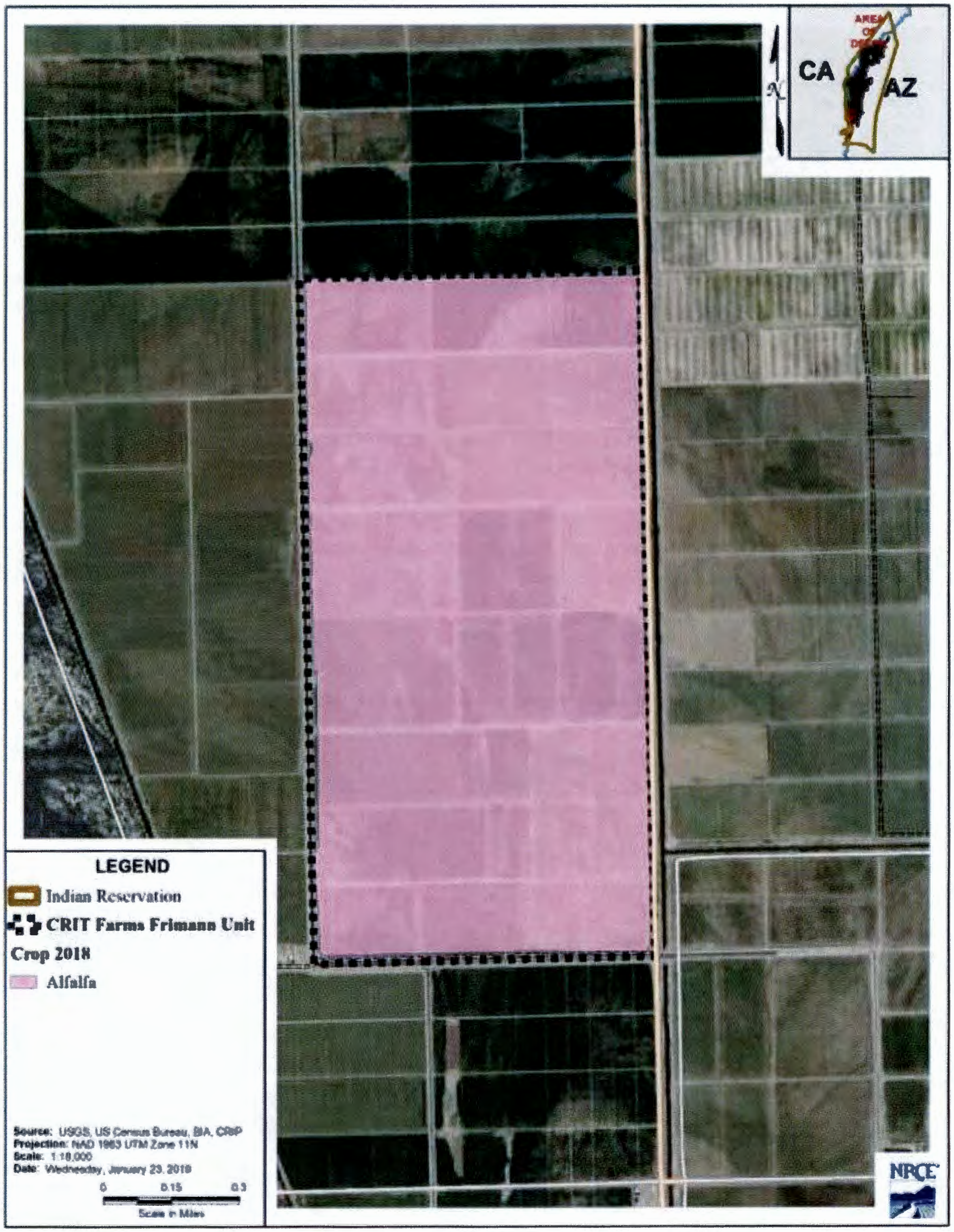

Figure F6. Cropping Pattern on CRIT Farms Frimann Unit in 2018.

Estimated Crop Evapotranspiration

Table F2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table F2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table F3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated <u>average annual unit area consumptive use</u> on this Farm Unit for 2014-2018 is 4.37 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 674.7 acres on the Farm Unit is 2,951 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 5,515 AFY.

Table F3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. CRIT Farms Frimann Unit.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	48.12	0.30	47.92	674.7	2,694	5,036
2015	75.19	50.15	0.93	49.35	674.7	2,775	5,187
2016	81.43	44.81	1.03	44.25	674.7	2,488	4,651
2017	77.70	52.17	0.82	51.88	674.7	2,917	5,453
2018	76.86	69.69	0.70	68.99	674.7	3,879	7,250
Average	77.26	52.99	0.76	52.48	674.7	2,951	5,515
				Unit area Net CU (AF/ac)		4.37	
				Max acreage	674.7	2,951	5,515

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for CRIT Farms Frimann Unit is presented in Table F4.

Table F4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, CRIT Farms Frimann Unit, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	85.1	159.0
February	3.57	5.09%	150.3	280.9
March	4.82	6.87%	202.8	379.0
April	6.83	9.74%	287.3	537.1
May	7.93	11.31%	333.8	624.0
June	9.09	12.96%	382.4	714.7
July	9.20	13.13%	387.3	724.0
August	8.71	12.42%	366.6	685.2
September	7.80	11.12%	328.2	613.4
October	4.40	6.28%	185.2	346.3
November	2.72	3.88%	114.4	213.8
December	3.03	4.32%	127.4	238.1
Annual	70.12	100.00%	2,950.7	5,515.4

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

H. FARM UNIT: CRIT FARMS MTA 700 UNIT

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

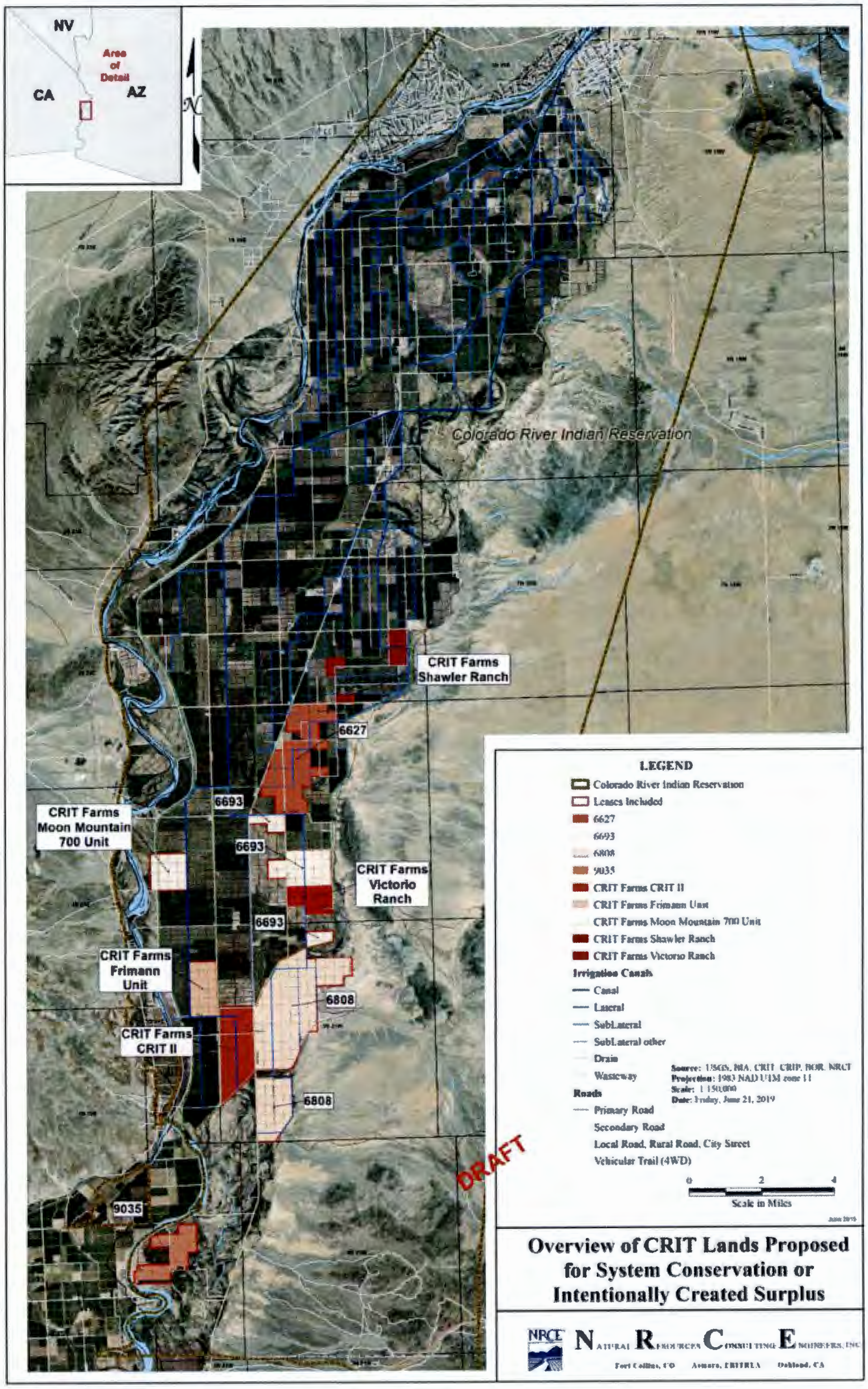

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T+273} u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

H. Farm Unit: CRIT Farms MTA 700 Unit

Farm Description and Location

The CRIT Farms MTA 700 Unit is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 25 and 26 Township 6N Range 22W (Gila and Salt River Meridian), La Paz County, Arizona. The MTA 700 Unit is bounded by the a levee and the USBR Palo Verde Drain on the west, irrigated cropland on the north and south, and Project Sublateral Lower 90 on the east. Figure H1 is an overview map of the Unit. Gross area of the unit is about 484.3 acres. A maximum of 465.8 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on the MTA 700 Unit is served primarily by Sub-lateral Lower 90 of the Project. Other farm units are served by Lower 90 downstream of this Unit and thus it cannot be turned off at the head gate or another upstream check structure. Farm gate turnouts on Sublateral Lower 90 serving the MTA 700 Unit will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 18 irrigated field parcels were identified within the actively irrigated area of the Unit (see Figure H1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure H1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

Figure H1. Overview Map of CRIT Farms MTA 700 Unit.

Cropping Patterns

Crop patterns/crop mix for field parcels on the MTA 700 Unit for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table H1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for the MTA 700 Unit is mapped in Figures H2-H6, for years 2014-2018, respectively.

Table H1. Cropping Patterns/Crop Mix of the CRIT Farms MTA 700 Unit, 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	465.8	100%	0%	0%	0%	0%	0%	4.2
2015	465.8	100%	0%	0%	0%	0%	0%	4.2
2016	465.8	100%	0%	0%	0%	0%	0%	4.2
2017	465.8	100%	0%	0%	0%	0%	0%	4.2
2018	465.8	33%	34%	0%	34%	0%	0%	4.2
Average		87%	7%	0%	7%	0%	0%	

Figure H2. Cropping Pattern on CRIT Farms MTA 700 Unit in 2014.

Figure H3. Cropping Pattern on CRIT Farms MTA 700 Unit in 2015.

Figure H4. Cropping Pattern on CRIT Farms MTA 700 Unit in 2016.

Figure H5. Cropping Pattern on CRIT Farms MTA 700 Unit in 2017.

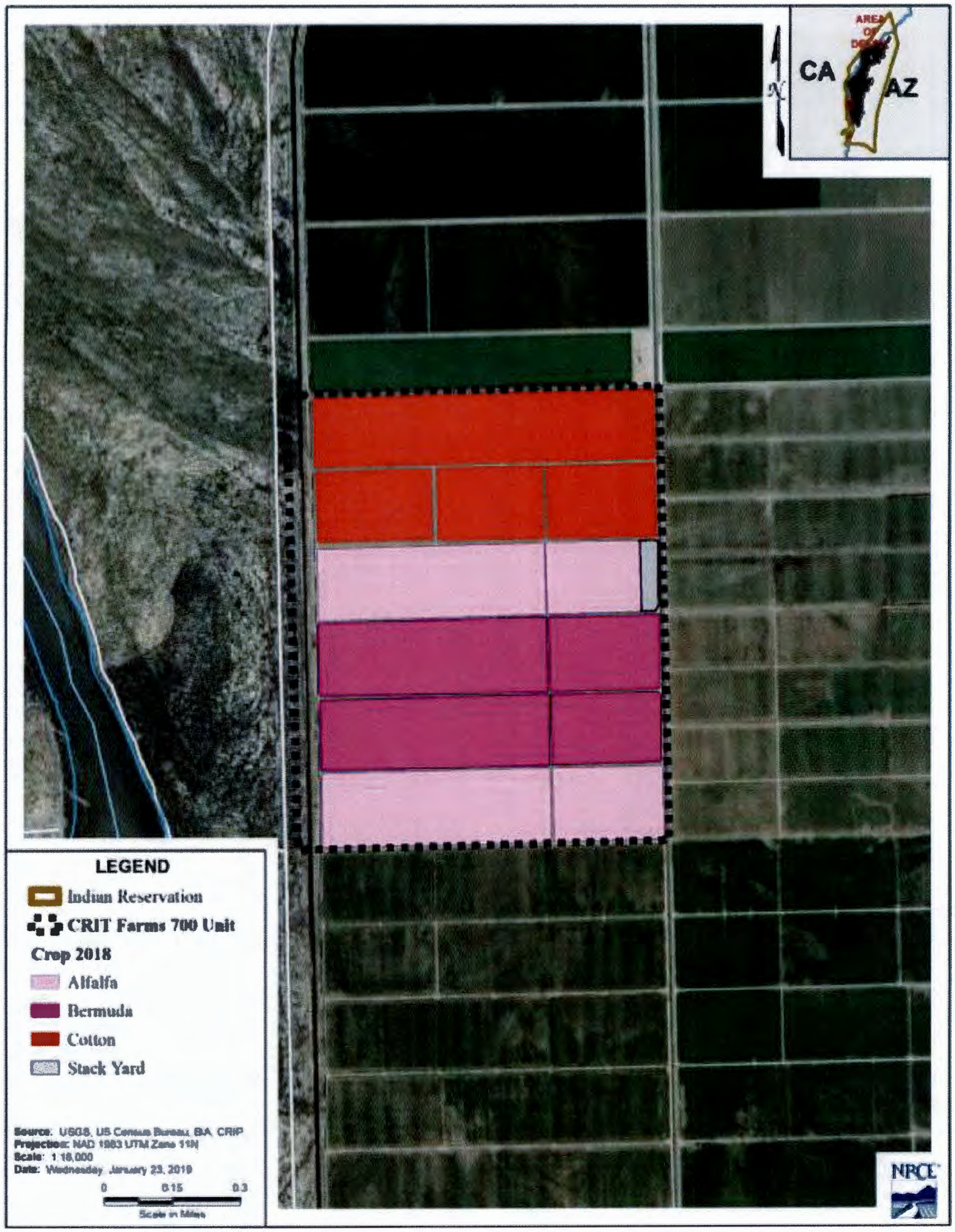

Figure H6. Cropping Pattern on CRIT Farms MTA 700 Unit in 2018.

Estimated Crop Evapotranspiration

Table H2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table H2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table H3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 5.50 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 465.8 acres on the Farm Unit is 2,562 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 4,789 AFY.

Table H3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. CRIT Farms MTA 700 Unit.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	67.87	0.30	67.57	465.8	2,623	4,903
2015	75.19	68.19	0.93	67.25	465.8	2,611	4,880
2016	81.43	73.89	1.03	72.86	465.8	2,828	5,286
2017	77.70	70.51	0.82	69.69	465.8	2,705	5,056
2018	76.86	53.27	0.70	52.68	465.8	2,045	3,822
Average	77.26	66.75	0.76	66.01	465.8	2,562	4,789
				Unit area Net CU (AF/ac)		5.50	
				Max acreage	465.8	2,562	4,789

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for CRIT Farms MTA 700 Unit is presented in Table H4.

Table H4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, CRIT Farms MTA 700 Unit, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	73.9	138.1
February	3.57	5.09%	130.5	243.9
March	4.82	6.87%	176.1	329.1
April	6.83	9.74%	249.5	466.4
May	7.93	11.31%	289.9	541.8
June	9.09	12.96%	332.0	620.6
July	9.20	13.13%	336.3	628.7
August	8.71	12.42%	318.3	595.0
September	7.80	11.12%	285.0	532.7
October	4.40	6.28%	160.9	300.7
November	2.72	3.88%	99.3	185.7
December	3.03	4.32%	110.6	206.8
Annual	70.12	100.00%	2,562.3	4,789.4

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

I. FARM UNIT: CRIT FARMS SHAWLER RANCH UNIT

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation Program (SCP) and Extraordinary Conservation Intentionally Created Surplus Program (EC ICS). Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use the sites listed in Table 1

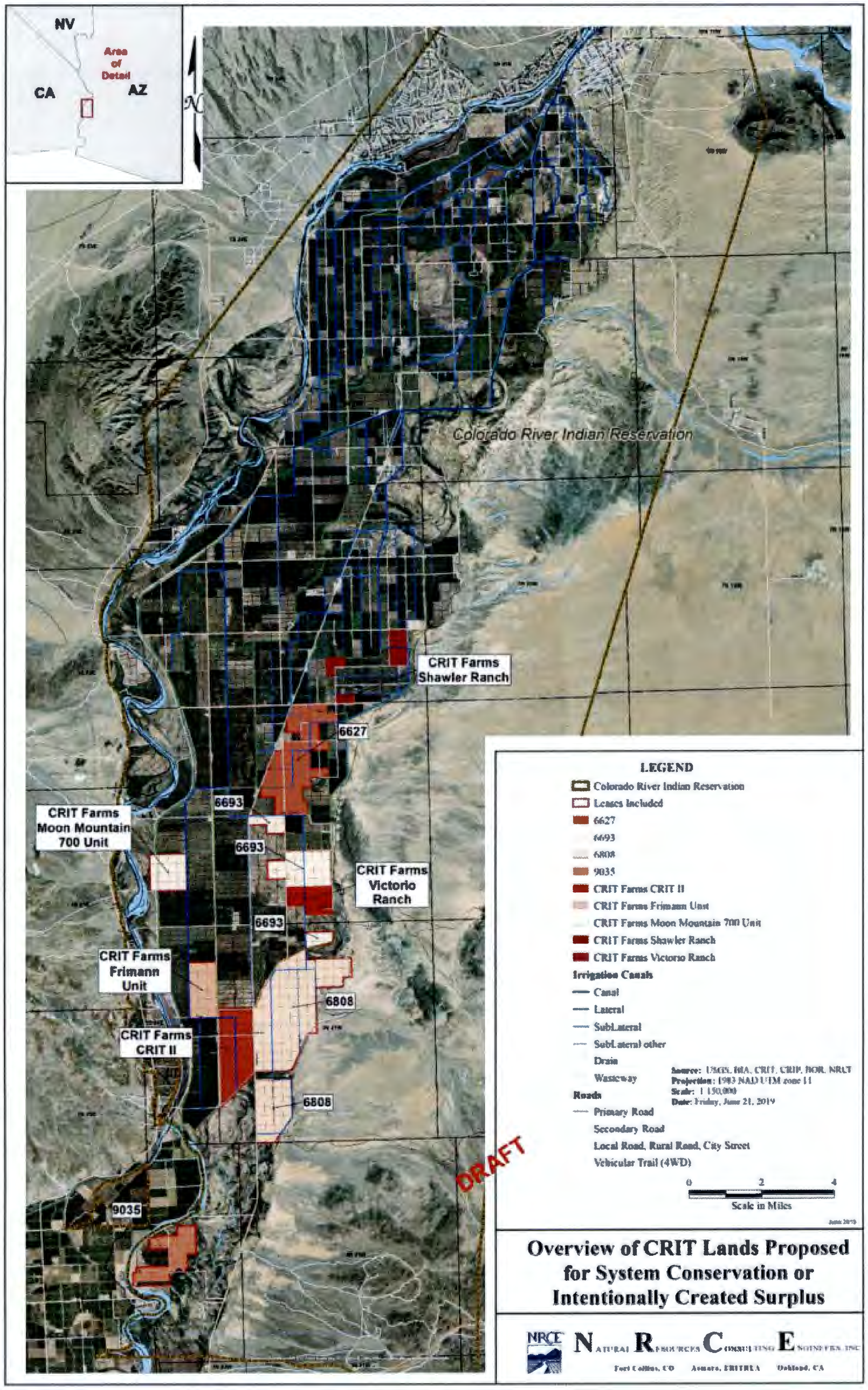

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T+273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34 u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_0 from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

I. Farm Unit: CRIT Farms Shawler Ranch Unit

Farm Description and Location

The CRIT Farms Shawler Ranch Unit is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 25, 27 and 34 Township 7N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. The Shawler Ranch Unit is not one contiguous block but contains three separate subunits (8 parcels in Section 25, 2 parcels in Section 27, and 3 parcels in Section 34). It is generally bounded by Navajo Road on the south, Peterson Road on the north and 14th Avenue on the west and 10th Avenue on the east. Figure I1 is an overview map of the Unit. Gross area of the unit is about 454.9 acres. A maximum of 439.5 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on the Shawler Ranch Unit is served primarily by sub-laterals 73-36 and 73-36-7 of the Project. Other farm units are served by these sub-laterals and thus they cannot be turned off at the head gate or another upstream check structure. Farm gate turnouts on the sub-laterals serving the Shawler Ranch Unit (subunits) will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 13 irrigated field parcels were identified within the actively irrigated area of the Unit (see Figure I1). Background aerial imagery in Figure H1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

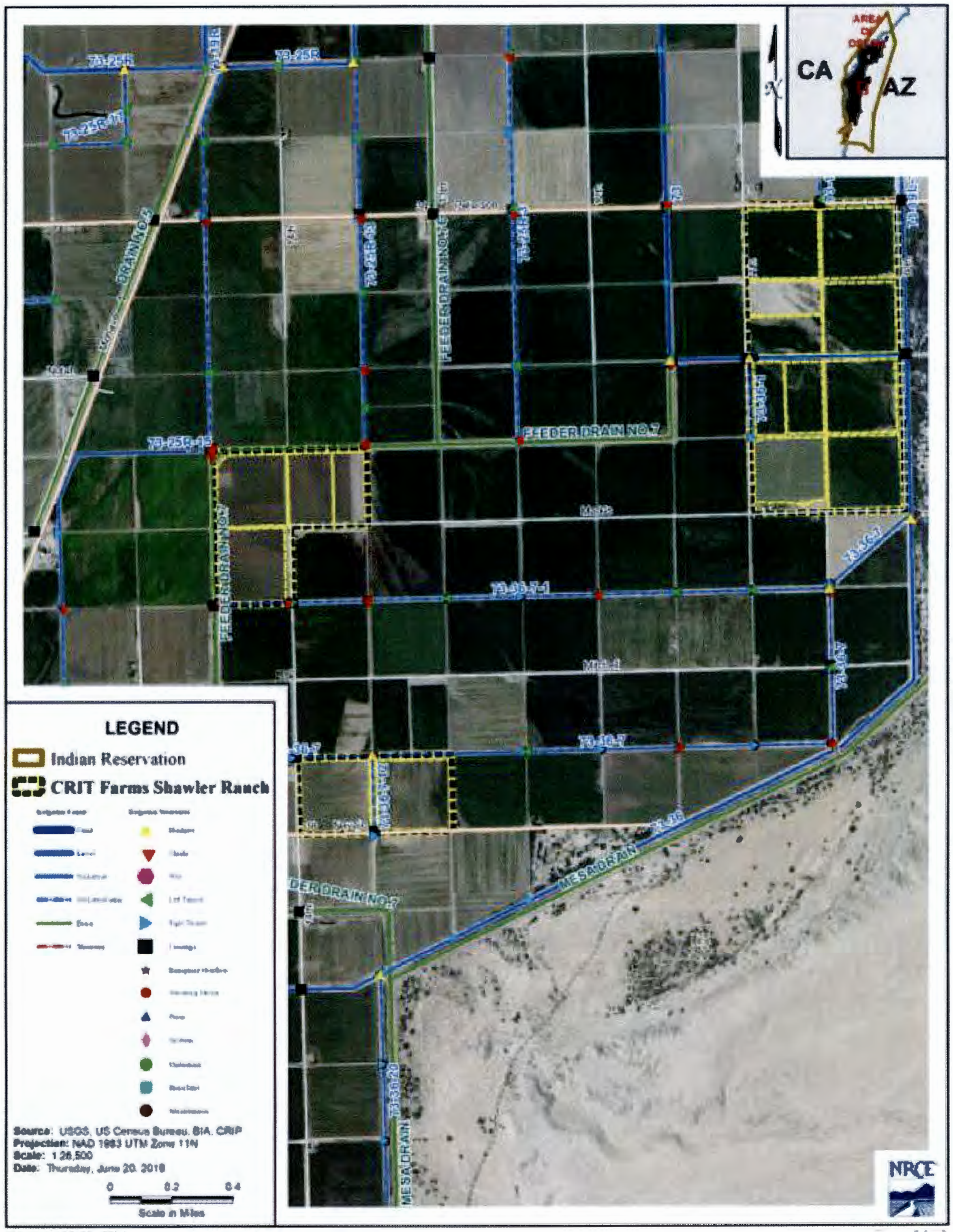

Figure I1. Overview Map of CRIT Farms Shawler Ranch Unit.

Cropping Patterns

Crop patterns/crop mix for field parcels on the Shawler Ranch Unit for the years 2014-2018 inclusive were available from CRIT Farms and are summarized in Table I1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for the Shawler Ranch Unit is mapped in Figures I2-I6, for years 2014-2018, respectively.

Table I1. Cropping Patterns/Crop Mix of the CRIT Farms Shawler Ranch Unit, 2014-2018 .

Year	Total Irrigated Crops	Alfalfa - Perennial	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	439.5	72%	28%	0%	0%	0%	0%	15.4
2015	439.5	100%	0%	0%	0%	0%	0%	15.4
2016	424.5	63%	37%	0%	0%	0%	0%	30.4
2017	424.5	55%	37%	0%	0%	8%	0%	30.4
2018	424.5	55%	45%	0%	0%	0%	0%	30.4
Average		69%	30%	0%	0%	2%	0%	

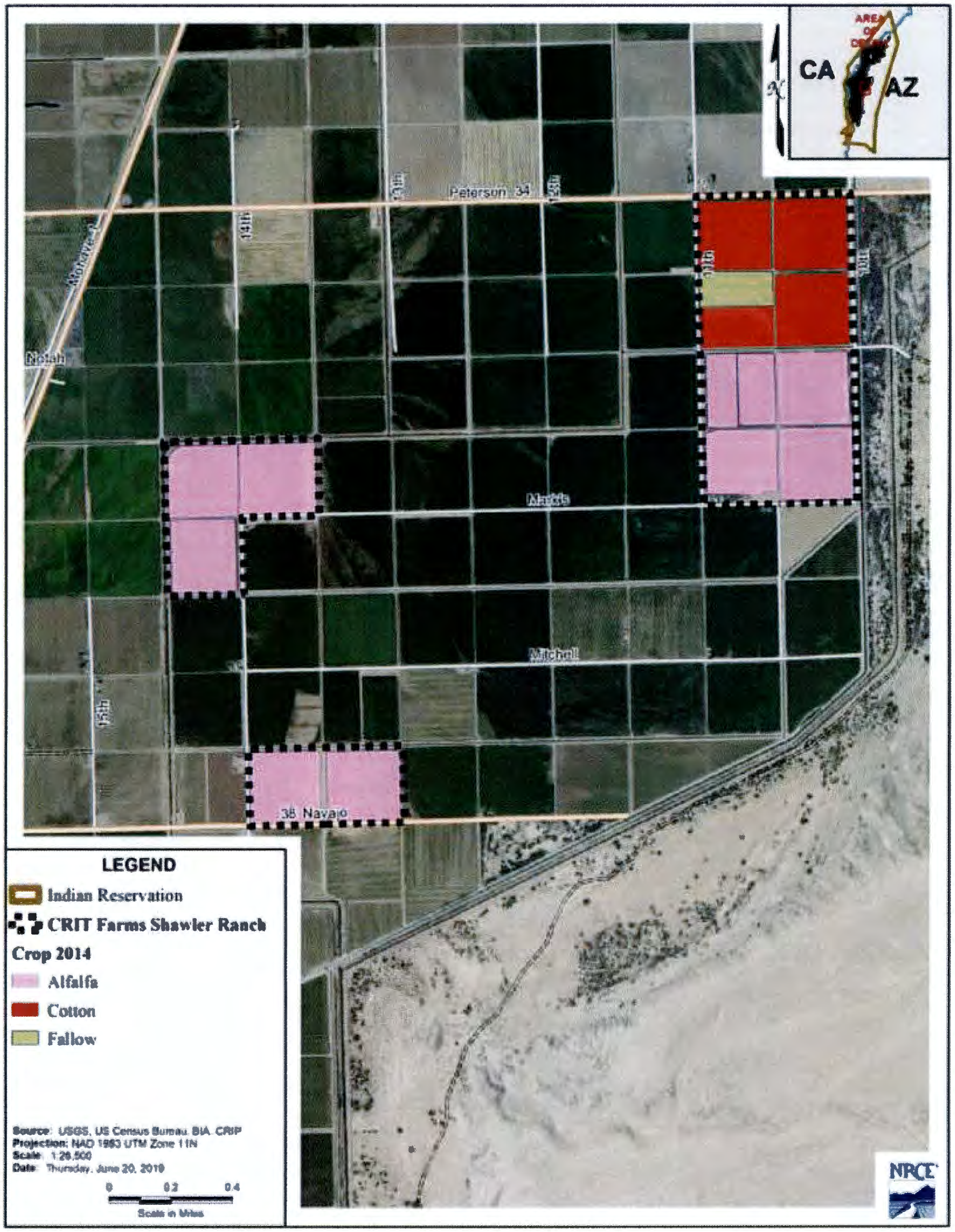

Figure I2. Cropping Pattern on CRIT Farms Shawler Ranch Unit in 2014.

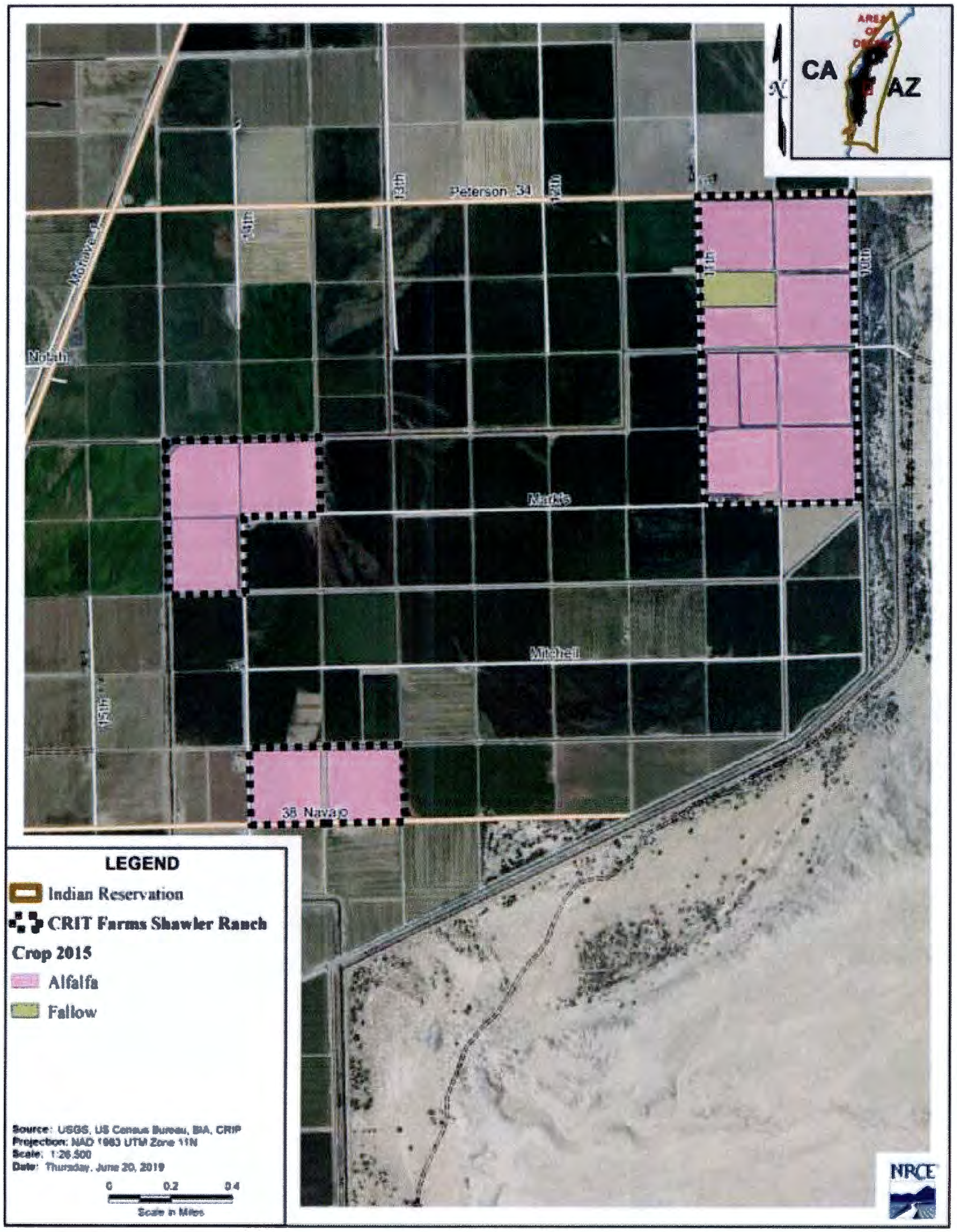

Figure I3. Cropping Pattern on CRIT Farms Shawler Ranch Unit in 2015.

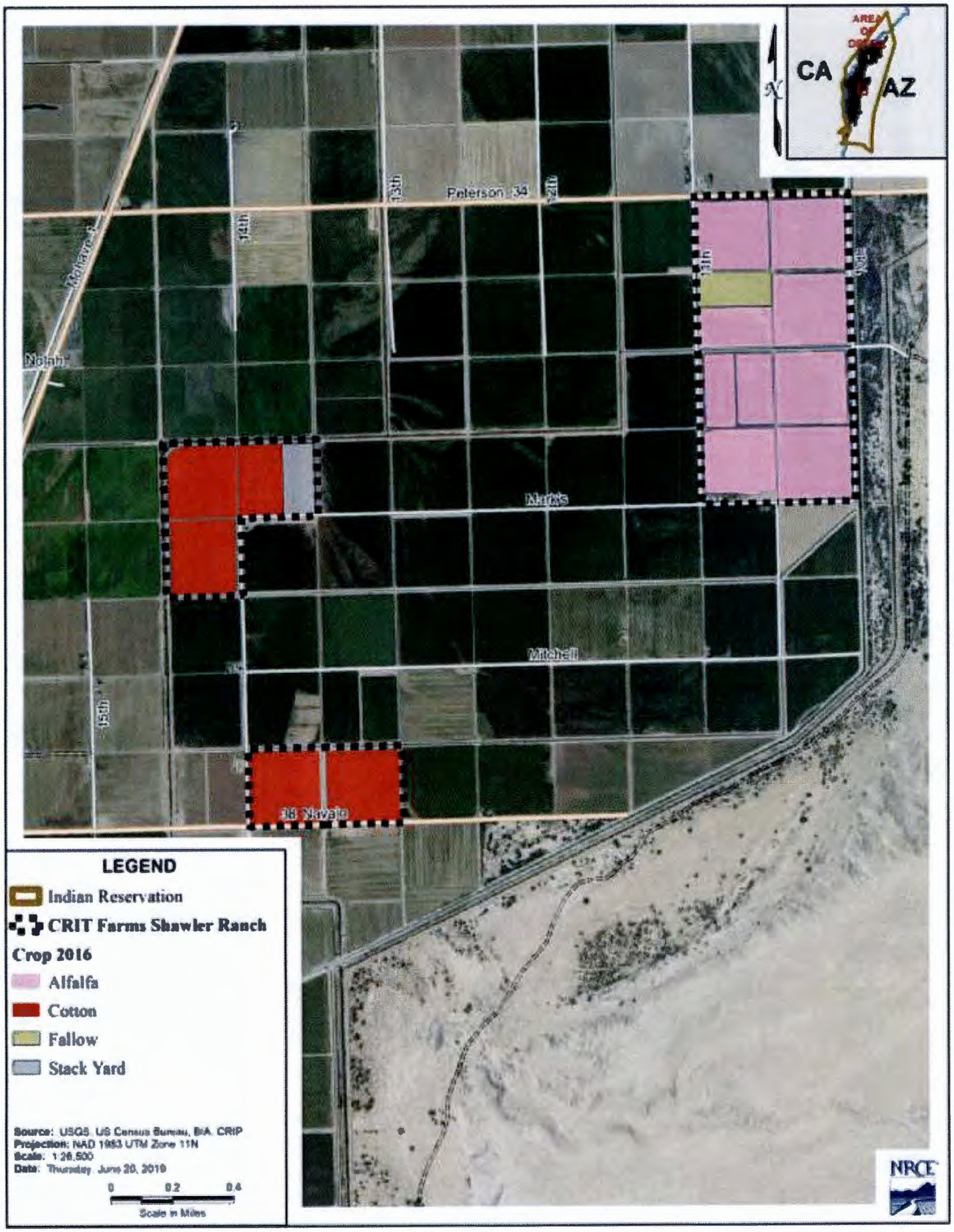

Figure I4. Cropping Pattern on CRIT Farms Shawler Ranch Unit in 2016.

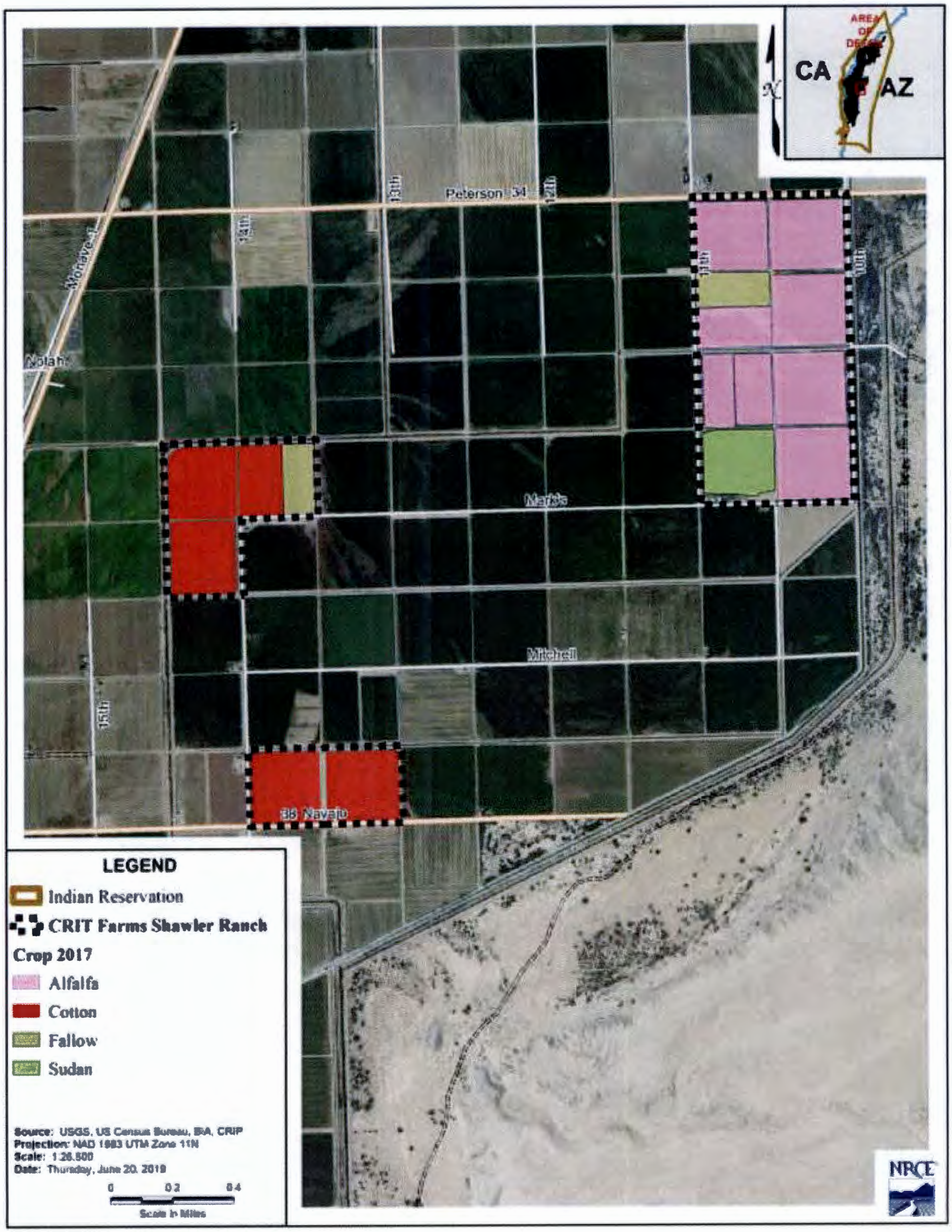

Figure I5. Cropping Pattern on CRIT Farms Shawler Ranch Unit in 2017.

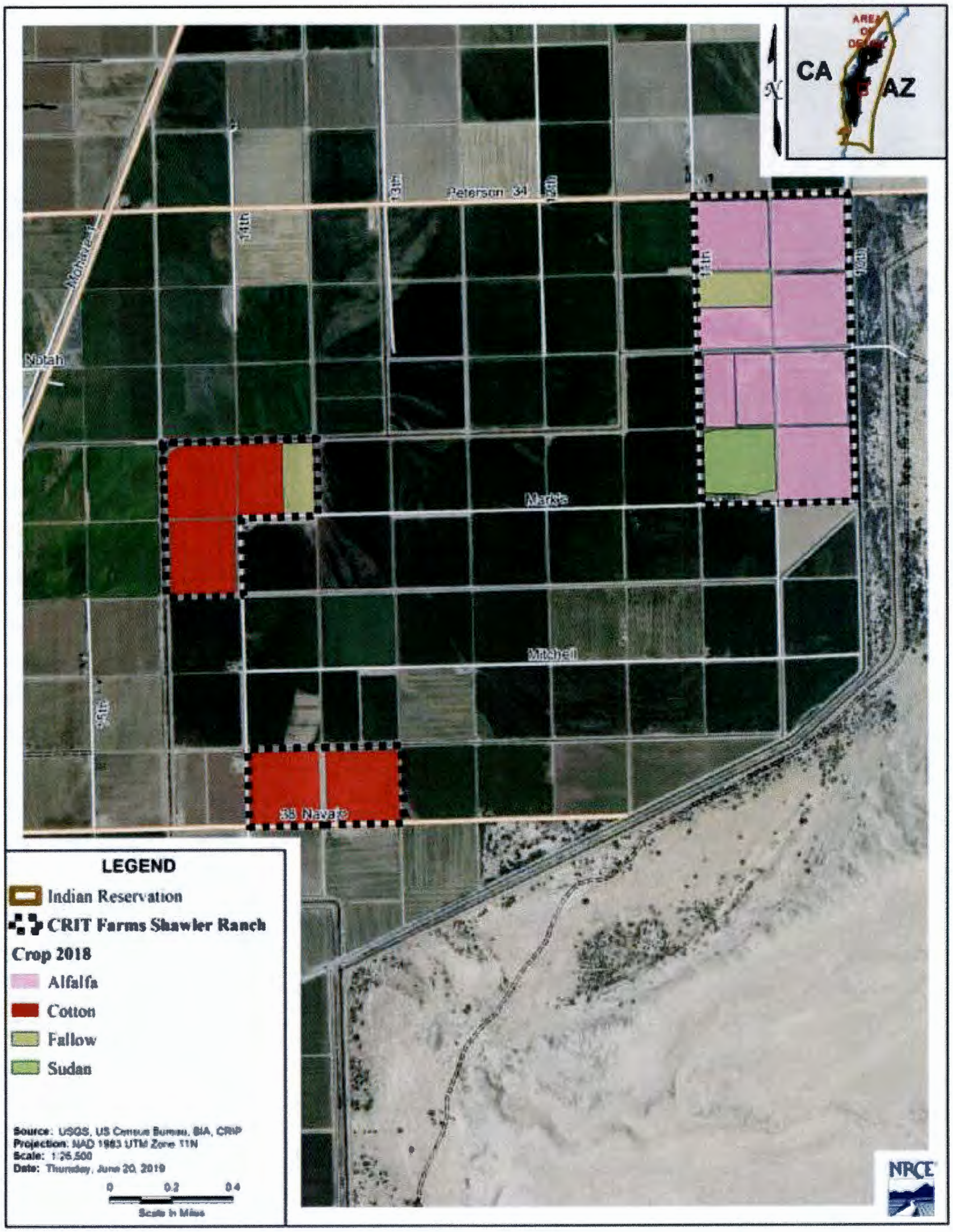

Figure I6. Cropping Pattern on CRIT Farms Shawler Ranch Unit in 2018.

Estimated Crop Evapotranspiration

Table I2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table I2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table I3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 5.02 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 439.5 acres on the Farm Unit is 2,206 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 4,124 AFY.

Table I3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. CRIT Farms Shawler Ranch Unit.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Net Actual Consumptive Use	Net Crop Area Fallowed	Net Actual Consumptive Use Demand[3]	Diversion Reduction at Headgate Rock Dam (AF)[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	59.42	0.30	59.18	439.5	2,168	4,052
2015	75.19	68.19	0.93	67.25	439.5	2,463	4,604
2016	81.43	62.40	1.03	61.73	424.5	2,184	4,082
2017	77.70	57.46	0.82	57.00	424.5	2,017	3,769
2018	76.86	56.38	0.70	55.83	424.5	1,975	3,691
Average	77.26	60.77	0.76	60.20	430.5	2,161	4,040
						5.02	
				Max acreage	439.5	2,206	4,124

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for CRIT Farms Shawler Ranch Unit is presented in Table I4.

Table I4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, CRIT Farms Shawler Ranch Unit, 2014-2018.

Month	Mean annual Alfalfa Crop ET (in) for period of analysis	% of total	Monthly Net Actual Consumptive Use Demand (AF)	Monthly Diversion Reduction at Headgate Rock Dam (AF)
January	2.02	2.88%	63.6	118.9
February	3.57	5.09%	112.4	210.0
March	4.82	6.87%	151.6	283.4
April	6.83	9.74%	214.8	401.6
May	7.93	11.31%	249.6	466.6
June	9.09	12.96%	285.9	534.4
July	9.20	13.13%	289.6	541.3
August	8.71	12.42%	274.1	512.3
September	7.80	11.12%	245.4	458.7
October	4.40	6.28%	138.5	258.9
November	2.72	3.88%	85.5	159.9
December	3.03	4.32%	95.3	178.1
Annual	70.12	100.00%	2,206.4	4,124.0

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

E. Farm Unit: CRIT Farms Victorio Unit

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

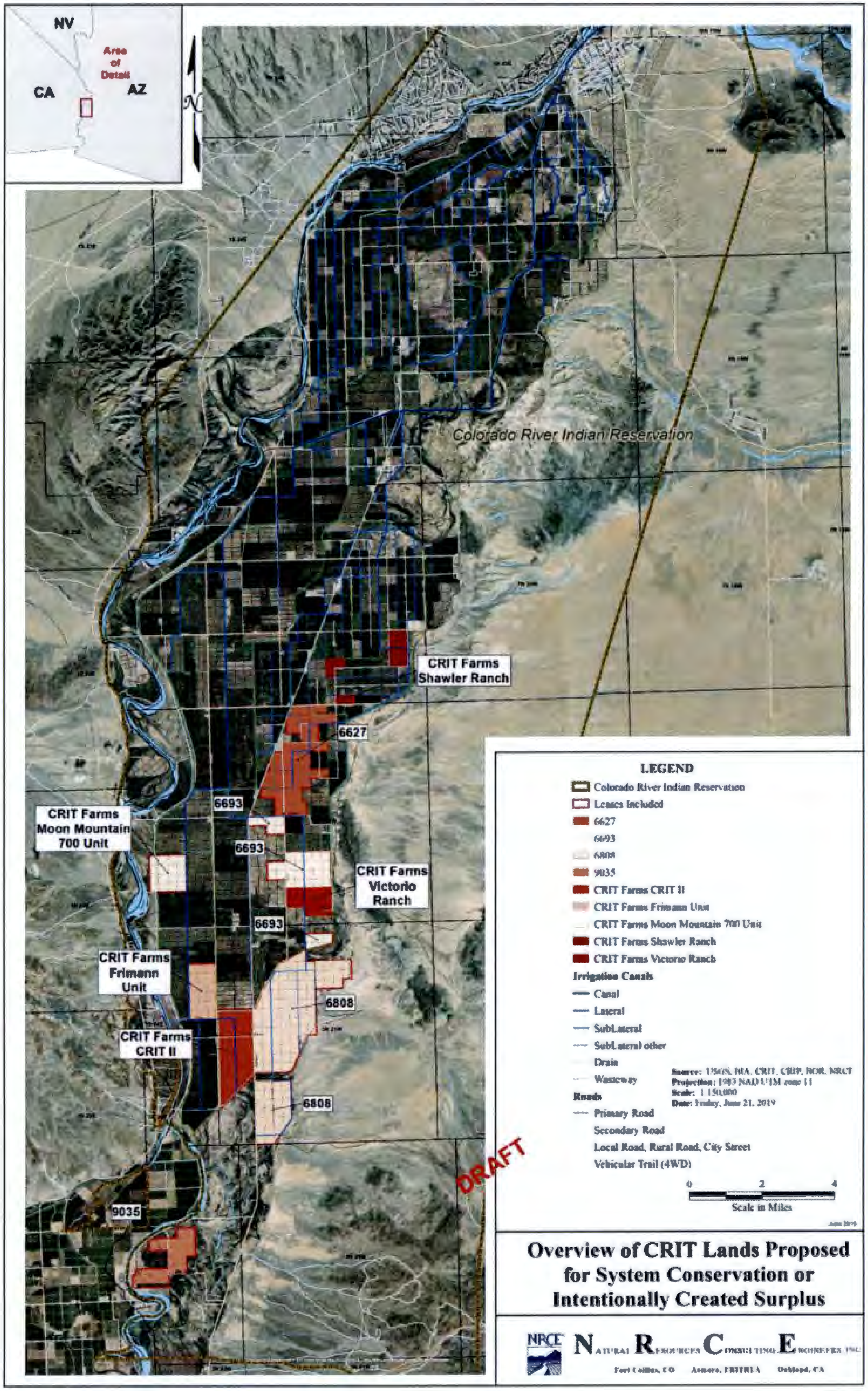

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T + 273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

E. Farm Unit: CRIT Farms Victorio Unit

Farm Description and Location

The CRIT Farms Victorio Unit is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 33 and 34 Township 6N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. The Victorio Unit is bounded by 17th Avenue on the west, Farm Unit 6693 on the north, Mesa Drain on the east and idle land on the south. Figure E1 is an overview map of the Unit. A maximum of 424.7 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on the Victorio Unit is served primarily by Sub-lateral 90-56 of the Project. This sublateral serves other farm fields in the area and thus cannot be turned off at the head gate. Farm gate turnouts on Sublateral 90-56 serving the Victorio Unit will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 19 irrigated field parcels were identified within the actively irrigated area of the Unit (see Figure E1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure E1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

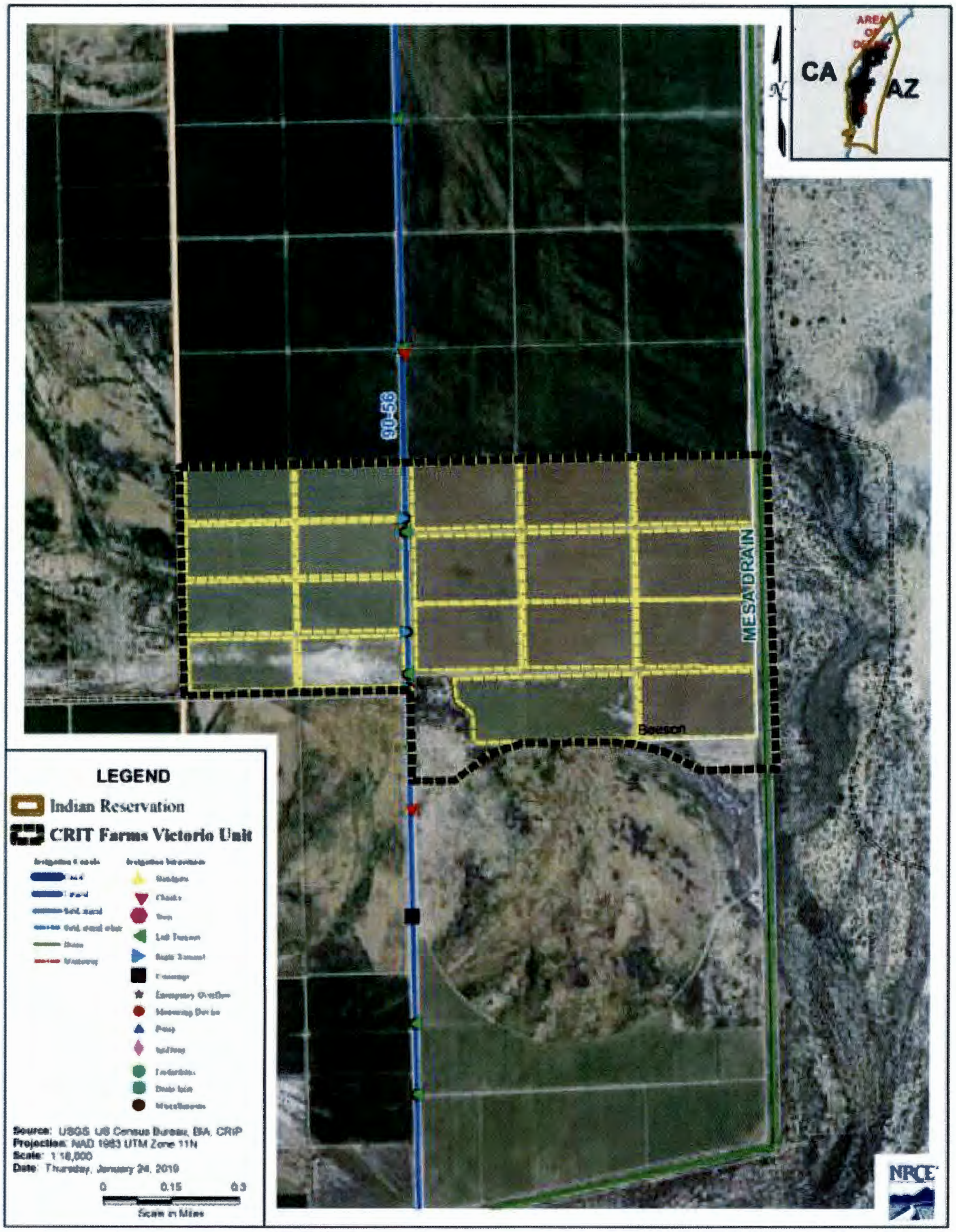

Figure E1. Overview Map of CRIT Farms Victorio Unit.

Cropping Patterns

Crop patterns/crop mix for field parcels on the Victorio Unit for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table E1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for the Victorio Unit is mapped in Figures E2-E6, for years 2014-2018, respectively.

Table E1. Cropping Patterns/Crop Mix of the CRIT Farms Victorio Unit, 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	370.7	95%	0%	0%	5%	0%	0%	54.0
2015	406.8	87%	0%	0%	13%	0%	0%	17.9
2016	406.8	0%	0%	87%	13%	0%	0%	17.9
2017	406.8	59%	0%	0%	13%	27%	0%	17.9
2018	406.8	59%	27%	0%	13%	0%	0%	17.9
Average		60%	5%	17%	12%	5%	0%	

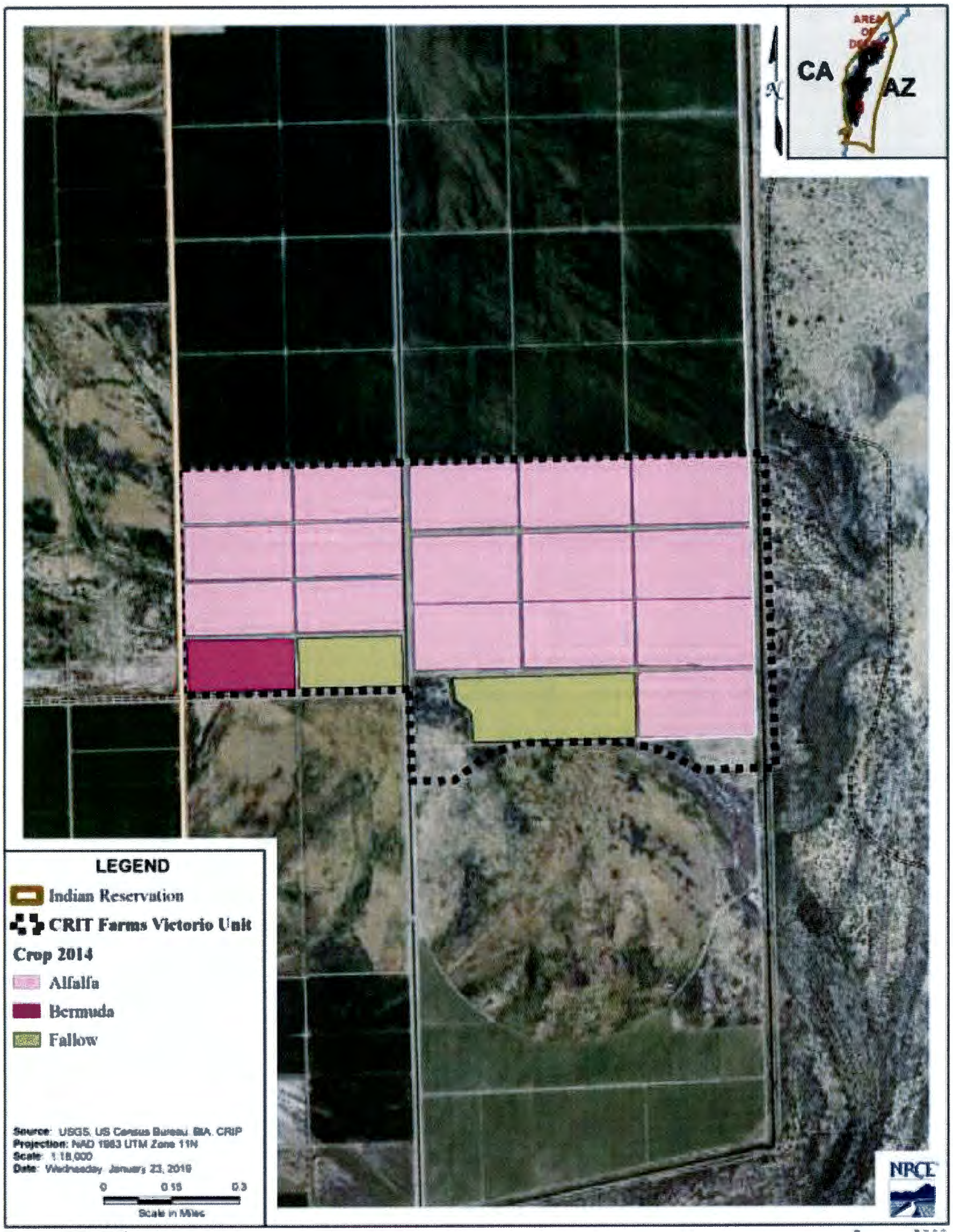

Figure E2. Cropping Pattern on CRIT Farms Victorio Unit in 2014.

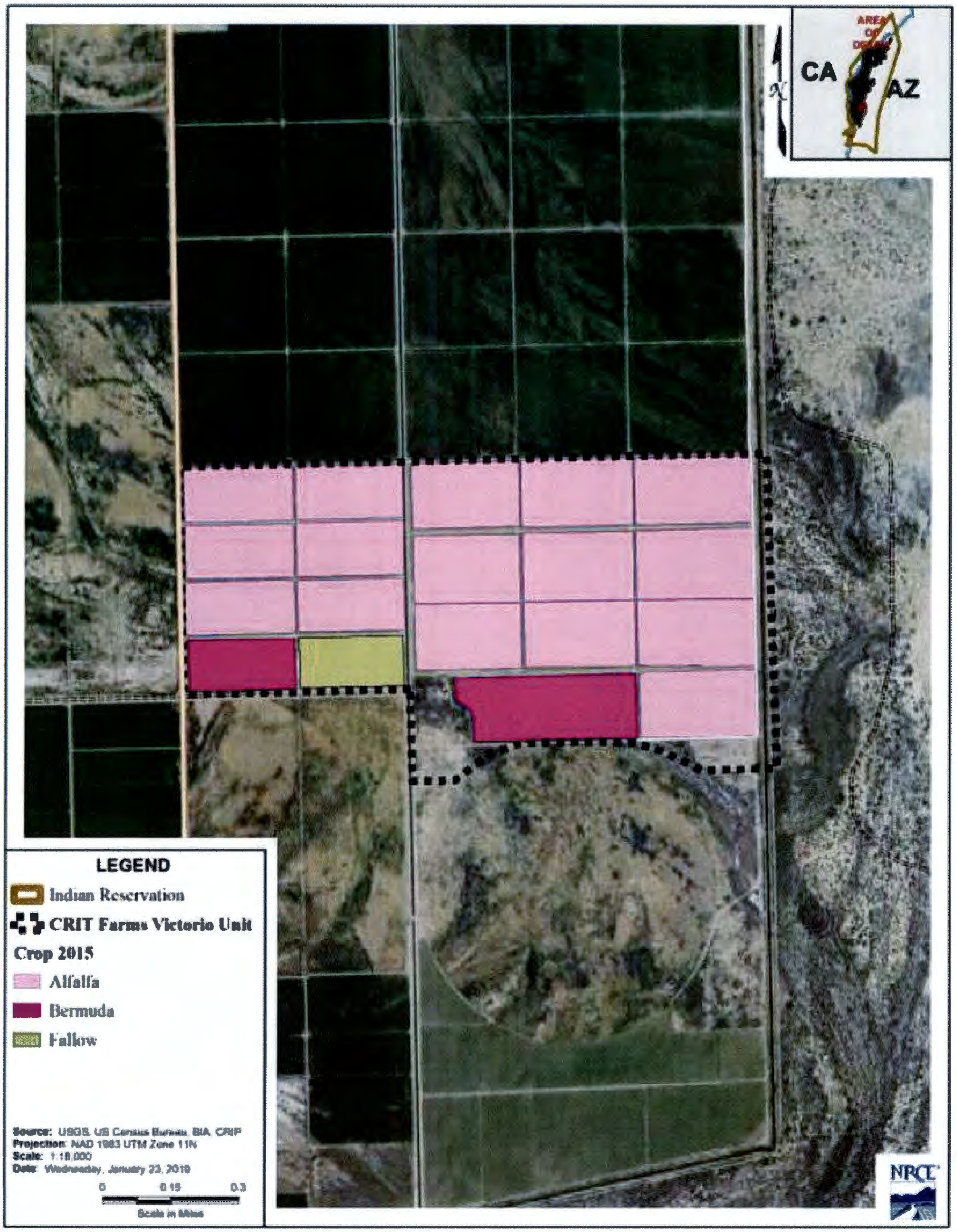

Figure E3. Cropping Pattern on CRIT Farms Victorio Unit in 2015.

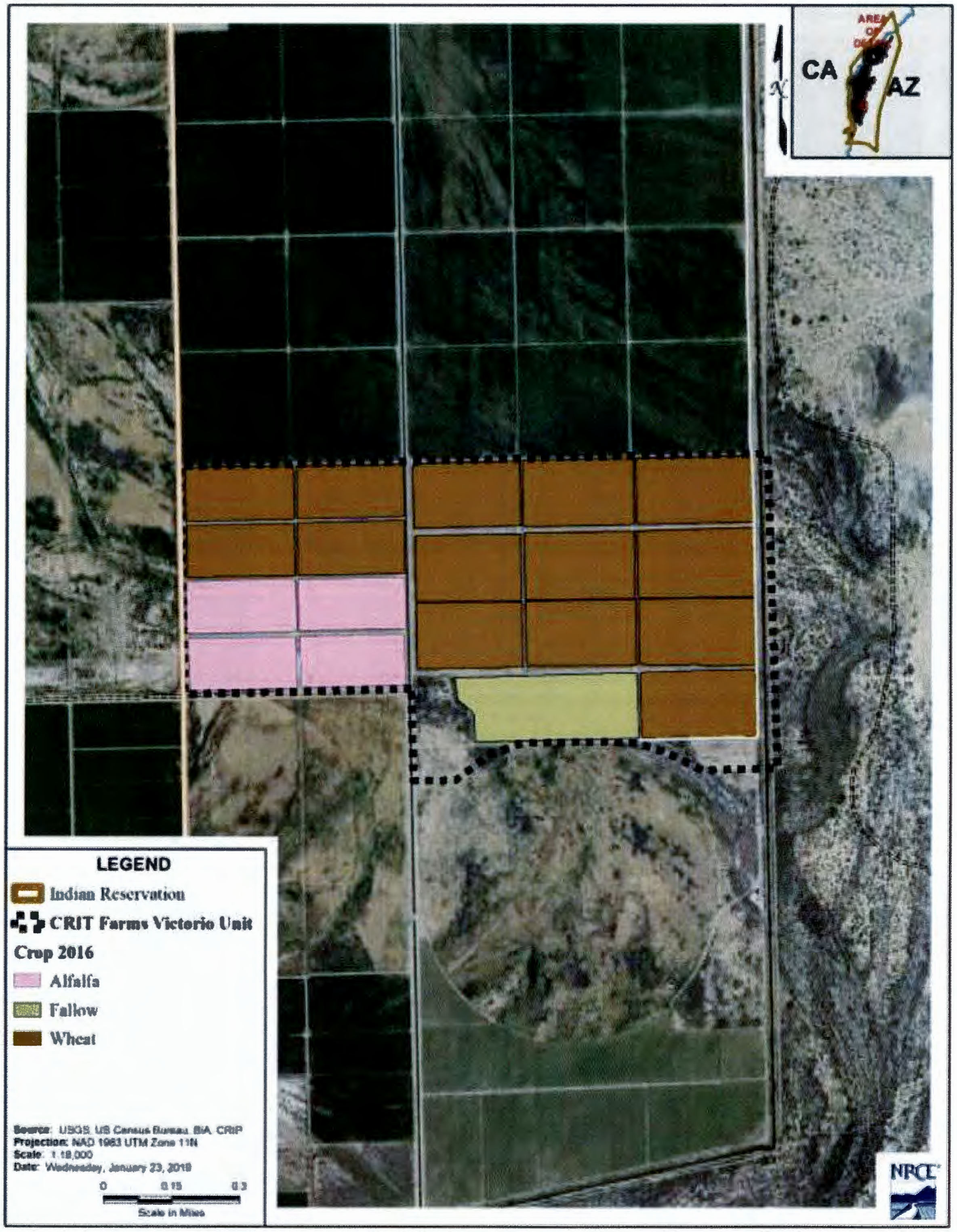

Figure E4. Cropping Pattern on CRIT Farms Victorio Unit in 2016.

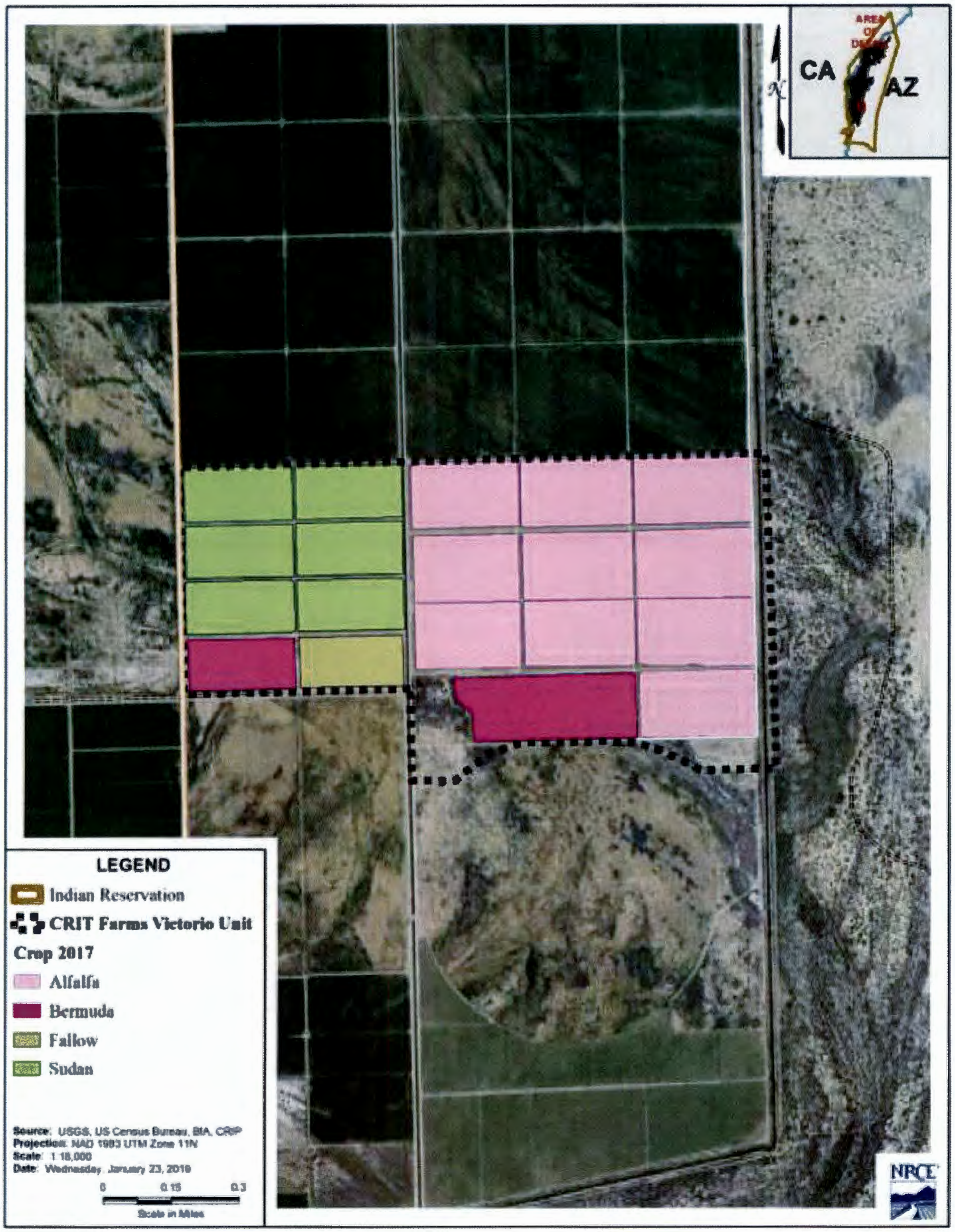

Figure E5. Cropping Pattern on CRIT Farms Victorio Unit in 2017.

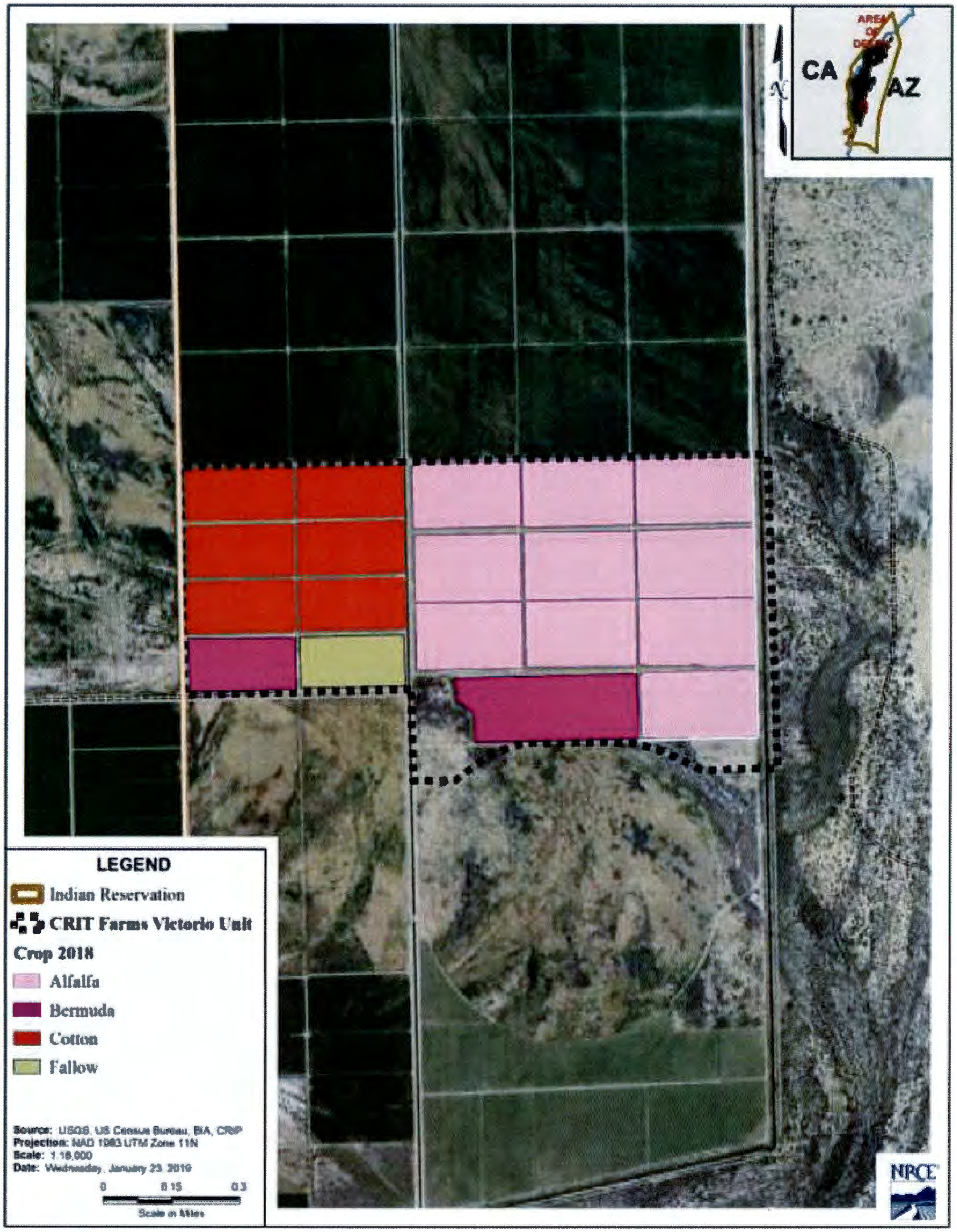

Figure E6. Cropping Pattern on CRIT Farms Victorio Unit in 2018.

Estimated Crop Evapotranspiration

Table E2 below presents estimated annual and 5-year average reference ET_0 and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table E2. Annual and 5-year Average Reference ET_0 and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_0[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table E3 below presents reference ET_0, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 4.61 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 406.8 acres on the Farm Unit is 1,877 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 3,508 AFY.

Table E3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. CRIT Farms Victorio Unit.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	66.99	0.30	66.68	370.7	2,060	3,850
2015	75.19	65.73	0.93	64.80	406.8	2,197	4,106
2016	81.43	28.20	1.03	27.24	406.8	923	1,726
2017	77.70	61.25	0.82	60.66	406.8	2,056	3,843
2018	76.86	59.06	0.70	58.45	406.8	1,981	3,704
Average	77.26	56.25	0.76	55.57	399.6	1,844	3,446
				Unit area Net CU (AF/ac)		4.61	
				Max acreage	406.8	1,877	3,508

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for CRIT Farms Victorio Unit is presented in Table E4.

Table E4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, CRIT Farms Victorio Unit, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	54.1	101.1
February	3.57	5.09%	95.6	178.6
March	4.82	6.87%	129.0	241.1
April	6.83	9.74%	182.8	341.6
May	7.93	11.31%	212.3	396.9
June	9.09	12.96%	243.2	454.6
July	9.20	13.13%	246.4	460.5
August	8.71	12.42%	233.2	435.8
September	7.80	11.12%	208.7	390.2
October	4.40	6.28%	117.8	220.2
November	2.72	3.88%	72.8	136.0
December	3.03	4.32%	81.0	151.5
Annual	70.12	100.00%	1,876.8	3,508.1

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

A. FARM UNIT: MTA 6627

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

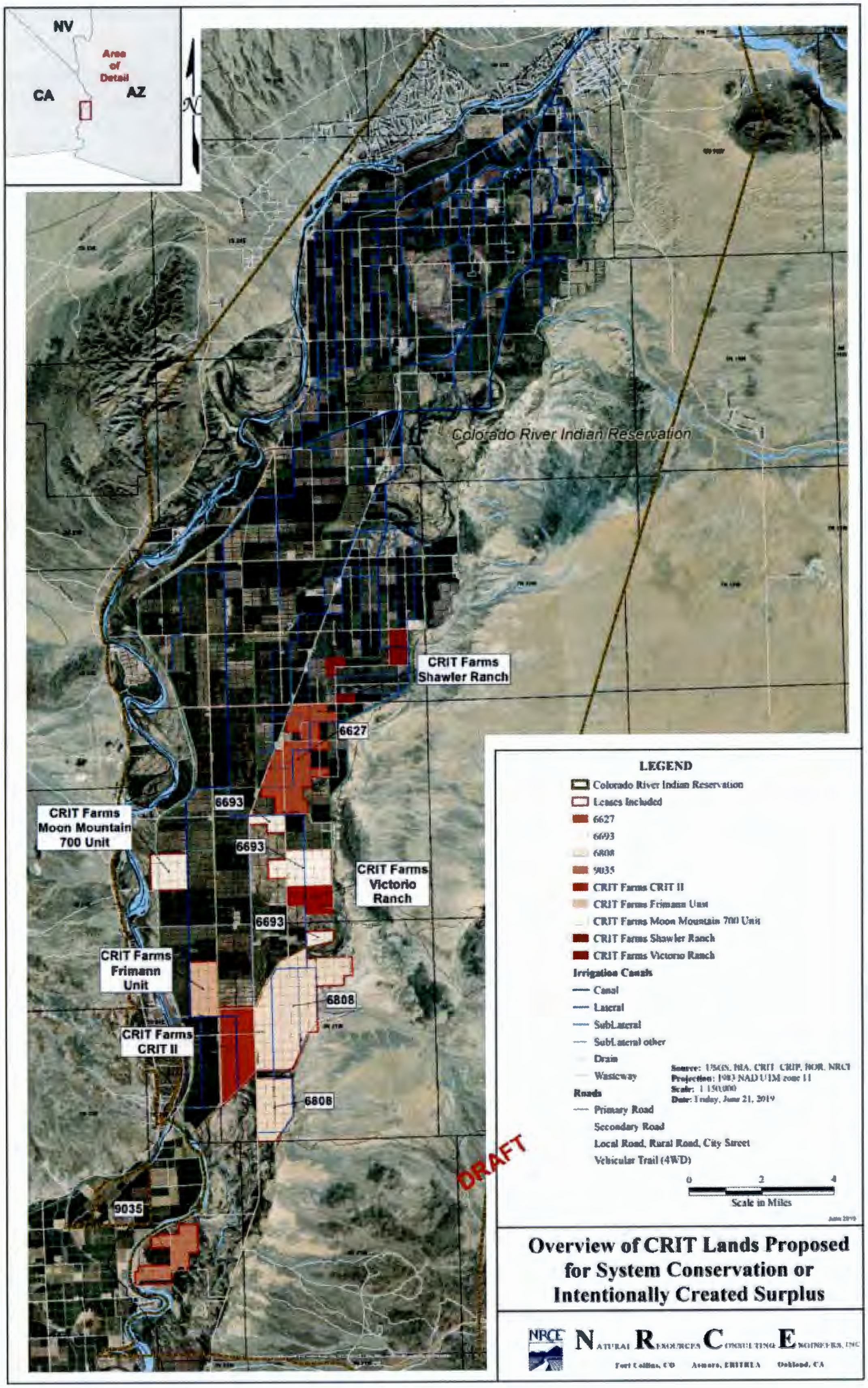

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma\frac{900}{T+273}u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

A. Farm Unit: MTA 6627

Farm Description and Location

Farm Unit MTA 6627 (aka MTA Farms) is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 3, 4, 8, 9, 10, 16, and 17 Township 6N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. Unit 6627 is bounded by Mohave Road on the west, Navajo Road on the north, and Tsosie Road on the south. Figure A1 is an overview map of the Unit. Gross land area of MTA Farms is 1,957.63 acres. Approximately a maximum of 1,884. 4 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is occupied by buildings, hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on MTA Farms is served primarily by Sub-lateral 73-36 of the Project. This sublateral serves other farm fields in the area and thus cannot be turned off at the head gate. Farm gate turnouts on Sublateral 73-36 serving MTA Farm will be chained and locked. An area of approximately 280 acres on MTA Farm is served water from Sublateral 73-25R-37. This sublateral can be shut off at its headgate and the headgate chained and locked. An area of approximately 280 acres on MTA Farm is served water from left turnout #9 on Sublateral 90-56. This turnout can be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project A total of 66 irrigated field parcels were identified within the actively irrigated area of MTA Farms (see Figure A1). Background aerial imagery in Figure A1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

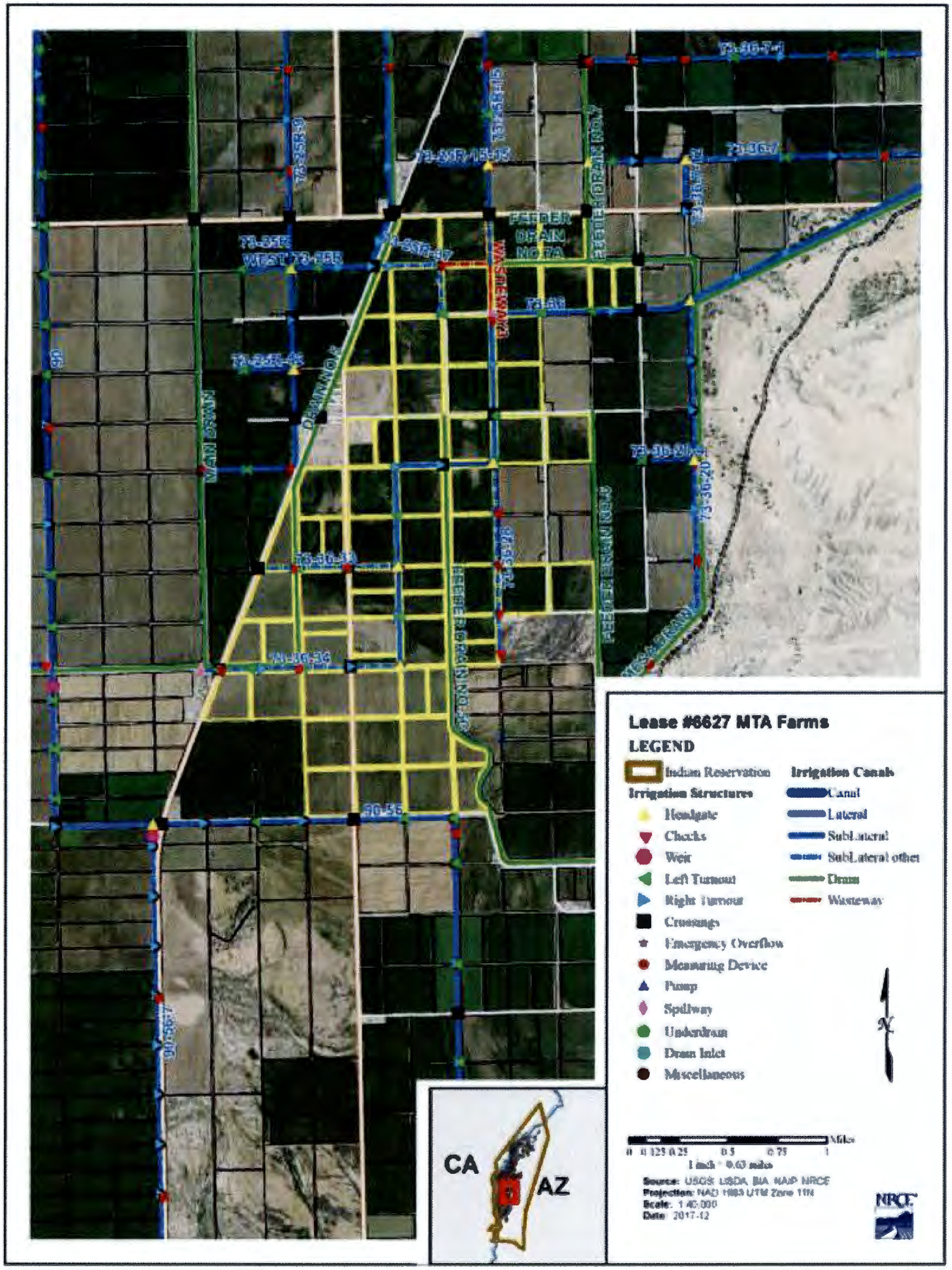

Figure A1. Overview Map of Farm Unit MTA 6627.

Cropping Patterns

Crop patterns/crop mix for field parcels on Farm Unit 6627 for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table A1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for Farm Unit 6627 is mapped in Figures A2-A6, for years 2014-2018, respectively.

Table A1. Cropping Patterns/Crop Mix of Unit MTA 6627: 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	1882.9	98%	0%	0%	0%	2%	0%	0.0
2015	1882.9	100%	0%	0%	0%	0%	0%	0.0
2016	1845.3	100%	0%	0%	0%	0%	0%	37.7
2017	1884.0	100%	0%	0%	0%	0%	0%	0.0
2018	1884.0	2%	0%	0%	0%	98%	0%	0.0
Average		80%	0%	0%	0%	20%	0%	

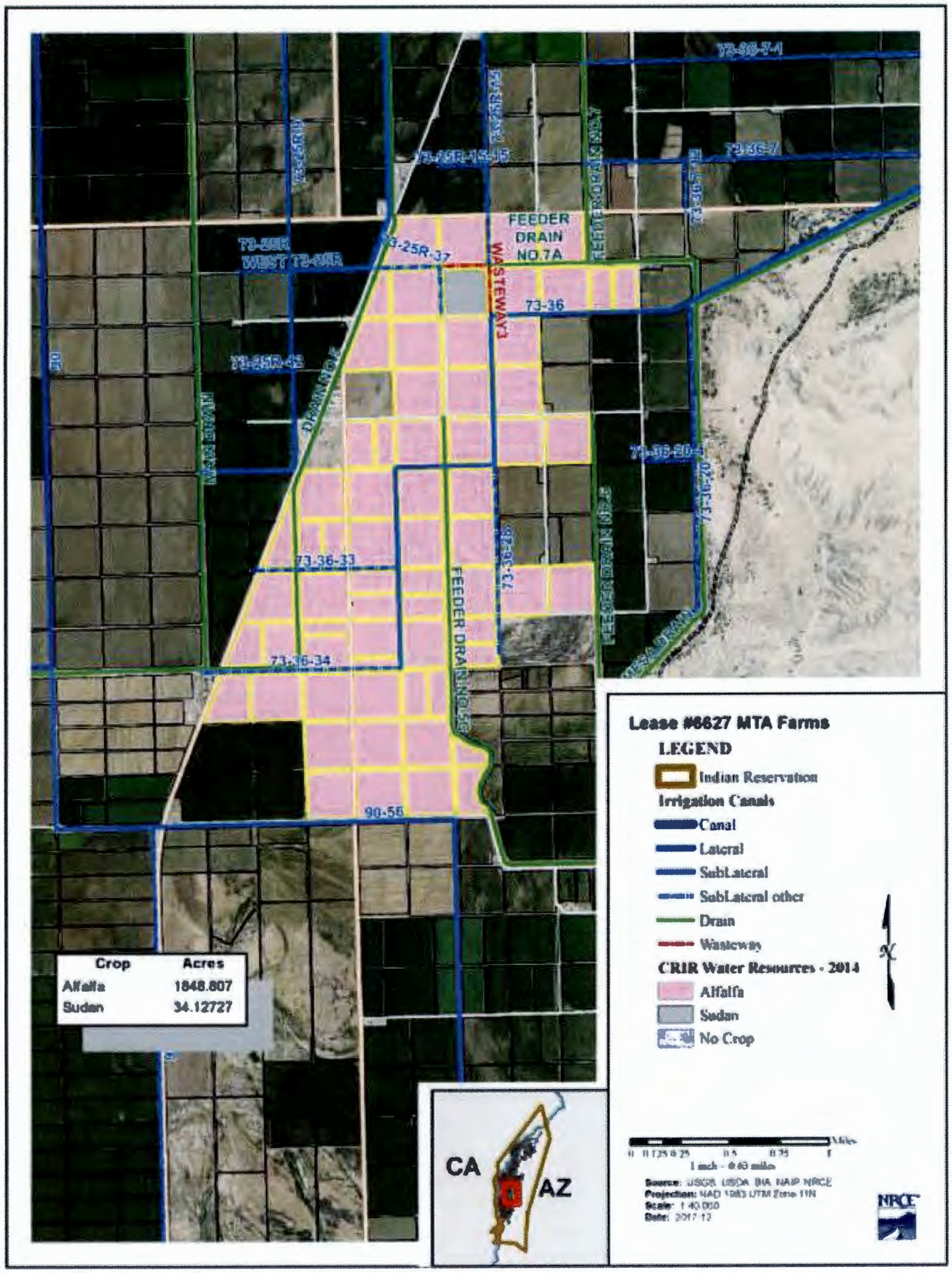

Figure A2. Cropping Pattern on Farm Unit MTA 6627 in 2014.

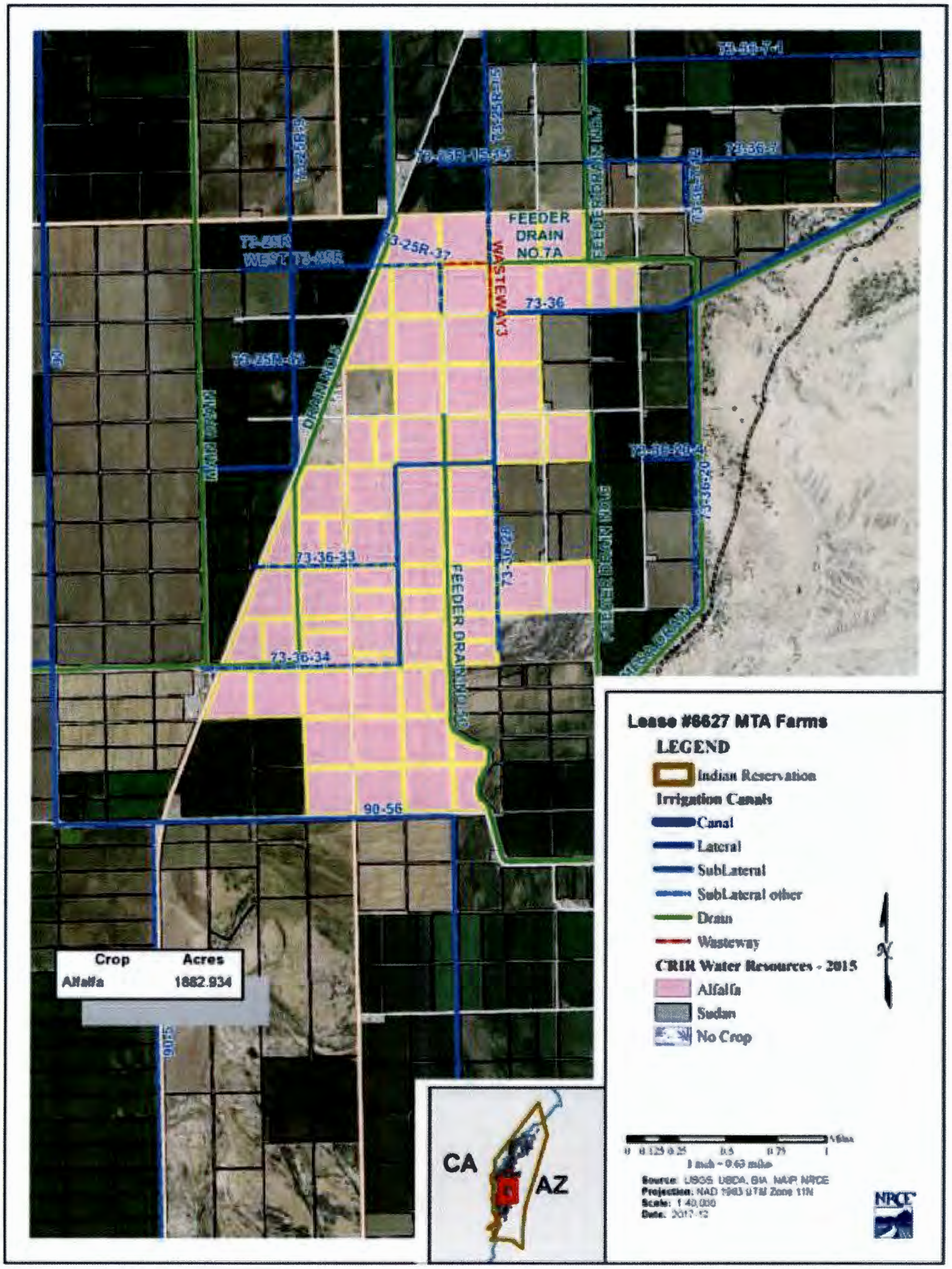

Figure A3. Cropping Pattern on Farm Unit MTA 6627 in 2015.

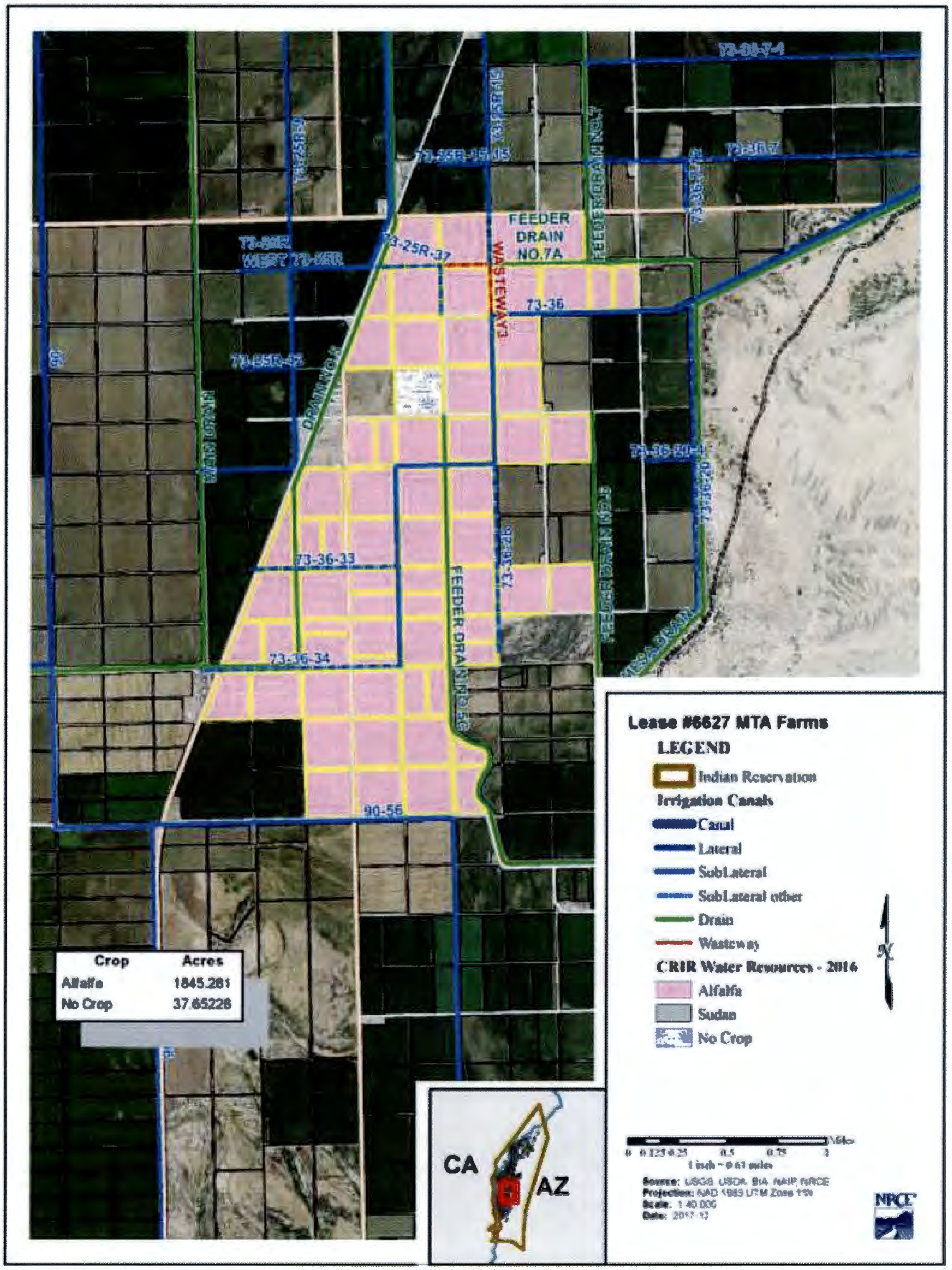

Figure A4. Cropping Pattern on Farm Unit MTA 6627 in 2016.

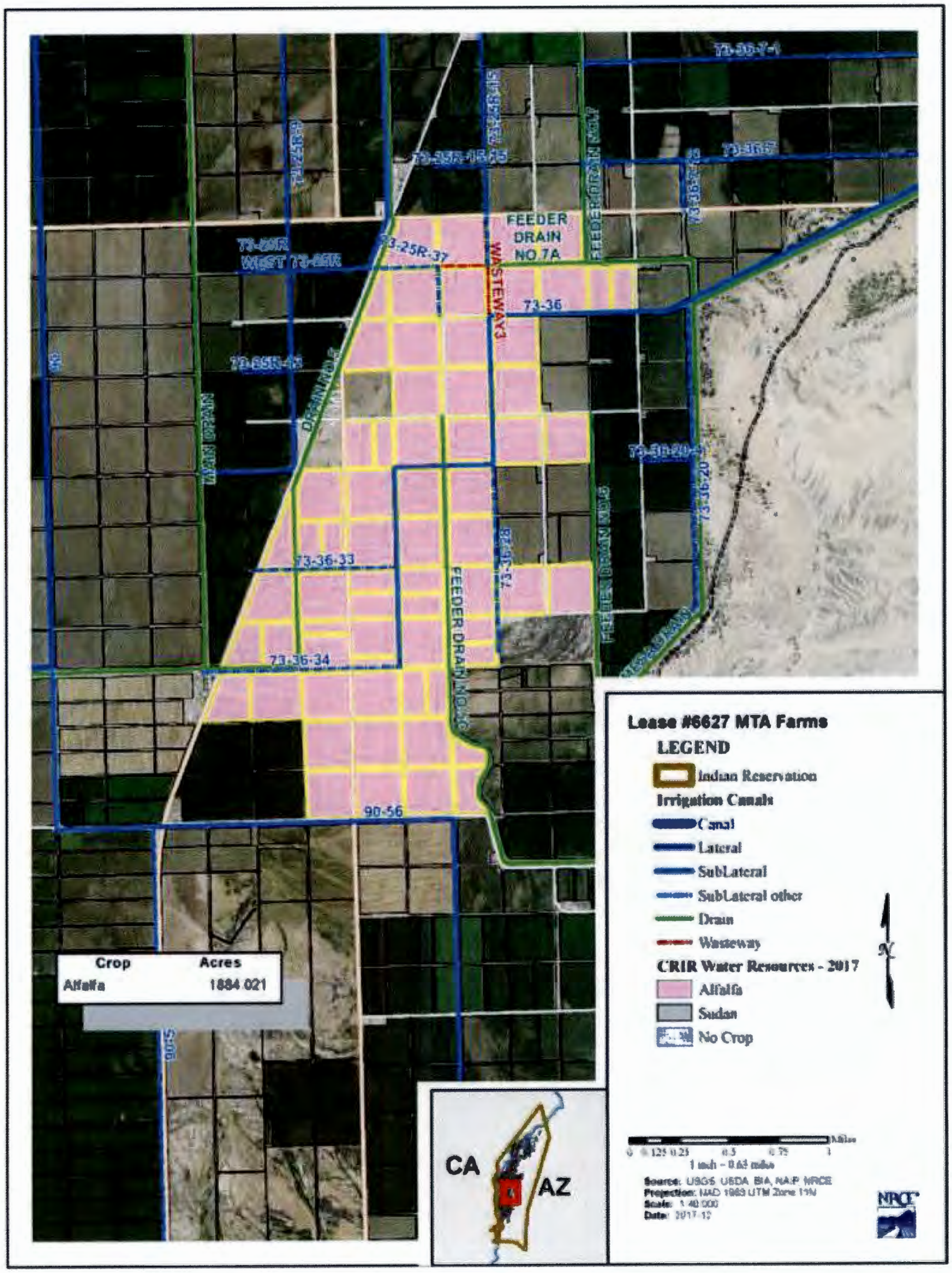

Figure A5. Cropping Pattern on Farm Unit MTA 6627 in 2017.

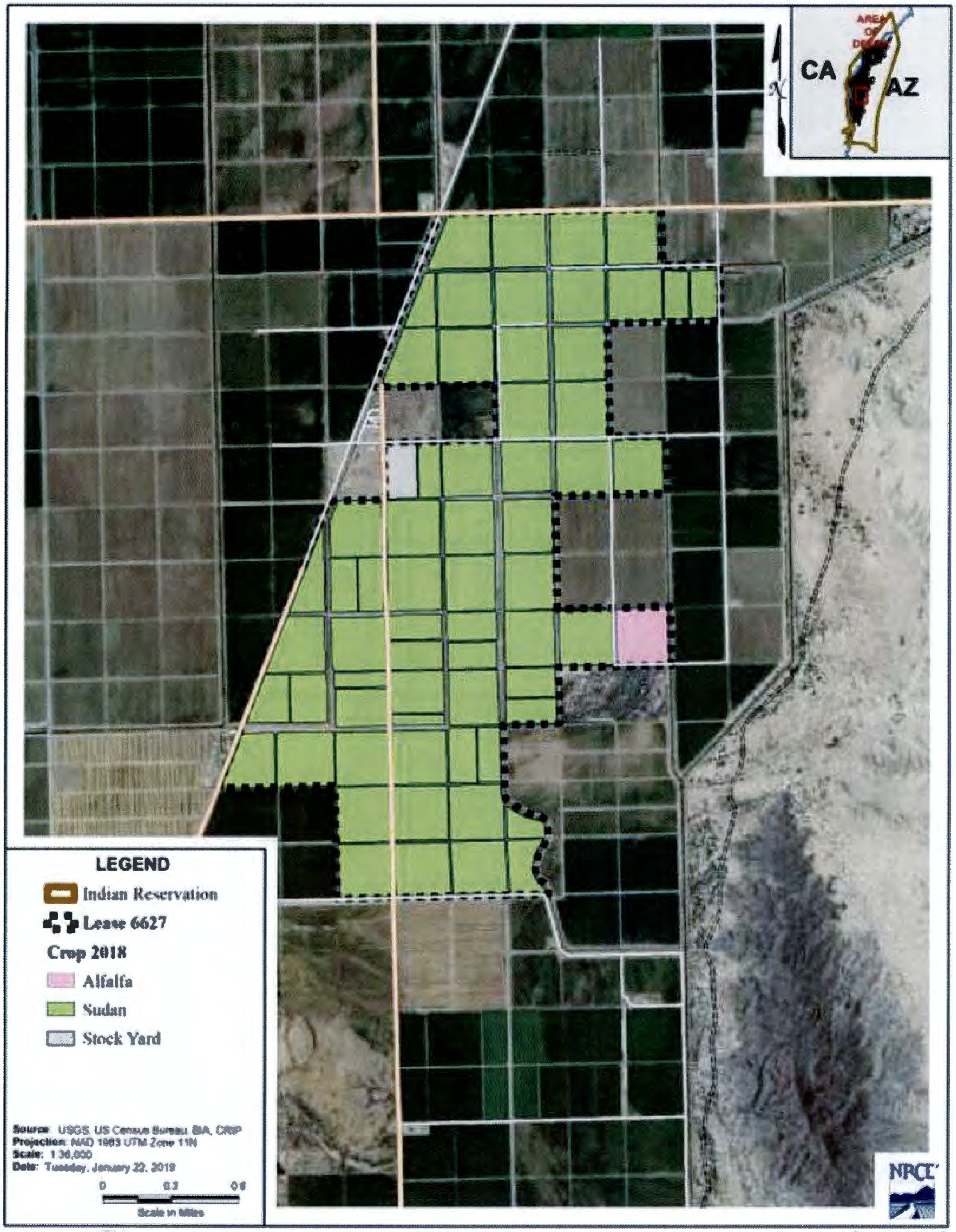

Figure A6. Cropping Pattern on Farm Unit MTA 6627 in 2018.

Estimated Crop Evapotranspiration

Table A2 below presents computed annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table A2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table A3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 5.39 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 1884 acres on the Farm Unit is 10,157 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 18,985 AFY.

Table A3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. Farm Unit MTA 6627.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	67.45	0.30	67.15	1,882.9	10,537	19,696
2015	75.19	68.19	0.93	67.25	1,882.9	10,553	19,725
2016	81.43	73.89	1.03	72.86	1,845.3	11,204	20,942
2017	77.70	70.51	0.82	69.69	1,884.0	10,942	20,452
2018	76.86	46.69	0.70	46.68	1,884.0	7,328	13,698
Average	77.26	65.35	0.76	64.73	1,875.8	10,113	18,903
				Unit area Net CU (AF/ac)		5.39	
				Max acreage	1,884.0	10,157	18,985

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for Farm Unit MTA 6627 is presented in Table A4.

Table A4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, Farm Unit MTA 6627, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	292.8	547.3
February	3.57	5.09%	517.2	966.8
March	4.82	6.87%	698.0	1,304.7
April	6.83	9.74%	989.1	1,848.7
May	7.93	11.31%	1,149.1	2,147.8
June	9.09	12.96%	1,316.1	2,460.1
July	9.20	13.13%	1,333.3	2,492.1
August	8.71	12.42%	1,261.8	2,358.4
September	7.80	11.12%	1,129.7	2,111.5
October	4.40	6.28%	637.7	1,191.9
November	2.72	3.88%	393.8	736.1
December	3.03	4.32%	438.6	819.7
Annual	70.12	100.00%	10,157.0	18,985.0

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

D. Farm Unit: MTA 6693

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

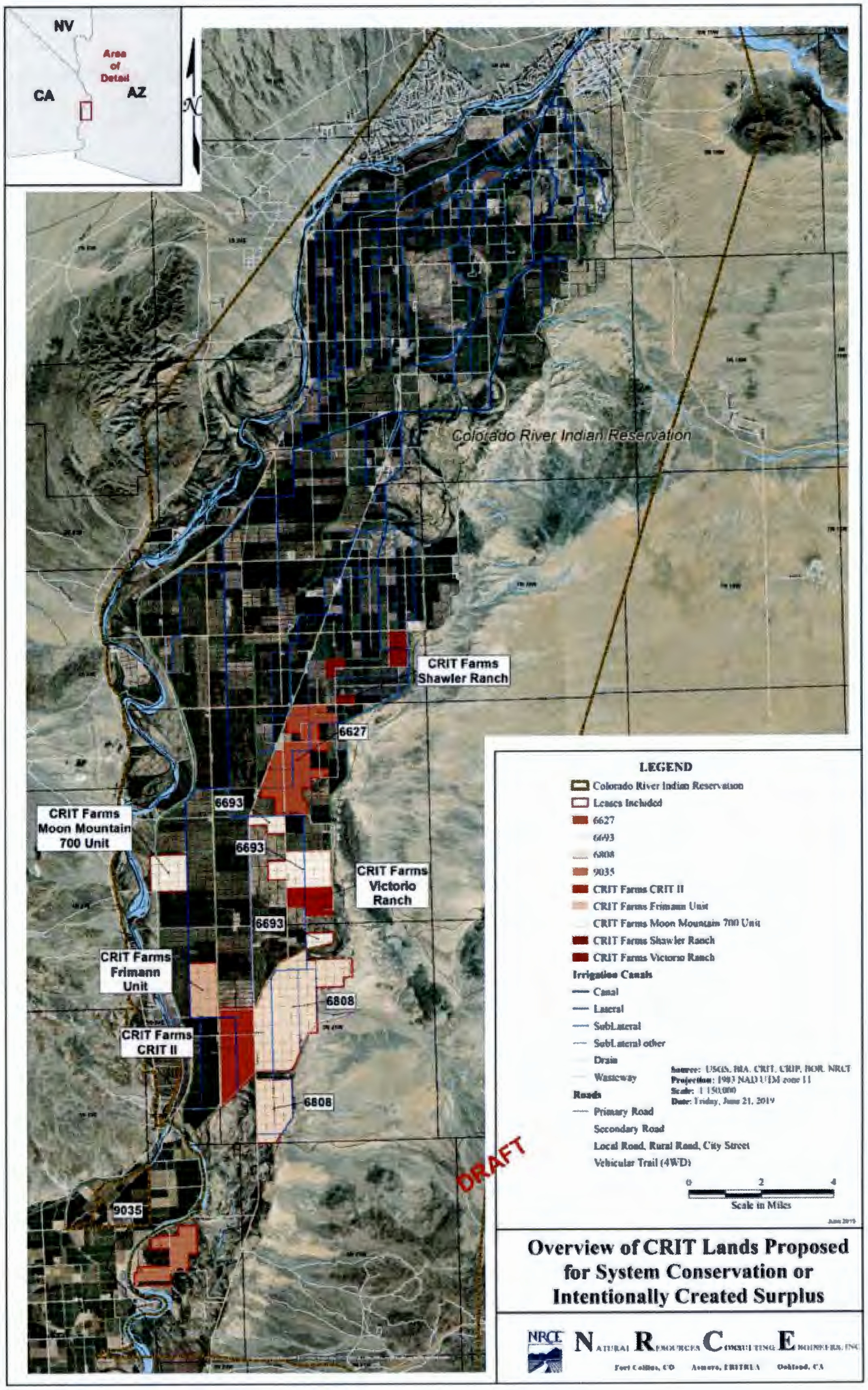

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T + 273} u_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

D. Farm Unit: MTA 6693

Farm Description and Location

Farm Unit MTA 6693 is located on the Colorado River Indian Reservation within the Project service area with field parcels in three separate subunits located within Sections 20, 27, 28, and 29 Township 6N Range 21W and Sections 3 and 4 Township 5N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. Unit 6693 is bounded by Mohave Road on the west, Tsosie Road on the north, Mesa Drain on the east and on the south. Figure D1 is an overview map of the Unit. Gross land area is 1,343.59 acres. Approximately a maximum of 1,183.9 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is idle or occupied by buildings, hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on Unit MTA 6693 is served primarily by Sub-lateral 90-56 of the Project. This sublateral serves other farm fields in the area and thus cannot be turned off at the head gate. Farm gate turnouts on Sublateral 90-56 serving Unit MTA 6693 will be chained and locked.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of up to 36 irrigated field parcels were identified within the actively irrigated area of Unit MTA 6693 (see Figure D1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure D1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

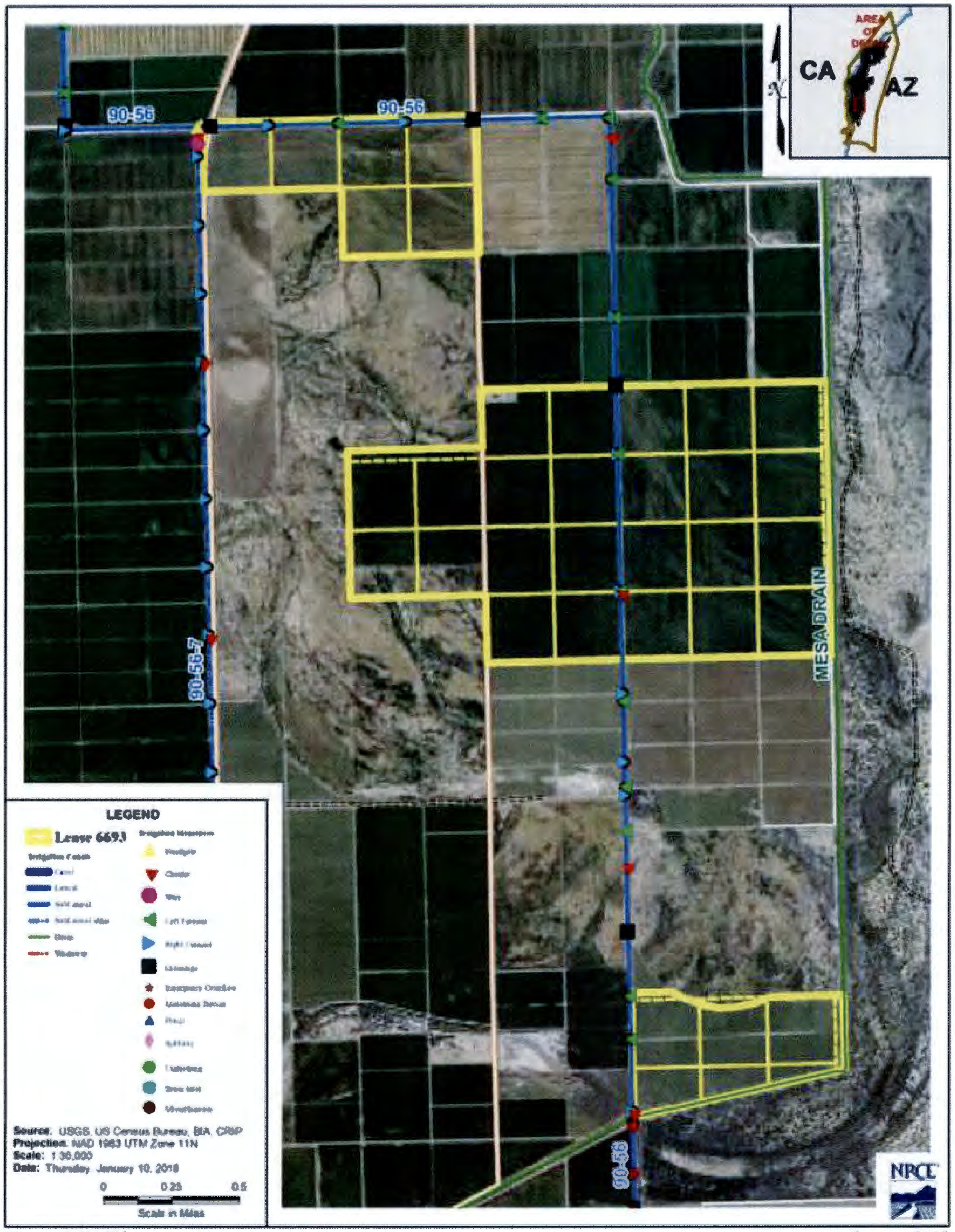

Figure D1. Overview Map of Farm Unit MTA 6693.

Cropping Patterns

Crop patterns/crop mix for field parcels on Farm Unit MTA 6693 for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table D1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for Farm Unit MTA 6693 is mapped in Figures D2-D6, for years 2014-2018, respectively.

Table D1. Cropping Patterns/Crop Mix of Unit MTA 6693, 2014-2018 .

Year	Total Irrigated Crop Acreage	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	1183.9	21%	6%	0%	21%	51%	0%	63.9
2015	1183.9	81%	0%	0%	19%	0%	0%	63.9
2016	1183.9	47%	0%	31%	15%	0%	6%	63.9
2017	1127.1	90%	0%	0%	10%	0%	0%	120.7
2018	1183.9	81%	0%	0%	0%	19%	0%	63.9
Average		64%	1%	6%	13%	14%	1%	

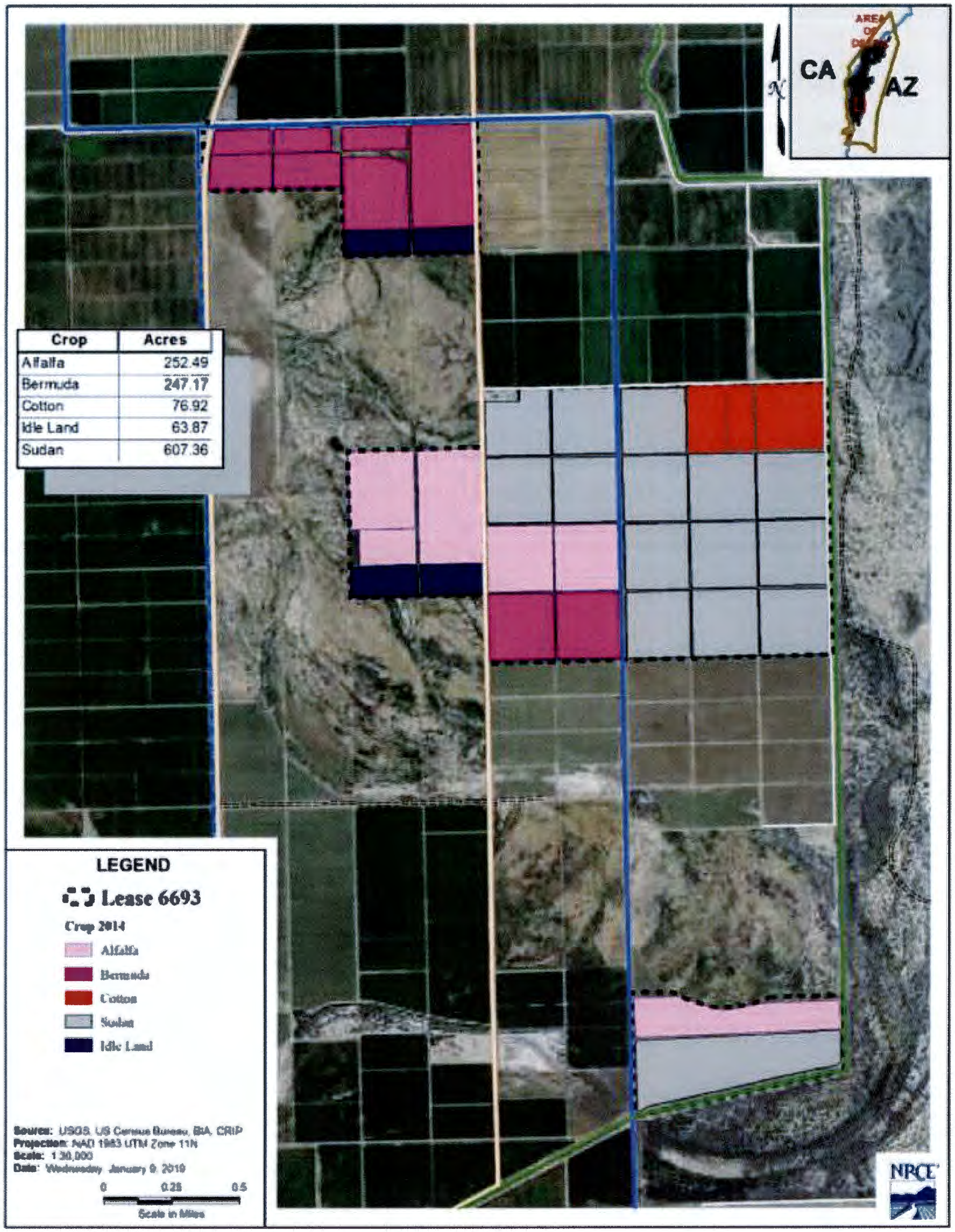

Figure D2. Cropping Pattern on Farm Unit MTA 6693 in 2014.

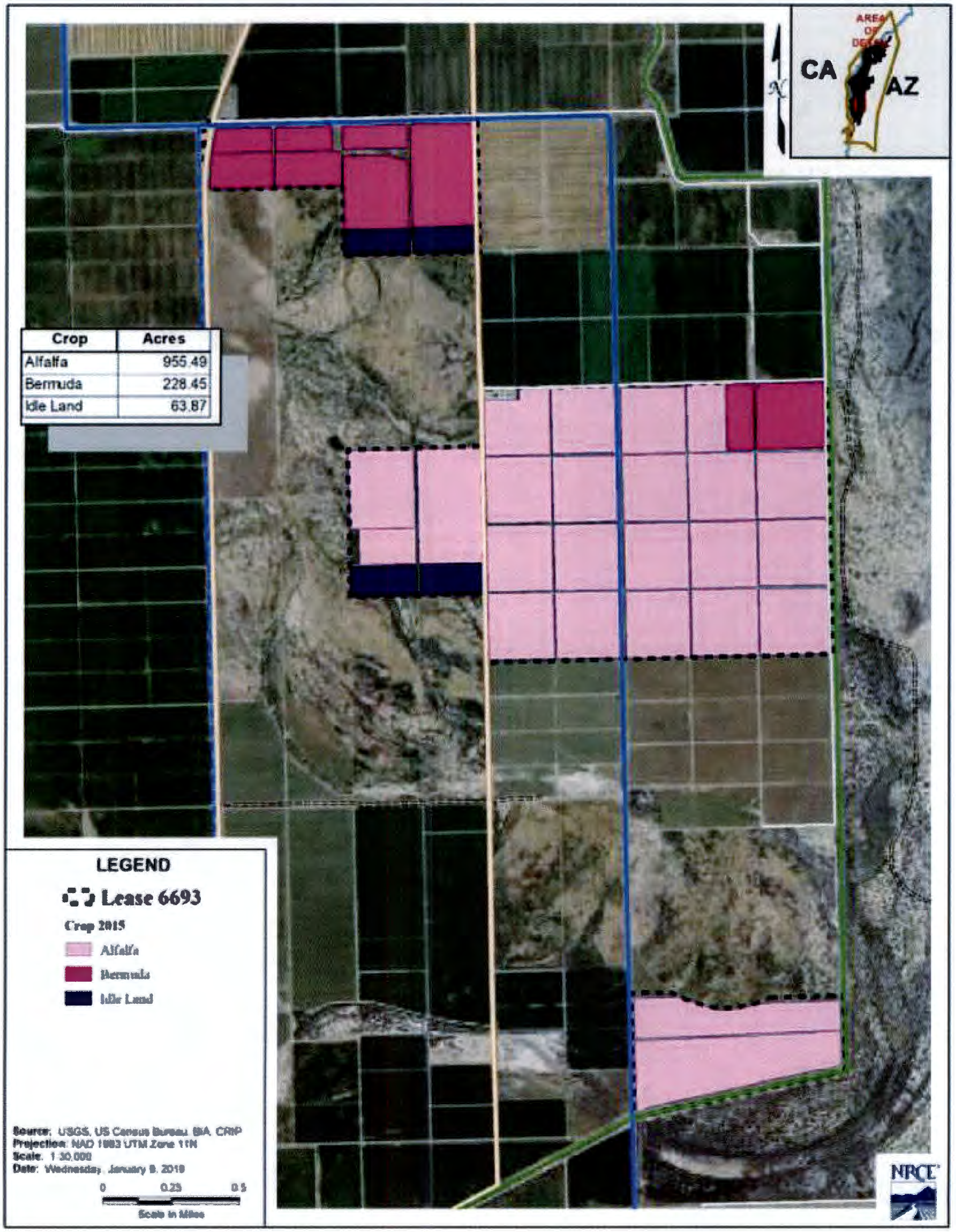

Figure D3. Cropping Pattern on Farm Unit MTA 6693 in 2015.

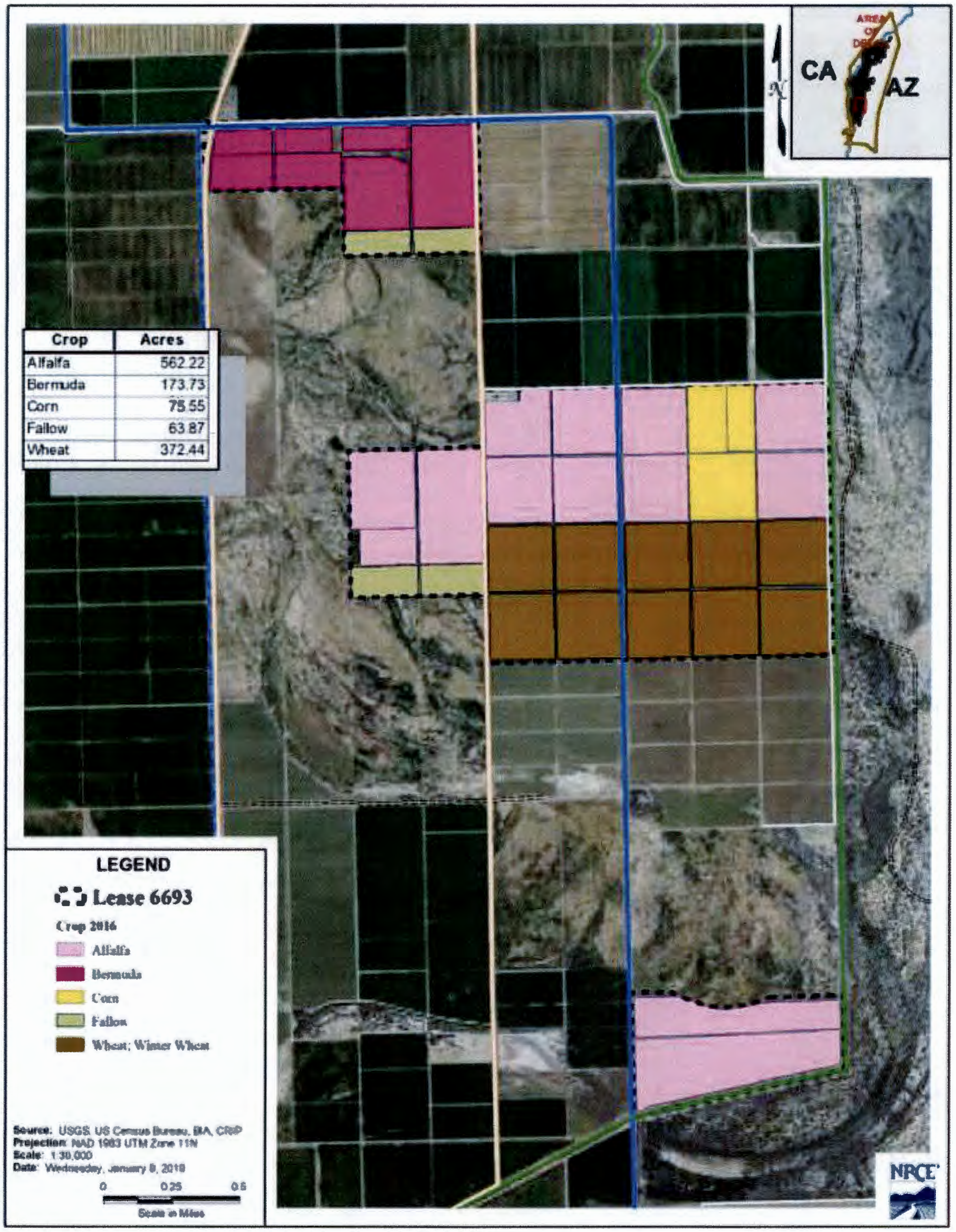

Figure D4. Cropping Pattern on Farm Unit MTA 6693 in 2016.

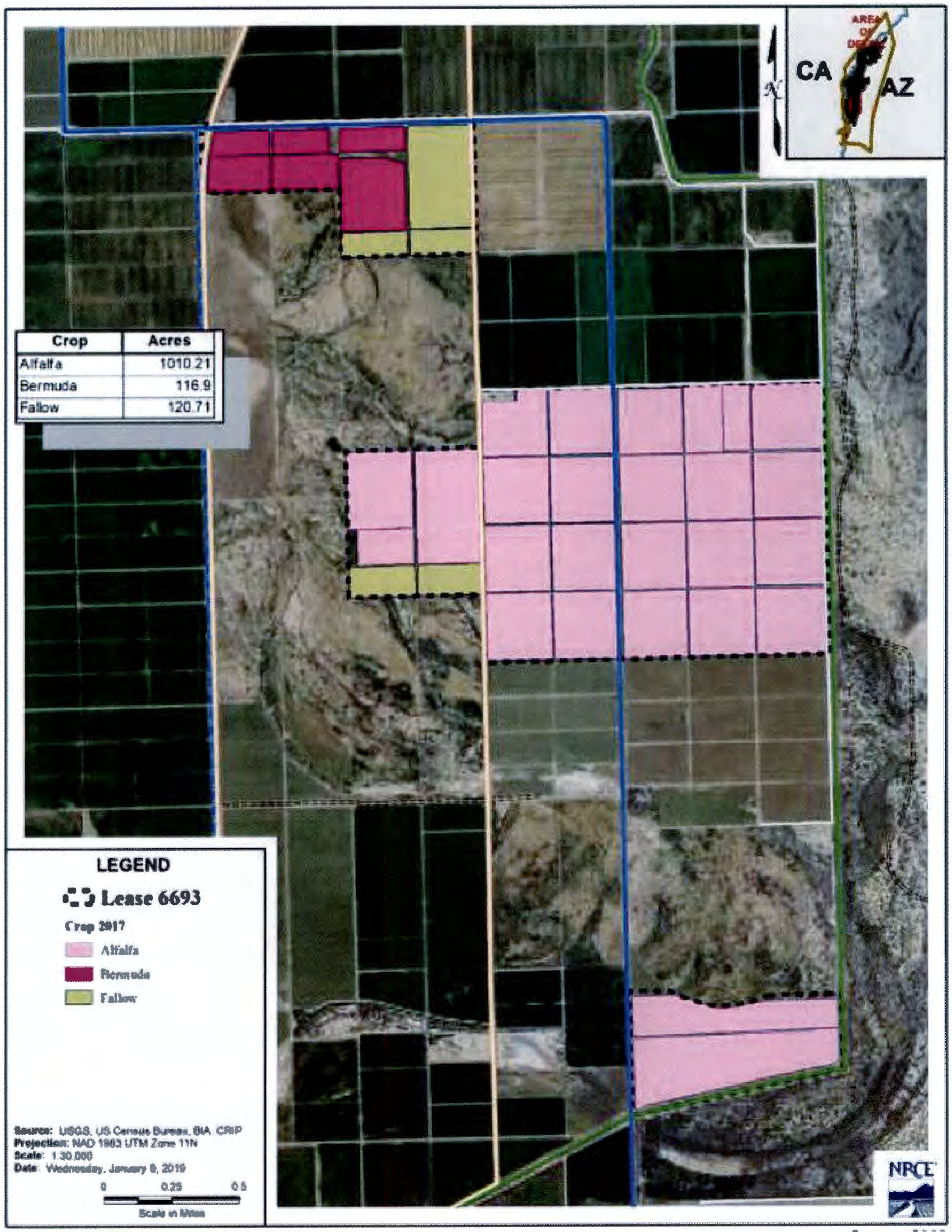

Figure D5. Cropping Pattern on Farm Unit MTA 6693 in 2017.

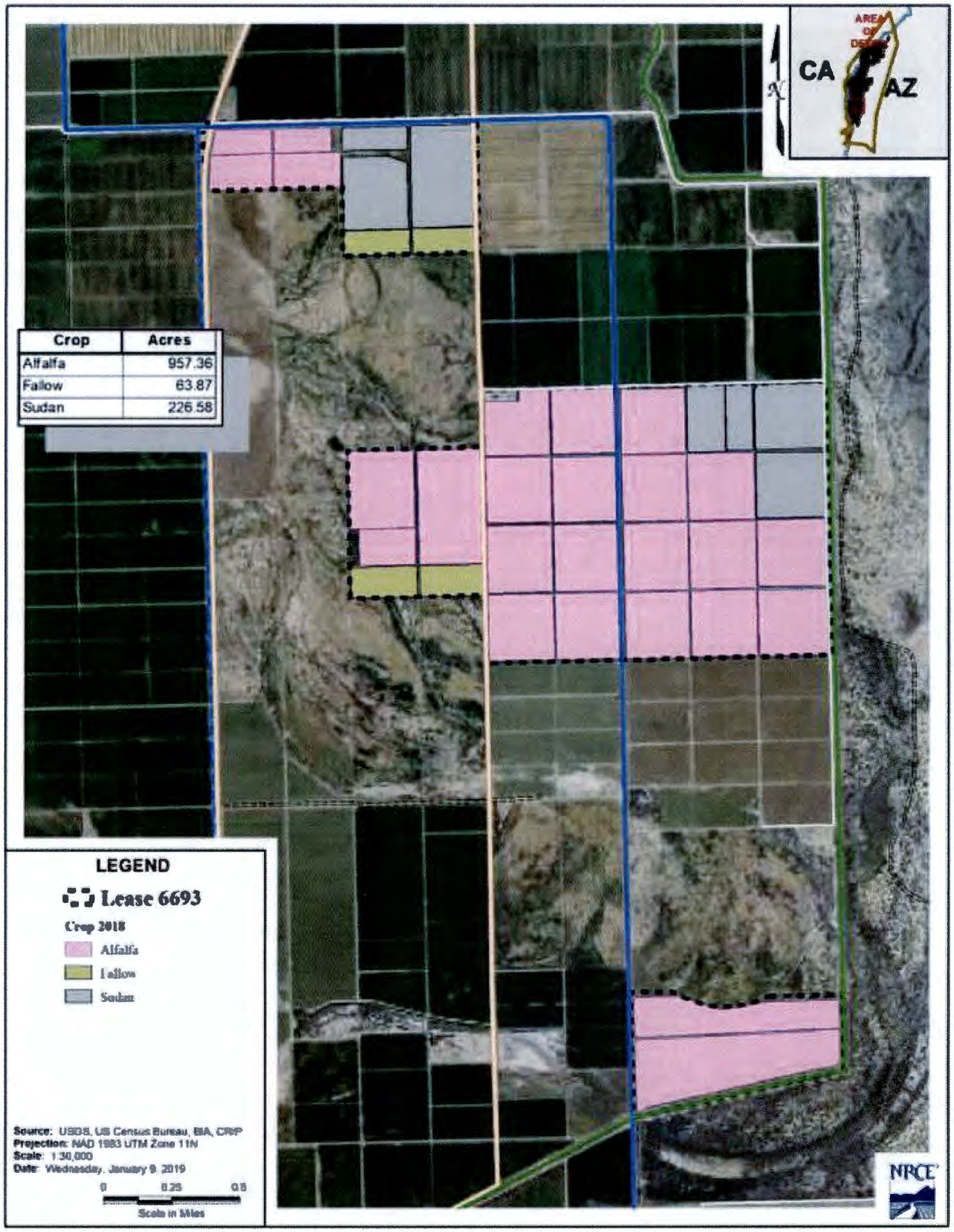

Figure D6. Cropping Pattern on Farm Unit MTA 6693 in 2018.

Estimated Crop Evapotranspiration

Table D2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table D2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table D3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 4.97 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 1183.9 acres on the Farm Unit is 5,886 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 11,001 AFY.

Table D3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. Farm Unit MTA 6693.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	50.16	0.30	50.01	1,183.9	4,934	9,223
2015	75.19	64.62	0.93	63.69	1,183.9	6,284	11,745
2016	81.43	53.67	1.03	52.67	1,183.9	5,197	9,713
2017	77.70	68.48	0.82	67.66	1,127.1	6,355	11,878
2018	76.86	65.20	0.70	64.63	1,183.9	6,377	11,919
Average	77.26	60.43	0.76	59.73	1,172.6	5,829	10,896
				Unit area Net CU (AF/ac)		4.97	
				Max acreage	1,183.9	5,886	11,001

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for Farm Unit MTA 6693 is presented in Table D4.

Table D4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, Farm Unit MTA 6693, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	169.7	317.1
February	3.57	5.09%	299.7	560.2
March	4.82	6.87%	404.5	756.0
April	6.83	9.74%	573.1	1,071.3
May	7.93	11.31%	665.9	1,244.6
June	9.09	12.96%	762.7	1,425.6
July	9.20	13.13%	772.6	1,444.1
August	8.71	12.42%	731.2	1,366.6
September	7.80	11.12%	654.6	1,223.6
October	4.40	6.28%	369.5	690.7
November	2.72	3.88%	228.2	426.5
December	3.03	4.32%	254.1	475.0
Annual	70.12	100.00%	5,885.7	11,001.4

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

C. Farm Unit: 6808

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022. Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

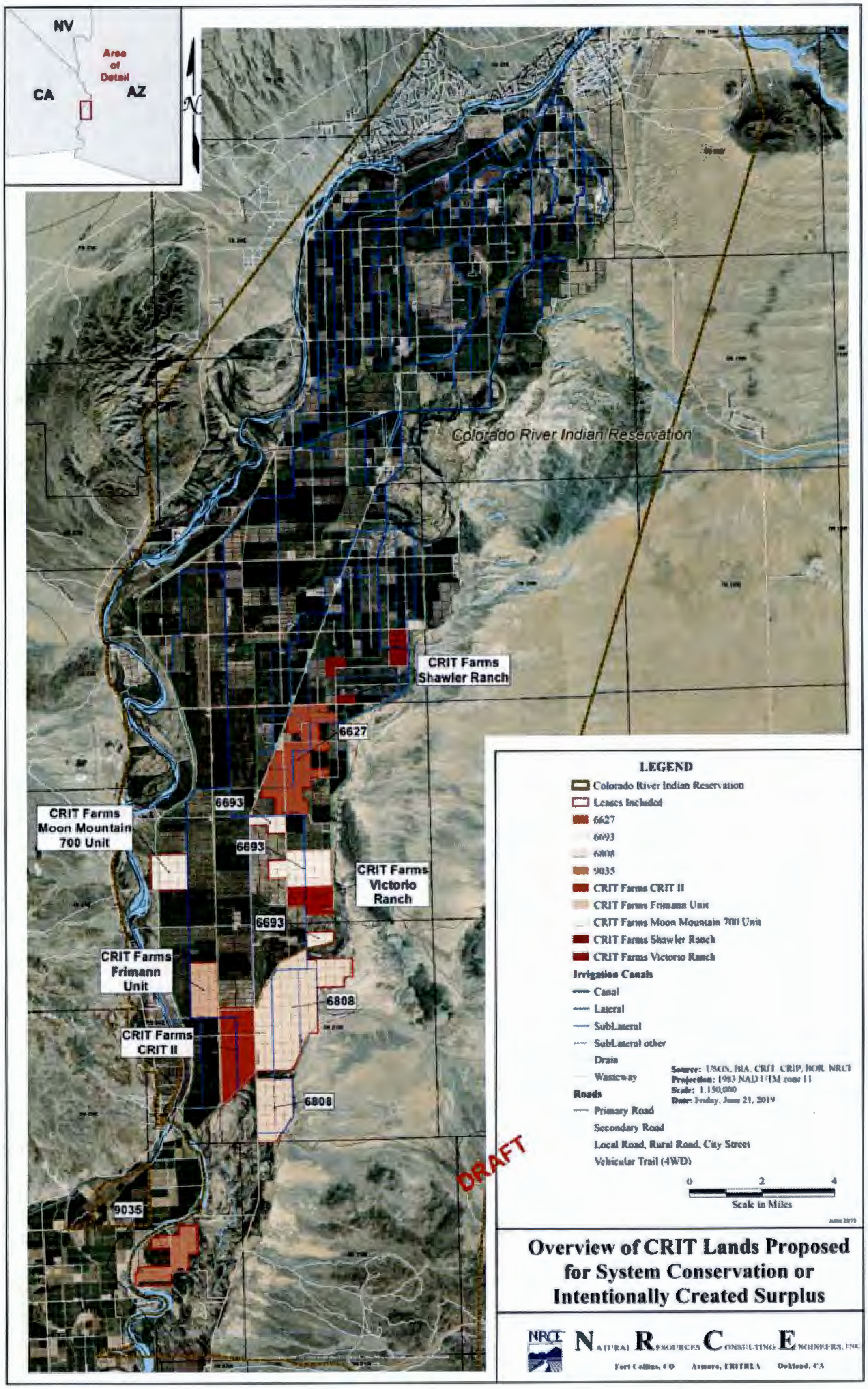

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY		Annual AFY
6627*	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	Rayner	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	Name	Time Period	Max. Net Irrigated Acreage	Ave. Cropping Pattern	Average AF/ac	Annual AFY	System Conservation AFY	EC ICS AFY	System Conservation* AFY	EC ICS** AFY	Annual AFY
6627	MTA Farms	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	Quail Mesa	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	MTA Farms	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	Victorio	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	Frimann	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	CRIT II	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	MTA 700	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	Shawler Ranch	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	Rayner	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T+273} u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

C. Farm Unit: 6808

Farm Description and Location

Farm Unit 6808 (aka Quail Mesa Farm) is located on the Colorado River Indian Reservation within the Project service area with field parcels located within Sections 4, 5, 8, 9, 10, 16, 17, 20, 21, 29, and 32, Township 5N Range 21W (Gila and Salt River Meridian), La Paz County, Arizona. Physically, Quail Mesa Farm is bounded by Mohave Road on the west, Beeson Road on the north, and undeveloped desert land on the east and south. Figure C1 is an overview map of the Unit. Tyson Wash divides the Farm into a north area and a south area. Gross land area of Quail Mesa Farm is 3,999.7 acres. Approximately 3,705.1 net field acres have been in irrigated crop production for at least the past 5 years. The acreage not in production is occupied by buildings, hay and equipment storage yards, roads, canals, and drains.

The irrigated cropland on Quail Mesa is the terminal farming unit served by Sub-lateral 90-56 of the Project. Irrigation water deliveries can be effectively shut off at the Quail Mesa heading which is Check 4 on Sublateral 90-56 just upstream of the pipe culvert crossing of the sublateral over Mesa Drain.

CRIT Water Resources Dept. provided geospatial data (AGR05 shapefile and associated attribute table) of delineated irrigated field parcels across the Project. A total of 78 irrigated field parcels were identified within the actively irrigated area of Quail Mesa Farms (see Figure C1). Background aerial imagery in Figure C1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations were found to show good agreement with the NAIP aerial imagery.

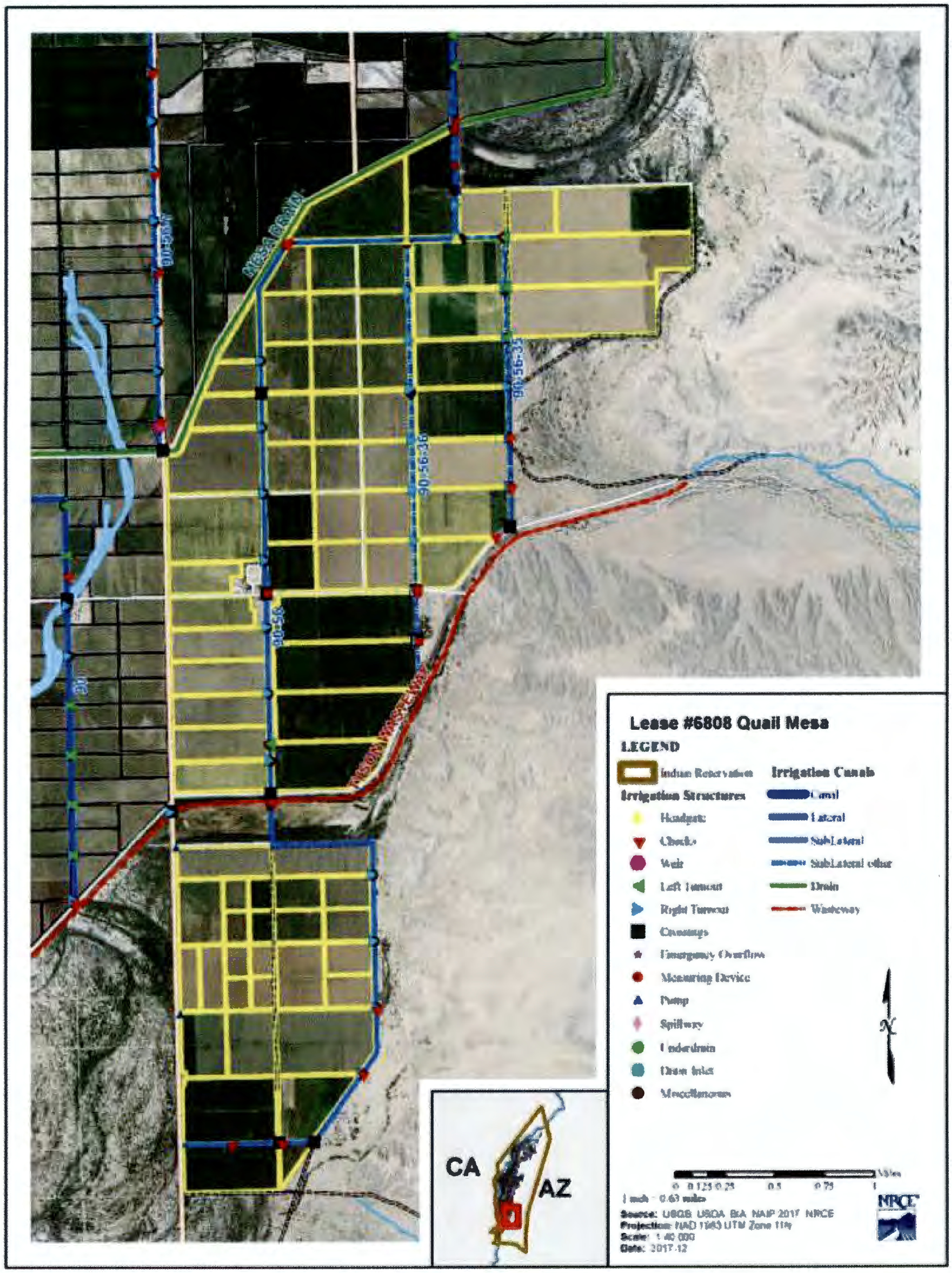

Figure C1. Overview Map of Farm Unit 6808.

Cropping Patterns

Crop patterns/crop mix for field parcels on Farm Unit 6808 for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD) and are summarized in Table C1. The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. The annual cropping pattern for Farm Unit 6808 is mapped in Figures C2-C6, for years 2014-2018, respectively.

Table C1. Cropping Patterns/Crop Mix of Unit 6808: Quail Mesa, 2014-2018.

Year	Total Irrigated Crop Acreage	Alfalfa - Perennial	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2014	3592.1	64%	0%	12%	6%	0%	18%	110.4
2015	3665.0	61%	0%	9%	4%	0%	25%	37.5
2016	3702.5	63%	0%	0%	16%	0%	21%	0.0
2017	3704.6	59%	0%	0%	0%	0%	41%	0.0
2018	3704.6	44%	0%	0%	3%	54%	0%	0.0
Average		58%	0%	4%	6%	11%	21%	

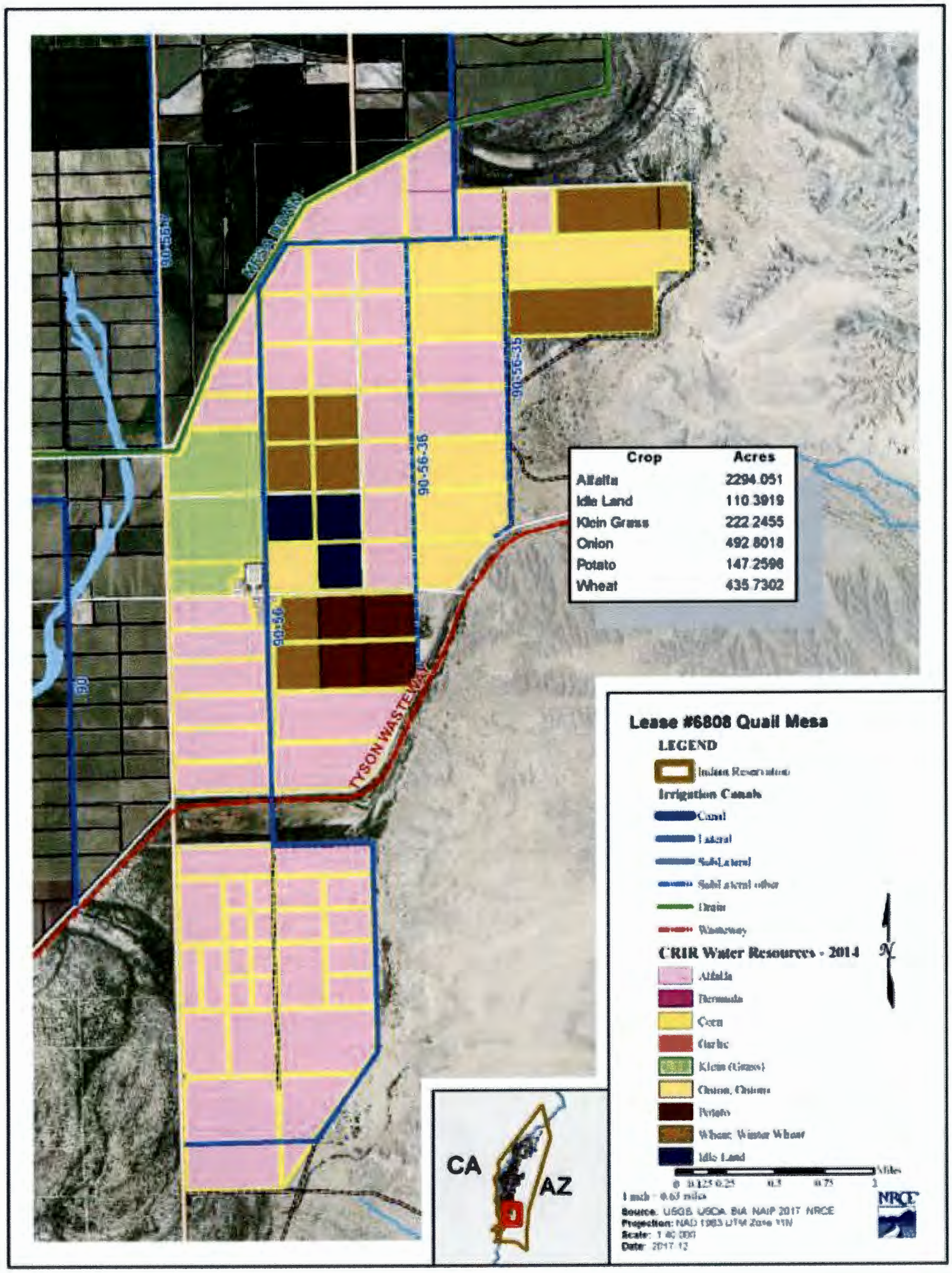

Figure C2. Cropping Pattern on Farm Unit 6808 in 2014.

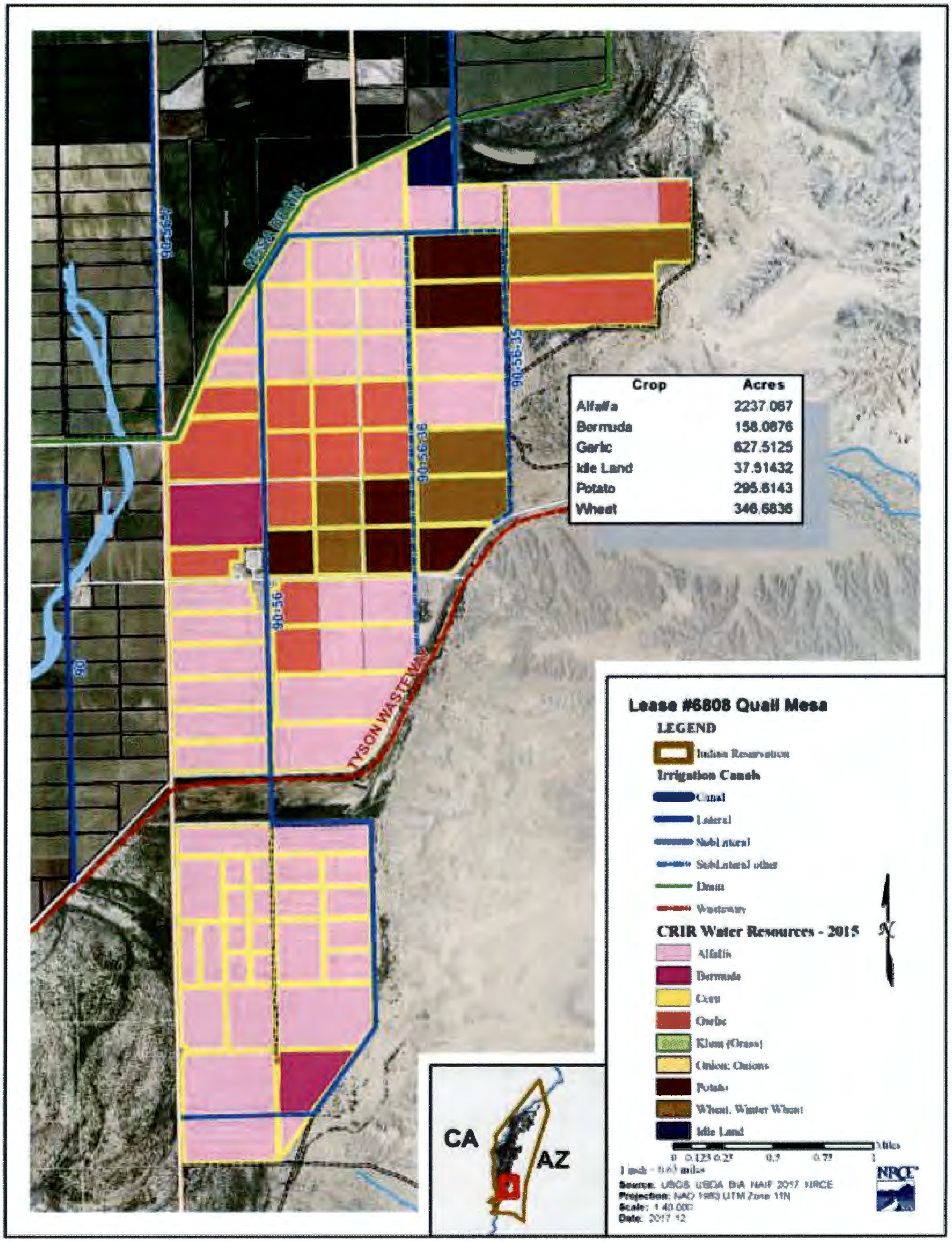

Figure C3. Cropping Pattern on Farm Unit 6808 in 2015.

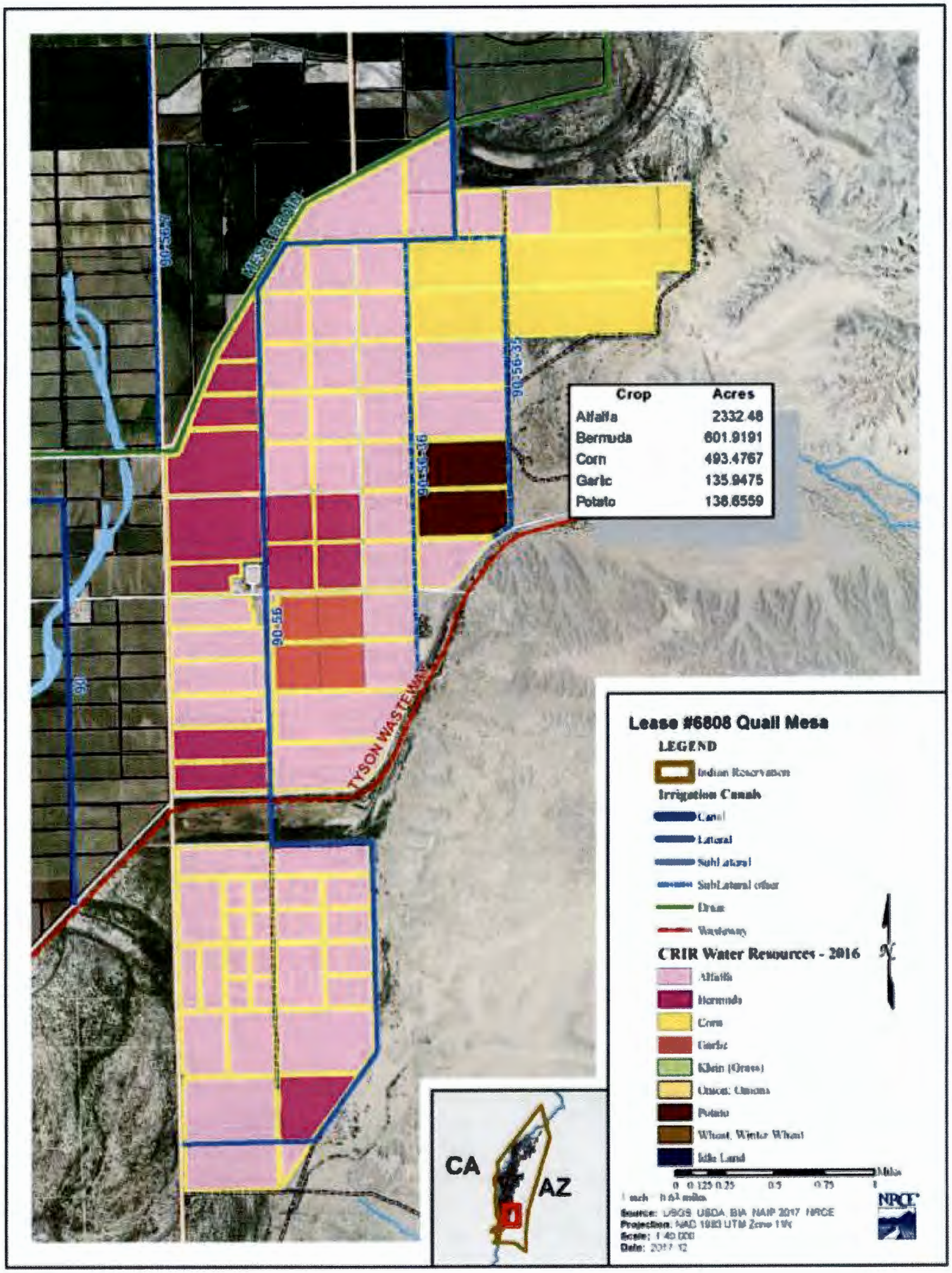

Figure C4. Cropping Pattern on Farm Unit 6808 in 2016.

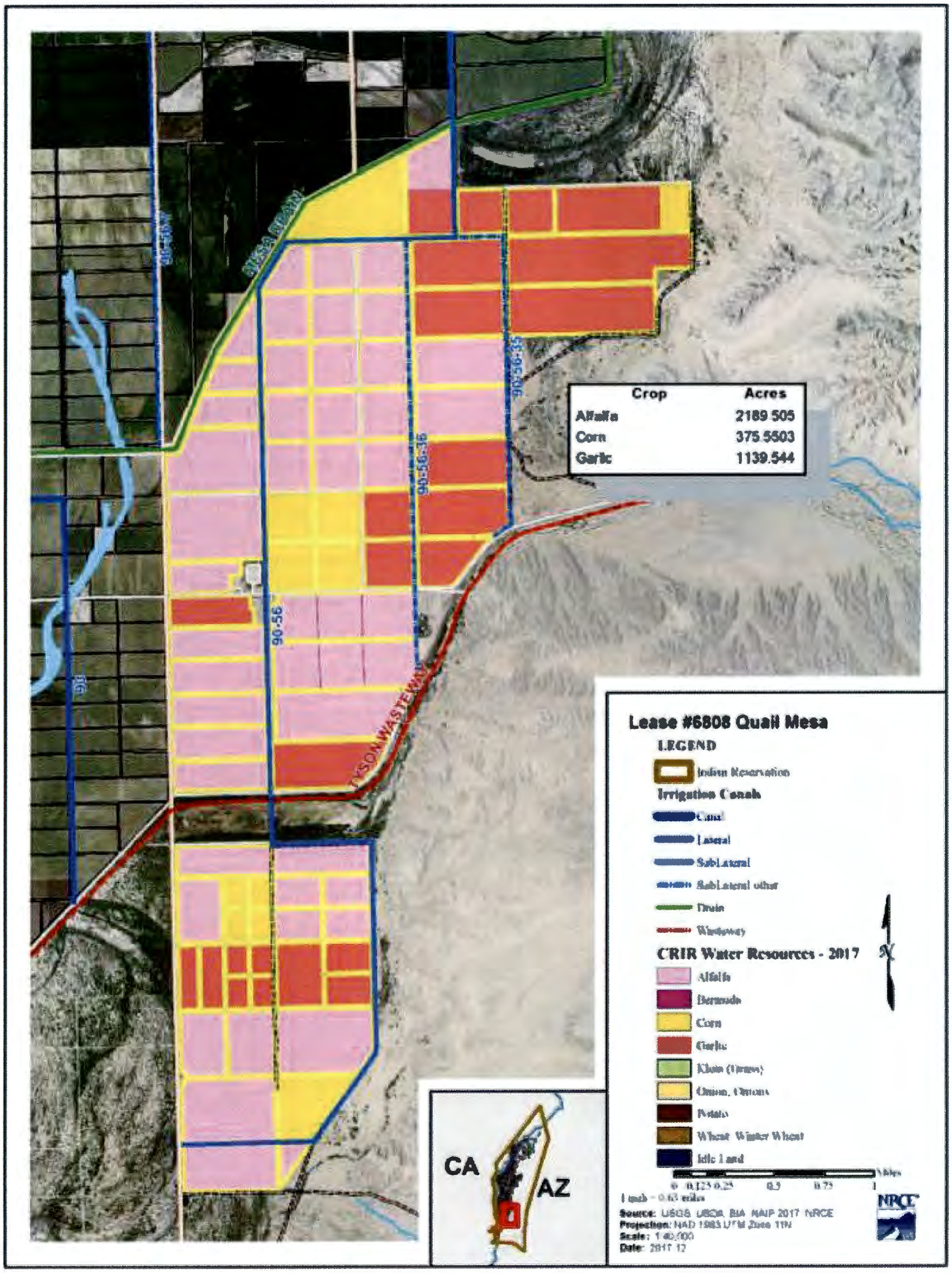

Figure C5. Cropping Pattern on Farm Unit 6808 in 2017.

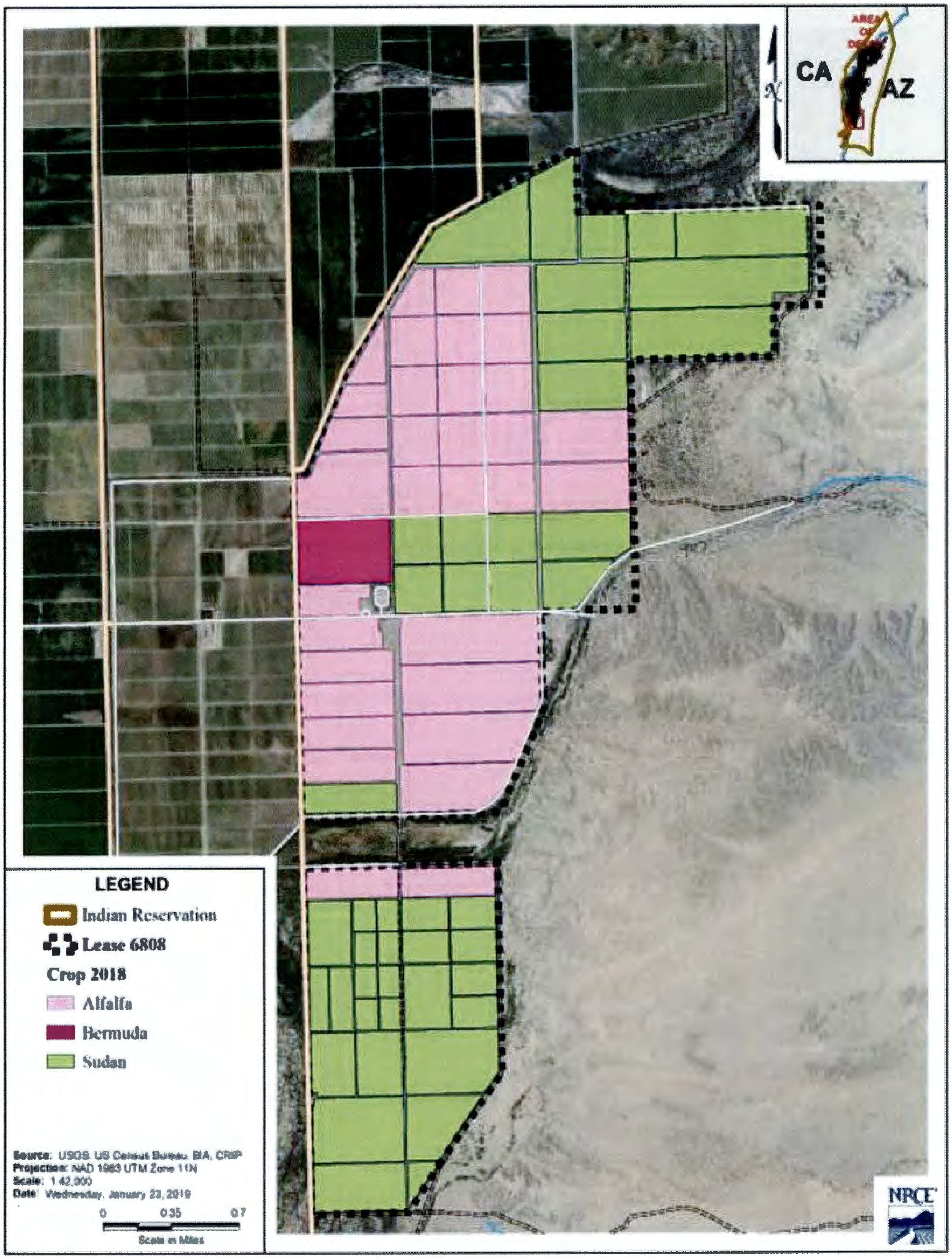

Figure C6. Cropping Pattern on Farm Unit 6808 in 2018.

Estimated Crop Evapotranspiration

Table C2 below presents estimated annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period using weather data from the AZMET Parker No. 2 weather station.

Table C2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2014-2018.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
2018	76.86	69.7	40.1	24.5	50.5	46.2	46.1
Average (in)		70.0	40.1	24.0	50.9	45.4	45.9
Average (af/ac)		5.84	3.34	2.00	4.24	3.79	3.83

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table C3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2014-18, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2014-2018 is 4.89 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 3704.6 acres on the Farm Unit is 18,130 AFY. Using an estimated average overall irrigation efficiency of 53.5%, the diversion requirement associated with this net water conservation is 33,888 AFY.

Table C3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2014-2018. Farm Unit 6808: Quail Mesa.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Weighted Average Net Consumptive Use	Net Crop Area Fallowed	Net Consumptive Use Demand[3]	Diversion Reduction[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2014	75.11	57.38	0.30	57.09	3,592.1	17,089	31,942
2015	75.19	57.15	0.93	56.24	3,665.0	17,178	32,108
2016	81.43	65.24	1.03	64.21	3,702.5	19,811	37,030
2017	77.70	60.56	0.82	59.74	3,704.6	18,443	34,474
2018	76.86	56.61	0.70	56.28	3,704.6	17,374	32,475
Average	77.26	59.39	0.76	58.71	3,673.7	17,979	33,606
				Unit area Net CU (AF/ac)		4.89	
				Max acreage	3,704.6	18,130	33,888

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for Farm Unit 6808 is presented in Table C4.

Table C4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, Farm Unit 6808, 2014-2018.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.02	2.88%	522.6	976.9
February	3.57	5.09%	923.2	1,725.6
March	4.82	6.87%	1,245.9	2,328.8
April	6.83	9.74%	1,765.4	3,299.9
May	7.93	11.31%	2,051.1	3,833.9
June	9.09	12.96%	2,349.3	4,391.2
July	9.20	13.13%	2,379.9	4,448.3
August	8.71	12.42%	2,252.2	4,209.7
September	7.80	11.12%	2,016.4	3,769.0
October	4.40	6.28%	1,138.2	2,127.5
November	2.72	3.88%	702.9	1,313.9
December	3.03	4.32%	782.8	1,463.2
Annual	70.12	100.00%	18,130.0	33,887.9

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EXHIBIT A 2020

TECHNICAL MEMORANDUM

Date: July 15, 2019

To: Tribal Council, Colorado River Indian Tribes (CRIT)

Cc: Rebecca Loudbear, Attorney General, CRIT
Margaret Vick, Esq., Special Counsel

From: Natural Resources Consulting Engineers, Inc.

PROPOSED LANDS FOR COMPENSATED SYSTEM CONSERVATION PROGRAM (SCP) AND EXTRAORDINARY CONSERVATION INTENTIONALLY CREATED SURPLUS (EC ICS)

B. FARM UNIT: RAYNER 9035

Overview

This technical memorandum provides summary information and technical analyses for proposed temporary fallowing of irrigated farm land on the Colorado River Irrigation Project (Project) and other lands outside the boundary of the Project, Colorado River Indian Reservation, State of Arizona. The proposed fallowing is recommended for consideration under the Compensated System Conservation (SC) Program and Extraordinary Conservation Intentionally Created Surplus (EC ICS) Program. Temporary agricultural land fallowing is recognized by the Programs as means for reducing consumptive use to result in conserved water stored in Lake Mead. Parcels of land will be designated for fallowing on an annual basis and described in a Creation Plan. At the time of designation each parcel will have a history of irrigation for at least three out of the most recent five years. Each parcel may be designated for fallowing for no more than five consecutive years.

Under this proposal, the Colorado River Indian Tribes (CRIT) would temporarily fallow irrigated cropland on nine different Farm Units. Summary data and information regarding the location of each Farm Unit, the crops produced, irrigated crop acreage, estimated crop evapotranspiration, effective rainfall, net crop consumptive use, and estimated total irrigation

diversion requirement averaged over the previous 5-year period for each Farm Unit is provided below. Fallowing is proposed to begin in calendar year 2019 and continue through 2022.

Project Description

CRIT proposes to forego irrigation water deliveries and reduce consumptive use of Colorado River water by temporarily fallowing irrigated cropland as described immediately below during the period 2019-2022. CRIT proposes to create Compensated System Conservation through fallowing of specific Farm Units and make the conserved water available to the Colorado River System to increase storage in Lake Mead during 2020-2022. CRIT proposes to create EC ICS through fallowing of specific Farm Units for various periods of time during 2019 and may designate part of the consumptive use not compensated as system conservation for EC ICS during 2020-2022.
Figure 1 is an overview map showing the locations of the Farm Units proposed for fallowing on the Colorado River Indian Reservation (Reservation) in the State of Arizona. The majority of these Farm Units are served by the Tribe's Colorado River Irrigation Project (Project), which diverts Colorado River water for irrigation of about 80,000 acres of land on the Reservation. One Farm Unit is located outside of the Project service area and diverts water directly from the Colorado River by pumping.

Two of the proposed Farm Units are currently fallowed and participating in the Pilot System Conservation Program:

a. MTA 6627—October 1, 2018 to September 30, 2019
b. Quail Mesa 6808—January 1, 2019 to December 31, 2019

Estimated Conservation of Colorado River System Water

Estimated average annual consumptive use reduction due to fallowing, and the associated reductions in diversions at Headgate Rock Dam or by direct pumping for each Farm Unit are summarized in Table 1 below.

CRIT proposes to use the average annual consumptive use reduction during October-December for Unit MTA 6627 and the total average annual consumptive use reduction for Unit Rayner 9035 for EC ICS creation in 2019. CRIT proposes to use all sites listed in Table 1

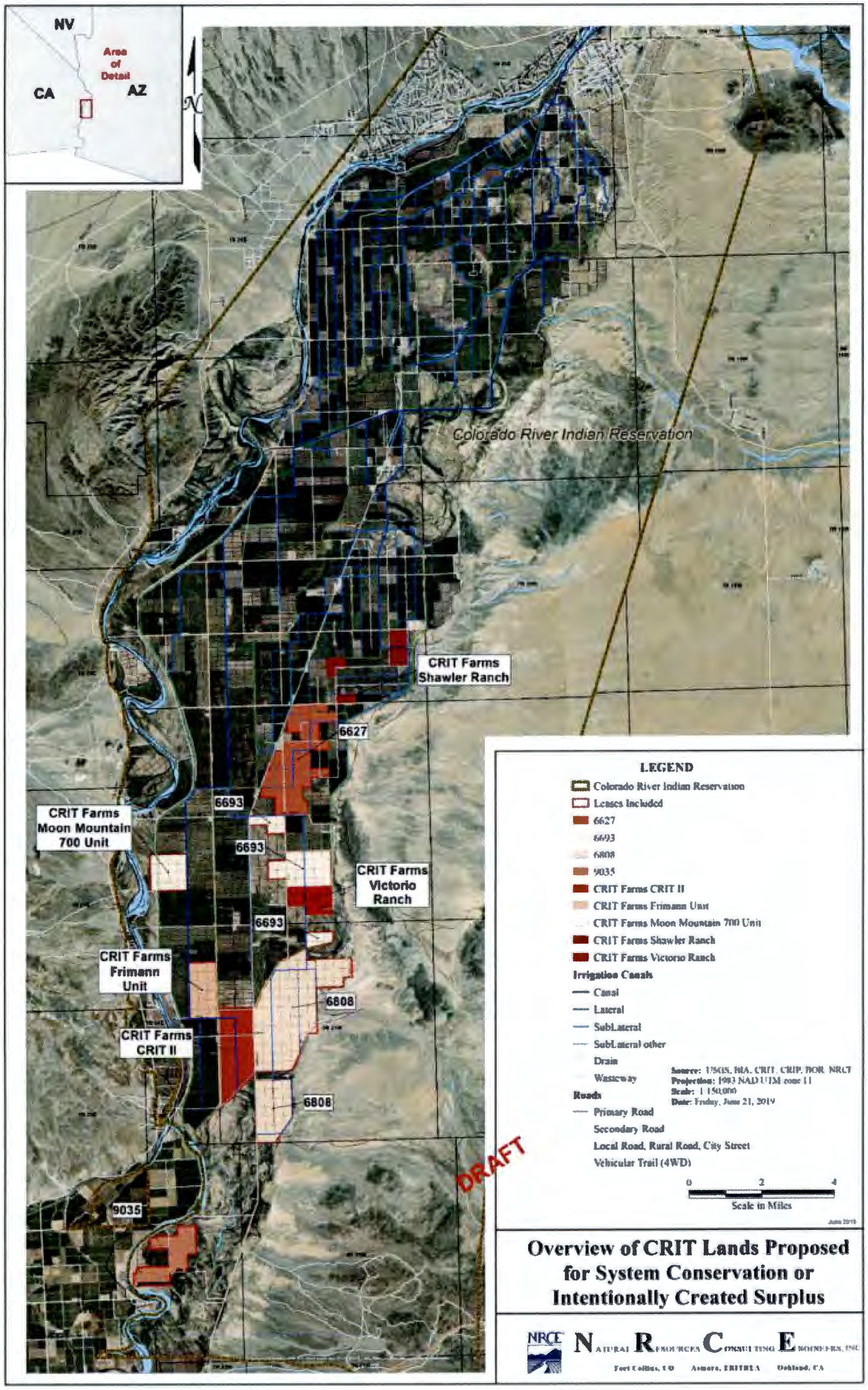

Figure 1. Overview of CRIT farm units proposed for fallowing for SC and EC ICS.

Table 1. Summary Cropping, Estimated Net Consumptive Use and Diversion Reduction for the Proposed Fallowing for CRIT ICS in 2019 and System Conservation and ICS in 2020.

Summary of CRIT ICS for 2019

					Net Consumptive Use		Efficiency Factor*	Diversion Reduction
Unit	**Name**	**Time Period**	**Max. Net Irrigated Acreage**	**Ave. Cropping Pattern**	**Average AF/ac**	**Annual AFY**		**Annual AFY**
6627*	**MTA Farms**	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	1,470	0.501	2,934
9035**	**Rayner**	2013-17	1055.7	43% alfalfa 35% cotton 14% Bermuda (grass hay) 8% Sudan	4.55	4,804	0.501	9,589
Totals			2,940			6,274		12,523

* Oct 1 2019-Dec 31 2019 only

** estimates in this table for 9035 are based on 2013-2017 USGS cropping data

Summary of CRIT System Conservation and ICS for 2020 (System Conservation in excess of 50,000 AF will be considered ICS).

					Total Net Consumptive Use		Net Consumptive Use Proration		Diversion Reduction Proration		Total Diversion Reduction
Unit	**Name**	**Time Period**	**Max. Net Irrigated Acreage**	**Ave. Cropping Pattern**	**Average AF/ac**	**Annual AFY**	**System Conservation AFY**	**EC ICS AFY**	**System Conservation* AFY**	**EC ICS** AFY**	**Annual AFY**
6627	**MTA Farms**	2014-18	1884.0	80% alfalfa 20% Sudan grass	5.39	10,157	9,450.7	706.2	17,664.8	1,486.7	19,152
6808	**Quail Mesa**	2014-18	3704.6	58% alfalfa 4% small grain 6% Bermuda (grass hay) 11% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.89	18,130	16,869.7	1,260.6	31,532.2	2,653.9	34,186
6693	**MTA Farms**	2014-18	1183.9	64% alfalfa 1% cotton 6% small grain 13% Bermuda (grass hay) 14% Sudan 21% Miscellaneous (onion, garlic, corn, potato)	4.97	5,886	5,476.3	409.2	10,236.1	861.5	11,098
CRIT Farms	**Victorio**	2014-18	406.8	60% alfalfa 5% cotton 17% small grain 12% Bermuda (grass hay) 5% Sudan	4.61	1,877	1,746.5	130.5	3,264.4	274.7	3,539
CRIT Farms	**Frimann**	2014-18	674.7	52% alfalfa 26% cotton 18% small grain 4% Sudan	4.37	2,951	2,745.4	205.2	5,131.7	431.9	5,564
CRIT Farms	**CRIT II**	2014-18	1238.7	73% alfalfa 19% cotton 6% small grain 2% Miscellaneous (onion, garlic, corn, potato)	5.04	6,247	5,812.4	434.3	10,864.4	914.4	11,779
CRIT Farms	**MTA 700**	2014-18	465.8	86% alfalfa 7% cotton 7% Bermuda (grass hay)	5.50	2,562	2,383.8	178.1	4,455.7	375.0	4,831
CRIT Farms	**Shawler Ranch**	2014-18	439.5	69% alfalfa 30% cotton 2% Sudan	5.02	2,206	2,052.9	153.4	3,837.2	323.0	4,160
9035***	**Rayner**	2013-17	788.0	52% alfalfa 32% cotton 12% Bermuda (grass hay) 4% Sudan	4.72	3,721	3,462	259	5,770	545	6,315
Totals			10,786			53,736	50,000	3,736	92,757	7,866	100,623

* based on Project overall average irrigation efficiency equal to 53.5%

** based on Project CU/Diversion ratio of 0.475 for 2018 using methodology designated in the LBOps ICS Exhibit S for CRIT.

*** estimates in this table for 9035 are based on 2013-2017 USGS cropping data with linear move sprinkler area removed;

and, for System Conservation diversion reduction, an overall average irrigation efficiency for direct pumping from River equal to 60%

to create up to 50,000 AF/year of Compensated System Conservation with any excess over 50,000 AF/year designated as EC ICS during the period 2020. The same farm units listed in Table 1 or different farm units may be designated for fallowing in 2021 and 2022.

Methodology

This section provides a brief description of the data and methods used to estimate:

- the amount of water conserved due to fallowing of irrigated cropland on each Farm Unit for each year of analysis; this is the net consumptive irrigation water use savings due the cropland fallowing; and,
- the associated irrigation water diversion required to provide that amount of water at the farm field.

Results are presented for each proposed Farm Unit in individual succeeding sub-sections of this technical memorandum.

Farm Unit Description and Location

Location data and legal description (PLSS) for each Farm Unit proposed for fallowing were obtained from CRIT Realty and/or CRIT Farms, the Tribal farming enterprise. This information generally included total gross and net acreage of the unit. Net irrigated crop acreage on each field of each Unit was determined using CRIT Water Resources Department (WRD) AGR05 field parcel polygon shapefile. The maximum net irrigated field acreage in any single year of the study period was used to determine the total volume of consumptive use savings due to fallowing.

Information on the Colorado River Irrigation Project (Project) irrigation delivery system was generally available from the US Bureau of Indian Affairs (BIA), the Federal agency that owns and operates the Project on behalf of CRIT. NRCE has prepared a detailed assessment of the Project (NRCE, 2016; NRCE, 2017).

Cropping Patterns

Crops typically produced on the Reservation include alfalfa (for hay), cotton, small grains (wheat, oats, barley), Bermuda and other grass hay, Sudan grass, and variety of minor miscellaneous crops (onions, garlic, corn, potato) (NRCE, 2016).

Crop patterns/crop mix for field parcels on the Farm Units for the years 2014-2018 inclusive were available from annual crop survey work performed by the CRIT Water Resources Department (WRD). The cropping pattern on the Project is determined by field survey each year and spatially referenced on Project maps using WRD's AGR05 field parcel polygon shapefile. For Unit 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Cropping pattern/crop mix maps for all Farm Units for the respective years analyzed are included in the subsection for each Farm Unit. A table summarizing the cropping pattern/crop mix for each Farm Unit for each year and average for the period analyzed is included.

Estimation of Consumptive Use

The factors considered in estimating crop consumptive use include cropped area and cropping patterns, reference evapotranspiration, crop coefficients, and precipitation. Crop evapotranspiration (ET_c) or crop consumptive use (crop CU) is defined as the evapotranspiration rate from disease-free, well-fertilized crops, grown in large fields, under optimum soil water conditions, and achieving full production under given climatic conditions (Allen et al., 1998). Potential crop water use or crop evapotranspiration estimates for the period 1996 to present for the Colorado River Irrigation Project service area have been prepared (NRCE, 2016).

For the purposes of this study, ET_c estimates using the single (mean) crop coefficient-reference evapotranspiration approach. Under this approach, reference crop evapotranspiration for a hypothetical green surface of actively transpiring vegetation is multiplied by a crop coefficient for a specific crop to estimate crop ET on a daily or monthly basis:

$$ET_c = K_C * ET_o$$

where:

ET_c = crop evapotranspiration (inches or mm);

K_c = crop coefficient (dimensionless);

ET_o = grass reference crop evapotranspiration (inches or mm)

The reference ET-crop coefficient method is widely used due to its simplicity, reproducibility, relatively good accuracy, and transportability among locations and climates.

For this analysis, reference ET (ET of an extensive area of short crop similar to 12-cm grass not short of water, ET_o) was computed using the ASCE Standardized Reference Evapotranspiration Equation (ASCE, 2005). The ASCE Standardized Reference ET Equation for a short (grass) reference surface is:

$$ET_o = \frac{0.408\Delta R_n + \gamma \frac{900}{T+273} u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34u_2)}$$

where:

ET_o = standardized reference crop evapotranspiration for (grass) short crop

Δ = slope of the saturation vapor pressure-temperature curve

R_n = net radiation at the crop surface

γ = psychrometric constant

T = mean daily air temperature measured at 1.5-2 m above ground level

u_2 = mean daily wind speed measured at 2 m above ground level

e_s = saturation vapor pressure

e_a = mean actual vapor pressure

This equation is the same as the ASCE Penman-Monteith Equation (Jensen et al., 1990 and Jensen and Allen, 2016) but with several simplifying "standardized" methods employed to compute several of the variables and parameter used in the Equation as given in ASCE (2005).

Jensen et al. (1990) report and summarize results of a comprehensive study comparing evapotranspiration estimates from different estimating methods to measurements of

evapotranspiration made at 11 different lysimeter sites around the world representing a wide range of climatic conditions from humid to arid, and elevations from below sea level to 9100 ft MSL. Nineteen methods were compared to lysimeter measurements on a monthly basis, and thirteen methods were compared on a daily basis. The ASCE Penman-Monteith method as given in Jensen et al. (1990) was determined to provide the overall best estimates of seasonal ET and average peak monthly ET with the least error as compared to lysimeter measurements across all ranges of climate and elevation.

The ASCE Reference ET Equation (ASCE, 2005) is a physically-based approach accounting for energy available for evaporation and aerodynamic transport of moisture away from the evaporating surface. Because of this physically-based formulation, it requires detailed weather measurements including air temperature, relative humidity, incoming total solar radiation, and wind speed. Such weather measurements are available from the Arizona Meteorological Network (AZMET) operated by the University of Arizona College of Agriculture and Live Sciences and Arizona Cooperative Extension (https://cals.arizona.edu/AZMET/). Two AZMET electronic weather stations are currently in operation in the Parker Valley and both stations are located on the Colorado River Indian Reservation (https://www.usbr.gov/lc/region/g4000/wtracct.html):

Parker No. 1 (site 8), Latitude 33.964296, Longitude -114.485501, Elev. 322 ft above MSL
Parker No. 2 (site 35) Latitude 33.863015, Longitude -114.472974, Elev. 302 ft above MSL

Daily weather and ET_o data from the AZMET Parker No. 2 Station for the respective 5-year period of analysis were used in this study (AZMET, 2013-2018).

The crop coefficient, K_c, integrates the effects/differences of specific crop characteristics that affect water use of the specific crop to the water use of the reference crop. This methodology for estimated crop ET assumes the crop is growing under ideal conditions, and not stressed for water or nutrients, and thus, is considered the potential crop ET or potential consumptive use. Actual crop ET in farm fields is typically less than potential crop ET due to factors such as water stress, salinity, insect and disease pressure, etc.

Daily crop coefficient values for the primary crops comprising around 90% of the total irrigated crop acreage [alfalfa, cotton, small grains (wheat, oats, rye, barley, millet), Bermuda hay,

Sudan grass) grown on the Reservation were obtained from reports on crop coefficients prepared for the USBR LCRAS (https://www.usbr.gov/lc/region/g4000/wtracct.html#LCRAS) program (Jensen, 1998 and Jensen, 2003). Several minor "miscellaneous" crops have been and currently are produced on small acreage on the Reservation. Over the period 2013-2018, these minor crops have comprised an average of only 3.52% of the total irrigated crop acreage on the Project. These include but are not limited to corn, onions, garlic, crucifers, lettuce, and other small vegetable and melon crops. Most often these crops are produced for seed (crucifers, lettuce) or dehydration (onion, garlic) or animal feed (corn silage) and not as fresh market produce. Crop coefficients for a "miscellaneous" crop category were assumed to be equal to the average of the primary crops. This process is explained in more detail in Appendix B of NRCE (2016).

In the case of alfalfa, Jensen (1998, Appendix C) recognized the published crop coefficients for alfalfa hay represent potential (maximum) alfalfa ET under conditions where harvest and removal of hay is not delayed, and crop water stress does not occur. Jensen (1998) estimated the coefficients were about 15% too high for normal farm practices when hay may not be removed right after cuttings, some water stress might occur, non-uniformity of crop conditions, etc. To adjust for these effects and provide alfalfa hay consumptive use estimates closer to actual conditions, Jensen (1998) applied a factor of 0.85 to the alfalfa hay crop coefficients.

The differences between actual ET occurring under the field conditions of the PROJECT and potential ET from crop coefficient-reference ET approach can be estimated using a remote sensing approach which allows for the determination of actual evapotranspiration from both vegetated and bare soil surfaces by solving the full surface energy balance using remotely sensed visible and thermal band data. While this type of study has not been performed on the Project service area, two such studies have been conducted on large irrigation districts in the region and the results provide some insight on the differences between actual and potential crop consumptive use that may be occurring on the Project:

- Clark et al. (2008) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different combinations of soils, on-farm irrigation method, and crop types, found on Imperial Irrigation District (IID). In this case, the Surface Energy Balance Algorithm for Land (SEBAL) (Bastiaanssen, 1998) and

LandSat satellite imagery with 30 m thermal resolution for water year 1998 was used to estimate actual ET. Potential ET was estimated using the dual crop coefficient approach presented in Allen et al. (1998). The results were presented as ratios of actual ET to potential ET. Across IID the average ratio was found to be 0.85. For graded border and graded furrow irrigation of mature alfalfa and new alfalfa on all soil types, the IID ratio of actual ET to potential ET ranged from 0.83 to 0.87.

- Elhaddad and Garcia (2014) reported the results of comparisons of actual ET (as determined by remote sensing energy balance methods) to potential ET (as determined by the crop coefficient-reference ET approach) for several different crop types found on Palo Verde Irrigation District (PVID). In this case, actual ET was estimated using the ReSET Raster method (Elhaddad and Garcia, 2008) and LandSat 7 satellite imagery with 30 m thermal resolution for calendar year 2002. Potential ET was estimated using methods employed by the USBR in the Lower Colorado River Accounting System (LCRAS) (USBR, 1996-2014). The average ratio of actual ET to potential ET across PVID was found to be 0.86. For alfalfa, the ratio was found to be 0.86.

The results of these studies support the alfalfa hay crop coefficient adjustments suggested by Jensen (1998). Thus, for this analysis, alfalfa crop ET, as computed using the Jensen (1998, 2003) alfalfa crop coefficients (published coefficients multiplied by a factor of 0.85 to account for less than ideal growth conditions) was taken as an estimate of actual alfalfa crop ET. For Sudan, small grains, and grass hay, actual crop ET was estimated to be 0.85 times potential crop ET. For cotton and higher value minor miscellaneous crops (garlic, onion, potato) a factor of 1.00 was assumed.

Growing season durations of the various crops are implicit in the daily crop coefficients prepared by Jensen (1998, 2003) and were adopted for this analysis.

The net irrigation water requirement (NIR) or net consumptive irrigation water use (NetCU) represents the quantity of water required at the farm field to supply the estimated irrigation water demand of a crop during its growth period over and above the amount of natural precipitation water available for crop use. NIR or NetCU is computed as the crop ET minus the effective precipitation. Effective precipitation is that portion of total precipitation which is available for crop use. NRCE

adopted the flat monthly multiplier approach to estimate effective precipitation (Jensen, 1993) as used in USBR LCRAS reporting of crop water use. Average annual precipitation measured at the AZMET Parker No. 2 Station is 3.96 inches for the period: 2014-2018 (AZMET, 2013-2018). Using the LCRAS method, effective precipitation on the Reservation is about 0.76 inches per year, or just less than about 20 percent of average annual precipitation, for the 2014-2018 period at this location.

For each year analyzed, the weighted average NIR or NetCU was determined based on acreages of the individual crop types and the NIR or NetCU of each crop for that year. Using this result, an overall average unit area net crop consumptive irrigation water use (AF/ac) for the 5-year study period was determined. This 5-year average unit area net crop consumptive irrigation water use is listed for each Farm Unit in Table 1. The 5-year average unit area net crop consumptive irrigation water use is multiplied by the maximum (for the 5-year study period) annual acres irrigated for the Farm Unit to determine the total volume of NetCU due to fallowing and listed for each parcel in Table 1.

Diversion Requirements

NRCE (2017) has performed water balance analyses at the conveyance/delivery system level to estimate the magnitude of conveyance system losses (seepage, evaporation, and operational spills) experienced with the current infrastructure and operational management of the Project. Farm gate deliveries were estimated. These analyses allowed an assessment of conveyance/delivery system efficiency. As well, farm field level water balance analyses comparing net crop irrigation water requirements (NIR) to the estimated field level supplies or farmgate deliveries were performed. These comparisons allowed an assessment of on-farm losses to ditch seepage, deep percolation and tailwater runoff and estimation of on-farm efficiency. The overall assessment comparing net crop irrigation water requirements (NIR) to diversions allowed estimation of Project irrigation efficiency.

For the proposed Farm Units served by the Project, the total irrigation diversion requirement at Headgate Rock Dam corresponding to the Farm Unit net consumptive irrigation water use was estimated by dividing the farm field (NIR or NetCU) by the estimated project irrigation efficiency (product of irrigation delivery system conveyance efficiency and on-farm application efficiency).

For the purposes of these analyses, an overall Project irrigation efficiency of 53.5% was applied (NRCE, 2017).

Farm Unit 9035 is not served by the Project. This site diverts irrigation water by pumping directly from the Colorado River. Water is distributed across the farm using concrete lined ditches. Irrigation for the period of study 2013-17 was by flood (low gradient border and furrow) irrigation, although in years prior to this period linear move sprinklers were used on parts of the lease, and CRIT's future plans include leasing parts of the unit and irrigating with the linear move sprinkler again. An average application efficiency of about 65-66% for border and furrow irrigation on the Reservation is used. For Unit 9035, the conveyance losses to seepage and operational spill are minor compared to the Project. A conservative conveyance efficiency of 90% is assigned on this unit. This results in an irrigation efficiency estimate of 60% for the unit.

Monthly Distribution

The annual cropping patterns found for each Farm Unit illustrate varying acreages of the primary crops from year to year and from Unit to Unit. To normalize this variability, monthly distributions of the total average annual NetCU savings and total average annual diversion reductions for each Farm Unit were determined by computing a monthly proportion of the total annual volume based on the 5-year average monthly and annual alfalfa crop evapotranspiration computed using reference crop ET_o from the AZMET Parker No. 2 electronic weather station and LCRAS crop coefficients for alfalfa.

Verification

During the fallowing period, in order to ensure that any vegetation remaining on the fallowed lands does not consumptively use Colorado River water by drawing water from the Colorado River aquifer, CRIT shall, at its expense, control and eradicate any green vegetation growth.

Weed control will likely performed using chemical applications. Records of weed control applications, including date, chemicals used, rates of application, etc. will be prepared and maintained. CRIT agrees to provide Reclamation, Arizona Department of Water Resources, and other applicable entities, with information and updates, when requested, regarding the vegetation eradication program. Stubble from previous cropping will be kept on field surface to the extent

possible to reduce wind erosion. USBR personnel will be granted access to the Farms to perform periodic on-site inspections to verify compliance.

The means of irrigation water deliveries to each Farm Unit proposed for fallowing are described for each respective Unit. Irrigation water deliveries can be completely curtailed through control of farm gate turnouts or through control of sublateral head gates. CRIT agrees to furnish and install padlocks to lock the farm gate turnouts on fields fallowed to the extent possible to do so. In the event that a turnout serves multiple fields of which not all are being fallowed, other practical mechanisms, including but not limited to, dirt berms in the portion of the irrigation ditch serving the fallowed field, or sealing the on-farm turnouts onto fallowed fields will be used to the extent possible to assure that no water deliveries can be made onto the fallowed fields.

Verification of Conserved Water Diversion Reduction from Approved Water Order

Total estimated diversion requirements on monthly and annual time steps for the actively irrigated areas of the proposed Farm Units that will be fallowed have been estimated. CRIT's annual water order (as determined and approved through the 43 CFR, Part 417 (Part 417) consultation between the BIA, US Bureau of Reclamation and CRIT) will be reduced by the estimated annual diversion requirements of the Farm Units for the agreed fallowing periods. Estimated monthly net consumptive use and diversion requirements of the Farm Units have also been determined. These monthly estimates allow determination of partial year water conservation and diversion reductions when fallowing periods are not a full 12-month period. Total annual CRIT Project and other Arizona diversions (with the fallowing and diversion reduction in progress) will not exceed CRIT's Colorado River annual water right allocation for Arizona as adjusted by the diversion reductions, and thereby avoid inadvertent overruns (diversions in excess of CRIT's adjusted entitlement—decreed AZ water right less the estimated diversion requirements of the fallowing program).

For Unit 9035, which diverts by direct pumping of water from the Colorado River, conserved water diversion reduction can be verified through routine monitoring of the electric power meter readings and account for the Unit's pumping facilities.

B. Farm Unit Rayner 9035

Farm Description and Location

Farm Unit Rayner 9035 (aka Rayner Farm) is located on the Colorado River Indian Reservation outside the Project service area with field parcels located within Sections 14, 15, 22, and 23, Township 4N Range 22W (Gila and Salt River Meridian), La Paz County, Arizona. Physically, Rayner Farm is close to Ehrenburg AZ, and is bounded by the Colorado River on the north, west, and southwest, and undeveloped land on the east and southeast. Figure B1 is an overview map of the Unit. Gross land area of Unit 9035 is about 1,140.7 acres. Approximately, a maximum of 1,055.7 net field acres have been in irrigated crop production during 2013-17. A portion of the farm will be leased out in 2020 to a private grower. That area, approximately 270 acres, will be irrigated by a linear move sprinkler irrigation system. Figure B2 shows the remaining irrigated area that will be fallowed, approximately a maximum of 788 net field acres have been in irrigated crop production during 2013-17 with the linear move sprinkler fields removed. The acreage not in production is occupied by buildings, hay and equipment storage yards, corrals, roads, canals, and drains.

The irrigated cropland on Rayner Farm is irrigated by direct pumping from the Colorado River. The pump station on the River is located on the north side of the Unit. Irrigation water deliveries can be effectively shut off from the fallowed lands by closing all sub-lateral headgates.

This Farm Unit has not been previously mapped by CRIT Water Resources Dept. Delineated irrigated field parcels on the Unit were determined using supplemental PLSS parcel description data provided from CRIT Realty and Google Earth imagery. A total of approximately 30 irrigated field parcels were identified within the actively irrigated area of Rayner Farm (see Figure B1), although field parcel boundaries are noted to have changed with some consolidation or further subdivision apparent during the study period. Background aerial imagery in Figure B1 is dated 2017 and from the USDA National Agriculture Aerial Imagery Program (NAIP): (http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/naip-imagery/). The CRIT field parcel delineations show good agreement with the NAIP aerial imagery.

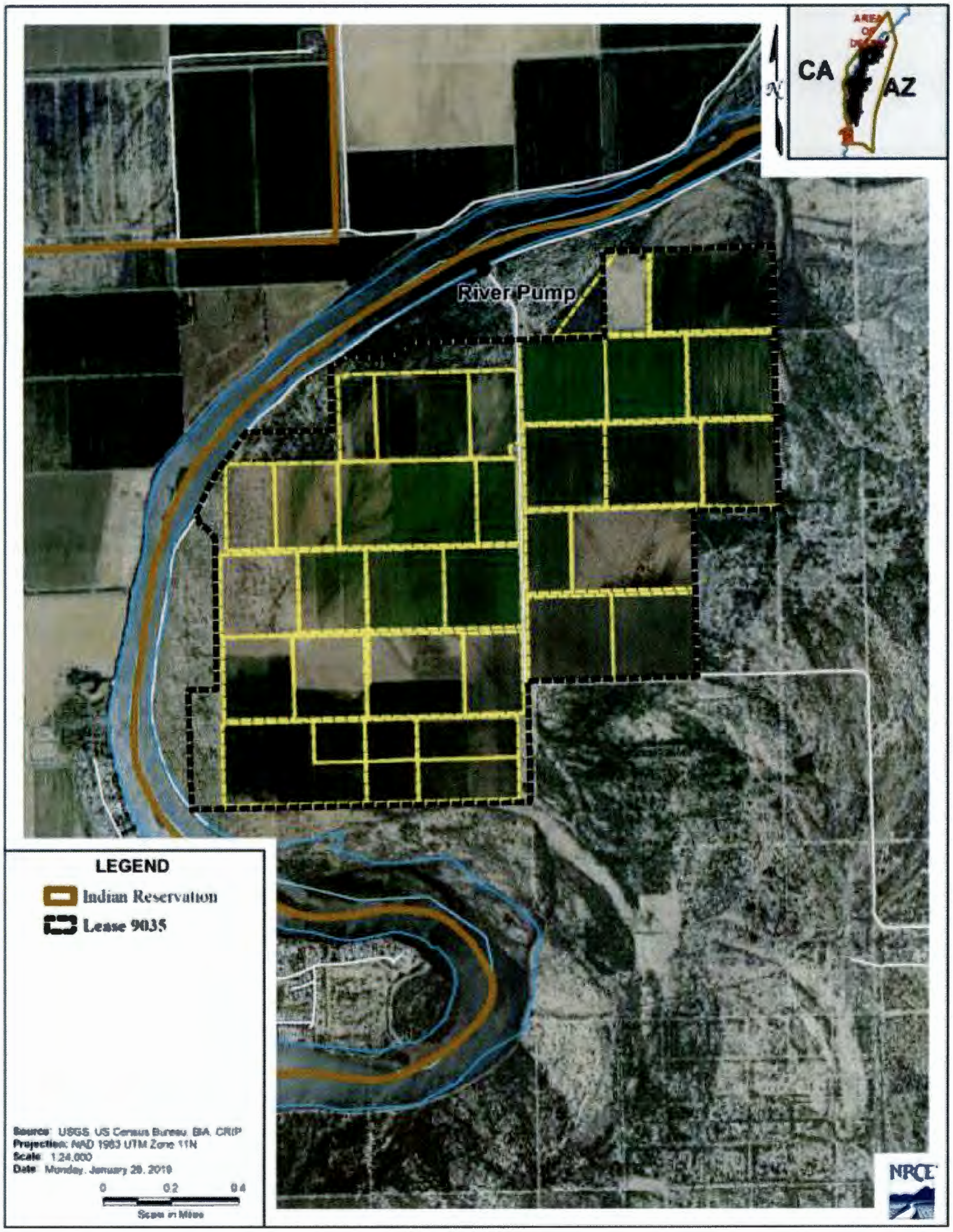

Figure B1. Overview Map of Farm Unit Rayner 9035.

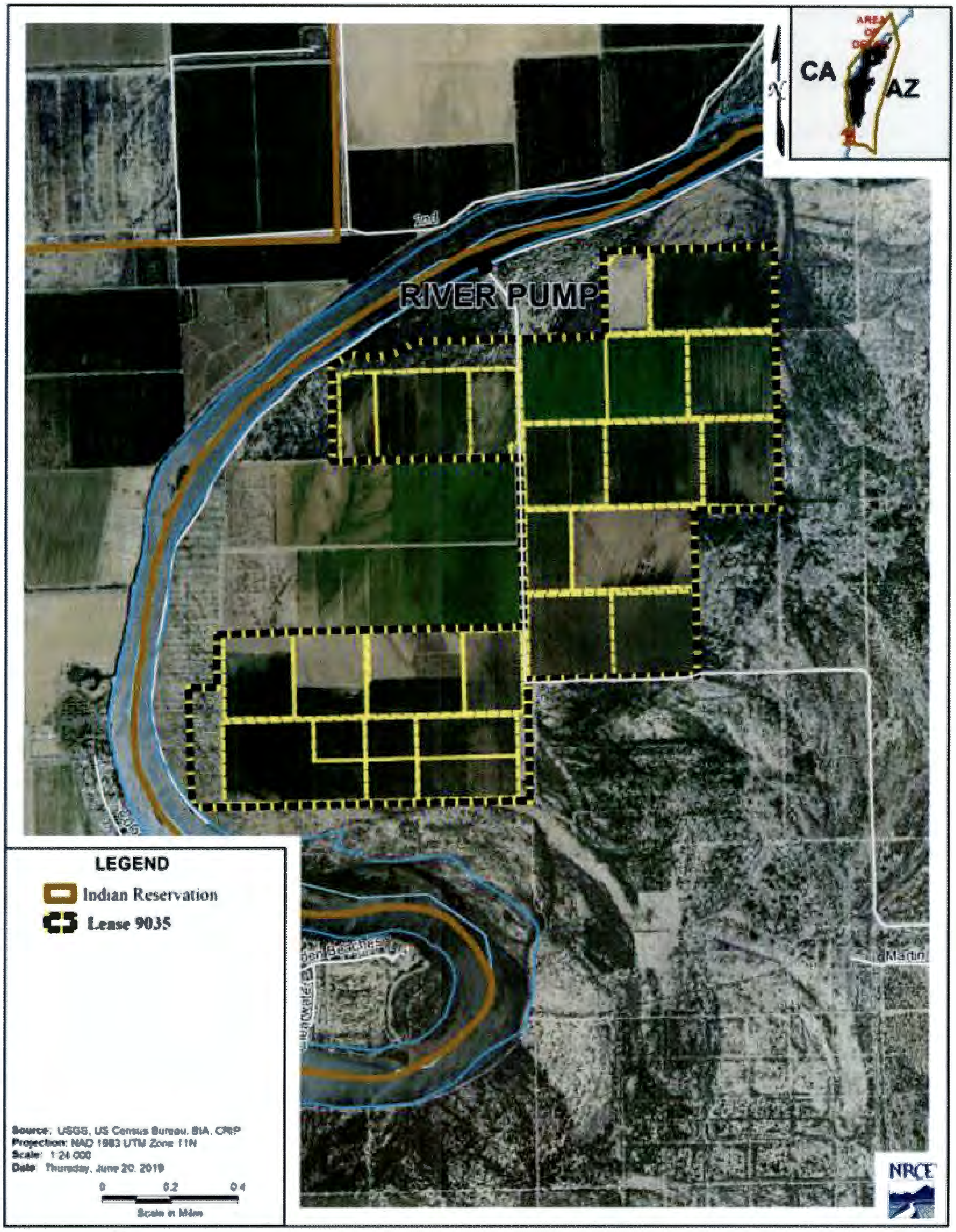

Figure B2. Overview Map of Farm Unit Rayner 9035 with the Area under the Linear Move Sprinkler System Removed.

Cropping Patterns

For Farm Unit Rayner 9035, cropping pattern data were not available from the CRIT WRD. For this unit, cropping pattern data collected by the USGS for the period 2013-2017 were made available by the USBR (Jeremy Dodds, USBR, personal communication, July 12, 2019). Unit 9035 has not been farmed since May 2018, and thus 2018 is not included in the analysis. The USGS crop pattern data are 100% coverage, on the ground crop survey data collected annually on the Rayner unit for USBR during 2013-17. Results (with the fields under the linear move sprinkler system removed) are summarized in Table B1. The annual cropping pattern for Farm Unit Rayner 9035 is mapped in Figures B3-B7, for years 2013-2017, respectively.

Table B1. Cropping Patterns/Crop Mix of Unit Rayner 9035, 2013-2017.

Year	Total Irrigated Crop Acreage	Alfalfa - Perennial	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops	Idle Acreage
2013	785.8	47%	43%	0%	10%	0%	0%	21.6
2014	785.8	54%	35%	0%	10%	0%	0%	21.6
2015	622.1	42%	45%	0%	13%	0%	0%	185.4
2016	785.8	56%	19%	0%	24%	0%	0%	21.6
2017	788.0	61%	19%	0%	0%	20%	0%	21.6
Average		52%	32%	0%	12%	4%	0%	

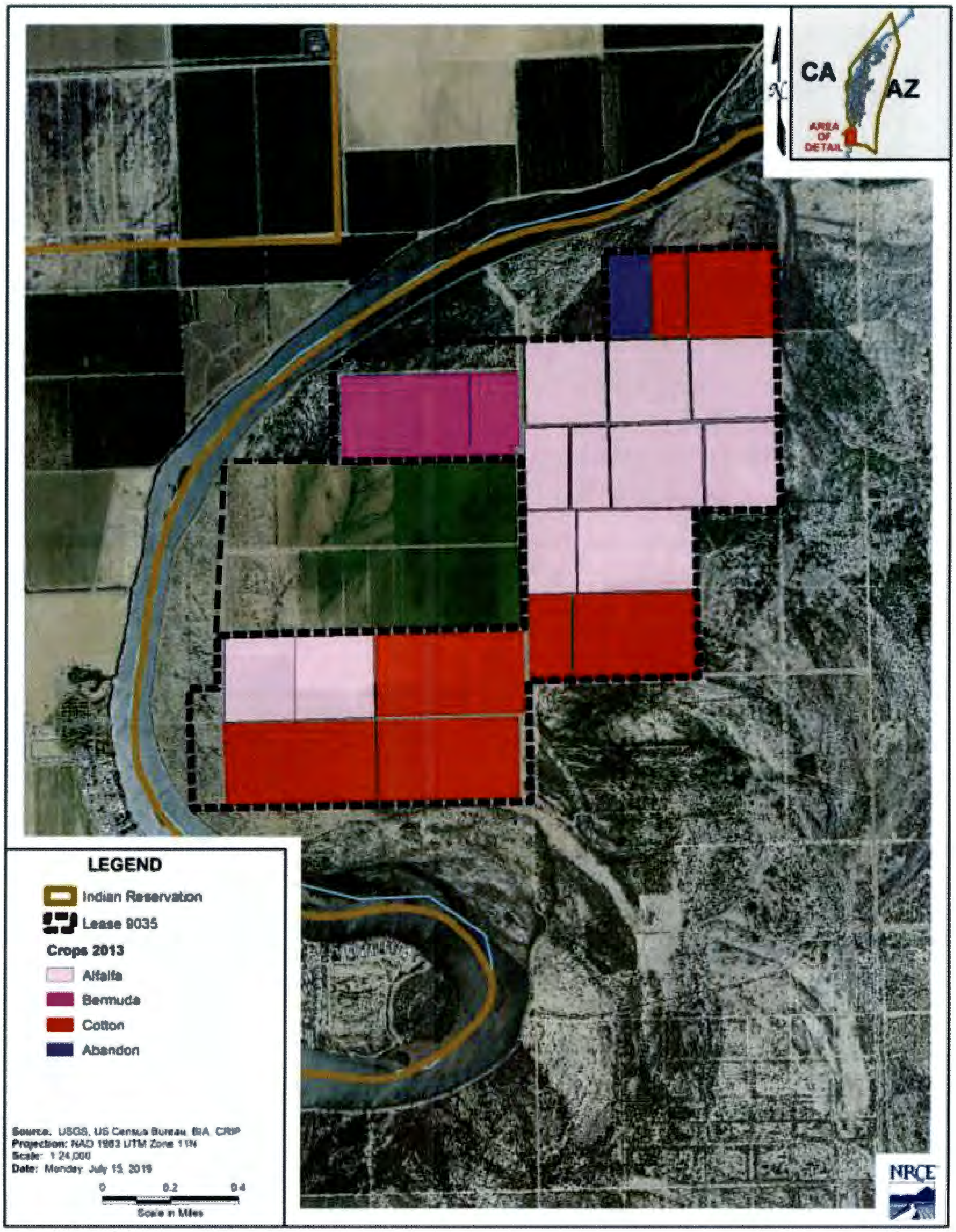

Figure B3. Cropping Pattern on Farm Unit Rayner 9035 in 2013.

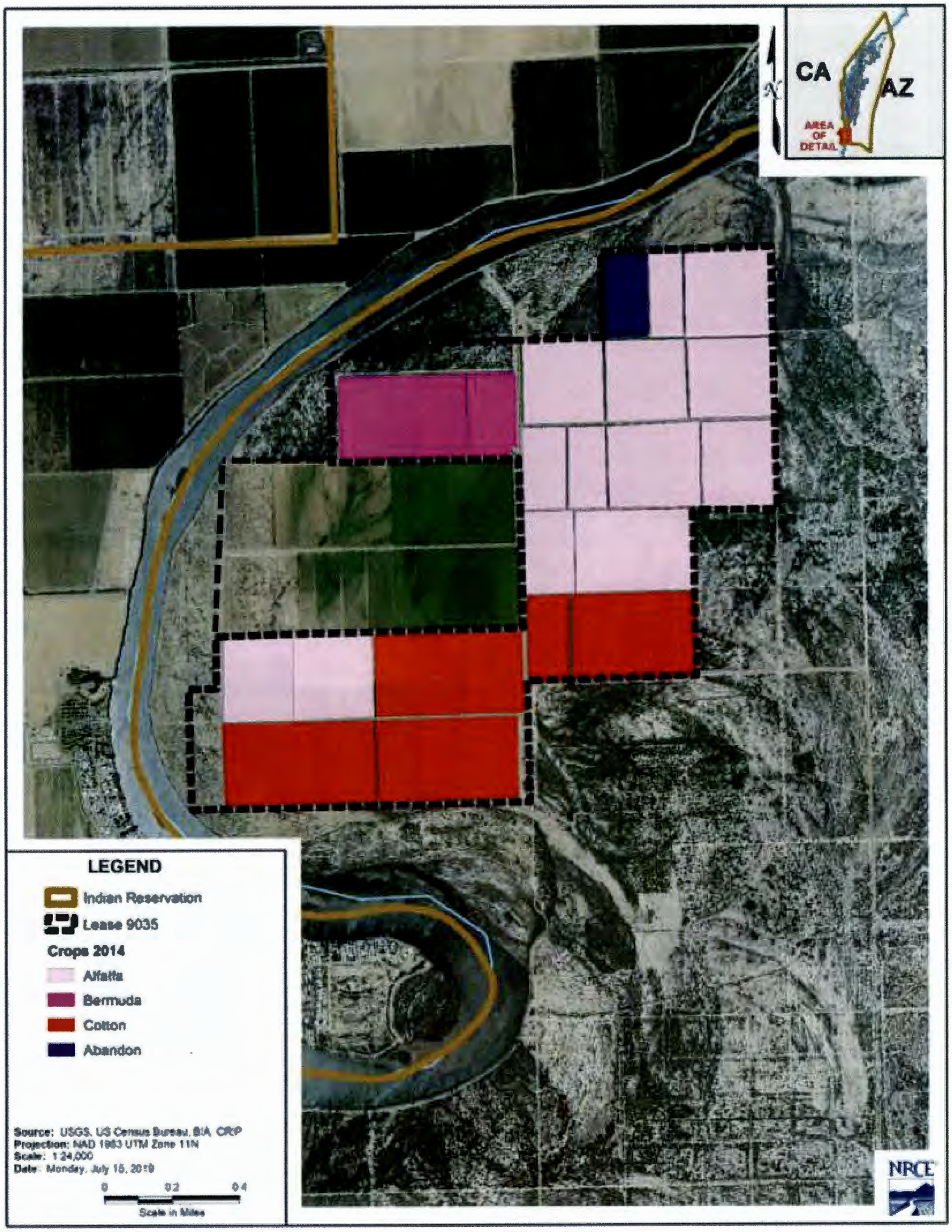

Figure B4. Cropping Pattern on Farm Unit Rayner 9035 in 2014.

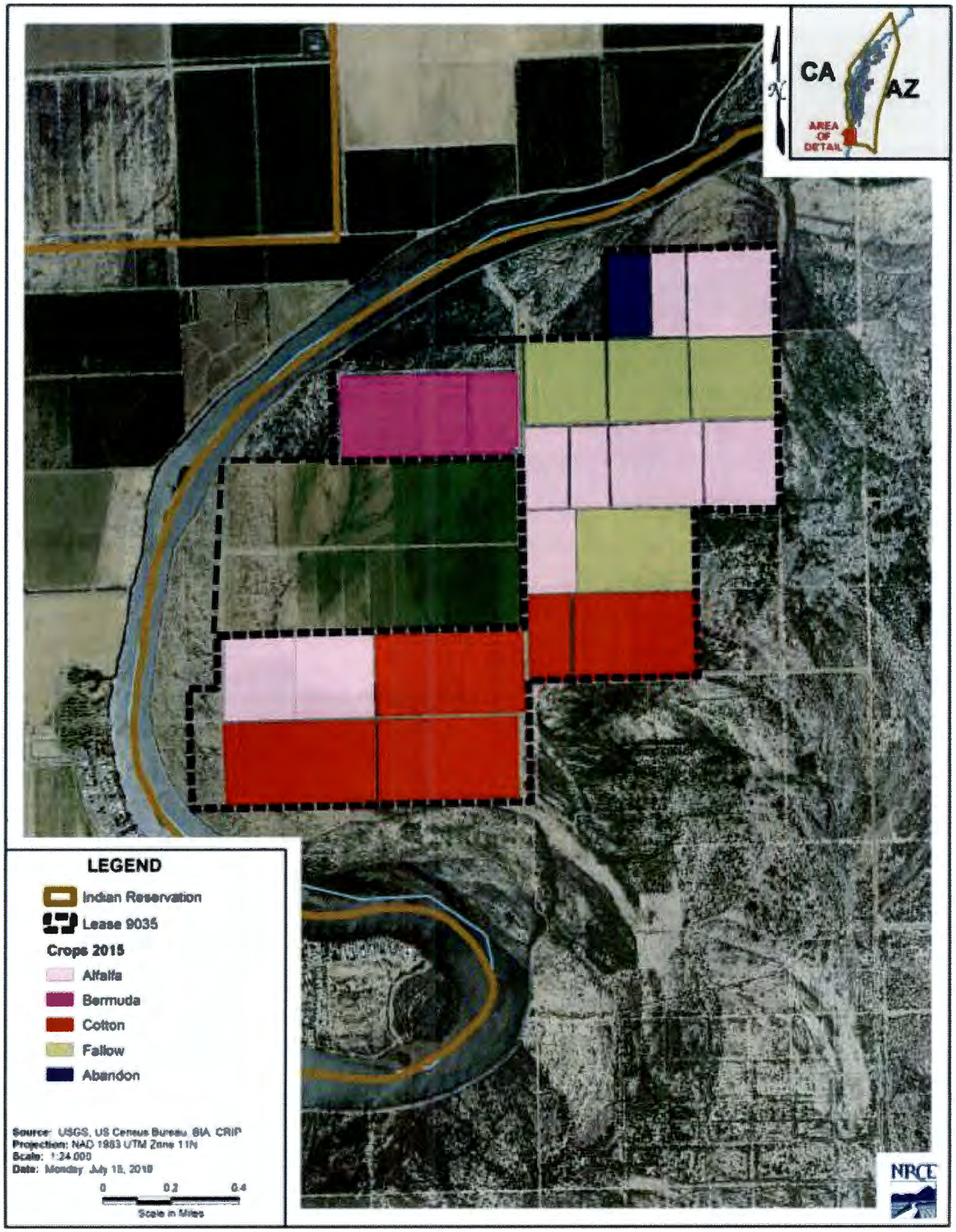

Figure B5. Cropping Pattern on Farm Unit Rayner 9035 in 2015.

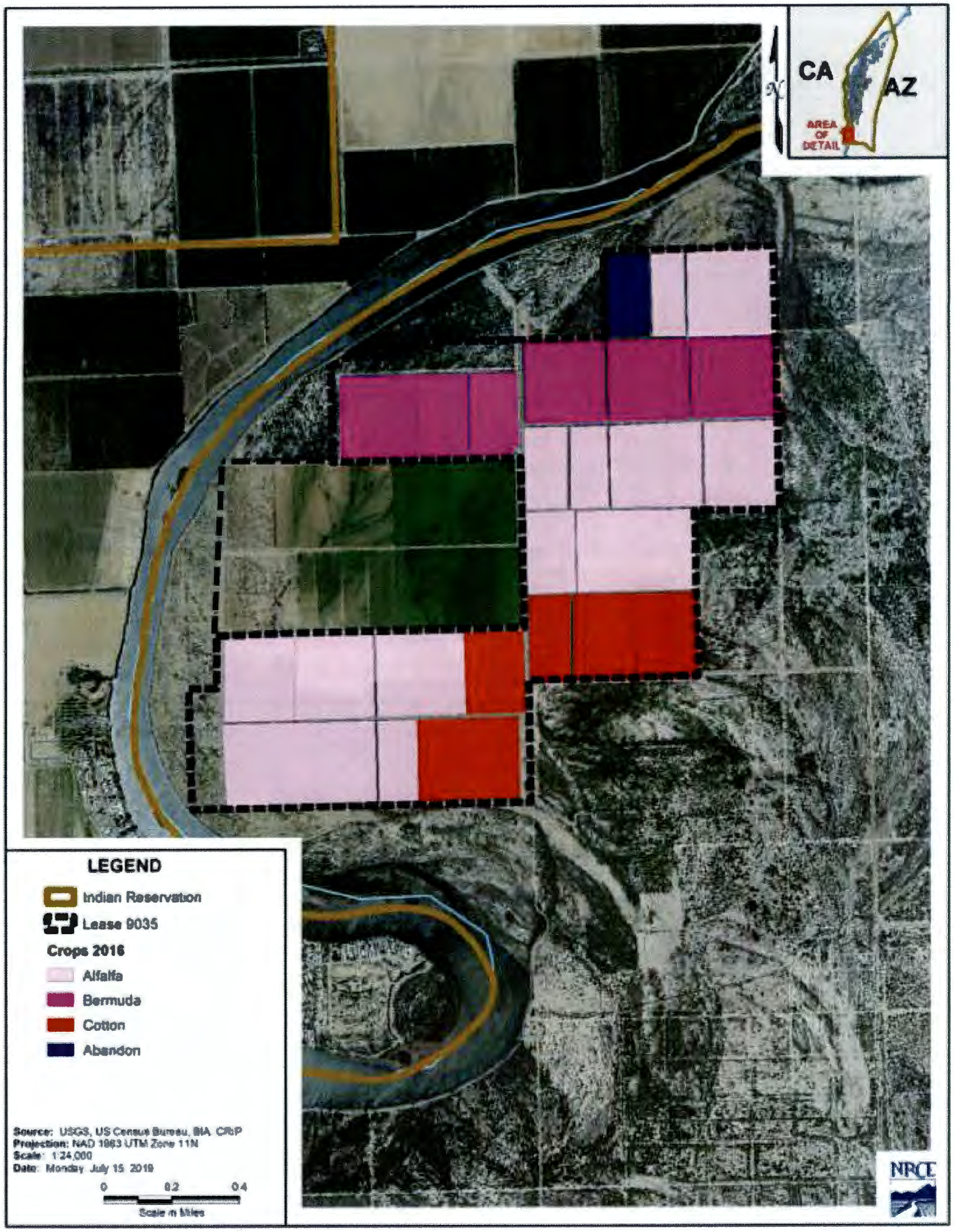

Figure B6. Cropping Pattern on Farm Unit Rayner 9035 in 2016.

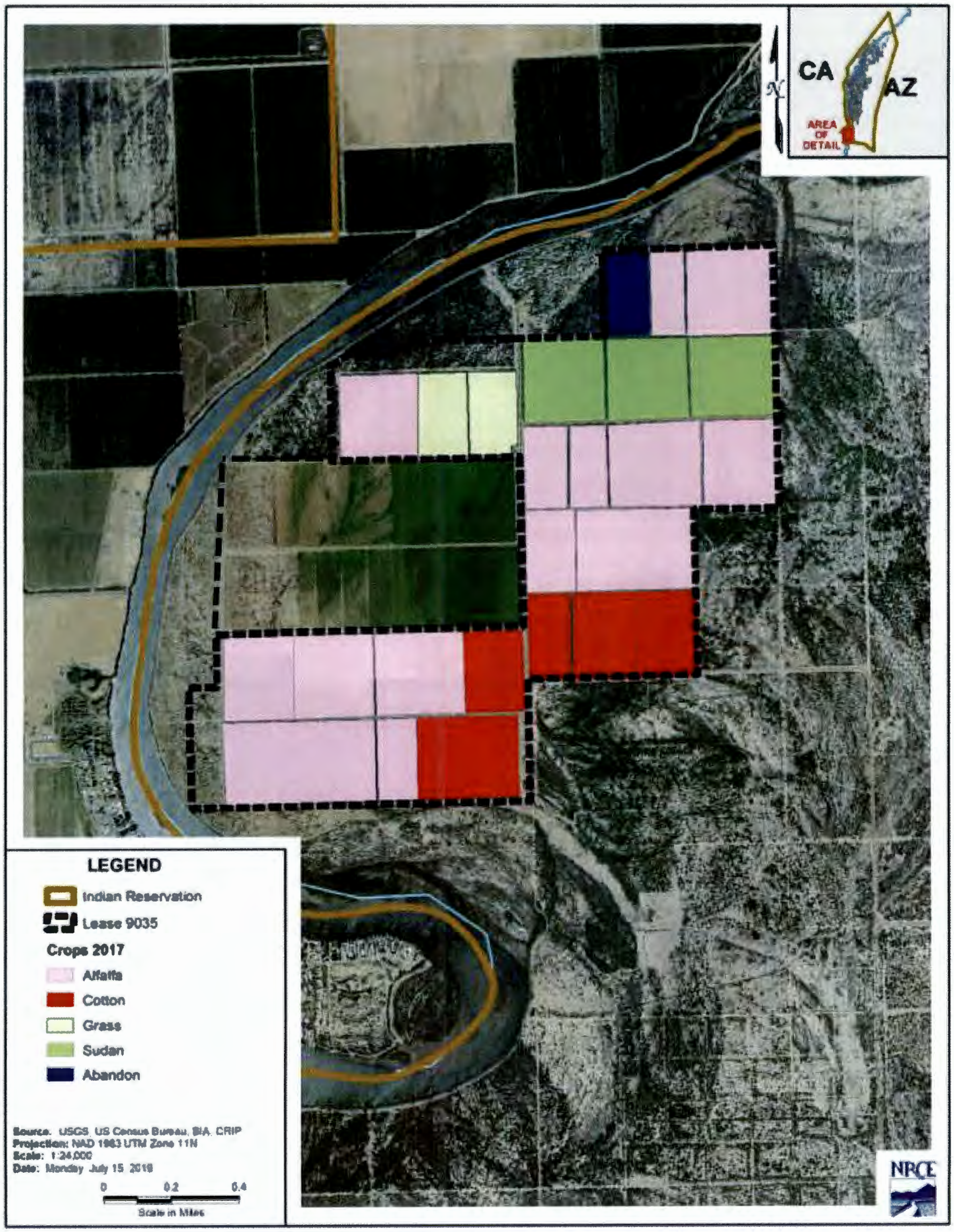

Figure B7. Cropping Pattern on Farm Unit Rayner 9035 in 2017.

Estimated Crop Evapotranspiration

Table B2 below presents computed annual and 5-year average reference ET_o and crop ET (inches/year) for crops grown on the Reservation during the 5-year study period: 2013-2017 using weather data from the AZMET Parker No. 2 weather station.

Table B2. Annual and 5-year Average Reference ET_o and crop ET (inches/year) for Reservation Crops for 2013-2017.

Year	Reference ET_o[1]	Alfalfa	Cotton	Small Grains	Grass (Bermuda/ Rye)	Grass (Sudan)	Misc. Crops
2013	76.18	69.1	38.0	25.2	49.8	45.0	45.4
2014	75.11	67.9	37.7	24.5	49.6	44.6	44.9
2015	75.19	68.2	39.1	23.0	49.7	43.8	44.5
2016	81.43	73.9	43.2	24.3	53.7	46.4	48.0
2017	77.70	70.5	40.5	23.6	50.9	46.2	46.2
Average (in)		69.9	39.7	24.1	50.7	45.2	45.8
Average (af/ac)		5.83	3.31	2.01	4.23	3.77	3.82

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

Estimated Net Consumptive Irrigation Water Use and Diversion Requirement

Table B3 below presents reference ET_o, area-weighted average crop ET, effective precipitation, area-weighted average net consumptive use (NetCU), and associated diversion requirement (diversion reduction) for each year of the study period, and as an average of the 5-year period: 2013-17, based on the crop acreage and cropping pattern/mix discussed above. The estimated average annual unit area consumptive use on this Farm Unit for 2013-2017 is 4.72 AF/ac. The total estimated volume of water conserved due to the proposed fallowing of a maximum acreage of 788 acres on the Farm Unit is 3,721 AFY. Using an estimated average overall irrigation efficiency of 60%, the diversion requirement associated with this net water conservation is 6,202 AFY.

Table B3. Annual and 5-year Average Reference ET_o, Area Weighted Crop ET, Effective Precipitation, Area Weighted Net CU and Diversion Reduction for 2013-2017. Farm Unit Rayner 9035.

Year	Reference ET_o[1]	Weighted Average Actual Crop ET (ETa)[2]	Effective Precip.	Net Actual Consumptive Use	Net Crop Area Fallowed	Net Actual Consumptive Use Demand[3]	Diversion Reduction at Direct Pumping from River[4]
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(in)	(in)	(in)	(in)	(ac)	(AF)	(AF)
2013	76.18	53.79	0.16	53.70	785.8	3,517	5,861
2014	75.11	55.27	0.30	55.05	785.8	3,605	6,009
2015	75.19	52.73	0.93	52.06	622.1	2,699	4,498
2016	81.43	63.01	1.03	62.16	785.8	4,071	6,785
2017	77.70	59.90	0.82	59.40	788.0	3,900	6,500
Average	77.12	56.94	0.65	56.47	753.5	3,558	5,931
						4.72	
				Max acreage	788.0	3,721	6,202

[1] Reference evapotranspiration of a short crop similar to 12-cm tall grass.

[2] Estimated actual crop ET accounting for water stress and less than ideal growth conditions. Weighted average calculated using irrigated acreages.

[3] Column (5) divided by 12 and multiplied by Column (6)

[4] Column (8) divided by overall Project efficiency

The monthly distribution of the total average annual NetCU saving and total average annual diversion reduction for Farm Unit Rayner 9035 is presented in Table B4.

Table B4. Monthly Distribution of Net Consumptive Use and Associated Diversion Reduction, Farm Unit Rayner 9035, 2013-2013.

Month	Average annual Alfalfa Crop ET (in) for period of analysis		Monthly Net Consumptive Use Demand	Monthly Diversion Reduction
	(inches)	% of total	(AF)	(AF)
January	2.09	2.99%	111.2	185.4
February	3.64	5.21%	194.0	323.3
March	4.91	7.04%	262.0	436.7
April	6.96	9.97%	371.1	618.6
May	8.06	11.56%	430.1	716.9
June	9.00	12.90%	479.9	799.8
July	8.88	12.73%	473.6	789.3
August	8.56	12.27%	456.4	760.7
September	7.80	11.19%	416.2	693.7
October	4.24	6.08%	226.4	377.3
November	2.75	3.94%	146.5	244.2
December	2.88	4.13%	153.5	255.8
Annual	69.76	100.00%	3,721.0	6,201.7

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EXHIBIT B – FUNDING AGREEMENT

EXHIBIT B

AGREEMENT BETWEEN THE ARIZONA DEPARTMENT OF WATER RESOURCES AND THE ENVIRONMENTAL DEFENSE FUND, INC. TO FUND THE CREATION OF SYSTEM CONSERVATION WATER IN LAKE MEAD BY THE COLORADO RIVER INDIAN TRIBES

PREAMBLE: The Colorado River Indian Tribes ("CRIT") have agreed to fallow sufficient irrigable farm land on the Colorado River Indian Reservation in Arizona ("CRIR") to create 50,000 acre-feet of System Conservation Water in Lake Mead ("CRIT Proposal") in each of three years beginning January 1, 2020 and ending December 31, 2022 ("Fallowing Period"). CRIT will forego irrigation water deliveries and fallow approximately 10,000 acres of farmland in exchange for receiving from the Arizona System Conservation Fund ("Fund") $247.20 per acre-foot of water in 2020, with a 3% annual escalator, for up to 150,000 acre-feet conserved in Lake Mead and available to the Lower Colorado River System to maintain lake levels ("Project").

The Arizona Department of Water Resources ("ADWR"), the U.S. Bureau of Reclamation ("Reclamation"), and the Central Arizona Water Conservation District ("CAWCD") will enter an agreement setting forth the terms for CRIT's creation of System Conservation Water in Lake Mead ("CRIT Agreement"). This Exhibit B will be part of the CRIT Agreement. To fund the Project, the State of Arizona has appropriated $30,000,000 in FY 2019/2020 for deposit into the Fund pursuant to Laws 2019, Chapter 1, Sec. 21. Contingent on this funding agreement becoming effective as set forth in Section XI below, EDF has agreed to deposit a total of $2,000,000 into the Fund by January 31, 2020 and use best efforts to contribute an additional $6,000,000 into the Fund no later than July 15, 2021.

This Agreement ("Funding Agreement") is intended to describe the State of Arizona's and EDF's commitment to contribute monies to the Fund to assist in funding the Project during the Fallowing Period such that CRIT receives compensation from the Fund in accordance with Section 8 of the CRIT Agreement.

I. *Key Terms*: The defined terms in the CRIT Agreement shall have the same meaning in this Funding Agreement.

II. *Cost of Project*: The total cost for the conservation of 150,000 acre-feet of water in Lake Mead by CRIT is $38,160,000, which includes $160,000 of interest that will accrue in the Fund from monies contributed to the Fund for the purpose of funding the Project by the State of Arizona and EDF, and others if necessary, during the Fallowing Period.

III. Financial Contributions by State of Arizona: To fund the Project, the State of Arizona has appropriated $30,000,000 in FY 2019/2020 for deposit into the Fund pursuant to Laws 2019, Chapter 1, Sec. 21. ADWR expects that these monies will be deposited by the State into the Fund by July 31, 2019. No other monies shall be deposited into the Fund by the State of Arizona to complete its obligation to the CRIT pursuant to the CRIT Agreement. Interest accrued on the monies deposited into the Fund by the State of Arizona will accrue to the benefit of CRIT and will be paid to CRIT in accordance with the terms of Section 8 of the CRIT Agreement up to the total amount of funding for CRIT to create 150,000 acre-feet of System Conservation Water. Any monies remaining in the Fund including accrued interest, after the final payment to CRIT, shall be returned to the State of Arizona and EDF according to each party's contribution to the Fund. Any monies contributed to the Fund by a party other than the State of Arizona and EDF, shall not be included in the distribution of monies remaining in the Fund to the State and EDF.

IV. Financial Contributions by EDF:

EDF shall make financial contributions to the Fund according to the Table below:

Contributions	**Due Date**	**EDF**
Contribution 1	On or before July 31, 2019	$ 1,000,000.00
Contribution 2	On or before January 31, 2020	$ 1,000,000.00
TOTAL		**$ 2,000,000.00**

Interest accrued on the monies deposited into the Fund by EDF for the purpose of funding the Project will accrue to the benefit of CRIT and will be paid to CRIT in accordance with the terms of Section 8 of the CRIT Agreement. Any monies remaining in the Fund including accrued interest, after final payment to CRIT, shall be returned to EDF and the State of Arizona according to each party's contribution to the Fund. Any monies contributed to the Fund by a party other than the State of Arizona and EDF, shall not be included in the distribution of monies remaining in the Fund to the State and EDF.

V. Additional Contributions by EDF: In addition to EDF's agreement to contribute $2,000,000 to the Fund according to the provisions set forth in Section IV herein, EDF has made significant progress toward raising $2,000,000 to $3,000,000 to be contributed to the Fund by January 31, 2021. EDF will use best efforts to raise an additional amount of money to be contributed to the Fund on or before July 15, 2021 in an amount equal to the difference between $8,000,000 and the total amount of monies previously contributed to the Fund by EDF. Any monies contributed by EDF to the Fund pursuant to this Section shall be used to fund the Project under the terms of the CRIT Agreement. Notwithstanding any other provision in this Funding Agreement, the total amount of contributions that EDF will endeavor to make to the Fund during the Fallowing Period shall not exceed $8,000,000.

VI. Notice: EDF agrees that should it be unable to meet any of its funding commitments as set forth in Sections IV and V herein, it shall provide written notice to ADWR and CRIT no later than July 1, 2021 stating the reason for, and the amount of, its funding shortfall. EDF shall not be held liable by any of the parties to the CRIT Agreement in the event that EDF is unable to raise funds beyond its $2,000,000.00 commitment herein.

VII. Invoicing: ADWR will invoice EDF for its $1,000,000 contribution due on or before January 31, 2020 at least sixty (60) days prior to the final due date listed in the table in Section IV herein.

VIII. Payments to CRIT by ADWR: Payments from the Fund by ADWR to CRIT shall be made in accordance with the terms of the CRIT Agreement

IX. Third-Party Beneficiary: CRIT is a third-party beneficiary to this Funding Agreement.

X. Performance Metrics: Specific performance metrics are set forth in Sections 6 and 8 of the CRIT Agreement and must be met prior to payment from the Fund by ADWR to CRIT. ADWR will provide these performance metrics to EDF in the same manner that it was provided to ADWR within 45 days of ADWR's receipt of such metrics. The terms of the CRIT Agreement govern the implementation of this Funding Agreement.

XI. Effective Date: This Funding Agreement becomes effective upon the occurrence of the latter of: (1) signing of this Agreement by ADWR and EDF, and (2) signing of the CRIT Agreement by all of the parties to that agreement.

XII. Termination Date: This Funding Agreement shall terminate upon fulfillment of the obligations set forth herein and in the CRIT Agreement. ADWR is supportive of establishing a program to create additional system conservation water in Lake Mead to protect lake levels if participants and funders are willing and able to participate.

ADWR and EDF's signature below indicates agreement with the terms of this Funding Agreement. This Funding Agreement may be signed in counterparts, each of which shall be an original and all of which, together shall constitute Exhibit B of the CRIT Agreement.

ADWR:	**Approved as to form:**
By: Thomas Buschatzke	By: Ayesha Vohra
Thomas Buschatzke	Ayesha Vohra
Its: Director	Its: Deputy Counsel
Date: 7/19/19	
ENVIRONMENTAL DEFENSE FUND, INC.	**Approved as to form:**
By:	By:
Its: CAO	Its:
Date: 7-30-19	

EXHIBIT 6.1.2

EXHIBIT B

AGREEMENT BETWEEN THE ARIZONA DEPARTMENT OF WATER RESOURCES AND THE ENVIRONMENTAL DEFENSE FUND, INC. TO FUND THE CREATION OF SYSTEM CONSERVATION WATER IN LAKE MEAD BY THE COLORADO RIVER INDIAN TRIBES

PREAMBLE: The Colorado River Indian Tribes ("CRIT") have agreed to fallow sufficient irrigable farm land on the Colorado River Indian Reservation in Arizona ("CRIR") to create 50,000 acre-feet of System Conservation Water in Lake Mead ("CRIT Proposal") in each of three years beginning January 1, 2020 and ending December 31, 2022 ("Fallowing Period"). CRIT will forego irrigation water deliveries and fallow approximately 10,000 acres of farmland in exchange for receiving from the Arizona System Conservation Fund ("Fund") $247.20 per acre-foot of water in 2020, with a 3% annual escalator, for up to 150,000 acre-feet conserved in Lake Mead and available to the Lower Colorado River System to maintain lake levels ("Project").

The Arizona Department of Water Resources ("ADWR"), the U.S. Bureau of Reclamation ("Reclamation"), and the Central Arizona Water Conservation District ("CAWCD") will enter an agreement setting forth the terms for CRIT's creation of System Conservation Water in Lake Mead ("CRIT Agreement"). This Exhibit B will be part of the CRIT Agreement. To fund the Project, the State of Arizona has appropriated $30,000,000 in FY 2019/2020 for deposit into the Fund pursuant to Laws 2019, Chapter 1, Sec. 21. Contingent on this funding agreement becoming effective as set forth in Section XI below, EDF has agreed to deposit a total of $2,000,000 into the Fund by January 31, 2020 and use best efforts to contribute an additional $6,000,000 into the Fund no later than July 15, 2021.

This Agreement ("Funding Agreement") is intended to describe the State of Arizona's and EDF's commitment to contribute monies to the Fund to assist in funding the Project during the Fallowing Period such that CRIT receives compensation from the Fund in accordance with Section 8 of the CRIT Agreement.

I. Key Terms: The defined terms in the CRIT Agreement shall have the same meaning in this Funding Agreement.

II. Cost of Project: The total cost for the conservation of 150,000 acre-feet of water in Lake Mead by CRIT is $38,160,000, which includes $160,000 of interest that will accrue in the Fund from monies contributed to the Fund for the purpose of funding the Project by the State of Arizona and EDF, and others if necessary, during the Fallowing Period.

III. Financial Contributions by State of Arizona: To fund the Project, the State of Arizona has appropriated $30,000,000 in FY 2019/2020 for deposit into the Fund pursuant to Laws 2019, Chapter 1, Sec. 21. ADWR expects that these monies will be deposited by the State into the Fund by July 31, 2019. No other monies shall be deposited into the Fund by the State of Arizona to complete its obligation to the CRIT pursuant to the CRIT Agreement. Interest accrued on the monies deposited into the Fund by the State of Arizona will accrue to the benefit of CRIT and will be paid to CRIT in accordance with the terms of Section 8 of the CRIT Agreement up to the total amount of funding for CRIT to create 150,000 acre-feet of System Conservation Water. Any monies remaining in the Fund including accrued interest, after the final payment to CRIT, shall be returned to the State of Arizona and EDF according to each party's contribution to the Fund. Any monies contributed to the Fund by a party other than the State of Arizona and EDF, shall not be included in the distribution of monies remaining in the Fund to the State and EDF.

IV. Financial Contributions by EDF:

EDF shall make financial contributions to the Fund according to the Table below:

Contributions	**Due Date**	**EDF**
Contribution 1	On or before July 31, 2019	$ 1,000,000.00
Contribution 2	On or before January 31, 2020	$ 1,000,000.00
TOTAL		**$ 2,000,000.00**

Interest accrued on the monies deposited into the Fund by EDF for the purpose of funding the Project will accrue to the benefit of CRIT and will be paid to CRIT in accordance with the terms of Section 8 of the CRIT Agreement. Any monies remaining in the Fund including accrued interest, after final payment to CRIT, shall be returned to EDF and the State of Arizona according to each party's contribution to the Fund. Any monies contributed to the Fund by a party other than the State of Arizona and EDF, shall not be included in the distribution of monies remaining in the Fund to the State and EDF.

V. Additional Contributions by EDF: In addition to EDF's agreement to contribute $2,000,000 to the Fund according to the provisions set forth in Section IV herein, EDF has made significant progress toward raising $2,000,000 to $3,000,000 to be contributed to the Fund by January 31, 2021. EDF will use best efforts to raise an additional amount of money to be contributed to the Fund on or before July 15, 2021 in an amount equal to the difference between $8,000,000 and the total amount of monies previously contributed to the Fund by EDF. Any monies contributed by EDF to the Fund pursuant to this Section shall be used to fund the Project under the terms of the CRIT Agreement. Notwithstanding any other provision in this Funding Agreement, the total amount of contributions that EDF will endeavor to make to the Fund during the Fallowing Period shall not exceed $8,000,000.

VI. Notice: EDF agrees that should it be unable to meet any of its funding commitments as set forth in Sections IV and V herein, it shall provide written notice to ADWR and CRIT no later than July 1, 2021 stating the reason for, and the amount of, its funding shortfall. EDF shall not be held liable by any of the parties to the CRIT Agreement in the event that EDF is unable to raise funds beyond its $2,000,000.00 commitment herein.

VII. Invoicing: ADWR will invoice EDF for its $1,000,000 contribution due on or before January 31, 2020 at least sixty (60) days prior to the final due date listed in the table in Section IV herein.

VIII. Payments to CRIT by ADWR: Payments from the Fund by ADWR to CRIT shall be made in accordance with the terms of the CRIT Agreement

IX. Third-Party Beneficiary: CRIT is a third-party beneficiary to this Funding Agreement.

X. Performance Metrics: Specific performance metrics are set forth in Sections 6 and 8 of the CRIT Agreement and must be met prior to payment from the Fund by ADWR to CRIT. ADWR will provide these performance metrics to EDF in the same manner that it was provided to ADWR within 45 days of ADWR's receipt of such metrics. The terms of the CRIT Agreement govern the implementation of this Funding Agreement.

XI. Effective Date: This Funding Agreement becomes effective upon the occurrence of the latter of: (1) signing of this Agreement by ADWR and EDF, and (2) signing of the CRIT Agreement by all of the parties to that agreement.

XII. Termination Date: This Funding Agreement shall terminate upon fulfillment of the obligations set forth herein and in the CRIT Agreement. ADWR is supportive of establishing a program to create additional system conservation water in Lake Mead to protect lake levels if participants and funders are willing and able to participate.

ADWR and EDF's signature below indicates agreement with the terms of this Funding Agreement. This Funding Agreement may be signed in counterparts, each of which shall be an original and all of which, together shall constitute Exhibit B of the CRIT Agreement.

ADWR:

By: [signature]
Thomas Buschatzke
Its: Director
Date: 7/19/19

Approved as to form:

By: Ayesha Vohra
Ayesha Vohra
Its: Deputy Counsel

ENVIRONMENTAL DEFENSE FUND, INC.

By: [signature]

Its: CAO

Date: 7-30-19

Approved as to form:

By: ____________________

Its: ____________________

EXHIBIT 6.2.1

INTERGOVERNMENTAL AGREEMENT BETWEEN THE ARIZONA WATER BANKING AUTHORITY AND THE GILA RIVER INDIAN COMMUNITY FOR THE DEVELOPMENT OF INTENTIONALLY CREATED SURPLUS FIRMING CREDITS

This Intergovernmental Agreement ("AWBA ICS Firming IGA" or "this IGA")) is made this 20th day of May, 2019, and is between the Arizona Water Banking Authority, an agency of the State of Arizona ("AWBA") and the Gila River Indian Community ("the Community"), a federally recognized Indian tribe organized pursuant to the Indian Reorganization Act of 1934. The Community and AWBA are sometimes each referred to in this IGA as a "Party" and collectively as the "Parties."

RECITALS

A. AWBA acts as an agent for the State of Arizona in meeting the State's firming obligations to the Community under section 105(b)(2)(A) of the Arizona Water Settlements Act (Pub. L. No. 108-451, 118 Stat. 3478) and the Amended and Restated Gila River Indian Community Water Rights Settlement Agreement.

B. On June 16, 2015, AWBA and the Community entered into an intergovernmental agreement ("2015 IGA"), attached as Attachment 1, that establishes an annual process to ensure that the obligations of the State of Arizona under section 105(b)(2)(A) of the Act are satisfied.

C. Exhibit B of the 2015 IGA describes several firming methods identified by the Parties that may be utilized to satisfy a firming obligation.

D. On December 13, 2007, the Secretary of the Interior ("Secretary") executed a Record of Decision that included Interim Guidelines for Lower Basin Shortages and Coordinated Operations of Lake Powell and Lake Mead ("2007 Interim Guidelines"). The 2007 Interim Guidelines include a mechanism to encourage and account for augmentation and conservation of water supplies, referred to as intentionally created surplus. One category of ICS is Extraordinary Conservation ICS ("ICS").

E. Certain parties in the Lower Basin and the Secretary developed additional operational tools through the Lower Basin Drought Contingency Operations Plan ("LBOps") to address and reduce the likelihood of the continued decline of the elevation of Lake Mead. Through Pub. L. No. 116-14 and the Lower Basin Drought Contingency Plan Agreement ("LBDCP Agreement"), the parties thereto agreed to the implementation of the LBOps.

F. In connection with the adoption of the LBDCP Agreement, including the LBOps, and the implementation of its terms of the LBDCP in Arizona, the AWBA and various other parties within Arizona have developed an implementation plan ("Arizona LBDCP Implementation Plan"), designed, among other things, to offset deliveries of ICS contemplated to occur prior to December 31, 2026, through conservation of additional volumes of water in Lake Mead during that time ("Offset Goal"). The Arizona LBDCP Implementation Plan is described and attached as an exhibit to the Arizona Drought Contingency Plan Framework Agreement ("DCP Framework Agreement").

G. The Arizona LBDCP Implementation Plan estimates that the minimum volume of system conservation and ICS needed to offset the delivery of Central Arizona Water Conservation District ("CAWCD") ICS as mitigation from January 1, 2020 to December 31, 2026, requires the creation of at least 400,000 acre-feet of system conservation and ICS ("Conservation Offsets") to meet the Offset Goal.

H. To facilitate the Offset Goal in the Arizona LBDCP Implementation Plan, the Community proposes to create, in accordance with the Arizona ICS Framework Agreement, at least 200,000 acre-feet of ICS from 2019 through 2021 to be left in Lake Mead until at least December 31, 2026.

I. Under Section IV.A. of the LBOps, ICS created in 2019 and 2020 shall be assessed a one-time, ten percent reduction for system and evaporation losses.

J. The AWBA desires to provide payment to the Community for creation of 50,000 acre-feet of the 200,000 acre-feet of ICS created by the Community in order to accrue 45,000 acre-feet of firming credits to satisfy a future firming obligation ("ICS Firming Credits").

K. This AWBA ICS Firming IGA provides for ICS Firming Credits through payment for creation of ICS by the Community, which shall be considered an additional method to satisfy the firming obligations set forth in the 2015 IGA.

AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are acknowledged, and intending to be legally bound, the parties hereby agree as follows:

1. Term. This IGA shall be effective as of the date set forth in the introductory paragraph of this IGA (the "Effective Date") and shall thereafter continue in full force and effect until it expires as set forth in Section 7 of this IGA.

2. Creation of ICS. As part of the Arizona LBDCP Implementation Plan the Community shall create 200,000 acre-feet of ICS as follows:

   2.1 The Community shall create 17,000 acre-feet of ICS in 2019 and 33,000 acre-feet of ICS in 2020 ("AZ Firming ICS") in accordance with the Arizona ICS Framework Agreement to satisfy its obligations under this IGA.

2.2 The Community shall create 100,000 acre-feet of ICS in 2019 ("Reclamation Firming ICS") in accordance with the Arizona ICS Framework Agreement.

2.3 Except as provided in Section 2.6, the Community agrees that it shall not order delivery of the AZ Firming ICS or Reclamation Firming ICS and shall not transfer or assign the AZ Firming ICS or Reclamation Firming ICS at any time before December 31, 2026.

2.4 The Community shall create an additional fifty thousand (50,000) acre-feet of ICS ("Community ICS") in accordance with the Arizona ICS Framework Agreement. Except as provided in Section 2.6, the Community shall not take delivery of Community ICS at any time before December 31, 2026.

2.5 The Community agrees to create an additional twenty-two thousand (22,000) acre-feet of ICS ("Conditional ICS") in accordance with the Arizona ICS Framework Agreement. Except as provided in Section 2.6, the Community shall not take delivery of Conditional ICS at any time before December 31, 2026.

2.6 If, at any time before December 31, 2026, the parties to Arizona DCP Framework Agreement determine that the estimated minimum volume of Conservation Offsets needed to offset the delivery of Central Arizona Water Conservation District ICS on at least an acre-foot by acre-foot basis will be less than four hundred thousand (400,000) acre-feet, the Community may take delivery of AZ Firming ICS, Community ICS or Conditional ICS in an amount that does not create a deficit in the volume of Conservation Offsets necessary to meet the Offset Goal.

3. Price. Subject to the terms and conditions of this IGA, AWBA agrees to pay the Community for the creation of the 45,000 acre-feet of AZ Firming ICS as follows:

3.1. A minimum of two million five hundred thousand dollars ($2,500,000) for the AZ Firming ICS created in 2019, at $240 per acre-foot of AZ Firming ICS, to accrue ICS Firming Credits after a one-time deduction of ten percent (10%) is assessed of AZ Firming ICS created in 2019 pursuant to Section IV.A.2 of the LBOps.

3.2. The balance of AZ Firming ICS created in 2020 shall be paid at $247.20 per acre-foot of AZ Firming ICS to accrue ICS Firming Credits after a one-time deduction of ten percent (10%) is assessed of AZ Firming ICS created in 2020 pursuant to Section IV.A.2 of the LBops. Payments may be made in installments at the discretion of AWBA in accordance with the pricing schedule set forth in Section 4 of this IGA.

4. Installments. If AWBA elects to make installment payments for the AZ Firming ICS created under Section 3.2 the per acre-foot unit price for AZ Firming ICS shall be in accordance with the following schedule:

2020	$247.20/acre-foot
2021	$254.40/acre-foot
2022	$261.60/acre-foot

2023	$268.80/acre-foot
2024	$276.00/acre-foot
2025	$283.20/acre-foot
2026	$290.40/acre-foot
2027	$297.60/acre-foot
2028	$304.80/acre-foot
2029	$312.00/acre-foot

5. Billing.

5.1. AWBA agrees to use good faith efforts to procure funding to carry out the intent of this IGA.

5.2. AWBA shall make the $2.5 million payment described in Section 3.1 to the Community on or before December 31, 2019.

5.3. On or before September 1 of each year of this IGA, AWBA shall estimate the amount of funding AWBA shall have available for the payment described in Section 3.2 ("Annual Funding Amount") for inclusion in AWBA's preliminary Annual Plan of Operation ("APO") for the following year.

5.4. On or before December 31 of each year of this IGA, AWBA shall confirm under its final APO for the following year the Annual Funding Amount available for accrual of ICS Firming Credits that year.

5.5. Except for 2019, no later than May 1 of each year of this IGA, the Community shall invoice AWBA for the payment amount identified in the AWBA's APO for that year. In 2019, the Community shall invoice AWBA for the payment amount identified in Section 5.2 within 30 days after the United States approves the Community's 2019 ICS Creation Plan.

5.6. In the event AWBA is unable to obtain the full or partial Annual Funding Amount for any year of this IGA, AWBA shall provide written notice informing the Community of the difference in available funds such that the Community can make any necessary billing adjustments prior to invoicing AWBA.

5.7. Except as provided in Section 5.2, payment by AWBA to the Community shall be made on or before the thirtieth (30th) day following the invoice date. Failure by the AWBA to make payment within 30 days following the invoice date shall not constitute a default or breach of this IGA so long as AWBA provides complete payment for the AZ Firming ICS created in 2019 and 2020 on or before December 31, 2029, or by a date thereafter if later agreed to in writing by the Parties.

6. Procedures for Implementing Firming Method.

6.1. Provided payment is made to the Community as set forth in Section 5.2, AWBA can register accrued ICS Firming Credits to the Firming Account upon payment. Thereafter, the annual ICS Firming Credits that AWBA can register to the Firming Account shall be calculated by dividing the Annual Funding Amount by the per-acre foot price corresponding to that year and then multiplying the result by zero-point-nine (0.9) and rounding to the nearest whole number. For example, if the Annual Funding Amount in 2020 is $3,000,000, AWBA would register 10,922 acre-feet of ICS Firming Credits to its Firming Account.

6.2. After December 31, 2026, in a year when the State of Arizona has a firming obligation to the Community, upon the request of AWBA, the Community shall cause ICS Firming Credits to be delivered to satisfy the State of Arizona's firming obligation so long as there are ICS Firming Credits in the Firming Account; provided, however, the Community's obligation to deliver ICS Firming Credits under this IGA shall be subject to the rules, regulations, or guidelines governing the delivery of ICS.

6.3. After December 31, 2026, the Parties agree to use the ICS Firming Credits created under this IGA before any other firming resources established in the 2015 IGA, or otherwise, during a year when the State of Arizona has a firming obligation to the Community.

6.4. In the Community's sole discretion, ICS Firming Credits created pursuant to this IGA may be debited to reduce the State of Arizona's firming obligation to the Community on an acre-foot per acre-foot basis under any other method agreed to by the Parties, such as pre-firming, beginning after December 31, 2026, subject to the rules, regulations or guidelines governing the delivery of ICS.

6.5. The use of ICS Firming Credits shall be considered an additional method to satisfy the firming obligations set forth in the 2015 IGA.

7. Renewal, Expiration, or Termination. Unless otherwise extended or renewed by the parties to this IGA, this IGA and all rights and privileges, duties and obligations, as set forth hereunder shall expire at the close of business on December 31, 2029. However, any ICS Firming Credits registered to the Firming Account under this IGA shall survive the expiration or termination of this IGA until all AWBA Firming Credits have been extinguished to satisfy a firming obligation.

8. Default. Unless otherwise provided, the failure of either Party to perform any term, covenant, or condition of this IGA results in default of that Party if that failure continues for thirty days following the receipt of written notice from the other Party.

9. Remedies. If an event of default occurs, the non-defaulting Party may immediately terminate this IGA by written notice to the defaulting Party and/or may pursue specific performance.

10. Miscellaneous Provisions.

10.1. Interpretation. This IGA is governed by and must be construed and interpreted in accordance with and in reference to the laws of the State of Arizona.

10.2. No Third-Party Beneficiaries. This IGA is solely for the benefit of the Parties and does not create, nor shall it be construed to create, rights in any third party unless expressly provided herein. No third party may enforce the terms and conditions of this IGA.

10.3. Conflict of Interest. The Parties to this IGA are hereby notified of A.R.S. § 38-511.

10.4. Availability of Funds. In accordance with ARS § 35-154, every payment obligation of the AWBA under this IGA is conditioned upon the availability of funds appropriated or allocated for payment of such obligation. If funds are not allocated or available for the continuance of this IGA, this IGA may be terminated by the AWBA at the end of the period for which funds are available. No liability shall accrue to the AWBA in the event this provision is exercised, and the AWBA shall not be obligated or liable for any future payments or for any damages as a result of termination under this paragraph.

10.5. Permits. The Parties shall obtain and maintain all licenses, permits and authority necessary to perform their obligations pursuant to this IGA, and shall comply with all applicable state, federal and local laws, including but not limited to those regarding employment insurance, disability insurance and worker's compensation. This IGA does not relieve either party from any obligation or responsibility imposed upon it by law.

10.6. No Employment. Neither Party shall be considered an officer, employee or agent of the other. No monitoring or supervisory responsibility over the other Party's activities arises on the part of the other arises or as a result of, or pursuant to, this IGA other than as expressly provided herein.

10.7. Severability. The provisions of this IGA are severable to the extent that if any provision is held unenforceable under applicable law, the remaining provisions of the IGA shall remain in effect.

10.8. No Indemnification. Each Party to this IGA is independently responsible in the event of its own negligence. Neither Party agrees to indemnify the other Party.

10.9. Resolution of Disputes. The Parties shall attempt to resolve all claims, disputes, controversies, or other matters in question between the Parties arising out of, or relating to, this IGA ("Dispute") promptly, equitably, and in a good faith manner. Any Dispute arising out of this IGA is subject to arbitration to the extent required by A.R.S. §§ 12-133 and 12-1518. The prevailing Party in such arbitration may seek enforcement of such award in any court of competent jurisdiction.

10.10. Amendments. This IGA may be modified, amended, or revoked only by the express written agreement of the Parties.

10.11. Entire Agreement. This IGA constitutes the entire agreement between the Parties and no understandings or obligations not expressly set forth in this IGA are binding upon the Parties.

10.12. Waiver. No delay in exercising any right or remedy shall constitute a waiver unless such right or remedy is waived in writing signed by the waiving party. A waiver by any Party of any right or remedy hereunder shall not be construed as a waiver of any other right or remedy, whether pursuant to the same or a different term, condition or covenant.

10.13. Captions. All captions, titles, or headings in this IGA are used for the purpose of reference and convenience only and do not limit, modify, or otherwise affect any of the provisions of this IGA.

10.14. Rules, Regulations and Amendment or Successor Statutes. All references in this IGA to the Arizona Revised Statutes include all rules and regulations promulgated by ADWR under such statutes and all amendment statutes and successor statutes, rules, and regulations to such statutes, rules, and regulations existing as of the date of this IGA.

10.15. Notices. Any notice, demand, or request authorized or required by this IGA shall be in writing and shall be deemed to have been duly delivered by email to a valid email address designated by the Parties, or if mailed, first-class or delivered, to the following address:

For the AWBA:

Manager
Arizona Water Banking Authority
P.O. Box 36020
Phoenix, Arizona 85067-6020

For the Community:

Gila River Indian Community
Att'n: General Counsel
Post Office Box 97
525 W. Gu u Ki
Sacaton, Arizona 85147

The designation of the address or addressee, including email addresses, may be changed by notice given as provided in this Section.

Notice is deemed to have been given on the date on which notice is personally delivered, delivered to an overnight delivery service, mailed, or emailed. Notice is deemed to have been received on the date on which the notice is actually received, or delivery is refused.

10.16. Equal Opportunity. The Parties shall comply with State Executive Order No. 75-5, as amended by State Executive Order No. 2009-9, and all other applicable Federal and State laws, rules and regulations relating to equal opportunity and non-discrimination, including the Americans with Disabilities Act.

10.17. Records and Inspections. All books, accounts, reports, files and other records in relation to this IGA shall be subject at all reasonable times to inspection and audit by the Parties throughout the term of this IGA and for a period of five years after the completion of this IGA. Upon request, a Party must produce original of any or all such records.

10.18. Uncontrollable Forces. No Party will be considered to be in default in the performance of any of its obligations hereunder (other than obligations to make payments) when a failure of performance is due to Uncontrollable Forces. The term "Uncontrollable Forces" shall mean any cause beyond the control of the Party unable to perform such obligation, including, but not limited to, failure of or threat of failure of facilities, flood, earthquake, storm, fire, lightning and other natural catastrophes, epidemic, war, riot, civil disturbance or disobedience, strike, labor dispute, labor or material shortage, sabotage, terrorism, or restraint by court order or public authority, and action or nonaction by, or failure to obtain the necessary authorizations or approvals from, any governmental agency or authority, which by exercise of due diligence such Party could not reasonably have been expected to avoid and which by exercise of due diligence it shall be unable to overcome. Drought is not an Uncontrollable Force for the purposes of this IGA. Nothing contained herein shall be construed to require a Party to settle any strike or labor dispute in which it is involved.

IN WITNESS WHEREOF, both the Community and AWBA have executed this IGA on the date first listed above.

GILA RIVER INDIAN COMMUNITY	**ARIZONA WATER BANKING AUTHORITY**
By: ______________________	By: ______________________ Thomas Buschatzke, Chair
Approved as to form:	Attest:
By: ______________________	By: ______________________ Kathryn A. Sorensen, Secretary

EXHIBIT 6.2.2

AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE GILA RIVER INDIAN COMMUNITY FOR THE CREATION OF INTENTIONALLY CREATED SURPLUS FOR FIRMING

This Agreement ("**Agreement**") is made this 20th day of May 2019, ("**Effective Date**") by and between the UNITED STATES OF AMERICA ("**United States**"), represented by the Secretary of the Interior ("**Secretary**") acting through the Regional Director of the Lower Colorado Region of the Bureau of Reclamation ("**Reclamation**") executing this Agreement, and the GILA RIVER INDIAN COMMUNITY ("**Community**"), a federally recognized Indian tribe organized pursuant to the Indian Reorganization Act of 1934. The Community and Reclamation are sometimes each referred to in this Agreement as a "**Party**" and collectively as the "**Parties**."

Recitals

A. WHEREAS, Title II of the Arizona Water Settlements Act of 2004 ("**AWSA**"), the Gila River Indian Community Water Rights Settlement Act of 2004 (118 Stat. 3499), authorized settlement of the Community's water rights claims and resulted in the Amended and Restated Gila River Indian Community Water Rights Settlement Agreement, dated December 21, 2005, as amended;

B. WHEREAS, the Community holds an entitlement to annual delivery of Central Arizona Project ("**CAP**") water under the Amended CAP Water Delivery Contract Between the United States and the Gila River Indian Community, dated May 15, 2006, which superseded and replaced Contract No. 3-07-30-W0284, dated October 22, 1992;

C. WHEREAS, Section 105(a) of the AWSA requires the Secretary and the State of Arizona to establish a firming program to ensure that 60,648 acre-feet of CAP non-Indian agricultural priority water reallocated to Arizona Indian tribes under Section 104(a)(1) of the AWSA and made available pursuant to the Arizona Water Settlement Agreement among the United States, the Arizona Department of Water Resources, and the Central Arizona Water Conservation District ("**CAWCD**"), effective September 20, 2006, shall, for a 100-year period, be delivered during water shortages in the same manner as water with a CAP municipal and industrial delivery priority is delivered during water shortages;

D. WHEREAS, the Secretary's total firming obligation as required by the AWSA is up to 36,924 acre-feet annually for a 100-year period beginning December 14, 2007;

E. WHEREAS, the United States and the CAWCD entered into the Central Arizona Project System Use Agreement, Agreement No. 17-XX-30-W0622, dated February 2, 2017, to, among other things, facilitate the use of the CAP system to firm long-term contracts during a water shortage directly or through exchange;

F. WHEREAS, the Central Arizona Project System Use Agreement provides for use of the CAP system to deliver water, whether for firming or other purposes;

G. WHEREAS, on December 13, 2007, the Secretary signed the *Record of Decision, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations of Lake Powell and Lake Mead* ("**2007 Interim Guidelines**"), adopting the 2007 Interim Guidelines for a period to be in effect through December 31, 2025, and implementing key elements of Colorado River management including the development of Intentionally Created Surplus ("**ICS**") in Lake Mead from conserved Colorado River System and nonsystem water, and for the delivery of ICS pursuant to applicable Federal law to encourage water conservation actions and increase the flexibility of meeting water demand from Lake Mead, particularly under drought and low reservoir conditions;

H. WHEREAS, the Community is eligible to create Extraordinary Conservation ICS ("**EC ICS**") through December 31, 2026, and the Community's EC ICS DCP-related Exhibit, defining an EC ICS creation project, has been approved by the Secretary;

I. WHEREAS, the Colorado River Basin States have developed drought contingency plans in response to the ongoing historic drought and (i) the United States, and Arizona, California and Nevada developed the Lower Basin States Drought Contingency Plan and its Exhibit 1 Lower Basin Drought Contingency Operations, and (ii) the United States, Arizona and CAWCD entered into the Framework Agreement For An Arizona ICS Program (collectively, "**DCP Agreements**") which together, among other things, create new flexibility to incentivize additional voluntary conservation of water to be stored in Lake Mead and contains actions in addition to those authorized or required by the 2007 Interim Guidelines;

J. WHEREAS, the Colorado River Drought Contingency Plan Authorization Act, Public Law No. 116-14, dated April 16, 2019, directs the Secretary to execute and implement agreements concerning Colorado River drought contingency management and operations, and for other purposes; and

K. WHEREAS, in exchange for monetary compensation, Reclamation and the Community desire to enter into this Agreement whereby the Community agrees to make its EC ICS available to Reclamation for firming.

NOW, THEREFORE, in consideration of the mutual covenants herein contained, Reclamation and the Community agree as follows:

Purpose

This Agreement provides for the Community to make EC ICS available to Reclamation for firming and for the United States to compensate the Community monetarily for such EC ICS.

Agreement

1. Term. This Agreement shall commence on the Effective Date and shall thereafter continue in full force and effect until December 31, 2026; Provided, however, the Community's commitments in Section 7 of this Agreement shall continue until fulfilled.

2. Community Creation of EC ICS. The Community will conserve 100,000 acre-feet in Lake Mead prior to December 31, 2020, pursuant to ICS creation plans approved by Reclamation. A one-time deduction of ten percent (10%) will be assessed of EC ICS pursuant to Section IV. A. 2. of the Lower Basin Drought Contingency Operations Agreement. The EC ICS created herein shall be for the exclusive use of the United States to fulfill its firming obligations and shall be in addition to other volumes of ICS created by the Community.

3. Payment and Quantity of EC ICS for Firming. Subject to the terms and conditions of this Agreement, Reclamation agrees to pay the Community for the creation of 100,000 acre-feet of EC ICS prior to December 31, 2026. The assessment of 10,000 acre-feet of EC ICS due to the one-time ten percent deduction assessed on EC ICS referenced in Section 2 herein, shall be borne by Reclamation. During the term of this Agreement, payments may be made in installments at the discretion of Reclamation in accordance with the pricing schedule set forth in Section 4 of this Agreement.

4. Price. Reclamation may make payments to the Community for all 100,000 acre-feet of EC ICS in 2019, or may pay any portion in subsequent years through 2026. The price of the EC ICS shall begin at $240.00 per acre-foot in calendar year 2019, and shall be escalated by three (3) percent annually thereafter in accordance with the following schedule:

2019	$240.00/acre-foot
2020	$247.20/acre-foot
2021	$254.40/acre-foot
2022	$261.60/acre-foot
2023	$268.80/acre-foot
2024	$276.00/acre-foot
2025	$283.20/acre-foot
2026	$290.40/acre-foot

5. CAP Cost Recovery. Cost Recovery will be achieved pursuant to Section 14 of the Framework Agreement For An Arizona ICS Program. Reclamation shall pay CAWCD for CAP fixed operations, maintenance, and replacement costs on the volume (100,000 acre-feet) of Community CAP water conserved to create EC ICS for firming in Lake Mead in calendar year 2019.

6. Reimbursement For Overpayment. In the event the Community fails to create the amount of EC ICS for firming, as was paid for by Reclamation in accordance with this Agreement, the Community agrees to reimburse Reclamation for the overpayment within 30 days of receipt of a bill for collection from Reclamation. Reimbursement shall be calculated to be

equal to the cost per acre-foot paid for by Reclamation to the Community for EC ICS not created.

7. Timing and Delivery of EC ICS For Firming.

7.1 Timing. Reclamation shall not request, and the Community shall not order, delivery of EC ICS for firming at any time before December 31, 2026.

7.2 Delivery of EC ICS For Firming. After December 31, 2026, upon the request of Reclamation, and at Reclamation's sole discretion, the Community shall cause EC ICS to be delivered to satisfy the Secretary's firming obligation so long as EC ICS paid for by Reclamation remains in the Community's account as reflected in Reclamation's annual *Colorado River Accounting and Water Use Report: Arizona, California, and Nevada*.

8. Renewal and Expiration. Unless otherwise extended or renewed by the Parties to this Agreement, this Agreement and all rights and privileges, duties and obligations, as set forth hereunder shall expire at the close of business on December 31, 2026; Provided, however, the Community's commitments in Section 7 of this Agreement shall continue until fulfilled.

9. Future Agreements. The Parties agree to enter into agreement(s) providing for the delivery of EC ICS for firming and delivery or exchange of other water and/or credits previously acquired by Reclamation for firming. Parties agree to consult within 30 days on an EC ICS delivery agreement as required by 2007 Interim Guidelines and a federal arrangement for delivery of water for firming by the United States through the CAP system.

10. Miscellaneous Provisions.

10.1 Notices. Any notice, demand, or request authorized or required by this Agreement shall be in writing and shall be deemed to have been duly given if delivered by email to a valid email address designated by the Parties, or if mailed first class or delivered, to the following address:

If to the Community:

Stephen R. Lewis, Governor
525 West Gu u Ki
P.O. Box 97
Sacaton, Arizona 85147

With a copy to:

Linus Everling, General Counsel
525 West Gu u Ki
P.O. Box 97
Sacaton, Arizona 85147

If to Reclamation:	Regional Director Lower Colorado Region Bureau of Reclamation Attention: LC-4400 P. O. Box 61470 Boulder City, NV 89006-1470
With a copy to:	Area Manager Phoenix Area Office Bureau of Reclamation 6150 West Thunderbird Road Glendale, AZ 85306

10.2 Non-Waiver. No Party to this Agreement shall be considered to have waived any right hereunder except when such waiver of the right is given in writing. The failure of a Party to insist in any one or more instances upon strict performance of any provisions of this Agreement or to take advantage of any of its rights hereunder shall not be construed as a waiver of any such provisions or a relinquishment of any such rights for the future, but such provisions and rights shall continue and remain in full force and effect.

10.3 Representations and Warranties.

10.3.1 Each Party has all legal power and authority to enter into this Agreement and to perform its obligations hereunder on the terms set forth in this Agreement, and the execution and delivery hereof by each Party and the performance by each Party of its obligations hereunder shall not violate or constitute an event of default under the terms or provisions of any agreement, document, or instrument to which each of the Parties is a party or by which each Party is bound.

10.3.2 Party warrants and represents that the individual executing this Agreement on behalf of the Party has the full power and authority to bind the Party he or she represents to the terms of this Agreement.

10.3.3 This Agreement constitutes a valid and binding agreement of each Party, enforceable against each Party in accordance with its terms.

10.4 Governing Law. This Agreement shall be interpreted, governed by, and construed under applicable Federal law and any relevant provisions of Arizona state law. In case of conflict between Federal law and Arizona state law, Federal law controls. To the extent permissible under the Federal Rules of Civil Procedure and other applicable Federal authority, venue for adjudication of any disputes under this Agreement shall be in an appropriate Federal court.

10.5 Binding Effect and Limited Assignment. The provisions of this Agreement shall apply to and bind the successors and assigns of the Parties upon receipt of written agreement to the terms of this Agreement, but no assignment or transfer of this Agreement or any right or interest therein shall be valid until approved in writing by all Parties. This Agreement is and shall be binding upon and shall inure to the benefit of the Parties and, upon dissolution, the legal successors and assigns of their assets and liabilities.

10.6 Amendment, Modification, and/or Supplement. This Agreement may be amended, modified, or supplemented only by the written agreement of the Parties. No amendment, modification, or supplement shall be binding unless it is in writing and signed by all Parties.

10.7 Judicial Remedies Not Foreclosed. Nothing in this Agreement shall be construed: (i) as in any manner abridging, limiting, or depriving any Party of any means of enforcing any remedy either at law or in equity for the breach of any of the provisions hereof, or of any other remedy which it would otherwise have; or (ii) as depriving any Party of any defense thereto which would otherwise be available. In the event that any dispute arises regarding this Agreement, the Parties agree to meet and attempt to resolve the dispute before seeking remedy.

10.8 Availability of Information. Subject to applicable Federal laws and regulations, each Party to this Agreement shall have the right during office hours to examine and make copies of the other Party's books and records relating to matters covered by this Agreement. All information and data obtained or developed with the performance of duties mentioned in this Agreement shall be available upon request to a Party, subject to the provisions of the Freedom of Information Act or other applicable law. However, use of said reports, data and information shall appropriately reference the source for the respective documents.

10.9 No Third-Party Beneficiaries. This Agreement is not intended nor shall it be construed to create any third-party beneficiary rights to enforce the terms of this Agreement on any person or entity that is not a Party.

10.10 Counterparts. This Agreement may be executed in counterparts, each of which shall be an original and all of which, together, shall constitute only one Agreement.

10.11 Authority of the Secretary. Nothing in this Agreement diminishes or abrogates the authority of the Secretary under applicable Federal law, regulation, or the Consolidated Decree, as it may be further modified.

10.12 Contingent on Appropriation or Allotment of Funds. The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

IN WITNESS WHEREOF, the Parties hereto have executed this Agreement No. 19-XX-30-W0657 on the day and year first written above.

GILA RIVER INDIAN COMMUNITY

By: ______________________
Stephen R. Lewis
Governor

UNITED STATES OF AMERICA

By: ______________________
Terrance J. Fulp, Ph.D.
Regional Director
Lower Colorado Region
Bureau of Reclamation

Approved as to form:

By: ______________________ for
Linus Everling
General Counsel

EXHIBIT 6.3

David C. Roberts
Associate General Manager, Water Resources
PAB232 | P.O. Box 52025
Phoenix, AZ 85072-2025
P: (602) 236-2343 | C: (602) 818-7747
Email: Dave.Roberts@srpnet.com

SRP
Delivering water and power™

February 27, 2019

Mr. Patrick Dent
Water Control Manager
Central Arizona Water Conservation District
P.O. Box 43020
Phoenix, Arizona 85080-3020

Re: CAWCD/SRP Water Exchange Agreement for the Drought Contingency Plan

Dear Patrick:

The Central Arizona Water Conservation District ("CAWCD") and the Salt River Valley Water Users' Association ("SRP") are parties ("Parties") to the agreement entitled "Water Exchange Agreement between the Central Arizona Water Conservation District and Salt River Valley Water Users' Association dated December 2nd, 2002 ("Water Exchange Agreement"). Under Section 5(b)(i-iii) of the Water Exchange Agreement, the Authorized Representatives are authorized to arrange the terms of each water exchange under the Agreement.

This letter agreement ("Letter Agreement") is entered into under Section 5(b) of the Water Exchange Agreement to confirm and document the terms of a multi-year water exchange that will be conducted as part of the Arizona Lower Basin Drought Contingency Plan ("AZ LBDCP") Implementation Plan. The Parties intend for CAWCD to complete the exchange by prioritizing the delivery of CAP Project Water consisting of Extraordinary Conservation Intentionally Created Surplus ("EC ICS") created and held in Lake Mead by CAWCD. EC ICS is defined and described in the Record of Decision for the Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead approved by the Secretary on December 13, 2007 ("Interim Guidelines"). The Interim Guidelines describe the restrictions surrounding the creation and delivery of EC ICS and authorize delivery of EC ICS only through 2036. The Parties acknowledge that the Lower Basin States will negotiate a new set of guidelines for the period after 2026 that may govern the rules regarding delivery of EC ICS. In addition, under the Lower Basin Drought Contingency Plan Agreement and associated Exhibits, EC ICS may be converted to DCP ICS under certain circumstances which will affect the conditions and timing of the recovery of DCP ICS (recoverable through 2057). Though the Parties intend to complete the exchange by prioritizing the delivery of CAP Project Water consisting of EC ICS, the Parties acknowledge that conditions may change and other sources of water may be necessary to complete the exchange as provided under Paragraph 4 below. The Parties intend to maximize the flexibility in determining the types of water used to complete the exchange.

Therefore, the Authorized Representatives agree to a water exchange as follows:

1. This Letter Agreement shall become effective ("Effective Date") when both of the following have occurred:

   a. This Letter Agreement is executed by both Parties; and

   b. The Secretary of the United States Department of the Interior ("Secretary") has executed the Lower Basin Drought Contingency Plan Agreement.

2. This Letter Agreement shall terminate on the date on which CAWCD has delivered to SRP the full quantity of Exchange Water, as defined in Paragraph 3.

3. Commencing on January 1, 2021 and continuing through December 31, 2025, SRP shall annually provide CAWCD with up to 10,000 acre-feet of Salt River and Verde River water as defined in Section 6(d)(i) of the Water Exchange Agreement ("SRP Water") via delivery to CAWCD customers located within or near the Salt River Reservoir District for total quantity of up to 50,000 acre-feet over the 5-year period. The total quantity of water ultimately delivered by SRP to CAWCD customers is referred to as "Exchange Water" in this Letter Agreement. The Parties shall meet and confer on or before December 1 of each year to discuss and mutually agree on (1) the amount of SRP Water to be delivered to CAWCD customers during the upcoming calendar year, and (2) the timing of the SRP Water deliveries to CAWCD customers during that year.

4. Commencing on or after January 1, 2027, CAWCD shall provide SRP with water from the types of water described in Subparagraphs 4(a), (b), and (c) to complete the exchange. The Parties shall meet and confer on or before December 1 of each year to discuss and mutually agree on (1) the type of water CAWCD shall deliver to SRP in the upcoming calendar year, (2) the amount of water to be delivered to SRP during that year, and (3) the timing of the water deliveries to SRP during that year. The exchange shall be complete when SRP receives the full quantity of Exchange Water from CAWCD. For purposes of the delivery of water to SRP to complete the exchange, CAWCD shall use the following types of water in the following priority, when available:

   a. CAP Project Water consisting of EC ICS.

   b. Other CAP Project Water.

   c. Other water sources. The Parties acknowledge that the other water sources referenced in this Subparagraph 4(c) may require an amendment to the Water Exchange Agreement and the Parties agree to work together in good faith in event the Parties determine such amendment is required.

5. Upon the Effective Date, CAWCD reserves 50,000 acre feet of EC ICS for SRP for the specific purpose of providing a source of CAP Project Water for delivery to SRP under Paragraph 4 above. On January 1, 2027, CAWCD will adjust the volume of EC ICS reserved for SRP to the volume of Exchange Water actually delivered to CAWCD under Paragraph 3. The reservation of EC ICS provided in this Paragraph 5 shall be reduced, on an acre-foot for acre-foot basis, for each acre-foot of water CAWCD provides

to SRP under Paragraph 4 above, including the delivery of EC ICS. The Parties acknowledge that the delivery of EC ICS is authorized until 2036. In the event (1) CAWCD has not completed the exchange by 2036, and (2) the delivery of EC ICS is authorized beyond 2036 in subsequent agreements governing EC ICS among Lower Basin contractors, the intent of the Parties is to extend the reservation under applicable law. The Reservation of EC ICS for SRP in this Paragraph 5 shall not be construed to limit the water sources CAWCD may use to complete the exchange, consistent with the procedures and priorities in Paragraph 4.

6. SRP's Water Transmission and Communications Department and CAWCD's Water Control Department shall jointly coordinate all water deliveries as mutually agreed under Paragraph 4 above.

7. Points of Exchange under Subparagraph 2(c) of the Water Exchange Agreement: The Parties agree that the Point of Exchange for the SRP Water delivered by SRP to CAWCD customers under Paragraph 3 shall be to the Granite Reef Diversion Dam. The Parties agree that the Point of Exchange for the water delivered by CAWCD to SRP under Paragraph 4 shall be where the CAP/SRP Interconnection Facility as defined in Section 2(a) of the Water Exchange Agreement discharges CAP water into the SRP water delivery system.

8. If any provisions of this Letter Agreement are found to be inconsistent with the Water Exchange Agreement, including any amendment as described in Subparagraph 4(c) above, the Water Exchange Agreement shall govern.

Please sign below to indicate CAWCD's acknowledgement of the above terms and then return the original to me at the address indicated on the top of the page.

If you have any questions, please call me at 602-236-2343.

Sincerely,

David C. Roberts

David C. Roberts
Associate General Manager-Water Resources
SRP Authorized Representative

Acknowledged: ______________________ Date: 2-27-2019

Cc (via email):

Greg Adams, CAWCD
Ted Cooke, CAWCD
Chuck Cullom, CAWCD
Darrin Francom, CAWCD
Jay Johnson, CAWCD
Tom McCann, CAWCD
Marcus Shapiro, CAWCD Alt. Authorized Rep.
Suzanne Ticknor, CAWCD

Charlie Ester, SRP
John Felty, SRP
Bruce Hallin, SRP
Christa McJunkin, SRP
Chuck Podolak, SRP
Patrick Sigl, SRP
Greg Watkins, SRP Alt. Authorized Rep.
Cheryl Zittle, SRP

EXHIBIT 7.1

2019 Arizona LBDCP Implementation Plan Exhibit 7.1 -FINAL- 08/23/2019

#	MITIGATION REQUIREMENTS BY YEAR BY POOL (after Firming offsets, before % reductions)	2019 No Shortage	2020 Tier Zero No Mitigation*	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage*	2026 Tier 3 Shortage*	TOTALS
2	Excess CAP	0	0	0	0	0	0	0	0	0
3	Ag Pool	0	0	85,045	85,045	0	0	0	0	170,090
4	NIA	0	0	83,979	83,979	146,718	146,718	157,588	0	618,982
5	M&I	0	0	0	0	0	0	0	0	0
6	Indian Priority	0	0	0	0	0	0	12,767	0	12,767
7	Priority 3	0	0	0	0	0	0	0	0	0
8	TOTAL	0	0	169,024	169,024	146,718	146,718	170,355	0	801,839

#	MITIGATION REQUIREMENTS BY YEAR BY PARTY (% reductions by tier and no 2026 mitigation)	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage *	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage*	2026 Tier 3 Shortage*	TOTALS
10	Excess CAP Pool	0	0	0	0	0	0	0	0	0
11	Ag Pool (not by party)	0	0	85,045	85,045	0	0	0	0	170,090
12	NIA	0	0	83,979	83,979	110,038	110,038	78,794	0	466,829
13	GRIC NIA	0	0	56,162	56,162	66,620	66,620	47,734	0	293,299
14	TON NIA	0	0	0	0	0	0	0	0	0
15	Phoenix NIA	0	0	19,827	19,827	23,871	23,871	16,986	0	104,383
16	Chandler NIA	0	0	2,087	2,087	2,513	2,513	1,788	0	10,987
17	Gilbert NIA	0	0	817	817	984	984	700	0	4,304
18	Glendale NIA	0	0	363	363	437	437	311	0	1,910
19	Mesa NIA	0	0	2,952	2,952	3,554	3,554	2,529	0	15,543
20	Scottsdale NIA	0	0	1,758	1,758	2,117	2,117	1,506	0	9,257
21	Tempe NIA	0	0	12	12	15	15	10	0	64
22	WMAT NIA	0	0	0	0	9,927	9,927	7,229	0	27,083
23	Reallocation	0	0	0	0	0	0	0	0	0
24	All others	0	0	0	0	0	0	0	0	0
25	M&I	0	0	0	0	0	0	0	0	0
26	Indian Priority	0	0	0	0	0	0	6,379	0	6,379
27	GRIC IP	0	0	0	0	0	0	3,634	0	3,634
28	T-O IP	0	0	0	0	0	0	718	0	718
29	WMAT IP	0	0	0	0	0	0	23	0	23
30	Ak Chin IP	0	0	0	0	0	0	795	0	795
31	FMYN IP	0	0	0	0	0	0	82	0	82
32	Pascua Yaqui IP	0	0	0	0	0	0	10	0	10
33	SCAT IP	0	0	0	0	0	0	858	0	858
34	SRPMIC IP	0	0	0	0	0	0	250	0	250
35	YAP IP	0	0	0	0	0	0	10	0	10
36	TOTAL	0	0	169,024	169,024	110,038	110,038	85,173	0	643,298

	MITIGATION PROPOSAL BY YEAR BY PARTY	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage*	2026 Tier 3 Shortage*	TOTALS
38	AG POOL	0	0	105,000	105,000	70,000	70,000	70,000	70,000	490,000
39	Delivered Wet water	0	0	105,000	88,500	0	0	0	0	193,500
40	Cities USF to GSF	0	0	46,500	46,500	0	0	0	0	93,000
41	Wet Water **	0	0	58,500	42,000	0	0	0	0	100,500
42	Other (Pumps)	0	0	0	16,500	70,000	70,000	70,000	70,000	296,500
43	NIA	0	0	83,979	83,979	110,038	110,038	78,794	0	466,829
44	GRIC NIA	0	0	56,162	56,162	66,620	66,620	47,734	0	293,299
45	Wet Water **	0	0	22,465	22,465	39,972	39,972	28,641	0	153,514
46	Compensated***	0	0	33,697	33,697	26,648	26,648	19,094	0	139,784
47	TON NIA	0	0	0	0	0	0	0	0	0
48	Phoenix NIA	0	0	19,827	19,827	23,871	23,871	16,986	0	104,383
49	Wet Water **	0	0	19,827	19,827	23,871	23,871	16,986	0	104,383
50	Compensated	0	0	0	0	0	0	0	0	0
51	Chandler NIA	0	0	2,087	2,087	2,513	2,513	1,788	0	10,987
52	Wet Water **	0	0	2,087	2,087	2,513	2,513	1,788	0	10,987
53	Compensated	0	0	0	0	0	0	0	0	0
54	Gilbert NIA	0	0	817	817	984	984	700	0	4,304
55	Wet Water **	0	0	817	817	984	984	700	0	4,304
56	Compensated	0	0	0	0	0	0	0	0	0
57	Glendale NIA	0	0	363	363	437	437	311	0	1,910
58	Wet Water **	0	0	363	363	437	437	311	0	1,910
59	Compensated	0	0	0	0	0	0	0	0	0
60	Mesa NIA	0	0	2,952	2,952	3,554	3,554	2,529	0	15,543
61	Wet Water **	0	0	2,952	2,952	3,554	3,554	2,529	0	15,543
62	Compensated	0	0	0	0	0	0	0	0	0
63	Scottsdale NIA	0	0	1,758	1,758	2,117	2,117	1,506	0	9,257
64	Wet Water **	0	0	1,758	1,758	2,117	2,117	1,506	0	9,257
65	Compensated	0	0	0	0	0	0	0	0	0
66	Tempe NIA	0	0	12	12	15	15	10	0	64
67	Wet Water **	0	0	12	12	15	15	10	0	64
68	Compensated	0	0	0	0	0	0	0	0	0
69	WMAT NIA	0	0	0	0	9,927	9,927	7,229	0	27,083
70	Wet Water **	0	0	0	0	9,927	9,927	7,229	0	27,083
71	Compensated	0	0	0	0	0	0	0	0	0
72	Reallocation	0	0	0	0	0	0	0	0	0
73	All others	0	0	0	0	0	0	0	0	0
74	M&I	0	0	0	0	0	0	0	0	0
75	INDIAN PRIORITY	0	0	0	0	0	0	6,379	0	6,379
76	TOTAL	0	0	188,979	188,979	180,038	180,038	155,173	70,000	963,208

	WET WATER** REQUIREMENTS BY YEAR	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage*	2026 Tier 3 Shortage*	TOTALS
78	AG POOL	0	0	58,500	42,000	0	0	0	0	100,500
79	NIA	0	0	50,282	50,282	83,390	83,390	59,700	0	327,045
80	M&I	0	0	0	0	0	0	0	0	0
81	INDIAN PRIORITY	0	0	0	0	0	0	6,379	0	6,379
82	TOTAL	0	0	108,782	92,282	83,390	83,390	66,080	0	433,924

	CAWCD Mitigation Resources	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage *	2026 Tier 3 Shortage*	TOTALS
84	Lake Pleasant Project Water	0	0	50,000	0	0	0	0	0	50,000
85	SRP Exchange (CAWCD ICS reserved)	0	0	10,000	10,000	10,000	10,000	10,000	0	50,000
86	CAWCD ICS (As OFFSET per sub-Paragraph 1.10 of Framework Agreement)	0	0	40,282	73,782	64,890	64,890	47,580	0	291,424
87	Operational Supplies	0	0	5,000	5,000	5,000	5,000	5,000	0	25,000
88	Compensated Conservation			3,500	3,500	3,500	3,500	3,500		17,500
89	Annual Mitigation Balance	0	0	0	0	0	0	0	0	0

90 LAKE MEAD OFFSET USE OF CAP ICS(footnote)	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage *	2026 Tier 3 Shortage*	TOTALS
92 CRIT SC (US/NGOs/State)	0	50,000	50,000	50,000	0	0	0	0	150,000
94 GRIC/AWB Firming	17,000	33,000	0	0	0	0	0	0	50,000
96 CAWCD ICS reserved for SRP Exchange	0	0	10,000	10,000	10,000	10,000	10,000	0	50,000
98 Tribal ICS	0	50,000	0	0	0	0	0	0	50,000
100 US/GRIC Firming (ICS to Lake Mead)	100,000	0	0	0	0	0	0	0	100,000
102 TOTAL	117,000	133,000	60,000	60,000	10,000	10,000	10,000	0	400,000

103 CAWCD Compensated Mitigation	2019 No Shortage	2020 Tier Zero No Mitigation	2021 Tier 1 Shortage*	2022 Tier 1 Shortage*	2023 Tier 2(a) Shortage*	2024 Tier 2(a) Shortage*	2025 Tier 2(b) Shortage *	2026 Tier 3 Shortage*	TOTALS
104 Compensated mitigation	$ -	$ -	$ 8,572,588	$ 8,815,208	$ 7,162,979	$ 7,354,845	$ 5,407,344	$ -	$ 37,312,964
105 Compensated Conservation ****	$ -	$ -	$ 406,000	$ 423,500	$ 413,000	$ 420,000	$ 427,350	$ -	$ 2,089,850
106 TOTAL	$ -	$ -	$ 8,978,588	$ 9,238,708	$ 7,575,979	$ 7,774,845	$ 5,834,694	$ -	$ 39,402,814

*Mitigation NIA % = '20-'22 = 100% for T1, T2(a), T2(b) & 0% T3, '23-'25 = T1&T2(a) = 75%, T2(b) = 50%, T3 = 0%: AG Mitigation per Agreements

** Wet Water = Water from CAWCD mitigation sources

***GRIC Compensated Compensation "floor" = 60% for '20-'22, 40% for '23-'25, use "floor" to illustrate minimum projected compensation for planning purposes

**** Uses the formula: 3,500 af * (current year capital charge + $50), pursuant to Agreement between Metropolitan Domestic Water Improvement District and CAWCD